A6.4-SB007-AA-A13

Information note

Compilation of the public input on removal activities under the Article 6.4 mechanism

Version 02.1

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. The Supervisory Body of the mechanism established by Article 6, paragraph 4, of the Paris Agreement (Article 6.4 mechanism), at its sixth meeting (SB 006), requested the secretariat to open a structured call for input for 14 days from the week of 17 July 2023.[1] The call was open from 18 July to 1 August 2023, and 40 submissions were received from stakeholders in response to the call.

2. The Supervisory Body further requested the secretariat to update the information note "Compilation of the public inputs on removal activities under the Article 6.4 mechanism" to incorporate submissions to the structured consultations undertaken in June–July 2023.

2. Purpose

3. The purpose of this document is to provide an updated compilation of the public input on removal activities under the Article 6.4 mechanism based on recent submissions.

3. Current work

4. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA), at its fourth session, invited Parties and admitted observer organizations to submit their views on activities involving removals, including appropriate monitoring, reporting and accounting for removals and crediting periods, addressing reversals, avoidance of leakage, and avoidance of other negative environmental and social impacts, in addition to the activities referred to in chapter V of the rules, modalities and procedures for the Article 6.4 mechanism by 15 March 2023.[2] Tables 1 and 2 contain the list of inputs received.

5. Table 2 also includes the input received:

   (a) In response to a specific call by the Supervisory Body that was open between 27 September to 11 October 2022 on "Activities involving removals under the Article 6.4 Mechanism of the Paris Agreement";[3]

   (b) In response to calls for input on issues included in the annotated agenda and related annexes of the meetings of the Supervisory Body;[4]

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[1] Details of the call for public input and the full submissions are available at : https://unfccc.int/process-and-meetings/the-paris-agreement/article-64-mechanism/calls-for-input/call-for-input-2023-structured-public-consultation-further-input-removal-activities-under-the.

[2] Details of the call for public input and the full submissions are available at: https://www4.unfccc.int/sites/submissionsstaging/Pages/Home.aspx

[3] Details of the call for public input and the full submissions are available at: https://unfccc.int/process-and-meetings/the-paris-agreement/article-64-mechanism/calls-for-input/sb002-removals-activities.

[4] Details of the call for public input and the full submissions are available at: https://unfccc.int/process-and-meetings/the-paris-agreement/article-64-mechanism/calls-for-input#__22.

(c) In response to calls for input to the structured consultation launched by the Supervisory Body at SB 005, which was open from 6 to 19 June 2023;[5]

(d) In response to calls for input to the structured consultation launched by the Supervisory Body at SB 006, which was open from was open from 18 July to 1 August 2023;[1]

(e) Further, the call for input from stakeholders on methodology requirements was open from 16 March to 11 April 2023.[6] Relevant input received in relation to leakage and permanence are also included in this document under table 2.

6. Part I of this document contains a compilation of input received in response to the calls opened prior to SB 005.

7. Part II (page 85 onwards) contains a compilation of input received in response to the call for input to the structured consultation launched at SB 005.

8. Part III (page 173 onwards) contains a compilation of input received in response to the call for input to the structured consultation launched at SB 006.

9. The secretariat synthesised, paraphrased, and grouped the information in the submissions for easy readability and flow of information. In that process, despite the best efforts, some relevant information may have been unintentionally omitted or not correctly represented. Also, it was difficult to fit some information under the prevailing elements and categories. Moreover, due to some submissions being received late and paucity of time, some input may not have been considered. Future iterations of this document will take into account this additional input. Readers are encouraged to consult the full submissions available at the “Calls for input” web page of the Supervisory Body’s public website to fully understand the background and context in which proposals are made in the submissions.

10. In-text citations in this document (an acronym and a reference number, (e.g. ROK, 57; HLB, 1) are included to enable easy access to the original submissions. The reference section of this document also includes hyperlinks to the submissions.

Table 1. List of Parties who responded to the CMA 4 call for public input

Submission date	Party	Acronym	Reference number
22/05/23	Russian Federation	RU	53
09/05/23	United Kingdom	UK	54
02/05/23	Papua New Guinea on behalf of Coalition for Rainforest Nations	PN	55
17/04/23	Norway	NW	56

[5] Readers are encouraged to consult the full submissions available at the “calls for input 2023” web page of the Supervisory Body’s public web site to fully understand the background and context in which proposals are made in the submissions at: https://unfccc.int/process-and-meetings/the-paris-agreement/article-64-mechanism/calls-for-input/sb005-removals-activities.

[6] Details of the call for public input and the full submissions are available at: https://unfccc.int/process-and-meetings/the-paris-agreement/article-64-mechanism/calls-for-input/sb004-requirements-methodologies.

Submission date	Party	Acronym	Reference number
07/04/23	Republic of Korea	ROK	57
23/03/23	Colombia on behalf of Chile, Colombia, Guatemala, Panama, Paraguay, and Peru	CO	58
15/03/23	European Union on behalf of European Union	EU	59
01/06/23	Brazil on behalf of Argentina, Brazil and Uruguay (ABU)	ABU	60

Table 2. List of stakeholders who responded to the calls for public input

Submission date	Stakeholder	Acronym	Reference number
04/10/22	Hayes Limnology Lab: Ocean alkalinity enhancement using electrolysis	HLB	1
06/10/22	Planetary Technologies: Ocean alkalinity methods	PT	2
10/10/22	GCC: Inputs on Annex 5 to the SB002 annotated agenda	GCC	4
11/10/22	Winrock: ACR & ART input-6.4 removals public comment	ACR	8
11/10/22	Wetlands International: Inputs on removal activities	WI	9
11/10/22	Verdane: Response to UNFCCC Article 6.4 call	VA	10
11/10/22	TREEO: Review Article 6.4 mechanism	TREEO	11
11/10/22	TNC: Removals and REDD-plus	TNC	12
11/10/22	Timber Finance Initiative: Engineered timber as carbon storage	TFI	13
11/10/22	The HBAR Foundation: Response of THF to UNFCC Calls for Input on A6.4M	HBAR	14
11/10/22	Stockholm-Exergi: Contribution by Stockholm Exergi in response to UNFCCC’s Call for input 2022	SE	15
11/10/22	Running Tide: Article 6.4 input for ocean-based carbon removal	RT	17
11/10/22	Perspectives: Input on removal activities under A6.4 Mechanisms	PCR	18
11/10/22	Orsted: Peatlands and BECCS	OD	19
11/10/22	Instituto Acao Verde: Deforestation Double Counting	IAV	22
11/10/22	ICLRC: Response to call for input 2022-Activities involving removals	ICLRC	24
11/10/22	GCCSI: Submission to the A6.4 Supervisory Body Call for Inputs 2022 - SB002-A05	GCCSI	25
11/10/22	Evident C-capsule: Inputs on removal activities	ECP	27
11/10/22	Drax: Response to the A6 consultation	DG	29

Submission date	Stakeholder	Acronym	Reference number
11/10/22	DAC Coalition: Recommendations from Direct Air Capture Coalition	DACC	30
11/10/22	Climeworks: Response to the documents regarding removals under Article 6.4	CW	31
11/10/22	Clean Air Task Force: CATF Article 6.4 Comments	CATF	32
11/10/22	Cercarbono: Additionality and double counting	CCO	33
11/10/22	Center for Clean Air Policy: CCAP Submision Annex 5 to the SB002	CCAP	34
11/10/22	Carbon Recycling: Contributions to the Information Note document	CRCY	36
11/10/22	Carbon Finance Labs: UNFCCC Article 6.4 Contribution	CFL	38
11/10/22	Carbon Engineering: Role of DACCS removal activities	CE	39
11/10/22	Carbon Business Council: Inputs on removal activities	CBC	40
11/10/22	CARBFIX: Subsurface mineralization of CO_2	CARBFIX	41
11/10/22	BeZeroCarbon: Consultation response	BZC	43
11/10/22	Bellona: Response to CDR call for input	BF	46
11/10/22	Arcusa S: Call for input 2022 - activities involving removals under the Article 6.4 Mechanism	SA	47
11/10/22	ALLCOT: Inputs on Land-Based Removals	ALLCOT	48
13/10/22	Center for International Environmental Law: CIEL Submission on Article 6.4 Removals (late submission)	CIEL	50
14/10/22	IETA: Removals input for 6.4SB (late submission)	IETA	51
27/10/22	MDB Working Group comments on the annotated agenda of the third meeting of the Supervisory Body	MDB WG	53
15/03/23	Office of the United Nations High Commissioner for Human Rights (OHCHR) on behalf of The Office of the UN High Commissioner for Human Rights	OHCHR	60
10/04/23	Action Group on Erosion Technology and Concentration (ETC group) on behalf of Action Group on Erosion Technology and Concentration (ETC Group)	ETC	61
21/03/23	Oeko-Institut e.V. Institute for Applied Ecology on behalf of Stockholm Environment Institute, University of Edinburgh and Oeko-Institut	OI	62
17/03/23	Bellona Foundation (BF) on behalf of Bellona Foundation	BF	63
16/03/23	Center for International Environmental Law (CIEL)	CIEL	64

Submission date	Stakeholder	Acronym	Reference number
16/03/23	Heinrich Böll Foundation (HBF)	HBL	65
15/03/23	Global Carbon Capture and Storage Institute on behalf of The Global CCS Institute	GCCSI	66
15/03/23	LIFE Education Sustainability Equality (LESE) on behalf of Women and Gender	LESE	67
15/03/23	Carbon Capture and Storage Association (CCSA)	CCSA	68
15/03/23	ActionAid International on behalf of CLARA submission, submitted by ActionAid International	CLARA	69
15/03/23	International Emissions Trading Association (IETA)	IETA	70
15/03/23	WWF	WWF	71
15/03/23	Institute for Agriculture and Trade Policy (IATP)	IATP	72
15/03/23	Friends of the Earth International on behalf of Friends of the Earth International	FOE INT	73
15/03/23	Institute for Governance and Sustainable Development (IGSD)	IGSD	74
15/03/23	The University of Texas at Austin	UT	77
14/03/23	Indigenous Education Network of Turtle Island (IENTI/IEN) on behalf of Indigenous Environmental Network (IEN)	IEN	78
14/03/23	Carbon Market Watch (CMW) on behalf of Carbon Market Watch (CMW)	CMW	78 (a)
14/03/23	Plymouth Marine Laboratory (PML)	PML	79
14/03/23	Environmental Defense Fund (EDF) on behalf of Environmental Defense Fund, Conservation International, The Nature Conservancy, Wetlands International, Rare, Ocean Conservancy, Ocean & Climate Platform, National Wildlife Federation	EDF	80
20/04/23	Stockholm Exergi	SE	81
31/03/23	Drax Group	DG	82
27/03/23	Friends of the Earth Germany/ BUND	FOE + BUND	83
22/03/23	Friends of the Earth England, Wales and Northern Ireland	FOE UK	84
17/03/23	Carbon Finance Lab	CFL	85
17/03/23	AirCapture and Denominator	AD	86
17/03/23	IEAGHG	IEAGHG	88
22/05/23	Jack Roberts	JR	89
22/05/23	Jason Demeny	JD	90
22/05/23	Thoralf Gutierrez (Sirona Tech)	TG	91
22/05/23	Richard Edwards (Clo Carbon Cymru)	CLO	92
22/05/23	Paul Halloran (University of Exeter)	UOEX	93

Submission date	Stakeholder	Acronym	Reference number
22/05/23	CarbonRun	CR	94
22/05/23	Inplanet GmbH	IP	95
17/03/23	Inplanet GmbH	IP	95
22/05/23	Prof. Ning Zeng (University of Maryland)	UMD	96
22/05/23	Tim Isaksson	TI	97
22/05/23	Planetary Technologies	PT	98
22/05/23	Paolo Piffaretti (Carbonx)	CX	99
22/05/23	David Andersson (ECOERA AB)	ECOERA	100
22/05/23	Adam (Zopeful Climate)	ZC	101
23/05/23	Hanna Ojanen (Carbonculture)	CCULT	102
22/05/23	Tony S. Hamer (GHG PATS)	PATS	103
23/05/23	Carbon-Based Consulting LLC	CB	104
23/05/23	Carbon Removal India Alliance (CRIA)	CRIA	105
23/5/2023	BlueSkies Minerals Inc.	BS	106
24/05/23	Carbon Business Council	CBC	107
24/05/23	Kaja Voss (Inherit Carbon Solutions AS)	ICS	108
24/05/23	Lead authors of the State of Carbon Dioxide Removal Report	SCDRR	109
24/05/23	Cella	CLLA	110
24/05/23	Stockholm Exergi	SE	111
24/05/23	Plymouth Marine Laboratory	PML	112
24/05/23	Injy Johnstone	IJ	113
24/05/23	OpenAir	OAIR	114
24/05/23	OXO Earth	OXO	115
26/05/23	Keep Our Sea Chemical Free	KOSCF	116
27/05/23	Marginal Carbon AB	MC	117
24/05/23	Charm Industrial	CHI	118
24/05/23	Carbon Finance Labs	CFL	119
24/05/23	Dr. Robert Chris	DRCS	120
25/05/23	Stockholm Environment Institute; University of Edinburgh; Oeko-Institut	SEI+	121
27/05/23	Linden Trust for Conservation	LTC	122
29/05/23	1PointFive	1.5	123
24/05/23	Seafields	SF	124
24/05/23	Microsoft Inc.	MS	125

Submission date	**Stakeholder**	**Acronym**	**Reference number**
24/05/23	Climeworks AG	CW	126
27/05/23	Equatic	EQ	127
28/05/23	IEAGHG	IEAGHG	128
29/05/23	Business Council for Sustainable Energy	BCSE	129
30/05/23	Business Council for Sustainable Energy	BCSE	129
31/05/23	Running Tide	RT	130
25/05/23	Negative Emissions Platform and other co-signatories	NEP	131
10/06/23	Phil Kithil	PK	132
11/06/23	CCU Alliance	CCU	133
12/06/23	Timber Finance	TFI	134
25/05/23	Air Capture	AC	135
25/05/23	Mati Carbon Removals	MCR	136
25/05/23	Center for Negative Carbon Emissions	CNCE	137
25/05/23	CarbonPlan	CP	138
25/05/23	Captura	CAPT	139
25/05/23	UNDO	UNDO	140
25/05/23	Neustark AG	N-AG	141
25/05/23	44.01	44.01	142
25/05/23	IETA	IETA	143
25/05/23	Carbon Direct.Inc	CD	144
25/05/23	The Doers Club	TDC	145
25/05/23	Drax Group	DG	146
25/05/23	Carbfix	CARBFIX	147
25/05/23	Puro.earth	PURO	148
25/05/23	CO2RE Hub	CO2RE	149
25/05/23	Swiss Lenten Fund	SLF	150
25/05/23	Coalition for Negative Emissions	CNE	151
25/05/23	Climate Analytics GmbH	CA	152
25/05/23	Climate Action Platform Africa	CAPA	153
25/05/23	The Bioenergy Association of Finland	BEAF	154
25/05/23	Zero Emissions Platform	ZEP	155
25/05/23	Leefmilieu	LU	156
25/05/23	Carbon Gap	CG	157
25/05/23	Orsted	ORST	158

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25/05/23	The Bellona Foundation	BF	159
25/05/23	Fern	FERN	160
25/05/23	Carbon Capture and Storage Association	CCSA	161
25/05/23	Dogwood Alliance	DA	162
25/05/23	CCS+ Initiative	CCSI	163
25/05/23	Stripe Climate & Shopify	SCS	164
25/05/23	Carboniferous	CF	165
25/05/23	National Wildlife Federation	NWF	166
24/05/23	KLIMPO	KLIMPO	167
25/05/23	Direct Air Capture Coalition	DACC	168
25/05/23	Octavia Carbon	OC	169
25/05/23	Aspiration	ASPI	170
25/05/23	Global CCS Institute	GCCSI	171
24/05/23	Carbon Capture Inc.	CCI	172
25/05/23	Biofuelwatch	BW	173
25/05/23	Carbon Capture Coalition	CCC	174
25/05/23	Environmental Defense Fund	EDF	175
24/05/23	Paebbl	PBL	176
25/05/23	EFI Foundation	EFIF	177
25/05/23	Recarb	RB	178
25/05/23	World Resources Institute	WRI	179
25/05/23	Clean Air Task Force (CATF)	CATF	180
24/05/23	Edison Electric Institute (EEI)	EEI	181
25/05/23	Ocean Visions	OV	182
25/05/23	John M. Fitzgerald	JMF	183
26/05/23	Prof. William R Moomaw (Tufts University)	WRM	184
26/05/23	PD Forum	PDF	185
25/05/23	CIBOLA Partners	CIBO	186
25/05/23	Heirloom	HM	187
25/05/23	Perspectives Climate Research GmbH	PERSP	188
25/05/23	Carbon Engineering	CE	189
26/05/23	Boston Consulting Group	BCG	190
25/05/23	Mary S. Boot, Partnership for Policy Integrity and Chad Hansen, John Muir Project	PPI	191
25/05/23	Nasdaq Stockholm	NSQ	192

Submission date	Stakeholder	Acronym	Reference number
09/06/23	Michael Hayes	MHS	200
12/06/23	Blueskiesminerals.inc	BSM	201
14/06/23	Seal Research Trust	SRT	202
15/06/23	CarbonRun	CR	203
15/06/23	Roberto Rochadelli (fupef)	RBI	204
15/06/23	Sky Harvest Carbon (Will Clayton)	SH	205
15/06/23	NovoCarbo	NC	206
15/06/23	Capture6	CAP6	207
16/06/23	Finnwatch	FNW	208
16/06/23	ECOERA	ECOERA	209
16/06/23	OpenAir	OAIR	210
16/06/23	Carbon Business Council	CBC	211
16/06/23	Rick Berg (Nori.inc)	NORI	212
16/06/23	Thomas Hoffmann (Decarbo Engineering GmbH)	THN	213
16/06/23	Timber Finance	TFI	214
16/06/23	CarbonPool	CPOOL	215
17/06/23	OceanForesters	OF	216
17/06/23	Takachar	TAK	217
18/06/23	Carbo Culture	CCE	218
18/06/23	Rewind.earth	REW	219
18/06/23	Clean Air Tech Limited	CATL	220
18/06/23	Elitelco	ELI	221
18/06/23	Otherlab	OLAB	222
18/06/23	Carbon Click, S.A. de C.V	CCL	223
19/06/23	Arca	ARC	224
19/06/23	AirMiners	AMN	225
19/06/23	Seaweed Generation	SWG	226
19/06/23	Max Planck Institute for Biogeochemistry	MPI	227
19/06/23	Carbon Mineralization Flagship Center	CNF	228
19/06/23	Green East Master Ltd	GEM	229
19/06/23	The Charles Darwin Rescue Plan	CDR	230
19/06/23	International Biochar Initiative	IBI	231
19/06/23	CarbonHemp Blo.Inc	CHB	232
19/06/23	CCS+ Initiative	CCSI	233

Submission date	Stakeholder	Acronym	Reference number
19/06/23	Microsoft	MS	234
19/06/23	ecoLocked GmbH	ELG	235
19/06/23	University of Hamburg	UOH	236
19/06/23	German Biochar Association	GBA	237
19/06/23	Omega Terraform	OT	238
19/06/23	Carbon Lockdown Project	CLP	239
19/06/23	Carbofex Oy	CFO	240
19/06/23	Everest Carbon Inc	ECI	241
19/06/23	Dead Battery Depot.ltd	DBD	242
19/06/23	CROPS Carbon International LTD	CROPS	243
19/06/23	Stockholm Exergi	SE	244
19/06/23	Carbonfuture	CFUT	245
19/06/23	C-Capsule	CCPLE	246
19/06/23	Captura	CAPT	247
19/06/23	44.01	44.01	248
19/06/23	XPRIZE	XPZ	249
19/06/23	Skyrenu Technologies	STECH	250
19/06/23	Carbuna AG	CAG	251
19/06/23	The Bellona Foundation	BF	252
19/06/23	Noya PBC	NPBC	253
19/06/23	Equatic	EQ	254
19/06/23	IATA and Airbus	IATA	255
19/06/23	Rivotto	RTTO	256
19/06/23	U.S. Biochar Coalition	USBC	257
19/06/23	FEWCOOP SA	FEWCOOP	258
19/06/23	Cella Mineral Storage, Inc	CLLA	259
19/06/23	Rethinking Removals Doers Club	RRDC	260
19/06/23	Eyob Tenkir Shikur	ETS	261
19/06/23	Kita	KITA	262
19/06/23	The Zero Emissions Platform	ZEP	263
19/06/23	Black Bull Biochar (BBB)	BBB	264
19/06/23	DEMOcritUS	DEMO	265
19/06/23	RedCarbon	RC	266
19/06/23	IEAGHG	IEAGHG	267

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19/06/23	Octavia Carbon	OC	268
19/06/23	Carbon Gap	CG	269
19/06/23	John M. Fitzgerald	JMF	270
19/06/23	Drax Group Plc	DG	271
19/06/23	ARCTECH USA	AU	272
19/06/23	Mati Carbon Removals	MCR	273
19/06/23	Direct Air Capture Coalition	DACC	274
19/06/23	Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science	GRI/LSE	275
19/06/23	Sitos Group, Inc	SGI	276
19/06/23	Crown Monkey	CM	277
19/06/23	Jim Ransom	JR	278
19/06/23	Terrra	TERRA	279
19/06/23	The European Biochar Industry Consortium	EBIC	280
19/06/23	Inventive Resources, Inc	IRI	281
19/06/23	STX	STX	282
20/06/23	HBAR Foundation	HBAR	283
20/06/23	Inversion Point Technologies Ltd	IPT	284
20/06/23	Oeko-Institut, Greenhouse Gas Management Institute, Stockholm Environment Institute, University of Edinburgh Business School, Infras, Carbon Limits, and Calyx Global	OI	285
20/06/23	remove	ROVE	286
20/06/23	Carbon Capture and Storage Association	CCSA	287
20/06/23	Running Tide	RT	288
20/06/23	ActionAid International	AAI	289
20/06/23	Carbon Recycling	CRCY	290
20/06/23	Planboo	PBOO	291
20/06/23	Spark Climate Solutions	SCL	292
20/06/23	From the Ground Up	FGU	293
20/06/23	TecnoFiltro SCS	TFSCS	294
20/06/23	Planetary Technologies	PT	295
20/06/23	Levitree, Inc	LVI	296
20/06/23	Partanna	PNNA	297
20/06/23	Earth’s Blue Aura	EBA	298

Submission date	Stakeholder	Acronym	Reference number
20/06/23	Greg H. Rau	GHR	299
20/06/23	Daniel Schwaag	DS	300
20/06/23	JPMorgan Chase & Co	JPM	301
20/06/23	Climeworks	CWORKS	302
20/06/23	International Coordinating Council of Aerospace Industries Associations	ICCAIA	303
21/06/23	Ted Christie-Miller (BeZERO)	BEZERO	304
21/06/23	Sylvera	SYLV	305
22/06/23	Pachama	PACHA	306
22/06/23	Conservation International	CI	307
23/06/23	Carbon Market Watch	CMW	308
24/06/23	Austrian Biomass Corbonisation Society	ABCS	309
25/06/23	PYREG GmbH	PYREG	310
26/06/23	IETA	IETA	311
23/06/23	Climate Analytics	CA	312
27/06/23	South pole	SP	313
29/06/23	Global CCS Institute	GCCSI	314
19/06/23	Carbon Capture Machine	CCM	315
19/06/23	Climate Land Ambition and Rights Alliance	CLARA	316
30/06/23	Center for International Environmental Law	CIEL	317
30/06/23	Carbon Engineering	CENG	318
30/06/23	Vertree	VRT	319
02/07/23	Carbon Twist	CTWIST	320
02/07/23	Project Developer Forum	PDF	321
03/07/23	Puro.earth	PURO	322
03/07/23	ReGen	REGEN	323
03/07/23	UBQ Materials	UBQ	324
03/07/23	Locus Solutions	LOCUS	325
03/07/23	GROVE VENTURES, Hetz Ventures, Firstime, VINTAGE, Jibe Ventures, GOOD COMPANY, fresh.fund, Epsilon, PLANETech (joint submission)	GROVE	326
04/07/23	Inversion Point Technologies (also submitted on 20 June, see below)	IPT	327
04/07/23	Albo Climate	ALBO	328
05/07/23	Bomvento	BOMV	329

Submission date	Stakeholder	Acronym	Reference number
05/07/23	Aspiration	ASPI	330
05/07/23	Environmental Defense Fund (EDF)	EDF	331
06/07/23	Deep Ocean Stewardship Initiative (DOSI)	DOSI	332
06/07/23	SYNCRAFT Engineering GmbH	SYNCR	333
06/07/23	IGNITE THE SPARK	IGSP	334
06/07/23	Civil society organizations (open letter from 127 signatories)	OPCSO	335
10/07/23	Atmosfair gGmbH	ATMO	336
08/07/23	Indigenous Environmental Network (IEN)	IEN	337
05/07/23	RedCarbon	RC	338
03/07/23	Carbon Business Council	CBC	339
17/07/23	Cornwall Carbon Scrutiny Group	CCSG	340
18/07/23	Government of Quebec	QB	341
20/07/23	New Zealand	NZ	342
21/07/23	Forair	FA	343
24/07/23	NatureBridge	NB	344
27/07/23	Stockholm Exergi	SE	345
27/07/23	SkyHarvest	SH	346
28/07/23	Kita	KITA	347
28/07/23	Perspective Climate Research	PCR	348
31/07/23	International and Comparative Law Research Centre	ICLRC	349
31/07/23	Carbon Recycling	CRCY	350
31/07/23	44moles	44M	351
31/07/23	Isometric	ISOMETRIC	352
31/07/23	Carbfix	CARBFIX	353
31/07/23	C-Capture and International REC Standard	CCPLE + RECS	354
31/07/23	CarbonPool	CPOOL	355
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4. Subsequent work and timelines

11. Further work will be carried out based on the guidance to be provided by the Supervisory Body.

5. Recommendations to the Supervisory Body

12. The Supervisory Body may wish to consider this document and provide guidance for any further work.

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1. Procedural background

1. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA), by its decision 3/CMA.3 “Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement”, requested the Supervisory Body of the mechanism established by Article 6, paragraph 4, of the Paris Agreement (the Supervisory Body) to elaborate and further develop, on the basis of the rules, modalities and procedures of the mechanism (RMPs, contained in the annex to the decision) recommendations on activities involving removals, including appropriate monitoring, reporting, accounting for removals and crediting periods, addressing reversals, avoidance of leakage, and avoidance of other negative environmental and social impacts, in addition to the activities referred to in chapter V of the RMPs (Article 6, paragraph 4, activity cycle).

2. The CMA, by decision 7/CMA.4, paragraph 22, requested the Supervisory Body to consider broader inputs from stakeholders provided in a structured public consultation process while developing the recommendations referred to in the paragraph above.

3. The following sub-sections present an overview of the feedback received. The submitting organizations are identified by their acronyms and reference number as shown under the cover note. A complete list of references is included under the Reference section of this document.

Part I. Inputs received in response to the calls opened prior to SB 005

2. Cross-cutting issues

4. The SB 005 Information Note calls for a discussion of Cross-cutting questions as follows:

(a) Discuss the role of activities involving removals and this guidance in supporting the aim of balancing emissions with removals through mid-century;

(b) What are the roles and functions of the following entities in implementing the operations referred to in this guidance: Activity proponent(s), Article 6.4 mechanism Supervisory Body (6.4SB), 6.4 mechanism registry administrator, Host Party, stakeholders?

(c) How are these elements understood, in particular, any interrelationships in their functions, timeframes, and implementation?

(d) Monitoring period;

(e) Crediting period;

(f) Timeframe for addressing reversals.

2.1. Overarching role of removals

5. Below is a summary of public inputs received.

6. All types of removals are needed to reduce net emission levels, balance residual emissions toward net-zero emissions, and achieve and sustain net negative emissions. Article 6.4 is perceived as a global standard for methodologies for carbon dioxide removal (CDR) activities. [JD, 90]

7. According to the IPCC, all emissions pathways that limit planetary warming to 1.5°C by the end of the century without overshoot, and 87% of pathways that limit warming to 2°C, rely on large-scale atmospheric CDR. [EDF, 175]

8. According to the IPCC AR6 Synthesis report, CDR will be needed at gigatonne scale by mid-century to meet the goal of the Paris Agreement. [OA, 114]

9. CDR technologies play an important role in bridging the gap between current emission reduction efforts and reaching net zero. [IP 95]

10. The State of CDR report highlights the importance of “engineered-based” CDR in the mitigation scenarios as assessed by the Intergovernmental Panel on Climate Change and the limited potential of “land-based” CDR methods to provide the required quantities of removals on their own, therefore, the need to complement these with engineered based CDR to keep the Paris climate goals within reach. [SCDRR, 109]

11. The most valuable role Article 6.4 can provide is finance and infrastructure for scaling up technological removal, which the current plan does not sufficiently provide. [IJ, 113]

12. While direct emissions reductions are critical to meeting the goals of the Paris Agreement and Article 6.4, the use of CDR is “unavoidable”, according to the IPCC to limit global warming to 1.5°C would require CDR on the order of 100–1000 GtCO2 during the 21st century. And to reach the upper range of this, engineering-based removal activities will be needed. [LTC, 122]

13. Considering the complementary role of CDR “to deep, rapid, and sustained emission reductions” as IPCC establishes, a mechanism is needed to avoid a conflating between mitigation from emission reductions and CDR so as to allow for more clarity on the role, foreseen share and timing of CDR. [CW, 126]

14. Article 6.4 mechanism should take a technology neutral approach that is aligned with scientific assessments of keeping the 1.5°C target. As the bulk of CDR needed for that would need to come from engineered CDR methods, it should support both land-based and engineering-based removal activities. In addition, there is a need to clearly differentiate between emissions reduction and removal so as to safeguard against CDR hampering far-reaching emission reductions. [NEP, 131]

15. Rather than categorizing solutions, Captura supports a method-neutral approach to methodology, with solutions assessed based on a universal set of criteria, such as those outlined by the Oxford Offsetting Principles, to allow the mechanism to support the most feasible solutions available on the market, including those that are currently in earlier stages of development. [CC, 139]

16. The Global South's abundance of untapped renewable energy potential is key: removal solutions with a high need for renewable energy, can provide anchor industrial demand that will enable investment in renewable energy, thus improving energy access. This abundance, paired with low existing emissions, means limited moral hazard for the deployment of new renewable energy capacity, as there is little high emission industrial infrastructure to displace. We urge the Supervisory Body to take the time to directly engage with any of the dozens of CDR practitioners and companies currently actively planning or considering projects or activities in the Global South. The Doers Club would be pleased to help facilitate that engagement. Regarding the process, SB would benefit from a broader and more inclusive consultation process. [CRDC, 145]

17. Request for the inclusion of all durable carbon removals but those to be included should be able to demonstrate environmental and social safeguards, and do no significant harm, and are required to meet the long-term goals of the Paris Agreement. [PE, 148]

18. Implementation of CDR technology at scale has the potential to help address energy poverty CDR can be a catalyst for green industrial development and economic growth in Africa. [CAPA, 153]

19. Establishing a global standard for methodologies for carbon removal activities, including novel removal activities, requires buy-in from market participants and other stakeholders. Carbon market rule-setters across the world are eagerly awaiting the guidance and methodologies to be developed under Article 6.4. [CCSI, 163]

20. There are already notable cases of public and private efforts to advance removal technologies in developing countries. For example, Ocean Visions, in partnership with the UN Decade of Ocean Science for Sustainable Development, is working with key stakeholders in developing countries to support capacity building and knowledge transfer to accelerate Ocean CDR research and development that could potentially lead to

implementation at scale. Engineered removals serve the objectives of the Article 6.4 mechanism as they promote mitigation of greenhouse gas emissions via enhancement of "sinks" while also promoting sustainable development; It is therefore an imperative to collaboratively advance all potential climate solutions including Ocean CDR and then deploy at scale the most promising ones, based on the best available scientific knowledge, comparative risk assessment, and socioeconomic benefits. [OV, 182]

21. As stated by the IPCC, durable carbon removals are required to meet the long-term goals of the Paris Agreement. As shown in the IPCC AR6 WG3 report (Chapter 12, section 3 of the Information Note on removal activities under Article 6.4), the volumes of future global carbon dioxide removal (CDR) deployment assumed in IAM (Integrated Assessment Models)-based mitigation scenarios are large compared to current volumes of deployment, which means that rapid and sustained up-scaling is required if we are to meet the Paris target. [NSQ, 192]

22. Biofuelwatch is deeply concerned about the inclusion of carbon dioxide removals into carbon market mechanisms in general. We believe that this would further delay vital efforts to reduce greenhouse gas emissions at source. Companies are announcing becoming "carbon negative" against a backdrop of a high emission pathway, especially from supply chains; supposedly offset by "negative emission" including BECCS and Direct Air Capture. And oil companies such as Eni are using investments in afforestation and reforestation, i.e. industrial tree plantations, to claim that they are offsetting their actual carbon emissions from fossil oil and gas, moreover often with no mention of the communities living on or using that land for their livelihoods. [BW, 173]

2.2. Removals for NDC achievement

23. Below is a summary of inputs received on the role of activities involving removals for NDC achievement:

24. As engineered removals forms an integral part of some countries' strategy, they should be part of the Article 6.4 mechanism scope to facilitate the achievement of the NDCs. [JD, 90]

25. Article 6 has immense potential to assist nations to achieve their NDCs more efficiently and to increase ambition. More specifically, Article 6.4 can assist countries that lack the capacity to implement domestic trading schemes. In addition to steep emission reductions, removals are necessary to achieve and sustain net negative emissions for which all types of removals (land-based and engineered) will be needed, and many novel removal methods are ready to be used by countries in their climate targets. The European Union' framework for removals through the Carbon Removal Certification Framework (CRCF) is under development and its methodologies would follow to correspond with the expected publication of Article 6.4 mechanism. In addition, separate frameworks and methodologies must be developed for emission reduction and carbon dioxide removal as Verra is planning to launch updates to their programme to differentiate reduction credits from removal. [Clo, 92]

26. The market shows growing demand for durable and quantifiable carbon removal solutions offered by engineered solution and willingness to accept higher costs in comparison to shorter-term and hard-to-measure purely land-based solution and scepticism about the quantitative role the latter can play. Ideally, the Article 6.4 framework should enable development of mega- and gigatonne engineered CDR. Many of engineered removals

pathways promote sustainable development and as they scale up, they have the potential to contribute to NDCs alongside decarbonisation and other forms of mitigation activity. [ZC, 101]

27. As countries rely on engineered removals to achieve their climate targets; achieving NDCs without engineered approach would be difficult. Article 6.4 is viewed as a global standard setter for methodologies for carbon removal activities, thus leaving engineered removals out of article 6.4 would imply missed opportunity to establish robust methodologies on a global level. [CC, 102]

28. Countries rely on engineered removals to achieve their climate targets and removals will become increasingly important. Article 6.4 is viewed as global standards for methodologies in carbon removal activities, thus excluding “engineered” removals from the scope would imply missed opportunity to develop robust methodologies on a global level. [MC, 117]

29. The role of engineered removals in meeting Nationally Determined Contributions Article 6.4 should provide countries with a supportive mechanism to help them reach their NDCs. Increasingly, countries are incorporating the use of engineered carbon removals into their NDCs to help them abate hard-to-decarbonize sectors, for example the United Kingdom’s Net-Zero Strategy 25 sets out specific targets for engineered removals in the interim to 2050. Belgium’s National LTS focuses on DACCS and BECCS, Given the diminished importance placed on permanent and durable storage in the information note, the proposed framework will make it harder for these countries to achieve their NDCs. [DACC, 168]

2.3. Outlook for specific removal technologies

30. In the Indian context, CDR activities and credits serve as a means for financial redistribution to some of the world’s poorest. The additional benefit of Biochar carbon removal improves the livelihood of the poorest by improving soil quality and raises yields. [CRIA, 105]

3. Inputs on specific elements

3.1. Definitions

31. The SB 005 Information Note includes a call for a discussion on potential elements of definitions for “Removals”.

32. Below is a summary of public inputs received on these issues.

3.1.1. General approach to definition

33. The Supervisory body may wish to define different types of removal activities. A high-level categorization could include the following two broad categories:

(a) Increasing the natural uptake of carbon in biogenic reservoirs: This may include living biomass, dead organic matter), soil organic carbon and harvested wood products (IPCC pools). It may involve different types of activities, such as afforestation/reforestation or restoration of degraded ecosystems. The extent to which carbon pools may qualify to generate credits under Article 6.4 needs to be carefully assessed;

(b) Long-term storage of carbon in geological or other non-biogenic reservoirs: This may include, inter alia, direct air capture and storage (DACCS), bioenergy carbon capture and storage (BECCS), storage of carbon in products or enhanced weathering. [EU, 59]

34. These two broad categories could be further subdivided by types of mitigation activities. [EU, 59]

35. The ROK supports the current comprehensive definition of removal which provides a room for direct air carbon capture and storage (DACCS) and direct air capture and carbon utilization (DACCU) technologies to be included as eligible removal activities. [ROK, 57]

36. The Supervisory Body should use a criteria-based approach to define CDR. CDR encompasses a wide range of approaches, some of which may not yet exist, and many of which transcend historical (and arbitrary) binaries, such as "land-based" versus "engineered." Encouraging this diversity is critical not only because of the nascent state of the field, but because of potential constraints on any single approach's ability to scale [SCS, 164]

37. A stakeholder workshop is proposed for the near future to address open issues and unclear definitions. With considerable small additional efforts, it will be possible to get good removal standards/methodologies. For such kind of workshop, we can develop more detailed and elaborated input than we can do now shortly before your meeting. [PD, 185]

38. A narrow definition of CDR hinders the industry's ability to find suitable solutions to climate crisis. The definition of acceptable methods for CDR should be broadened by adopting the definition presented by the Carbon Business Council. (See [CBC, 107]) [BS, 106]

39. Table 1.1 in the State of CDR report[7] provides an expert assessment of technology readiness level (TRL), and known risks as well as co-benefits, based on the literature and does not imply that engineering-based activities are technologically unproven and have unknown risks. [SCDR, 109]

40. Technology Readiness Levels (TRL) should be considered rather than excluding those that are not yet proven. As a given technology's TRL advances, it should become available under Article 6.4. Limiting inclusion of emerging technologies would hinder the development and commercialization of such technologies. Any activities that measurably and demonstrably reduces atmospheric carbon dioxide concentration while avoiding social and economic harm should be eligible as excluding any technology that is not already at scale from A6.4 contradicts the fact that all approach needed to meet the goals of the Paris Agreement. [AC, 135]

3.1.2. Using IPCC definitions vs going beyond IPCC definitions

41. Is important to consider the potential value of removal methods that also focus on the capture and permanent storage of other greenhouse gases. Stringent methane emissions reductions are directly linked to deep reductions of CO_2 needed by 2030 in 1.5°C compatible pathways. Therefore, UK domestic policy focuses on 'Greenhouse Gas Removals' (GGRs) where others may be more familiar with terms such as carbon dioxide removal, or CDR. The UK therefore favours pursuing the IPCC definition of carbon dioxide removals but expanded to include all greenhouse gases (GHGs). The UK does not see

[7] https://www.stateofcdr.org/resources (page 23 of the downloadable pdf report).

the rationale for limiting the type of GHG in the definition at this stage and believes it may risk prematurely disincentivising the development of future GHG removal technologies. As for activity categories, the UK recognizes a range of approaches as removals, which fall very broadly into two categories. This does not represent an exhaustive list of potential Article 6.4 removal activities, nor an indication of their eligibility. The broad two categories are:

(a) Nature-based methods such as afforestation and forestry management, other forms of habitat restoration (including blue carbon) and soil carbon sequestration can remove and store carbon dioxide at scale while delivering a range of additional environmental benefits such as biodiversity gain, air quality, and soil health. Nature-based removals are already a mature approach for capturing and storing carbon and, especially in the case of tree-planting, codes already exist to allow trading on the voluntary carbon market. While nature-based removals are already available at scale, their contribution can be limited by factors such as land availability and timescales for sequestration;

(b) Engineered solutions, such as Direct Air Carbon Capture and Storage (DACCS) and Bioenergy with Carbon Capture and Storage (BECCS), are necessary to offset and remove residual greenhouse gas emissions from hard to abate sectors and can offer highly durable removal of greenhouse gases from the atmosphere, potentially for thousands of years. Whilst the Information note: Removal activities under the Article 6.4 mechanism appears to classify BECCS as a land-based biological removal, the UK views BECCS as an engineered removal technology, given the engineering elements of the activity associated with carbon capture and storage. [UK, 54]

42. The UK also recognises that there is a suite of novel seawater-based greenhouse gas removal methods, (e.g. ‘Direct Ocean Capture’), that are at an earlier technological stage than DACCS or BECCS methods, that the UK classifies as engineered solutions. The UK believes that after guidance relevant for all Article 6.4 activities (both reductions and removals) is established, distinct guidance should build on this, and be developed for certain types of activities. At a minimum this should include separate guidance on methodologies for nature-based and engineering-based removals. This is due to the fact the individual monitoring, reporting and verification (MRV) protocols will inherently be activity specific. [UK, 54]

43. CATF recommends using the latest definition of Carbon Dioxide Removal provided by the IPCC Working Group III contribution to the Sixth Assessment Report Technical Summary: “Anthropogenic activities removing CO_2 from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological, geochemical or chemical CO_2 sinks, but excludes natural CO_2 uptake not directly caused by human activities.” Compared to the definition used in the IPCC Special Report on 1.5 degrees and the IPCC Working Group III Annex 1: Glossary, the definition outlined above has replaced “direct air capture” with a technology-neutral reference to “chemical CO_2 sinks”. In line with the IPCC, CATF considers CDR methods based on this definition to include enhancement of terrestrial- and ocean-based sinks through anthropogenic interventions such as forest management, afforestation and reforestation, coastal wetland restoration, and soil-carbon sequestration. [CATF, 32]

44. There is already a widespread confusion of terms, in case the application of Art 6.4 requires a departure from the definition proposed by IPCC AR6-WG-III, the document should clearly describe why that is necessary as well as how the proposed definition would be different. [SE, 15]

45. It would be useful to understand why a departure from the existing definition by the IPCC AR6-WG-III is required and how it would differentiate. If a new definition is required, we believe carbon should be replaced with GHG in consideration of allowing for ongoing innovations associated with other emission removal types (e.g.CH_4). These could be normalized to CO2e. [ECP, 27]

46. The definitions in the CDR space are often used inconsistently. Distinguishing between “engineering-based” and “land-based” carbon removal strategies is unclear and unnecessary, as an emerging set of solutions straddle both categories. We recommend the UNFCCC leverage its global leadership to bring greater clarity to this space by adopting a more specific definition of CDR that is consistent with existing norms and true to the fundamental goals of the process (for example, as used in IPCC AR6 WGIII Report Glossary p 1,796. Referred IPCC glossary extract is included below under paragraphs 17 (a) and (b):

    (a) Anthropogenic removals: The withdrawal of greenhouse gases (GHGs) from the atmosphere as a result of deliberate human activities. These include enhancing biological sinks of CO_2 and using chemical engineering to achieve long-term removal and storage. Carbon capture and storage (CCS), which alone does not remove CO_2 from the atmosphere, can help reduce atmospheric CO_2 from industrial and energy-related sources if it is combined with bioenergy production (BECCS), or if CO_2 is captured from the air directly and stored (DACCS). [Note: In the 2006 IPCC Guidelines for National GHG Inventories (IPCC 2006), which are used in reporting of emissions to the UNFCCC, ‘anthropogenic’ land related GHG fluxes are defined as all those occurring on ‘managed land’, i.e. “where human interventions and practices have been applied to perform production, ecological or social functions”. However, some removals (e.g. removals associated with CO_2 fertilisation and N deposition) are not considered as ‘anthropogenic’ or are referred to as ‘indirect’ anthropogenic effects, in some of the scientific literature assessed in this report. As a consequence, the land-related net GHG emission estimates from global models included in this report are not necessarily directly comparable with LULUCF estimates in national GHG Inventories.]

    (b) Carbon dioxide removal (CDR): Anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological or geochemical CO_2 sinks and direct air carbon dioxide capture and storage (DACCS) but excludes natural CO_2 uptake not directly caused by human activities. See also *Anthropogenic removals, Afforestation, Biochar, Bioenergy with carbon dioxide capture and storage (BECCS), Carbon dioxide capture and storage (CCS), Enhanced weathering, Ocean alkalinisation/Ocean alkalinity enhancement, Reforestation, and Soil carbon sequestration (SCS*). [EDF, 175]

47. The IPCC’s definition of CDR as “anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products” (IPCC AR6 WGIII Report p1,796) should be followed. The label of

"engineering-based" should be avoided as most CDR approaches are hybrid of nature and engineering. Furthermore, CDR is a new commercial sector and encompasses a range of pathways, from land-based soil and forest carbon sinks, biomass-based carbon removal and storage (BiCRS) to marine carbon dioxide removal (mCDR) to mineralization-based approaches to direct air capture (DAC), as well as emergent and yet-undiscovered methods. The sector is advancing quickly, and there are a number of approaches ready for deployment now, with more expected to reach that stage of maturity in coming years. To account for above, a method-neutral, criteria-based approach should be employed to determine eligibility of individual CDR project' under the Article 6.4 mechanism. Five key criteria for high-quality CDR are additionality, durability, net-negativity, verification, and equity and community engagement. [CBC, 107]

48. If the implication is that CCS of incinerated biogenic waste is not considered to be a removal, we disagree with this interpretation. Such CCS does face a set of requirements to be considered a removal but cannot a priori be deemed not to be a removal with regard the biogenic portion. [SE, 15]

49. Definitions must be consistent with the most up-to-date Intergovernmental Panel on Climate Change (IPCC) guidelines or decisions adopted by the Convention, the CMP and the CMA. 4. Definitions of parameters, concepts or approaches needed for crediting removals should be adopted after achieving a common understanding of each of them (i.e. time horizon, permanence period, storage period, among others). Categories and subcategories of the removal activities must be clearly defined and must have a delimited scope to facilitate the development of an appropriate methodological approach to quantify and monitor the removals achieved with an activity. [CO, 58]

50. The Information Note on removals presents a suggestion (paras 21-22) that an IPCC definition of removals be expanded beyond removal from the atmosphere, to include removal from the ocean. Article 6.4 rules should not rewrite IPCC definitions that were adopted by consensus, and which address removal from the atmosphere. Moreover, marine or ocean-based geoengineering is not an appropriate topic for consideration under Article 6.4. As other commenters have noted, the Supervisory Body should acknowledge and respect moratoria in place under other treaty processes. [CA, 152]

51. The IPCC's definition of CDR as "anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products" should be adopted. [OA, 114; CBC 107]

3.1.3. Definition of components (e.g. storage)

52. The Supervisory Body should consider the definition of a geological storage to also explicitly include mineralization in addition to "isolation from the atmosphere". The definition of a suitable site should not be limited to porosity and cap rock, but be defined by the objective of said characteristics as stated in (c) (i) "All available evidence, such as data, analysis and history matching, indicates that the injected carbon dioxide will be completely and permanently stored such that, under the proposed or actual conditions of use, no significant risk of seepage or risk to human health or the environment exists;". The requirement of porosity and caprock may be limiting to innovations in geological storage. Furthermore, it should be clarified that various states of carbon oxides (not just dioxides) can safely be injected and stored in geological reservoirs including liquid, in solution, in supercritical. [CW, 31]

53. The term "carbon sequestration" is not defined elsewhere, therefore, we recommend using the term "carbon storage" instead. Please consider our proposal (https://carbon-recycling.eco/) consisting of the same conversion technology (heating in an oxygen-limited environment) but defining a slightly different term of "Biocarbon" (and "Pyrocarbon"). The term biochar is defined by IPCC as a product for disperse soil application (without a monitoring of its permanence in the future), whereas the biocarbon is proposed to be tangibly disposed in a site subject to regular monitoring of the removed and stored biocarbon stocks. [CR, 36]

54. Taxonomy of removal activities. The following are the broad types of removal methods: (a) Biological methods: The separation of CO_2 from the atmosphere is achieved through the photosynthesis process. These methods can be further divided into: (i) Land based biological methods consisting of tree planting or regeneration of natural vegetation such as forests. Almost all current removals come from this category; This definition only includes CO_2 removal by afforestation and reforestation. In fact, growing forests now remove an amount of nearly 30% of annual emissions. This value can be substantially increased and perhaps doubled by managing more existing forests to achieve their potential for carbon accumulation and biodiversity by avoiding harvest. [WRM, 184]

55. This management option has been called "proforestation." In 2022, IPCC AR6 WG2 page 303 stated, "It is also the case that protection of existing natural forest ecosystems is the highest priority for reducing GHG emissions (Moomaw et al., 2019) and restoration may not always be practical. An actual demonstration that halting harvest (proforestation) results in major increases in carbon dioxide removal and accumulation of carbon in forests has been found in Tasmania when half the forest harvests were abruptly halted, within less than a decade, emissions from LULUCF went from +10 to -12 MMt CO_2. [WRM, 184]

56. Table 4 does not include proforestation that produces large trees that store disproportionate amounts of carbon. Lutz et al. (2018) found in a survey of 48 mature and old growth forests globally, the largest 1% of trees stored half the carbon. The four more heavily harvested forests in the United States in the study had just 30% of the carbon in the largest 1% of trees. [WRM, 184]

3.1.4. ‘CO2’ removal vs ‘GHG’ removal

57. IETA believes that the definition of removals should be clear and simple to avoid risks pertaining to environmental integrity. Yet, it should remain open for potential methods for carbon dioxide removals still under development. IETA agrees with the proposed definition from the IPCC that “CDR refers to anthropogenic activities removing CO_2 from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological, geochemical or chemical CO_2 sinks, but excludes natural CO_2 uptake not directly caused by human activities. Considering the limited experience and assessment of removal activities covering other greenhouse gases (GHGs) apart from CO_2, IETA do not see a need to explicitly address those in the definition of removals for the purpose of the Article 6.4 Mechanism, especially where these may risk conflating emission reductions and carbon removals. [IETA, 70]

58. Article 6.4 work on ‘removals’ should be conducted with a clear understanding that the scope is for removals of all greenhouse gases addressed by the UNFCCC. This is so despite a near term practical focus on CO_2 as other GHG removal methods may become more relevant over time. [PTV, 18]

59. For the sake of clarity, it is preferable to only focus on the removal of CO_2 from the atmosphere, since the removal of other GHGs is not currently anticipated at relevant scales and it is unclear if the removal of other greenhouse gases has a comparable mitigation effect to the removal of CO_2. [BF, 46]

60. Using CDR (carbon dioxide removal) instead of GGR (GHG removal) is logical when we are speaking about ecosystem-based removals. However, the removal of methane becomes more and more actual task. [WI, 9]

61. Trying to change the definition of removals, which is nothing more than the capture and storage of CO_2 emissions already in the environment, is complicating the discussion, more specifically:

    (a) It is not scientifically justifiable to treat temporary greenhouse gases equally to carbon dioxide as the GWP cannot be measured empirically and requires a choice of the time horizon. Carbon removal should be limited to carbon dioxide;

    (b) The definition must include all components of the mobile carbon pool (environment), not just the atmosphere. Defining carbon removal activities by where the CO_2 is captured will restrict options;

    (c) The definition focuses heavily on where the carbon dioxide is sourced but omits the fact that if a tree has been growing for decades and is cut down for BECCS, this tree is no longer part of the mobile carbon pool. Extending the minimum sequestration duration to 200-300 years would open the door for cutting down old growth;

    (d) The discussion of ownership arises because the mechanism focuses on removals. This could be avoided by focusing on storage instead as whether the carbon dioxide is captured from the source or the environment makes no difference. [CNCE,137]

62. Other factors need to be recognised in addition to CO_2 as ecosystems can store organic carbon whilst also contributing to global warming through emissions of non-CO_2 Green House Gases (GHGs). For example, wetlands are a source of methane. This methane can offset the carbon stored in coastal macroalgae habitats. Same applies to the contributions from nitrous oxide that are largely unknown. [PML, 112]

63. According to the Institute for Governance and Sustainable Development (IGSD) methane removal deserves a much greater emphasis than it has yet received in the documents and plans under A6.4. Methane removal is likely to be no less crucial than CO_2 removal, hence the urgency in understanding what options may be available here. And methane removal and CDR play fundamentally different roles in the climate solution ecosystem. Ideally, we should have them both, and they shouldn't be pitted against each other. [JF, 183]

3.1.5. Distinguishing reductions and removals

64. The Supervisory Body should establish workable definitions for reductions and removals to be agreed upon in tandem. This is especially considering the flexible nature of CCS, where point-source CCS projects can be considered reductions, while Direct Air Carbon Capture and Storage (DACCS) and Bioenergy Carbon Capture and Storage (BECCS) projects can be considered removals. The flexible nature of CCS is further demonstrated through the use of CCS networks, which can function for both reduction and removal

technologies, and that further streamline the necessary cost and resource efficiencies necessary for achieving the goal of the Paris Agreement and unlocking the 'net' in net zero emissions. Such nuances in the various applications of CCS technologies renders the case for the Supervisory Body to further discuss CCS in more detail in upcoming defining sessions involving removals. [GCCSI, 25]

65. Reporting the capture of biogenic carbon as avoidance or reduction would create an inconsistency between the accounting of CO_2 for the purposes of the 6.4 mechanism and those same emissions when accounted for in host country greenhouse gas emission inventories. As such, the importance of appropriate eligibility criteria is essential, to ensure that only biomass that has a neutral or positive carbon impact on the land sector during the project lifetime provides a removal supported by the carbon market. [DG, 146]

66. Mixed Farming and Agroforestry Systems (MiFAS) combines emission reductions and biogenic carbon dioxide removal through optimisation of resources and diversified production (energy, crops, trees, livestock) by different enterprises. It is theoretically transferable across Europe, North America, Canada and some regions of Asia and South America and expected to bring multiple co-benefits including economic and environmental. [Clo, 92]

3.1.6. Benefits of a reliable harmonized definition

67. A reliable and accurate definition of ‘removal activities’ is crucial to ensure a sound policy framework from the beginning. The principles adopted by the Advisory Council of the European Zero Emission Technology and Innovation Platform, outline the need for removal activities to specify the atmospheric origin and permanent storage of the removed CO_2, but also emissions associated with the removal process should be included in the emission balance and that the ‘net’ balance of a removal process should always be negative (i.e. remove more than is emitted) for it to qualify as a removal. The definition for ‘removal activities’ should include ‘net of all associated emissions’, to ensure that any certificate or credit issued on the basis of CDR actually results in a net removal from the atmosphere. [BF, 46]

68. Clearly defined terms will help establish understanding and a common set of principles across markets. These definitions likely need to be developed by a government body or third party and will benefit from broad stakeholder buy-in and community input. An improved definition is particularly needed for additionality, which is interpreted, determined, and weighted differently across players and markets. Encompassing and tech-neutral definitions for compliance and voluntary carbon markets will help to ensure that a wide a range of solutions as possible can be scaled up. [CBC, 40]

69. A clear definition and scope of the type of activity also contributes to reduce the risk of double counting. After classifying activities, it is crucial to ensure that a methodological approach will be developed only for those activities/technologies that are in a stage that could be replicated or deployed at scale to minimize the uncertainty of the impact in terms of CO_2 removal capacity. The risks and impacts of an activity must be sufficiently studied so that the implementation of the activity can take place properly ensuring that any negative side effect that may occur are taken into account and mitigated (i.e. ocean fertilization, ocean alkalinization). [CO, 58]

3.1.7. Concerns on Broad definition

70. A definition like the one then recommended by the Supervisory Body would be problematic as it could open the door to all manner of removal activities and putting them all on the same qualifying level, in the first place. In our view this open definition comes with in part serious risks to environmental and human systems and could threaten land and marine ecosystems, human rights and livelihoods. Storage in products should generally not be considered a removal activity under the Article 6.4 mechanism as most products have a short lifespan after which greenhouse gases will be re-released into the atmosphere, which does not comply with the demand for permanence of storage or reducing emissions. [HBL, 65]

71. The current definition on “removals” is excessively broad to the extent that it could include all types of anthropogenic activities/removal activities–including processes and in products–as long as that activity could remove greenhouse gases (GHG) from the atmosphere, even when the removal is temporary. This is a red flag for us and we want to underscore the need for due diligence to ensure environmental integrity and promote positive outcomes in terms of human rights, the right to health, gender equality, and the rights of local communities, Indigenous Peoples and Afro Descendants as well as other rights mentioned in the preambular of the Paris Agreement. [LESE, 68]

72. Products were problematically included in the definition of removals. Products should not be used in any definition of removals as a basis for crediting, due to impermanence risks outlined previously. Under such a definition, all wood products could qualify, yet these will not be able to satisfy permanence on the necessary time scale of at least 2-3 centuries. Similarly, such a definition could also allow crediting for synthetic fuels emanating from CCUS, even though these would be used at some point and hence the emissions would be re-released to the atmosphere (this is also because “durably store” is not specific enough in the definition and is open to interpretation). [CMW, 76]

73. Broadening the definition of Removals by including products as possible sinks is problematic, due to the large variability in permanence and the fact that no actors have formal control over the lifespan of products. We therefore suggest that products not be included. [WWF, 71]

74. We agree that the duration of carbon storage in harvested wood products is typically not very long, as acknowledged by IPCC rate constants for loss of carbon from these pools. [PPI, 191]

75. Harvested wood products can be seen as a lateral transfer of forest carbon into another pool – a transfer that is usually extremely leaky, entailing losses of up to 90% of the ecosystem carbon. The trade-off between storing limited carbon in products with a disproportionately large loss of carbon from forests is illustrated by work done by the European Commission’s Joint Research Centre (JRC) finds that wood products do not offer a net benefit by 2050, which is when the Paris Agreement calls for a balance between sources and sinks. [PPI, 191]

76. The SB is urged to eliminate reference to wood products as a viable strategy for removing and storing carbon and instead emphasize the importance of protecting as much forests as possible -- including allowing degraded, managed forests to grow old and intact -- as delivering the biggest carbon removal and storage impact. Beyond carbon storage, restoring ecological integrity lost as a result of logging for wood production is vital to

optimizing forests' ability to help protect communities against impending climate shocks including heat waves, floods and droughts. [DA, 162]

77. "Ocean carbon reservoirs involve a specific set of risks, challenges and opportunities:

(a) Poorly understood processes with potential synergistic impacts and long-term effects, such as proposals to increase CO_2 dissolved in ocean water or deposited on the ocean floor, must not be included in the scope of this Guidance;

(b) Significant science and governance gaps to be considered, particularly in international waters; thus a precautionary approach must prevail;

(c) However, some site-specific blue carbon activities in well-studied and the science may be robust enough. Coastal blue carbon ecosystems – such as mangroves, seagrasses and tidal marshes – sequester and store globally significant quantities of carbon in their biomass and underlying soils, which can be released if these ecosystems are disturbed by anthropogenic activities. In addition to climate mitigation benefits, these ecosystems provide a multitude of other services including resilience to climate change impacts." [WWF, 71]

78. Ocean-based carbon dioxide removal (OCDR), whether driven by biological or engineering-based methods, remains largely untested and more research is needed to understand the potential effects, durability, benefits, and risk of these activities. OCDR could have negative impacts on marine wildlife and human communities, especially if deployed without sufficient safeguards. OCDR activities should also require thorough, timely, and transparent communication with communities. In contrast, there are a handful of “low regret” ocean-based carbon removal activities that should also be scaled up, such as restoration of seagrass meadows, mangrove forests, and kelp forests. Such activities are likely to generate co-benefits for people and biodiversity, without presenting the same risks as “concept-stage” OCDR activities. [NWF, 166]

79. The IPCC AR6 Synthesis Report makes clear that avoided conversion is the greatest mitigation opportunity in the land sector (and one of the top opportunities in all sectors) in this decade.[8]However, the Article 6.4 framework completely excludes avoided conversion (or in other words, fails to encourage intentional preservation of carbon-dense ecosystems), the mechanism might therefore accidentally incentivize further conversion and associated emissions. One alternative might be to allow projects focused on avoided conversion to generate only modest credits for avoided emissions, which could reduce motivation to exaggerate the risk of loss, but still allow these projects to claim credit for the incremental carbon sequestration and storage in the ecosystem, ideally over a multi-decadal crediting period. We urge further consultation on this issue, to consider ways to recognize the value of standing forests and other ecosystems. Therefore, as the Supervisory Body considers projects that might be eligible under this mechanism, we wish to express our concerns around the potential for perverse incentives and unintended outcomes if activities that focus on avoided ecosystem conversion are not included. [NWF, 166]

[8] 3 IPCC. (2023). AR6 SYR (Longer Report), https://www.ipcc.ch/report/sixth-assessment-report-cycle/, p. 50 14Brack and King. (2020). Managing Land-based CDR: BECCS, Forests and Carbon Sequestration, Carbon Policy, https://onlinelibrary.wiley.com/doi/10.1111/1758-5899.12827.

3.1.8. Specific technologies

80. We support DAC, closed-system ocean removal, BECCS, and other permanent approaches as qualifying as a removal. Using BECCS as an example: i) Removal is permanent -- it is relatively straightforward to show permanent removal at end of life in a way that converting the biomass to engineered timber or other products is not; ii) Removal is verifiable -- it is relatively straightforward how to account for the emissions that are removed from the air and permanently sequestered. [BCG, 190]

81. We also agree that it would be helpful to include removal from oceans. The ocean has large mitigation potential, and there are many ocean-based "closed systems" with similar characteristics to engineered removals that pull CO_2 directly out of the atmosphere. These closed systems are verifiable in a way that open systems (e.g. ocean mineralization and algae growth in oceans) are not. [BCG, 190]

82. The definition of CDR should include ocean-based pathways as an essential complement to reducing CO_2 levels in the atmosphere. Altering the definition of CDR to include capture from both the “atmosphere and oceans,” as proposed in the Information Note, could help clarify the eligibility of various marine CDR pathways. Such pathways can capture and sequester CO_2 at gigaton scale, given the oceans' size, carbon sequestration capacity, and lack of land use complications. Both biological and non-biological marine pathways can capture and store CO_2 in ways that provide co-benefits, such as reduced anthropogenic ocean acidification, improved fishery yields, and feedstock production for food and durable products. [EFIF, 177]

83. River Alkalinity Enhancement (RAE) should be added. The knowledge base, technological readiness, effectiveness, affordability, scalability, social acceptance, safety, permanence, and verifiability of RAE are described in Sterling et al., 2023 (https://essopenarchive.org/doi/full/10.22541/essoar.168380809.92137625/v1). [CR, 94]

84. BiCRS (Biomass Carbon Removal and Storage) may be added as a category of activity that combines the advantages of natural photosynthesis and human engineering to achieve efficient carbon removal. For example, Wood Harvesting and Storage (WHS) stores sustainably sourced coarse woody biomass in a durable structure called Wood Vault (WV) through which carbon in the form of woody biomass is taken out of the “fast” photosynthesis-decomposition biotic carbon cycle and transferred to a “slow” geological carbon cycle via human engineering. Such method uses existing technologies and is low-cost and highly scalable while ensuring durability. [UMD, 96]

85. Ocean Alkalinity Enhancement method uses low energy and simple systems to achieve removal, and at the same time, brings benefit to the local ecosystem, thus contributing to sustainable development. [PT, 98]

86. Biochar Carbon Removal (BCR) is a mature technology and is ready to be scaled up. While it provides many of the benefits listed for Land-based activities, it is also an engineered approach. [CC, 102]

87. Biochar Carbon Removal is a mature technology and has been commercialized. As it utilizes waste and generates heat energy in the process, it contributes to reducing waste as well as meeting energy demands. The resulting biochar carbon is permanently locked in and its water holding capacity enhances climate-resilient agriculture. It is scalable and has the potential to provide carbon removal in the magnitude of several gigatonnes annually. [ECOERA, 100]

88. Carbon removal from biomethane production that uses proven technology is a viable solution and has the potential to contribute to sustainable development as biomethane production in itself contributes to sustainable development. Also, as Inherit's biomethane production uses waste stream such as sewage and food waste as feedstock, this type of Bioenergy with Carbon Capture and Storage (BECCS) should be categorised as a removal activity. [ICS, 108]

89. Carbon storage in basalt offers secure, long-term CO_2 storage. It injects carbon into basaltic formations, where carbon is sequestered in mineral form through geochemical reactions. The engineered mineralization of carbon in basalt has been demonstrated to be a safe and permanent storage option for carbon dioxide. No mobilizations of trace metals, no adverse effects to the biome, and no reduction in injectivity of the reservoir was detected after over 10 years of injections. Deployment of engineering-based carbon removal technologies should be considered where suitable conditions exist in terms of local and national acceptance, means for rigorous and transparent monitoring of impacts, availability of permanent storage options, and plentiful renewable energy potential. Such conditions are not exclusive to developed economies. For example, Kenya hosts basaltic formations, geothermal resources, and interest from the national government to deploy technologies. [CLLA, 110]

90. Bio-oil sequestration deliver carbon removals in a safe, permanent, and scalable manner and is technologically and economically proven. It also brings a number of co-benefits, including economic benefits, wildfire resilience, and improved air quality. [CI, 118]

91. The technical and commercial readiness of DAC is advanced enough to attract public funding. For sectors such as aviation that are difficult to decarbonize, DAC can contribute to reducing mitigation costs, especially as the cost of DAC technology will decline as the technology scales and improves. Inclusion of DAC under Article 6.4 Mechanism could catalyze the technology deployment. DAC contributes to the objectives of the Article 6.4 mechanism by delivering an overall mitigation in global emissions, thus furthering SDG 13 (Climate Action) and are aligned with SDG 8 (job) and SDG 9 (industry). The IPCC recognizes the role of DAC in that its modelled pathways that limit global warming to 1.5°C includes up to 310 Gt cumulative CDR from DAC with geologic CO_2 storage between the years 2020 and 2100. Its ability to provide additional, durable, and verifiable CDR merits DAC's inclusion within the Article 6.4 Mechanism. [1.5,123]

92. The oceans offer a huge opportunity to sequester and safely store carbon dioxide, restore ocean ecosystems and enhance coastal livelihoods in the developing world and because of its size, have the potential to scale. A number of ocean-based CDR approaches are currently being explored, each requiring additional research and testing and need Article 6 to provide a regulatory and governance framework. [SF, 124]

93. Marine carbon dioxide removal (mCDR) via upwelling of nutrient-rich deep ocean, is a marine carbon dioxide removal (CDR) method, which pump deep water to the ocean's surface and stimulate the biological carbon pump (BCP). Theoretically, the process increases the nutrient concentration in the surface layer and decreases surface water temperature. By applying Artificial Upwelling (AU) globally between the years 2020 and 2100 under several different atmospheric CO_2 emission scenarios, AU leads to an additional CO_2-uptake of as much as 3.70 Pg CO_2/year under a high emission scenario. [PK, 132]

94. Timber construction, as a nature-based and technological carbon removal solution, has proven to be feasible and is able to contribute 10% to the climate goals by 2050 if applied properly. As CO_2 is stored in the building, it can be measured and monitored. By setting specific criteria it can achieve centuries of CO_2. Carbon removal technologies, such as timer construction that are already proven to have a positive effect on climate, the SDGs and are immediately deployable, should be promoted. [TF, 134]

95. Enhanced Rock Weathering (ERW) accelerates the natural silicate weathering process that draws carbon from the atmosphere and sequester carbon in the oceans. It can be deployed at a gigaton scale for carbon dioxide removal while bringing measurable co-benefits such as improved crop productivity, reduced pestilence and soil enhancement. [MCR, 136]

96. Section 7 listing specific engineering-based removal activities but does not include Direct Ocean Capture. Captura's Direct Ocean Capture technology removes carbon dioxide from the surface layer of the ocean using proprietary electrodialysis technology and commercially available water/gas handling equipment. Using only seawater and renewable energy as inputs, the system removes carbon dioxide from seawater, delivering a stream of captured carbon dioxide gas that can be utilized or safely and securely stored using mature sequestration methods, such as geologic sequestration. The decarbonized seawater is returned to the ocean, enabling the drawdown of an equivalent quantity of carbon dioxide from the atmosphere as part of the natural equilibrium between the shallow ocean and the atmosphere. [CC, 139]

97. Carbfix has successfully applied its technology of geological CO_2 storage through subsurface mineralization in rocks, in Iceland for more than ten years, resulting in the safe, cost-effective, and permanent mineralization of over 90 thousand tons of CO_2. Over 100 peer-reviewed scientific papers have been published on the method. The natural process of mineralization on which our method relies is an important part of the Earth's carbon cycle and is responsible for the fact that more than 99% of all carbon on Earth is currently stored in mineral form underground. [CX, 147]

3.1.9. Engineering and nature based removals

98. The "Information note: Removal activities under the Article 6.4 mechanism" (A6.4-SB005-AA-A09), despite being in its 4th version, is far from being neutral and still offers analysis and opinion that falls outside of the RMP mandate. The summary of the analysis of technical features of various removal options contained in Table 3 therein aligns with neither the views of leading authorities, such as the IPCC, nor those of Parties and Observer organisations as contained in their submissions. Importantly, deliberation on the economic viability of certain technologies is neither an aspect called for in the RMP nor a matter that falls within the ambit of the SB. The documents contain slightly different information, presented in different tones and in different formats, presenting an obvious challenge to the effective processing of this material by SB members and other stakeholders. IETA specifically recommends the following:

    (a) Improving the process to ensure a balanced synthesis of information provided in submissions to date, reflective of the latest scientific views contained in the IPCC AR6, and the mandate given in the RMP; and ensuring it is presented in a balanced, impartial and accurate manner;

(b) Enhancing capacity. Ensuring that Parties and SB members have a deep understanding of the specific benefits, challenges, choices and trade-offs that are relevant to the methodological options available for integrating carbon removal into a crediting mechanism;

(c) Facilitating engagement. Consider options to enhance engagement to facilitate understanding and clarity in the lead up to, and at, COP28 (e.g. the possibilities to request for a mandate to arrange a workshop and/or other means of information exchanges between experts, market actors, SB members and Parties). The focus must be on ensuring constructive submissions to help bridge existing gaps in understanding and develop appropriate, science-based and broadly supported recommendations on removal activities that are aligned with the mandate set out in the RMP. [IETA, 143]

99. A number of submissions refer to unbalanced representation of the benefits of engineered carbon removals and call for next iteration of the information note to bring about greater balance and technology neutrality by remedying its negative depiction of engineered removals, reflecting the stakeholder submissions in favour of those technologies. [N-AG, 142] [44.01, 142] [CC, 139] [CO2RE, 149] [CNE, 151] [CA, 152] [BEAF, 154] [ZEP, 155] [CG, 157] [BF, 159] [CCSA, 161] [SCS, 164] [CCSI, 163] [CF, 165] [NWF, 166] [DACC, 168] [KLIMPO, 167] [AN, 170] [CCC, 174] [EDF,175] [WRI,179] [PBL, 176] [CATF, 180] [EE, 181] [OV, 182] [HM, 187] [PERSP, 188] [GCCSI, 66][CE, 189] [BCG, 190][9]

100. The mismatch between the current state of scientific knowledge on pros and cons of land-based versus engineered removals was found to be alarming. For broader scientific scrutiny of the various pros and cons ensued by respective carbon dioxide removal pathways, the IPCC AR6 WG3 full report[10] table 12.6 (pp.1275-1276) and the more detailed comparison found in “The State of CDR Report”[11] (pp.18-19) are recommended. [CG, 157]

101. The CCS+ Initiative disagrees with this narrow scope of the definition used for engineered removals, as well as the characterization of their market readiness, contribution to sustainable development, and suitability for deployment in developing economies. Submissions from leading organizations such as IETA, the Carbon Business Council, Negative Emissions Platform, and DAC Coalition have all expressed concerns about these issues. [CCSI, 163]

102. We commend the Supervisory Body for adopting an inclusive definition of CDR that aligns with the IPCC definition. CATF strongly encourages the Supervisory Body to include all removal activities in Article 6.4 that meet this definition including engineering-based methods such as direct air carbon capture and storage (DACCS) and bioenergy with carbon capture and storage (BECCS), as eligible under the objectives of the Article 6.4 mechanism. In the future, carbon removals may be certified by national governments, and they are following the UNFCCC’s work closely. Voluntary carbon markets are already

[9] This is not an exhaustive listing of all submissions providing this view but represents a sample of submissions.

[10] https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Zero%20Emissions%20Platform.pdf.

[11] https://www.stateofcdr.org/.

trading engineering-based credits and demonstrating feasibility at a growing scale. [CATF, 180]

103. We do not object to engineering-based removals and suggest keeping all options on the desk. But it should be recognised the nascent phase of these technologies and the questions of how relevant and to which extent carbon offsets may play a role in supporting significantly capital-intensive interventions. This should be kept in mind, and priorities need to be defined. [PD, 185]

104. From our perspective, the initial focus should be on nature-based removal projects as only these project types may have co-benefits for biodiversity and food security. Of course, nature-based removal is complex, but if properly designed, it can contribute over a long time to emission removals. [PD, 185]

105. Different sub sectors of engineering-based carbon removal solutions exist and some of the engineered CDR solutions are technologically proven and results in permanent removal. BECCS, CCUS and utilization (like concrete production) are economically proven and would bring significant climate benefit, yet requires additional policy support, such that could be provided by Article 6.4. They can contribute to sustainable development if developed equitably and could bring opportunities to developing world. [JR, 89]

106. The value of both nature-based and engineering-based removal approaches must be reflected as engineered removals also serve the objectives of the Article 6.4 mechanism as mitigation measures. While some "Engineered" approaches are at earlier stages of their development, they are needed to maximize the global carbon removal capacity over the coming decades. [JD, 90]

107. Nature based solutions are not permanent and are extremely easy to game, and while engineered solution have the potential to be scaled up further than nature-based solutions but requires subsidies to bring the cost down. [TG, 91]

108. We have concerns with Information note on removal activities' reference to carbon stored in wood products as an effective strategy for natural carbon capture and storage. Logging (aka forest management) for wood products has severely degraded forests around the world, diminishing carbon sinks and the biodiversity that underpins all life-sustaining ecosystem services. Any carbon stored in long-lived wood products represents only a fraction of the carbon that would have otherwise been stored in the forest. Moreover, when a forest is logged, not only is carbon emitted into the atmosphere, but its ability to remove and store carbon is compromised for many decades. Recent, peer-reviewed studies have documented the extent that logging for wood products is contributing to carbon emissions and degrading forests, including carbon sinks.[12] [DA, 162]

109. Some engineering-based technologies are commercialised, for example, "Orca" (https://climeworks.com/roadmap/orca (direct air capture and storage plant). While it is at an early stage and at a small scale, they are expected to rapidly scale and can be implemented in developing countries where renewable energy generation potential and geological storage potential exist. They are expensive at present but are necessary in addition to land-based approaches. Drawbacks exist for land-based activities, as listed in

[12] https://cbmjournal.biomedcentral.com/articles/10.1186/s13021-016-0066-5
https://www.nature.com/articles/nature25138
https://www.nature.com/articles/s41467-020-19493-3.

the Land Gap Report [13] (UNFCCC) including: competition for land-use with food production; potentially limited ability to scale up that requires careful assessments; intensive monoculture (e.g. for biochar) leading to biodiversity/ ecosystem-service trade-offs; potential for unintended adverse consequences such as altered water availability; difficulty in verification of removal, thus possibly economically ineffective; time lag between planting and build-up of carbon stocks; cost of long-term (multi-centennial) maintenance, and unavoidable loss caused by, for example, wildfires, disease, drought, among others.[UoEx, 93]

110. Land-based approaches including afforestation face limitations such as land availability, long-term maintenance requirements, and uncertainties surrounding permanence and stresses the importance acknowledging a broader range of innovative solutions, such as enhanced rock weathering. Enhanced rock weathering involves natural process in which, carbon dioxide is captured from the atmosphere and permanently stored in the form of carbonates, while at the same time, enhancing soil quality and agricultural productivity, thus offers a viable and sustainable method of carbon removal that can be implemented globally. [IP, 95]

111. There are scientific data available, such as the IPCC AR6 WG3, that support the fact that engineered removal methods need to be fully integrated to any framework for mitigation. In doing so, a mechanism must be put in place to ensure their use as safe and equitable as possible. [TI, 97]

112. Implied exclusion of engineering-based removal approaches from the mechanism based on their current immaturity of technologies is unjustifiable as technological development tend to follow exponential growth and while the current removal volume is low, it is likely to reach a significant scale in the near future. Some methods are less aligned with sustainable development but that does not apply to all engineering-based methods. [PT, 98]

113. Engineering-based removals offer opportunities for scalable, efficient carbon sequestration and can play a crucial role in achieving net-zero emissions, complementing efforts in land-based removals (IPCC and State of CDR). An increasing number of countries are incorporating engineered removals in their climate targets (see also “Cross-cutting”), notably Bio-Energy with Carbon Capture and Storage (BECCS) and Direct Air Capture (DAC), which demonstrate their potential for practical deployment and their importance in achieving our collective climate goals. [CX, 99]

114. The taxonomy of removal activities should be as broad as possible, and allowance should be made for emerging categories so as not to exclude potentially promising carbon removal “pathways”. The distinction between "engineered" and "land-based" is not useful as some level of engineering is required in many land-based activities while nature is an integral part of many of the engineering-based approaches. Instead, each approach should be evaluated by predefined criteria such as additionality, co-benefits, storage duration, among others so as to allow the market to ensure that the lowest-cost pathways that meet all regulatory requirements will be implemented first. In addition, while many of the engineering approach may be at “lower technology readiness levels”, it is likely that some of them will prove efficacious and cost effectiveness at significant scales within the next several years. [CB, 104]

[13] https://unfccc.int/documents/628104.

115. Carbon Business Council defines CDR as ”anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products”. The label of “engineering-based activities” is impractical as most CDR approach is a hybrid of nature and engineering. Instead, a set of criterial should be defined based on which a given CDR project eligibility is assessed, including additionality, durability, net-negativity, verification, and equity and community engagement. (See also [CBC, 107]) [CRIA, 105]

116. The distinction between engineering-based and land-based CDR approaches is not useful in discussing different groups of CDR methods. Instead, eligibility of individual “engineering-based” CDR activities for Article 6.4 should be assessed based on requirements regarding monitoring, reporting, accounting, addressing of reversals, avoidance of leakage and avoidance of other negative impacts rather than inclusion or exclusion by label of “engineering-based.” The 0.01 MtCO2 per year of current removals cited in table 3 refers to Direct Air Capture only, not all “engineering-based” methods. Adding removals from BECCS in line with table 4, it is around 1.8 MtCO2 per year. The 2 MtCO2 per year reported in the State of CDR for all “novel” activities includes biochar, which is not defined as “engineering-based” in the Information note. The estimates for what land-based activities currently remove is of 2,000 ± 900 MtCO2 per year. Of all modelled pathways that limit warming to 2°C with a likelihood of 66% or lower, 93% include BECCS while 27% include DACCS “engineering-based” removals. The IPCC states: “Modelled mitigation strategies to achieve these reductions include … deploying carbon dioxide removal (CDR) methods to counterbalance residual GHG emissions.” Risks associated with the large-scale deployment of land-based CDR methods such as threats to biodiversity, food security or water scarcity are not reflected as “cons” in table 3 of the information note. Sustainability implications of land-based CDR methods can be positive or negative depending on, for example, the implementation practices, the scale of biomass sourcing and other pressures on land. We recommend either adding the “cons” associated with unsustainable practices that are also possible or highlight the potentially positive or negative implications of land-based CDR methods depending on biomass source and level, implementation practices, geographical context and the degree of land competition among others. [SCDRR, 109]

117. On the pros and cons for Engineering-based activities and Land-based activities listed in table 3 of SB005-AA-A09, they depart from what is established by the IPCC, for example, the food and water related challenges for Land-based activities (Table 12.6 in AR6) is not included in cons. Furthermore, it lists BECCS as an emission reduction activity, while it is widely considered a removal activity including under the IPCC. [SE, 111]

118. Not all technology-based removals have sustainability co-benefits beyond SDG 13 but that should not block building the permanent, technological based removal capacity the world urgently needs. [IJ, 113]

119. The label of “engineering-based activities,” is not appropriate as most of CDR approaches are hybrid of nature and engineering. A method-neutral, criteria-based framework should be used to assess eligibility of CDR under the Article 6.4 mechanism. In addition, there are many cases of CDR deployed equitably and responsibly in the Global South”, thus contributing to sustainable development. [OA, 114]

120. All removals serve the objective of Article 6.4. The comparison of engineered- approaches and land-based approach in Table 3, SB0005-AA-A09 is biased, and assessment of different removal methods should follow The IPCC AR6 WG3 and the State of CDR report.

A set of criteria should be defined that a carbon removal project must fulfil under the Article 6.4 mechanism. [MC, 117]

121. The categorisation of measures into engineering-based and land-based activities should be reconsidered as some removal measures, such as their bio-oil production, are hybrid in that they incorporate both activities. [Charm, 118]

122. Land-based removal activities offer many benefits but are often limited in scale, impermanent (less than 100 years), and contain the risk of reversal due to natural disaster and human activities as well as having large footprints and facing trade-offs related to food production and biodiversity preservation. In comparison, some of engineering-based removal activities offer nearly unlimited scale potential and can provide permanent storage with minimal risks of reversal. Several of those have started commercial operations, while others are preparing to scale in the coming years. Engineering-based removal activities also advance sustainable development by providing well-paying jobs and economic benefits, while mitigating climate change with limited environmental impacts. The importance of both land- and engineering-based approaches in the Article 6.4 mechanism. [LT, 122]

123. Engineered approaches have a key role to play in carbon removal, and we support the position presented by the Negative Emissions Platform (see [NEP, 131]). Both nature-based and engineered removal need to be pursued simultaneously to meet the long-term temperature goals of the Paris Agreement. Engineered based removal activities require technological improvements to scale and excluding it from the Article 6.4 mechanism will risk investors to hesitate to make the necessary investments. [MS, 125]

124. Land-based vs “engineering-based” dichotomy is a result of an incomplete definition of carbon removal. A more complete definition should focus on the movement of carbon from the fast to slow carbon cycle, where the total fast carbon removed exceeds the total slow carbon emitted within a given project boundary (also “Accounting”). Such removal activities could rebalance the natural carbon reservoirs by transferring carbon from fast cycling reservoirs (i.e. the biosphere, the atmosphere, and the upper ocean) to slow cycling reservoirs (i.e. the deep ocean and marine sediments, geologic storage), thereby serving broader goals of sustainable development. Because land-based activities primarily address fast cycle carbon sinks, those activities alone cannot rebalance the greater carbon cycle at a scale that effectively combats climate change. [RT, 130]

125. Additional “pros” that can be considered for engineering-based approaches include:

(a) permanent net removal of carbon dioxide from the atmosphere;

(b) broad range of technologies that can adopt to the local conditions;

(c) a removal potential that is many times greater than land-based activities;

(d) contribution to sustainable development;

(e) permanence and potential decline in the costs in the future. [NEP,131]

126. Classifying CDR methods as either “Land-based” or “Engineering-based” is not constructive. All carbon removal solutions bring risks and benefits, thus excluding them prematurely will lead to technology being locked-in and important research and innovation abandoned. [EQ, 127]

127. The evidence that engineered removals contribute to reducing the global mitigation costs can be seen in the climate scenario models used by the IEA which concluded that to achieve the 1.5C target with least cost mitigation measures would require 70Mt CO_2 pa captured by DACCS in 2030 and 600 Mt pa CO_2 by 2050 (ref IEA WEO 2022 and IEA ETP 2023). Also, there are more cons of land-based removals than listed in the table that should be considered. [IEAGHG, 128]

128. Regarding table 3 of SB0005-AA-A09, we disagree with the assessment of the current state and potential of removal technologies. A broad and full suite of technologies will be required if the goals of the Paris Agreement are to be met and believes that it should not be excluded from the full portfolio of technology solutions that are eligible under the 6.4 mechanism. (See IETA submission for the details and recommendations) [BCSE, 129]

129. Engineered removals have the potential to significantly lower the overall costs of achieving climate targets, especially because their costs are expected to decrease as they mature and scale up. [NEP, 131]

130. Before dismissing any technology, its full removal potential must be considered, rather than the current capacity. Since many of the engineering-based approaches are still unproven, they should not be ruled out at this point. Land-based activities have the disadvantage of potential reversal while engineering-based removals can be permanently stored which is essential for climate mitigation. In addition, because historical emissions can only be achieved through negative emissions, applications such as Direct Air Capture are crucial. [CCU, 133]

131. The TRL level of engineering solutions is growing rapidly through state- and privately funded research globally, for example in the UK, Germany, USA, China and Canada. Marine engineering solutions have great scalability. [PML, 112]

132. On the economic viability of engineering-based approaches, numerous companies have committed advance purchase agreements seeking to reduce their carbon footprint, facilitating economic returns for those projects. While the economics of large-scale engineering CDR pathways have yet to be demonstrated at the required scale, the cost reduction curves of technology shows that it decreases by learning-by-doing and they will become economically viable. CDR contributes to SDGs by creating jobs, economic growth, expand the affordability of clean energy, decarbonize hard-to-abate industries and reduce global GHG emissions. Furthermore, engineering CDR pathways can be deployed widely using modular-scale technologies in the developing world. [AC, 135]

133. Engineering-based approach seems to include approaches such as direct air capture, enhanced weathering, and ocean alkalinity enhancement, that constitute a significant portion of the relatively small portfolio of methods currently being explored to achieve long-term carbon removal. As such, excluding this category of carbon removal activities from the Article 6.4 mechanism contradicts pursuing the best available science to achieve the temperature stabilization goals of the Paris Agreement. To stabilize global temperatures requires carbon removal and long-duration storage that counters fossil CO_2 emissions while land-based activities offer only temporary storage. Although there are still uncertainties about the realistic potential of “engineering-based” removal activities and how to deploy them responsibly, they can play a distinct and important role in achieving temperature stabilization. Different carbon removal pathways be accurately characterization in terms of the durability. [CP, 138]

134. Methodological issues of land-based removals do not include some approaches that are already used in VCM standards, for example, an ecological indication that is widely used in VERRA standards. [WI, 9]

135. In general, nature-based credits are less likely to represent one tonne of real CO2e than engineered credits. While nature-based projects can have significant co-benefits, they also have risks of failing to properly engage indigenous people and local communities, displacing people off land, competing for scarce land-based resources, and other impacts. Indeed, with the projects under construction today, both DACCS and BECCS could demonstrate TRL 7 before 2025. Similarly, commercial firms are piloting enhanced weathering and other mineralization pathways today. [CD, 143]

136. Drax expresses concern regarding the management of the submission process and synthesis of information by the UNFCCC Secretariat as manifested in the latest iteration of the note. [DG, 145]

137. Neustark calls for a well-established distinction between mitigation in the form of reductions or removals and strongly believe that durability should be prioritised as it is inherent in all the IPCC definitions of CDR. “Anthropogenic activities removing CO_2 from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products.” Accordingly, the definition of a time horizon for this mechanism should be done in a way that does not put the inclusion of highly durable methods at risk. We encourage the A6.4 body to find a well-balanced storage threshold, reflecting both economic and scientific rationales. [N-AG, 141]

138. The removal of CO_2 from the atmosphere is not the result of a mitigation activity per se unless the removed carbon is stored. On the contrary, each net increase in forest carbon stocks corresponds to a mitigation activity since it is the result of a net removal of CO_2 from the atmosphere and its subsequent storage. That further means that having increasing removals across time is not a condition necessary to identify and quantify mitigation, although desirable given the climate crisis and the lack of global emission reductions. Because of the above, activities under REDD+ refer correctly to conservation and enhancement of carbon stocks, not just to CO_2 removals. [PN, 55]

139. It is important to differentiate between conventional geological storage and mineralisation which does not ‘store’ CO_2 but converts it into rock, removing CO_2 from the carbon cycle forever and ensuring it cannot escape back into the atmosphere. This is an important distinction as it affects safety regulations and potential monitoring and insurance requirements. [44.01, 142]

140. The importance of durable (or permanent) removal of CO_2 in a reservoir that is not prone to risk of reversal should be recognised. The rules and methodologies established under the Article 6.4 mechanism should standardize removals with respect to the durability of the storage. [RT, 130]

141. Durability of storage should be given more importance under A6.4 market and a time horizon should be defined in such a way not to exclude highly durable methods. [NEP,131]

142. The focus on the conventional but fundamentally arbitrary time horizon of 100 years is also of great concern. [BF, 159]

143. On the information Note for removal activities, some engineering-based approaches have already been technologically proven. Nearly 20 direct air capture (DAC) plants operate

globally today, and currently planned projects alone could achieve deployment of 5.5 tCO2 by 2030, according to the IEA. Additionally, technology-based approaches can support sustainable development goals. By one estimate, a 1 megaton DAC facility could create about 3,500 jobs across the supply chain and support related industries, such as cement and steel production. [NWF, 166]

144. The viability of engineered CDR is demonstrated by pilot projects like Climeworks' and Carbfix's joint Direct Air Capture (DAC) and carbon mineralization project in Iceland, showcasing technical feasibility and innovation. The demand for durable carbon credits, including those from engineered CDR, exceeds the current supply, which demonstrates its vast economical potential. By implementing appropriate regulations and policies, technologies like Direct Air Capture (DAC) can and will leverage economies of scale to be economically viable. (Fasihi, 2019)· Engineered CDR methods, particularly of a 'closed system' approach such as in DAC+Storage installations, pose minimal environmental or social risks. Both Direct Air Capture and CO_2 mineralization have been practised at scale for 7 and 15 years, respectively. Other methods of engineered carbon removal such as biochar, enhanced rock weathering, or ocean alkalinization have been practised at some scale, and while their ecosystem impacts need to be carefully assessed, they in fact have great promise for environmental and social co-benefits (IPCC, 2022). Companies like Octavia Carbon or Cella Mineral Storage in Kenya, Takachar in India, and InPlanet in Brazil have pilot safe engineered CDR methods in the Global South, and in their short history have created >50 mid- to highly skilled jobs between them. While applying the highest standards of safety, these companies should be encouraged to keep innovating and driving highly value-adding engineered CDR investment into the Global South. These companies provide templates for green growth to emerging economies in the Global South and have the potential to become catalysts for much larger-scale green transformation in countries of the Global South, by providing new bankable industrial demand for energy that can help accelerate investments in renewables (Mwangi, 2021). [OC, 168]

145. We have already set up an already operational Direct Air Capture (DAC) and already earned substantial DAC-based gold standard credits; Several other DAC companies have made multi-million-dollar sales. In total, 75% of the $200 million or 510,000 tonnes of purchased carbon removal in 2020-2022 were from DAC projects. Moreover, the scale-up of DAC is anticipated to create at least 300,000 high-paying jobs that will support whole communities, which is a major component of "sustainable development. [CCI, 172]

146. The Carbon Capture Coalition argues that there has been tremendous and encouraging progress in this industry over a very short period and disagrees with the above characterization of engineering-based removal activities. Currently, there are 18 direct air capture plants operating worldwide, capturing 10,000 tons of CO_2 per year— these facilities are pilot scale, except for Climeworks' Orca, the world's first commercial-scale DAC facility. [CCC, 174]

3.1.10. BECCS as removal activity

147. Durable storage is not yet defined, but the note pays recognition to a period of 200-300 years. BECCS delivers on each of the components of the definitions, by drawing down CO_2 from the atmosphere through photosynthesis and injecting the CO_2 for durable storage in geological formations. BECCS should not be classified as an emissions reduction activity, in contradiction of its status as a removal activity under the IPCC and leading scientific studies. [DG, 146]

148. It is a widely recognised practice that bioenergy based on sustainably managed forest areas is considered renewable energy and hence applying CCS activity to bioenergy based on sustainably managed forest areas can deliver removals, e.g. forest biomass for bioenergy is recognized by the European Union as renewable energy if it complies with a set of sustainability criteria established in the Renewable Energy Directive. In some cases, it might even be argued, that BECCS based on sustainably managed forest areas might provide greater co-benefits than BECCS based on plantation or energy crops specifically raised for the purpose of producing fuel for the power plant. Such plantation or energy crops might take up land areas for other uses compared to sustainably managed forest areas, which are already established. [ORST, 158]

149. See the assessment of the European Academies' Science Advisory Council. In short, negative emissions would only be possible if local wood processing residues are used (this is already no longer the case in the wood pellets market), serious progress is made in the efficiency of the capture and compression process, and there is an adequate long-term storage site available. Today, BECCS has not achieved negative emissions anywhere yet, and the only significant projects that exist are based on processes using the fermentation of grains (for ethanol production), not the combustion of woody biomass or municipal waste where the cost of isolating the CO_2 from the other gases would be prohibitively expensive. [FE, 160]

150. There are advantages to BECCS and other CDR pathways that use sustainable forest and waste feedstocks, with a substantial body of literature on the emissions benefits of BECCS from these sources, including their ability to achieve net-negative emissions at a low cost and with other co-benefits. [EFIF, 177]

151. On the classification of BECCS with sustainable biomass, it should be classified as removal and not emissions reduction activity, in line with the definition of the IPCC. According to the guidelines for National Greenhouse Gas: “If the [CCS] plant is supplied with biofuels, the corresponding CO_2 emissions will be zero, so the subtraction of the amount of gas transferred to long-term storage may give negative emissions. This is correct since if the biomass carbon is permanently stored, it is being removed from the atmosphere.” [NEP, 131]

152. Drax invites a concrete re-evaluation of the approach to BECCS within the next iteration of the note so that it better aligns with the positions of the IPCC[14], national governments[15] and the leading academic literature[16]. [DG, 145]].

153. The Dutch environmental organization Leefmilieu does not consider BECCS to be a solution to the climate problem. The technology for CCS in biomass plants is not yet operational anywhere. CCS is expensive and requires energy. BECCS requires huge

[14] 2006 Guidelines for National Greenhouse Gas Inventories and 2019 refinement to the Guidelines, Intergovernmental Panel on Climate Change.

[15] Several governments, such as that of the United Kingdom and Denmark, have committed to the importance of carbon dioxide removals from BECCS in delivering their national climate strategies. The United States of America’s Inflation Reduction Act provides fiscal support for removals delivered by BECCS.

[16] 3 The State of Carbon Dioxide Removal: a global, independent scientific assessment of Carbon Dioxide Removal, University of Oxford’s Smith School of Enterprise and the Environment, Smith et al, 2023.

quantities of wood that are not in stock. See the various reports from, for example, EASAC and NGOs as a biofuel watch[17] [LU, 156]].

154. The removal method of BECCS might not be suited for all countries globally but we are convinced that it will be for countries like Sweden. We kindly request the Supervisory Body for the mechanism established by Article 6, to recognize that engineering-based removal activities such as BECCS are essential to achieving the objectives under the Paris Agreement and its Article 6.4. [KLIMPO, 167]

155. Fern have published a briefing that summarises some of the main concerns with BECCS as follows:

(a) BECCS is proposed as a solution based on the assumption that bioenergy would be carbon neutral. But this assumption is incorrect, notably because of emissions from land use and forestry: today, 30 per cent of carbon dioxide in the atmosphere came from land use change (including deforestation), not fossil fuels. Moreover, BECCS itself produces significant emissions while we need to reduce GHG emissions immediately;

(b) BECCS has technical barriers, is indeed unproven at scale, and is prohibitively expensive;

(c) BECCS would require a huge amount of land, and push up the price of food;

(d) BECCS would most likely harm biodiversity;

(e) BECCS would take a huge amount of water and threaten more planetary boundaries - BECCS is a barrier to the energy transition. [FERN, 160]

156. Bioenergy with carbon capture and sequestration (BECCS) is often a prominent element of climate models but presents significant downsides that should be accounted for with the Article 6.4 removals framework. In particular, the demand for biomass poses threats to water resources, biodiversity, land conversion and deforestation, and competition with food production. As demand for biomass feedstocks increases to support BECCS, there is a significant threat from both direct and indirect land-use change. [NWF, 166]

157. A large body of work shows the ability of forests to continue storing carbon when mature and they do not become "saturated" as indicated; The fact that the majority of managed forests have greatly reduced carbon stocks compared to the carbon stock capacity of natural forests – thus could have hundreds of years of carbon accumulation ahead of them, if left alone, or managed only lightly; and Logging forests causes them to leak carbon in a variety of ways, e.g. removing forestry residues to serve as biomass feedstock – a forest "waste" that is generally assumed to simply decompose if not collected and burned for energy – actually depletes soil carbon stocks (Achat et al, 2015a5 ; Hamburg, 20196) and nutrient stocks (Achat et al, 2015b7), thus putting the carbon balance further into debt and potentially interfering with forest regeneration. [PPI, 191]

3.2. Monitoring and Reporting:

158. The SB 005 Information Note calls for a discussion on Monitoring and Reporting, including:

[17] EASAC: https://easac.eu/news/details/look-before-you-leap-european-science-academies-cautionagainst-subsidies-for-bioenergy-with-carbon-capture-and-storage-beccs
- Dutch KNAW: https://www.knaw.nl/nieuws/co2-opslag-wat-kan-en-wat-werkt.

(a) What timeframes and related procedures should be specified for these elements referred to in A6.4-SB003-A03?

(i) For initial monitoring and submission of monitoring reports (paragraph 3.2.14);

(ii) For subsequent monitoring and submission of monitoring reports (paragraph 3.2.14);

(b) For monitoring and submission of monitoring reports following an observed event that could potentially lead to a reversal (paragraph 3.2.14);

(c) For monitoring and reporting, including any simplified reporting, conducted after the end of the last crediting period of activities involving removals (paragraphs 3.1.10 and 3.2.13).

159. The Info note calls for discussing any further considerations to be given to the core elements for monitoring and reporting in A6.4-SB003-A03; where possible, identifying the applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types.

160. Below is a summary of public inputs received.

3.2.1. Principles and Procedures for monitoring.

161. Developing a robust approach to the monitoring, reporting, and verification (MRV) of negative emissions is essential to their deployment at scale, to instil public and market confidence, as well as ensuring the climate benefit is being realised, including monitoring in case of reversals so action can be taken. [UK, 54]

162. To support the UK's approach to GGR MRV, in 2021 we established a Task and Finish Group, comprised of experts across government, industry, academia, and regulatory services. The role of the group was to provide advice and guidance of the development of an MRV policy approach for engineered removals. Whilst this work has focused on the development of an MRV policy approach for engineered removals, the UK acknowledges that specific guidance on nature based MRV must also be developed by the Supervisory Body. The work by the Task and Finish Group is currently focused on CO_2 however we remain mindful of options focused on non-CO_2 GHG removals and will keep these under

review. The Task and Finish Group report set out the key challenges in this area, which are relevant to guidance on removal activities under Article 6.4, in particular:

(a) The importance of permanent removal from the atmosphere and determining how this is calculated including the system boundaries of a GGR process, quantifying how much CO_2 gets removed, at what rate, and for how long this is stored;

(b) Establishing and addressing gaps in the science of MRV capabilities for each GGR approach, in particular new and novel GGRs, and then developing detailed MRV protocols for these approaches;

(c) Addressing the challenge that certain land-based methods pose particular MRV challenges, especially in cases where captured carbon is challenging to track and measure and carries a risk of being re-emitted back into the atmosphere;

(d) Providing capacity for independent verification, to ensure that the amount, and permanence of removals are quantified, robustly and transparently;

(e) International engagement to share knowledge and understanding, to collaborate on addressing the governance and accounting challenges relevant to GGR, including those associated with international supply chains and encouraging international consistency where appropriate;

(f) Drawing on the MRV Task and Finish Group's advice, the UK identified a set of proposed principles for determining the legitimacy of a negative emission. These factors are also relevant to the Supervisory Body's work and determining the principles to guide considerations around A6.4 activity eligibility. [UK, 54]

163. Monitoring requirements in many offsetting systems refer to best practices for LULUCF by the IPCC. [RU, 53]

164. Monitoring should adhere to the principle of stakeholder engagement/consultation, in which women in all their diversity, local communities and Indigenous Peoples, and Afro Descendants living in the programme or project areas should be included in participatory monitoring of the removal activities. From the gender perspective, monitoring should be conducted in a gender responsive manner, including gender budgeting and building the capacity and empowering local women to carry out community/grassroots level monitoring. Activity participants should employ independent third parties to conduct the monitoring to provide independent verification. It is of utmost importance that these third parties are accredited entities as per the requirement of the Article 6.4 mechanism. The latter requirement may need to be developed by the Supervisory Body or incorporated as part of the roster of experts. We welcome that "…monitoring shall also be conducted after the end of the last crediting period of activities involving removals…" in the above paragraph. This is because reversals could occur anytime, including after the crediting

period of activities. [...] we would also like to see the following incorporated into this section:

(a) Information to demonstrate the additionality of the removal activity;

(b) Information on how to minimize the risk of non-permanence over multiple NDC implementation periods;

(c) Information to minimize the risk of leakage and adjust for any remaining leakage in the calculation of emission reductions or removals;

(d) For transparency, all reports by the activity participants should be made publicly available and easily accessible on the Article 6.4 mechanism public website;

(e) Shall undergo local and subnational stakeholder consultation consistent with applicable domestic arrangements, in relation to public participation, local communities and Indigenous Peoples, and Afro Descendants;

(f) Information on any grievances that have been filed. [LESE, 76]

165. The SB should define the principles for monitoring, e.g. accuracy, completeness, consistency, transparency, etc, in line with the IPCC guidelines and guidance. The monitoring of removal activities should be based on the quantification of carbon stocks based on IPCC guidance. The field measurements are important, especially at the beginning and at the end of the monitoring period to capture the totality of C stock changes, and that these estimations should be verified. [ALLCOT-48]

166. The Article 6.4 mechanism must set out robust monitoring, reporting and verification (MRV) requirements related to the operation of storage sites and methods. It is essential that appropriate monitoring approaches can be introduced for all activities on an equivalent basis (i.e. conferring the same level of confidence) to regularly confirm that carbon dioxide continues to be stored out of the atmosphere. In addition, the rules and methodologies under the mechanism must lay out the responsibilities and liabilities for compensating and remedying reversals of storage. [CCSA, 68]

167. CLARA is also concerned about the order in which these issues are being discussed. While some of the questions for regulating removals are unique, most in fact apply equally to all activities that might be eligible for sale as an offset. It would make the most sense then that the Supervisory Body design the methodology for the whole mechanism first and then address issues specific to removals. The complete governance package, of which recommendations on removals is only a piece, should be presented before anything is adopted. Doing otherwise risks confusion as well as increasing the risk of undermining ecosystem integrity and even the integrity of the Paris Agreement itself. [CLARA, 69]

168. Mechanism methodologies shall require that all removal activities monitor the achieved carbon stocks through their quantification using field measurements or remote-sensing, or a combination of both. This would allow for innovations associated with higher frequency more transparent means of monitoring for events of default and carbon performance. This would also allow for better predictive modelling of effective performance of new innovative ways of sequestering or capturing carbon for varying durations with varying performance expectations. We need 1,000 shots on goal. [CFL, 85]

169. Monitoring requirements for geological storage should rely wherever possible on existing regulatory regimes, where such regimes meet agreed minimum requirements, to avoid a complex layered structure of legal and voluntary market requirements. [CE, 39]

170. Monitoring requirements for geological storage should rely wherever possible on existing regulatory regimes, where such regimes meet agreed minimum requirements, to avoid a complex layered structure of domestic legal and Article 6.4 requirements. (IETA-51)

171. Existing regulatory frameworks and the proven history of geological CO_2 storage provide examples of how DAC technology can be deployed in a safe and environmentally sound manner, for example, MRV plans of existing operations that are approved by the United States Environmental Protection Agency for the permanent storage of CO_2. [1.5, 123]

172. It is key to create transparency in the market and qualify tangible impacts (net carbon removals) on project levels, national levels and on a global level. Therefore, MRV industry partner working groups, specifically in Direct Air Capture for industrial downstream applications, is recommended. The lack of acknowledgement of CCUS under UNFCCC A6 and therefore methodologies available for technology-based carbon removal (DACCUS) might continue to fragment the market into arbitrary self-certified carbon projects with opaque technology risks and delivery uncertainties - it is imperative to speed up methodology development with industry partners that can accelerate industrial decarbonization through carbon in setting in raw materials. [AD, 87]

173. The emissions reductions associated with removals must be monitored to ensure that GHG impacts are credible and verifiable, as well as to detect and compensate for reversals. Standards typically set minimum data collection thresholds and monitoring requirements, which may be carried out by project owners or with the help of government and local communities. While the monitoring techniques and technologies needed to accurately quantify projected or claimed GHG impacts vary widely across ecosystems and specific NCS pathways, there are two main categories of approaches. The first is direct monitoring, involving physical site visits to record measurements and changes in carbon stocks or other proxies. The second is remote sensing, usually aided by advanced technological sensors and capable of collecting data across vast and inaccessible landscapes. A robust system combines inventory approaches and remote sensing to estimate emissions and removals. [EDF, 80]

174. As we have extensive experience working with host countries in supporting them in their Nationally Determined Contributions, the development of their Measurement, Reporting, and Verification (MRV) systems, and in fostering their GHG inventories, we consider that consistencies in data between, e.g. standardized baselines, and information provided by the host countries under Article 13 and the enhanced transparency framework (ETF) should be better addressed. [CP, 186]

175. The significant complexity and uncertainty of MRV of emissions (and removals) of land-based activities and should be added as a “con” for Land-based methods. This is underlined by the large uncertainty range for assessments of current land-based removals (±45% in the State of CDR report) as well as the broader land use flux (evaluated as ±70% in IPCC 6th Assessment Working Group III report). [SCDR, 109]

176. [We] have developed a model that is based on physical measurements that can track the downstream transport and long-term storage of the carbon while keeping the MRV costs within economic viability. [MCR, 136]

177. All removal activities must be monitored continuously. One could also imagine that if scientific consensus is reached that a certain reservoir is functionally stable, the reservoir's monitoring can decrease in frequency. [SA, 47]

3.2.2. Monitoring in relation to specific CDR technologies (e.g. Modelling approaches)

178. The possibility that Ocean Alkalinity, and perhaps other approaches in the future, are best verified through modelling, indirect measurement, or other approaches as determined by the best scientific consensus at the time. [PT, 2]

179. Some approaches require special considerations in MRV, so the requirements should be flexible enough to encourage all legitimate technologies. For example, monitoring of carbon stocks would be impractical for the Ocean Alkalinity Enhancement pathway, which shows great promise. [CBC, 40]

180. Measurement and monitoring protocols for marine CDR and mineralization have already been demonstrated at small scales, so these technologies should continue to be considered in policy. Mineralization presents another promising pathway for near-permanent CDR, given that about one gigaton of CO_2 is already stored annually via natural carbon mineralization; technologically enhanced mineralization (at the surface or underground) could accelerate these removals five to tenfold. The Information Note's discussion of “Methodological issues related to engineering-based removal activities” suggests that no known monitoring methods exist for enhanced rock weathering and ocean-related CDR activities. While monitoring, reporting, and verification (MRV) technologies are not yet well-developed, there is existing proof of concept research and policy proposals for both technology areas that could be used as the foundation for MRV. Therefore marine-based CDR and Mineralization solutions need not be taken off the table for global policy—and action that could stunt innovation and investment. [EFIF, 177]

3.2.3. Addressing uncertainties

181. Discounts to address uncertainty is not a monitoring consideration but an accounting issue, and that it should be relocated. Applying conservative default factors to address uncertainty assumes that the estimate of uncertainty reflects systematic errors. However, almost always, the estimation of uncertainty mostly reflects random errors, i.e. normal variation of C stocks due to inherent natural conditions. This variability is usually mid-high for land-based removals. Activity proponents shall follow IPCC guidelines and guidance to reduce any systematic error in the estimation of C stocks at times 1 and 0, and to report uncertainties, without the need for adjusting the final removals estimate based on uncertainty. This would result in a loss of accuracy and create an artificial reduction of eligible A6.4 removals. Rather, the estimation of C stocks shall be technically assessed to ensure there is no bias in the estimates. [ALLCOT-48]

182. In relation to proposals to discount due to uncertainty, applying conservative default factors to address uncertainty assumes that the estimate of uncertainty reflects systematic errors. However, almost always, the estimation of uncertainty mostly reflects random errors, i.e. normal variation of carbon stocks due to inherent natural conditions. This variability is usually mid-high for land-based removals, and this is normal. Therefore, we propose to the A6.4SB that activity proponents follow IPCC guidelines and guidance to reduce any systematic error in the estimation of carbon stocks at times 1 and 0, and to report uncertainties, without the need to adjust the final removals estimate based on uncertainty as such would result in a loss of accuracy and create an artificial reduction of

eligible A6.4 removals. Rather, the estimation of carbon stocks should be technically assessed to ensure there is no bias in the estimates. [IETA,51)

183. IETA would welcome greater dialogue on the possibilities for, and implication of, using the recommended method of conservative default factors to account for measurement uncertainty. Such methods need to ensure that the environmental integrity of the resultant credits remains high, and that approaches support robust accounting against NDCs. [IETA,51)

3.2.4. Period and Frequency of monitoring and verification

184. Regarding removals by DACCS technologies, monitoring for geological storage can rely on the existing monitoring requirements and regulations of the CCS technology-based mitigation activities of the Clean Development Mechanism. Regarding paragraph 10, the ROK would like to point out that some engineering-based removal activities might not be appropriate for the monitoring after the end of the crediting period. This applies to DACCU activities with low permanence. Some products from DACCU technology-based activities may release their stocked CO_2 back into the atmosphere as they are consumed. Yet, the utilization of CO_2 captured from the atmosphere replaces unburned fossil fuels, which can lead to a permanent substitution effect. Therefore, monitoring the removal activities by DACCU technologies is required to focus on the manufacturing process for the CO_2-utilized products. This means the concept of periodic monitoring after the end of the crediting period is not applied in the case of DACCU technology-based removal activities. Therefore, regarding paragraph 10, the ROK thinks that Supervisory Body needs to elaborate the periodic monitoring requirements on a case by case. In the case of engineering-based approaches, long-lasting (or long durable) products from DACCU technologies require periodic monitoring after the end of the crediting period. Yet, undurable products from DACCU technologies such as synthetic fuels or carbonated drinks (beverage carbonation) does not require periodic monitoring after the end of the crediting period. [ROK, 57]

185. Frequency of monitoring could vary for different ecosystems/activities/strata, but could be made at least every 5 years and/or aligned with the NDC cycle. Monitoring plans should take into account harvesting-related implications and include monitoring and reporting loss events. [RU, 53]

186. Monitoring commitments should not be defined as a set number of years but rather be defined as a condition or set of conditions where safe and secure storage can be demonstrated. The monitoring period length should reflect the security of the storage medium chosen for the activity and the risk of potential reversal. As an example, in geologic storage the point at which the CO_2 plume has become predictable and reliably contained in line with reservoir modelling results is an important site closure condition that must be proved by the storage site operator prior to receiving a site closure ruling. Depending on the site and the circumstances, such a state could be reached in a matter of a few years after injection is complete, or in an extreme case could take hundreds of years. [IETA, 70]

187. On the frequency of monitoring, two “full” measurements are conducted encompassing the full crediting period. “Simplified” monitoring, i.e. remotely sensed forest cover should be allowed within the crediting period to ensure permanence and to understand if corrective actions are needed. In case the activity proponent seeks to verify removals

before the conclusion of the crediting period, then a second “full” measurement should be conducted to estimate C stock changes and, from this, removals. [ALLCOT-48

188. The reference to ‘accumulation of stocks’ assumes all removal types increase sequestration over time. This may be the case for nature-based solutions and carbon farming but not for engineered types like DAC and BECCS. The language across most of the consultation documents appears to derive from nature-based solutions and should be made more holistic/agnostic to account for full spectrum of removal types including utilisation/carbon-to-value. [ECP, 27]

189. The Supervisory Body should consider the impacts the timing of verification might have on the financing of projects. Requirements for verification that may delay verification may also delay when a project receives compensation for CDR and impacts the financing of the project. The project proponent should have some ability to verify more frequently or earlier than recommended if they carry the cost of verification as the verification schedule heavily dictates the business model. This is especially true for emerging technologies that are still working through the hurdles of scaling where the production of carbon stock may initially be slower than expected. [CW, 31]

190. In practice and in the case of projects with a crediting period of 15 years developed with smallholder farmers (most probably including about 2 harvesting cycles), ensuring a permanence period of at least 40 years is unrealistic. [TREEO, 11]

191. It is also not commonplace to require permanence monitoring beyond the project term/end date. We suggest broader stakeholder comment is sought prior to prescribing such approaches. [ACR, 8]

192. The monitoring period should not be underestimated. It cannot be limited only to a crediting period. Instead, monitoring needs to continue at a climate-relevant timescale, as the risk of reversal remains even after the end of a crediting period and unsuccessful removal may pose direct risks to human and natural systems. Monitoring must be transparent and conducted on a frequent basis. People, communities and rights holders affected by removal activities, must be involved in the monitoring in key positions. Monitoring should not be carried out by the proponents of the removal activity alone but should be independently verified by third parties. [HBL, 65]

193. Monitoring of a removal activity must not be limited to a crediting period, but instead should extend far beyond as the risk of reversals will remain. For example, if the crediting period for a forest restoration project is 10 years, monitoring should extend beyond that because the risk of deforestation extends beyond those 10 years. Arguably, monitoring is necessary as long as the offset emissions will be in the atmosphere, or at least the majority, meaning that a forest restoration project would need monitoring for many decades past the ten-year crediting period. While this is logistically daunting, integrity demands that an offset be as permanent as the fossil emissions it is enabling. This monitoring can and should be conducted in conjunction with people in the project area and third-party monitoring: monitoring should not only be done by project proponents, but also by third parties to provide independent verification. [CLARA, 69]

3.2.5. Reporting

194. The ROK thinks that paragraphs 11~14 well capture the basic requirements for reporting removal activities. Regarding paragraph 12(f) on safeguards and paragraph 12(g) on

sustainable development, the ROK thinks that these can be related to paragraph 21. The ROK hopes that reporting rules on safeguards and sustainable development can be aligned with the outcomes from the rule-making process on sustainable development by the Supervisory Body. This will be indicated again at the section 4.7. [ROK, 57]

195. Requirements of the recommendations do not include reporting on activities themselves. They address only reporting on Monitoring. However, all certification procedures include reporting on implementation and requirements to the project documentation. [WI, 9]

196. Reporting "records and logs of events or incidents" during the crediting period is unnecessary in light of the method proposed to estimate removals. Since removals are estimated based on the measured carbon stocks at time 1 - time 0, any C fluxes in between (due to disturbances, events or incidents) would be captured in the final estimation of total C stock changes. Documenting records, logs and providing a "summary of reversals notifications…" is costly and does not affect the final estimate of removals. Reporting any "events or incidents" becomes more important after the crediting period, to ensure permanence of A6.4 removals. It is proposed that A6.4 removal activities occur within local sustainable development plans, led by LCIPs, so that longer-term monitoring provisions are in place to track and counter any drivers of reversals. (ALLCOT-48)

197. Data required for the issuance of carbon removal certificates should be limited to measurable and verifiable data of the CDR event of activity itself. Monitoring of co-factors including environmental and social safeguards, contribution to SDGs, monitoring of reversal events should be periodic. [ECP, 27]

198. Reporting should include:

(a) Information on the amount of emissions of greenhouse gases removed;

(b) Information about the additionality of the reduced emissions (i.e. whether the project would have happened in the absence of it receiving support through the carbon market);

(c) Information about ongoing threats that may impact the permanence of the reversal;

(d) Information about the environmental and social impacts of the activities and how any adverse impacts will be avoided or mitigated;

(e) Information on how stakeholders and communities affected are/were involved and consulted;

(f) Information about any complaints filed and how they have been addressed. [HBL, 65]

199. Reporting must be transparent. All reports should be publicly available (at a minimum on the Article 6.4 mechanism's website) and easily accessible. Reporting should also include:

(a) Information on environmental and social impacts, including how any adverse impacts are being prevented or mitigated;

(b) Information on how stakeholders were/are being consulted;

(c) Information on any grievances that have been filed;

(d) Information about ongoing threats that may impact the permanence of the reversal;

(e) Information on additionality (i.e. whether the project would have happened in the absence of it receiving support through the carbon market). [CLARA, 69]

3.2.6. Use of digital technologies

200. Whilst the CDM can act as a useful precedent, Article 6.4 and carbon markets more broadly must evolve beyond in-person and manual audits where possible. Increasingly, digital technologies are being used to streamline data collection and processing for MRV processes. The remote verification of data can fast-track issuance of tradeable carbon assets, significantly reducing payment cycles for project developers and increasing their share of value generation, instead of verifiers or auditors. [ECP, 27]

201. Whilst manual data collection and in-person surveys will continue to play a key role, particularly for nature-based removals, their importance should not be assumed for engineered removals and seen as a benchmark for quality. In its requirements for MRV, the UNFCCC should advocate a greater role for automated data collection through IoT, mobile technology and online applications. [ECP, 27]

202. Combining the use of a professional digital tool for monitoring with satellite images can help the project developers avoid the high costs that should be allocated to DOEs. The verification events can also take place, but they will be less expensive and less detailed as the digital tool can simplify and shorten the process of verification. [TREEO, 11]

203. We agree that more innovative approaches and technologies should be supported by the mechanism for more accuracy of carbon stock quantification but also more involvement of smallholder farmers. As an example, the TREEO app allows to quantify the carbon from every single tree. The farmers will be empowered to monitor their own trees once a year by measuring the Diameter at Breast Height (DBH) which is linked in the app with an allometric formula allowing to estimate the biomass and the carbon stored. [TREEO, 11]

204. Enabling teams to create and operationalize digital methodologies using defined roles, actors who perform those roles, and data they produce linked back to unique units of value (e.g. 1 metric tonne of carbon dioxide equivalent (mtCO 2 e)) will enable transparent climate-asset tracking like never before. This will drive empirical improvements in climate accounting across a diverse array of methodologies and corresponding verifiers, actors, datasets, and climate-asset classes. [HBAR, 14]

205. DLT innovations can help to mitigate fears that it is neither practical nor credible to engage in the kind of robust longitudinal monitoring of nature-based removal activities necessary to verify credit issuance requests and detect reversals. Project-level Measurement, Reporting and Verification (MRV) is often assumed to require significant ongoing human capacity (i.e. boots on the ground), to involve high administrative costs (potentially with equity implications), and to present enforceability and liability challenges that scale faster as monitoring periods grow. Leveraging highly scalable, environmentally sustainable proof-of-stake DLT networks such as Hedera Hashgraph breaks those legacy assumptions and obsoletes traditional manual processes. [HBAR, 14]

206. DLT-enabled digital Measurement, Reporting and Verification (dMRV) procedures employ interoperable standards, are fed in real time by continuous remote sensor, IoT, LIDAR, drone, and satellite data feeds augmented by machine learning to identify data errors and fraudulent behavior, and are secured by verifiable, decentralized, digital identifiers for human or organizational actors. This is not speculative futurism, but a mature technology that is transforming carbon markets with end-to-end digitalization and enabling grassroots participation and granular visibility in asset creation from an international perspective. The World Bank recently illustrated this trend with case studies from across the world, demonstrating how dMRV systems are being used today for monitoring, reporting, and verification of mitigation outcomes and GHG inventories linked to forestry and land-use projects, among others. [HBAR, 14]

207. We urge the SB to consider how best to embed these innovative new DLT-based certification and verification tools into Article 6.4. Success will increase the mechanism’s credibility by enabling for the first time automated, cost-effective, and transparent verification of the performance of any nature- based removal project in the background, even over decades-long permanence periods. [HBAR, 14]

208. All data can then be recorded immutably in an openly discoverable and auditable way, effectively bringing the balance sheet of the planet onto a public ledger. By making progress of climate actors towards their mitigation goals visible, SB will discourage a race to the bottom, galvanize higher-ambition target-setting, and accelerate the impact of climate action in the aggregate without unduly compromising data privacy. [HBAR, 14]

3.2.7. Addressing reversal

209. Ownership of removal activities -- the US gov't defines the "owner" of carbon capture equipment as whoever owns the capture equipment, and then it is their responsibility to

ensure it is permanently sequestered. A similar logic could apply to the CDR/GGR space. Several US states also allow transfer of liability to the state governments to ensure long-term liability is met. [BCG, 190]

210. We suggest that other carbon pools can be linked to the above-ground/ below-ground pool in order to address the reversal. In other words, if the project developers ensure that the harvested trees went to wood construction and the residues were used for producing biochar, a permanence period of nearly 100 years can be ensured. In our vision, smallholder farmers in the global south should be engaged and should benefit from carbon projects and finance and actively contribute to carbon removal. The current requirements will just continue to exclude them from the whole process. [TREEO, 11]

211. Distributed ledger technology (DLT) offers the SB powerful tools to manage going forward, as reversals become more common. By enabling discovery of transparent, traceable climate data in standardized formats, DLT opens new pathways toward inclusive climate governance in a decentralized “digital commons.” [HBAR, 14]

3.3. Accounting for removals:

212. The SB 005 Information Note calls for a discussion on accounting for removals, including:

(a) Discuss any further considerations to be given to the core elements for accounting for removals in A6.4-SB003-A03; where possible, identifying their applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types;

(b) For activities involving removals that also result in emissions reductions, what are the relevant considerations, elements, and interactions between this guidance and the requirements for the development and assessment of mechanism methodologies, including.

213. Below is a summary of public inputs received.

3.3.1. General approach to accounting

214. Notwithstanding the fact that long-term monitoring for ecosystem-based activities primarily aims to resolve the issue of permanence of mitigation outcomes, it also ensures continuous maintenance of SDG and adaptation-related co-benefits. While removing the liability for long-term permanence, the tonne-year crediting approach discourages consistent, continuous action by the activity participants. The shift of crediting rate to the later part of the crediting period can hinder early action, especially for activities in boreal ecosystems, where lifecycles are more prolonged than in ecosystems of more southern regions. Tonne-based crediting, despite relatively less stringent conservativeness, is widely applied in voluntary carbon markets schemes and has well-developed package of instruments, including non-permanence risk assessment tools. Jurisdictional level safeguards combined with buffering and activity participant level monitoring and insurance requirements can sufficiently ensure the credibility of the outcomes, while non-permanence risk assessment with differentiated buffering can incentivize precaution on the side of activity proponents. The RMPs generally provide for three approaches for baseline setting i.e. best available technologies, benchmark approach, approach based on existing actual; or historical emissions with downward adjustment. The latter appears to be the most applicable one for the ecosystem-based activities given that the BL takes

into account the cycles of changes in the age structure of ecosystems, as relevant. BAT and benchmark-based baseline setting, if applied for ecosystem-based activities, would need to account for the differences in ecosystems, climate and natural zones. Due to low availability of field research data and information with sufficient discretion to reflect the variability of ecosystems such methods are likely to imply high level of uncertainty and therefore should not be recommended at early stages of the implementation of the Article 6.4 Mechanism. Namely, the Forest management reference levels used for CP2 in Kyoto protocol accounting are not applicable for project level activities, especially in the countries with significant variety of climate zones and natural conditions. Activities performed on a local level should account for such factors as soil type, species, lifecycle and harvesting cycle, etc., that in combination can differ even in closely located areas. [RU, 53]

215. A6.4ERs issued to removal activities should be well-aligned with the way in which the same activity is recorded in the national GHG inventory of the host party(ies). A robust accounting framework means that the transfers of A6.4 removal credits between Parties, any related corresponding adjustments, and the stocktake of progress against NDCs, should all seamlessly fit together (e.g. to avoid type I/type II errors that may arise due to methodological inconsistencies). As such, methodologies for carbon removals must be developed cognisant of the recommended approaches in IPCC Guidelines for National GHG Inventory compilation. Appropriate methodological requirements, reporting standards (e.g. requirements for certain higher Tiers to be applied by Parties hosting activities) and/or the use of accounting techniques that can reconcile differences, may all need to be explored to ensure there is consistency in records across issued credits and the reductions and removals recorded by Parties. [IETA, 70]

216. We recommend giving further consideration to the definition of additionality beyond its application to removals. The recommendations do not cover baselines for removals. IETA assumes this is because it is covered in the broader methodological recommendations under discussion by the A6.4SB. We note, however, that any baseline that includes future emissions (i.e. the baseline is >0) will result in credits being awarded for both emission reductions/avoided emissions and removals if net flows go below zero. (IETA-51)

217. Specific criteria for determining the baseline of forestry projects must be defined, as the general baseline criteria defined under the guidance for article 6, paragraph 4 do not apply to the forestry context. In the modalities and procedures approved at COP26 (Decision 3/CMA3), the definition of the baseline, contained in paragraph 36 of the referred decision, contemplates alternatives that do not seem fit for the purpose at hand, with the possible exception of the “historical approach (c). [ABU, 60]

218. The experience with CDM A/R methodologies has been that methodologies ended up being very conservative when it came to the inclusion of emissions from material used and implementation. This resulted in a situation where a lot of effort was required for determining relatively small sources of emissions (such as the carbon in fence posts used or emissions from fuel use for transporting seedlings to the site). We would encourage to apply the approach of using conservative default factors for emissions from equipment and materials used, and the implementation of the activities. In addition, the Supervisory Body might want to consider a threshold that would allow exclusion of certain sources of emissions if relatively small. [MDB WG, 53]

219. The A6.4 rules must ensure that removals activities for which credits are issued ensure the reservoirs are maintained over at least over a time frame comparable to fossil fuel emissions which they may be used to compensate. If the reservoirs cannot be maintained

over such a period with a high likelihood, then temporary credits or other solutions to deal with permanence and reversibility should be issued. This includes avoiding any methodology that creates a false equivalence between temporary or inherently reversible removals and permanent emissions, including some approaches to tonne-year crediting. [WWF, 71]

220. There has been for some time a general agreement that long cycle geological carbon emissions cannot be offset physically by short cycle biogenic removals on a one-to-on ratio. The SB's recommendation to the CMA on accounting for removals and crediting periods should derive from the climate warming potential asymmetry between fossil fuel related emissions and land-based offsets. Carbon Market Watch's advice to the SB to separate the accounting of emissions reductions from the accounting of removals is rooted in recognition of the asymmetry between geological emissions and biogenic removals: "There is not only no equivalence between fossil and biogenic carbon, but also between various 'types' of biogenic carbon. There is a spectrum of natural removals, according to their quality, longevity and stability." Ignoring the differences on the spectrum impedes accounting and crediting that not only reduces emissions but also restores natural ecosystem sinks in ways that are environmentally just, according to an important source of the Carbon Market Watch analysis. [...] [IAP, 72]

221. We would like to reiterate that tonne-year accounting must not be included under the 6.4 mechanism or in the SB's recommendations on removals. While storage of carbon over a few decades has benefits, this is not equivalent to permanent emission reductions/removals and must not in any way be used to offset ongoing/future fossil emissions which will on the other hand have long-term consequences. There are also significant doubts about additionality associated with tonne-year accounting: e.g. one approach is centred around the deferral of timber harvests for one year, which is extremely unlikely to satisfy real additionality tests. [CMW, 78]

222. Failing to appreciate BECCS as a sum of its parts risks the misapprehension that its initial stage – CO_2 temporarily stored within trees – is equal to or superior to the full outcome. In practice, BECCS activities involve anthropogenic enhancements to both the amount of CO_2 that is drawn from the atmosphere and the duration such CO_2 will be sequestered – each fundamental objectives of the mechanism. Proposal to limit the temporal scope of removals to those that occur post registration of the activity would logically lead to significant amounts of CO_2 being consigned to less durable biogenic storage, and the foregoing of renewable energy opportunities. [DG, 80]

223. Regarding the accounting for removals, it is of the utmost importance to adopt or accept approaches for the accounting in a way that they are consistent with the net-zero goal under the Paris Agreement. Any of the approaches adopted for accounting and crediting of removals needs to be conservative but at the same time must favour the cost effectiveness of removals activities. [CO, 58]

224. Tonne-year accounting methods based on economic discounting (e.g. Parisa et al. 2022) are also incompatible with achieving long-term temperature targets." [...].The fundamental flaw of the proposed tonne-year approaches is that it wrongfully presumes to equate short periods of carbon storage with permanent mitigation. [OI, 62]

225. The tonne-year accounting method proposed fails to reconcile the economic value of carbon removal activities with the physical realities of climate change. As explored further in our 2022 policy brief, Addressing Differences in Permanence of Carbon Dioxide

Removal. [...] Accounting of removals must be based on a foundation of physical climate science rather than stylised financial modelling. [BF, 63]

226. It is advised that engineered-based and land-based removals accounting are fundamentally separated. [GCCSI, 66]

227. It is crucial to take into account any removal activity that results in the increase of GHG emissions and the need for relevant guidance to be applied in such cases. Any increase on the GHG emissions caused by the implementation of the removal activity must be deducted from the achieved removals. Therefore, transparency and due diligence in monitoring are pivotal. [LESE, 67]

228. The mitigation potential of ‘Land-based activities’ should be reassessed taking into account important and climate-relevant factors in addition to CO_2. [PML, 112]

229. To achieve Net-Zero, Ton-Year accounting must be rejected. Instead, accounting methodologies have to reflect the reality principle. This means temporary credits for temporary measures (like NBS) and permanent credits for permanent measures (like mineralization). (also “Addressing Reversal”) [IJ,113]

230. Tonne-year accounting is problematic as it devalues high-quality long-duration CDR approaches necessary to counterbalance residual fossil carbon emissions, and durably remove carbon dioxide from the atmosphere. [OA, 114]

231. Instead of tonne-year accounting with vertical stacking, "Like-for-Like" principle should be applied which differentiates emissions in their impact and permanence. For example, short carbon cycle emissions, such as those from land-use changes, could be effectively offset by biosphere-based carbon removal methods, such as reforestation. In contrast, long-lived emissions, such as those from burning fossil fuels, should require more permanent measures to offset, such as direct air capture with geological storage. The definition of what constitutes long-lived storage under like-for-like removals can be set using a time horizon and a conservative discount rate. For example, using a 1% discount rate makes 200-year storage about 90% as valuable as permanent storage and 500-year storage 99,5% as valuable as permanent. (also “Addressing Reversal”) [MC, 117]

232. The use of tonne-year accounting methods in the context of Article 6.4. risks undermining the temperature ambitions of the Paris Agreement as it makes no assurances about stabilizing long-term global temperatures. No amount of temporary storage can physically compensate for fossil CO_2 emissions when considering long-term temperature stabilization. Verra has paused adoption of tonne-year accounting and the Integrity Council for the Voluntary Carbon Markets has excluded tonne-year accounting from its Core Carbon Principles. Critical questions such as how to set time horizons, apply discount rates, and make trade-offs between short-term and long-term warming should be pursued in consultation with climate experts to fully understand the risks posed by using tonne-year accounting. (also “Addressing Reversal”) [CP, 138]

233. Several other submissions reject tonne year accounting. There is scientific and political consensus that, while short-term carbon sequestration can play a role in slowing global warming and reducing peak temperatures, it should not be a substitute for permanent carbon removal, which is vital to ensuring future generations are protected from the risks of global warming and climate change. [44.01, 142] [N-AG, 142] [IETA, 143] [CX, 147] [CA, 152] [BEAF, 154]

3.3.2. Additionality of removals

234. The notion of additionality for BECCS and DACCS is very different from additionality for traditional carbon credits. Negative emissions with geological storage don't have any inherent in-value-chain-worth for the project owner. They are only produced for the purchaser of the negative emission rights, without the potential to come about for any other reason. There is, however, one critical limitation to this argument that must be assessed from an additionality perspective. If the project is eligible for state aid and such aid would be comprehensive enough to allow the project to meet its profitability targets without the carbon credit revenues, then – if the project receives such aid – the project would not be additional from the perspective of the voluntary market. [SE, 15]

235. Both DACS and BECCS benefit from government incentives in many jurisdictions, but these are not sufficient for viability on their own. As such we believe its self-evident that engineered carbon removal with permanent geological storage (i.e. DACS and BECCS) should be on the positive lists that you are working on. This is a critical issue to get right in order to enable billion-dollar scale investments. If it is not clear at the outset that projects will pass additionality tests, investors will not go ahead. [DG, 29]

236. Carbon removal has the distinct advantage of being directly measurable. One can measure the amount of carbon being removed and the amount of carbon added to a reservoir. This measurability makes carbon removal verifiable. An auditor can independently measure the carbon content of the reservoir and check it against the values reported by the storage operator. This means that accounting rules should move away from using hypothetical "business as usual" baselines - there is no excuse for not directly measuring the baseline, i.e. the carbon content of the reservoir before activities, directly since this is the strength of carbon removal. This observation means that none of the methodologies offered in decision 3/CMA.3, annex, paragraph 36 are sufficient to harness the level of verifiability offered by carbon removal activities. Instead, we would suggest that accounting rules should make the most of this feature to ensure the highest level of verifiability. This means that accounting rules - for all types of removal - must be able to (1) delineate the boundaries of the reservoir, (2) quantify the carbon added to a reservoir, (3) quantify the carbon content of the reservoir, (4) estimate the measurement error in a way that is commensurate across all types of removal. [SA, 47]

237. A distinction between emission reductions and removals does not make sense in the case of wetlands. Long-term sequestration is possible only on the back of emission reduction activities, for instance, rewetting of drained peatlands. Wetland habitats are the best example for the intrinsic relationship between emission reductions and emission removals. [WI, 9]

238. We suggest that the approach to financial additionality be reconsidered such that financial additionality isn't underpinned by a specific requirement that carbon finance must singularly "shift" project economics from negative to positive. Not only has this approach been widely gamed in the past, but it is also very often the case that carbon revenues by themselves (especially at current pricing) often are not fully capable of shifting these circumstances. Rather, they are used as a revenue supplement, or are part of a blended finance mechanism that allows the project to occur. We suggest the approach is revised to acknowledge forgone revenues and opportunity costs associated with project enrollment and continued monitoring and verification. [ACR, 8]

239. We suggest that specific definitions be elaborated for baseline and for additionality in the case of forestry activities. It is worth remembering that the same logic occurred in the regulation of the CDM. In the deliberation regarding the modalities and procedures, a consensus was reached on the definition of baseline and additionality in general and, in the subsequent COPs and CMPs, specific modalities and procedures for A/R projects, including definitions for additionality and baseline were defined, in Decision 19/CP.9, para. 22. [ABU, 60]

240. Performance additionality: When the document refers to the average performance of the peer activities in the industry or the sector, it is not clear whether it refers to emissions or production activity. [CCO, 33]

241. Positive lists are determined by many variables and can be very general, which can easily render them useless. Therefore, if it is decided to accept positive lists, it would be ideal to clarify the conditions for periodic monitoring of the variables that define them. [CCO, 33]

3.3.3. Using LCAs

242. The ROK thinks that the life cycle analysis (LCA) approach to engineering-based removal activities (including DACCS and DACCU) needs to be prepared by a group of experts and acknowledged by Supervisory Body. The ROK thinks that there should a separate paragraph that deals with an activity involving removals that results in 'substitution effects'. Substitution effects refer to the practice that carbon-intensive fuels or materials are replaced by captured CO_2 from removal activities as alternative resources. In the specific case of DACCU where CO_2 is captured from the atmosphere and stored into a product temporarily, CO_2 is utilized as alternative resources to CO_2 emitting resources. Such activities may realize substitution effects by avoiding emission of greenhouse gas that would otherwise be emitted to the atmosphere. In this case, net CO_2 removal can be zero due to temporary storage, but the substitution effects still remain. [ROK, 57]

243. The accounting requirements broadly states "minus emissions attributable to implementation of the activity". This should clearly be defined as based on a cradle to grave LCA and including embodied emissions. As the purpose of the activities is net negative emissions, all emissions from the activity should be considered to avoid over crediting. [CW, 31]

244. Standardisation of LCA's across certification standards are crucial in creating standardised accounting of carbon removal activity. It is recommended that facilities have a simple formula based on a methodology to determine the net carbon removal activity per event to streamline issuing of carbon removal certificates. This would account for Facility-specific lifecycle emissions, equipment and leakage. [ECP, 27]

245. LCAs are very useful when understanding where the emissions come from in a process or comparing the efficiency across different processes of the same type of system. Despite their wide and increasing application in carbon accounting, LCAs are not useful for carbon removal accounting purposes. Three decades of research have amassed a large body of literature on the issues with LCA, some of which are particularly pertinent to carbon removal, and many remain unresolved. The type of LCA will depend on the system being assessed which is problematic when carbon removal accounting spans activities as incomparable as forest growth and direct air capture and injection in geologic formations. Furthermore, they require knowledge of elements that are known only approximately or rely on generic datasets. Drawing boundaries for LCAs is a subjective activity yet a highly

important part of the process. This makes LCAs easy to manipulate and frequently inaccurate for accounting. LCAs also rely on large amounts of data that are frequently unknown or modeled, making the attribution of emissions a challenge. [SA, 47]

246. Removal activities should be measured based on a full life cycle assessment, thus accounting for the permanence and potential reversal of the activity. Doing so would require some adjustment in order to harmonize with IPCC guidance on accounting for the AFOLU sector. Tonne-year crediting effectively creates a false equivalence between temporary and permanent carbon storage and by legitimising short-term carbon storage, it poses significant risks to the goal of the Paris Agreement. (also “Addressing Reversal”) [NEP, 131]

247. The accounting of carbon removals should focus on accounting of storage, which can be done by directly measuring the amount of carbon captured and added into a reservoir. This measurability makes carbon storage verifiable as an auditor can independently measure the carbon content of the reservoir and check it against the values reported by the storage operator. The accounting rules - for all types of activities - must be to able to (1) delineate the boundaries of the reservoir, (2) quantify the carbon added to a reservoir, (3) quantify the carbon content of the reservoir, (4) estimate the measurement error in a way that is commensurate across all types of removal. If the accounting focuses, instead, on removals, one needs to measure net outcomes as one needs to know that a project does remove more carbon dioxide than it emits. However, this makes the accounting overly complex, subjective, and inaccurate because it would require a Life Cycle Analysis (LCA). LCAs, which requires use of approximation or generic data and require subjective judgements in some critical elements such as boundaries, are easy to manipulate and frequently inaccurate. In addition, as LCAs include other greenhouse gases, it requires GWPs, that is another source of uncertainties and value judgment on time horizons. The complexity, expense, and time necessary to perform an LCA make it a poor candidate as a tool to account for carbon removal. Accurate accounting for removals should rely on direct measurement of carbon stored, more specifically, what is in storage to account for any loss of carbon from storage. [CNCE, 137]

3.3.4. Double counting of CO_2 removals

248. Double counting refers to a situation where two parties claim the same carbon removal or emission reduction as a result of having counted GHG emissions, or atmospheric CO_2 removals, from the same source in both countries. In cities around the world that consume timber forest products, their use and destination was being accounted again, either as atmospheric CO_2 removal, or as GHG emissions from the final destination. In these countries, technologies and processes that reduce GHG emissions and remove atmospheric CO_2 through the use of industrial wood generate carbon credit benefits, generating a double count of GHG emissions associated with Brazilian industrial wood that has already been accounted for. [IAV, 22]

249. We support the flexibility for carbon removal projects to register against multiple registries and agree strict protocols must be implemented to prevent double issuance. Integrity checking and transaction processing should be adopted at Issuer level but greater linking, dialogue and communication between registries should be enforced to reduce risk of double issuance. Enabling view-only access for issuing data between registry providers for example may provide an added-layer of integrity checking for Issuers. Ideally, a global VCM registry within the UNFCCC's system of national government registries would be created so corresponding adjustments can be consistent. [ECP, 27]

250. We suggest further elaborating on the notion of "common practice additionality" to create more clarity on how that is understood and demonstrated. [ICLRC, 24]

251. Double counting is the most pressing issue that needs to be solved and corresponding adjustments (CAs) need to be implemented as soon as possible. On temporary crediting, horizontal stacking is superior to vertical stacking which uses tonne-year accounting (TYA). In addition to containing high risk of reversal, TYA involves a choice of discount factors that is a policy rather than scientific decision that is used to discounts the future socioeconomic costs benefits of climate impact. As TYA mixes the economics of discounting with the science of global warming, TYA credits cannot be used to make net-zero claims. In horizontal stacking, crediting period is sliced up in one-year increments and contains zero reversal risks if credits are issued ex post. Credits are valid for one year, after which they are retired and would have to be renewed, following a simple principle that climate claims are lost if credits are not replaced. (also “Addressing Reversal”) [OXO,115]

3.4. Crediting period

252. The SB 005 Information Note calls for a discussion on further considerations to be given to the core elements for crediting periods in A6.4- SB003-A03; where possible, identifying the applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types.

253. Below is a summary of public inputs received.

254. For removals with geological storage, considering the very significant amount of CAPEX and risk associated with the investments in capture, transport and storage, a minimum crediting period of 30 years should apply for this type of removals to allow for necessary investment decisions. [CFL, 38] [SE, 15] [ECP, 27]

255. Crediting period of 15 years renewable twice (15))(twice) needs to be supported. Is this number fitting equally for all activities? Rather than stating the number, state the criteria for determining it for each activity. [CW, 31]

256. Based on our experience and observation from the field, we strongly support a crediting period of 15 years which particularly encourages smallholder farmers to engage in afforestation and reforestation projects because in the majority of cases farmers do not want to commit directly for longer projects (e.g. 30 years). Having the possibility to renew the crediting period is much easier than designing a 30-year project from the beginning. However, requiring monitoring after the end of the project might be discouraging project developers because any monitoring would imply additional costs that might not be covered by the carbon money. [TREEO, 11]

257. The current proposal of 15-year crediting periods, which can only be renewed twice, seems too restrictive. This should be allowed to be renewed multiple times to take into account variations in durability between carbon removal methods. For example, biochar has around 100 years durability and direct air capture has 1,000- or 10,000-years durability. A maximum 30-year crediting period when continued removal is occurring is limiting. [BZC, 43]

258. The suggested crediting period of 15 years, renewable a maximum of twice, should be extended to a minimum of 30 years for durable removal facilities. The development of removal projects requires years to identify sites and storage locations, engage

communities, and secure off takers. Further, in the case of durable solutions, facilities are designed for an initial useful life that likely extends beyond the proposed 15-year crediting period. Without certainty around a renewal of the crediting period, the capital costs may outweigh identifiable revenues, risking disincentivizing durable removals. [DACC, 30]

259. In order to provide investors' confidence in investing billions into engineered removals a 15-year time horizon of certainty of revenues is far too low. We would suggest 30 years would be necessary to provide sufficient confidence and align with investment time horizons. Furthermore, we do not see any rationale whatsoever for the crediting period to only be renewed once for project which have no other economic reason to keep running other than carbon credit revenues associated to continued operations. [DG, 29]

260. The proposed 'crediting period' of removal activities is wholly insufficient for the purposes of climate mitigation and should expanded to the magnitude of (at least) centuries rather than decades. It should also be specified that if a removal activity is reversed it ceases to be a removal, unless the reversal has been replaced. A removal which fully reverses should be cancelled, as should any accounting transactions that have been made on the basis of this removal (e.g. an emission which was balanced out by that removal) along with a relevant liability or penalty. [BF, 46]

261. We suggest that maximum renewal shouldn't be set at 2, but rather should be based on demonstration of continued additionality and confirmation of the baseline. Requiring permanence monitoring beyond the project term for 'tonne-based' crediting is not standard practice and would significantly reduce participation in many sectors of the carbon market. We suggest broader stakeholder input is sought prior to prescribing such an approach [ACR, 8]

3.5. Addressing Reversals

262. The SB 005 Information Note calls, in order to minimize the risk of non-permanence of removals over multiple NDC implementation periods, and, where reversals occur, ensure that these are addressed in full:

(a) Discuss the applicability and implementation aspects of these approaches, including as stand-alone measures or in combination, and any interactions with other elements of this guidance: a) non-permanence risk buffer (pooled or activity-specific); b) Insurance / guarantees for replacement of ERs where reversals occur (commercial, sovereign, other); c) Other measures for addressing reversals in full;

(b) Discuss the appropriate timeframe(s) for applying the approaches, including any interactions with other elements of this guidance and the applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types;

(c) What risks of non-permanence need to be minimized, and how can these risks have identified, assessed, and minimized?

263. In respect of risk assessment, how should the following elements be considered in the implementation of the approaches in (a) and any other relevant elements in this guidance?

(a) Level of non-permanence risk assessment, e.g. activity- or mechanism-level;

(b) Timing for risk assessment(s);

(c) Entity(ies) responsible for risk assessment(s), e.g. activity proponent, 6.4SB, actuary;

264. How should the following elements be considered in the implementation of the approaches in (1) above and any other relevant elements in this guidance?

(a) Methods for determining the level of buffer pool contributions;

(b) Composition of buffer pool, including in relation to ER vintages and contributing activity types or categories;

(c) Intentional and unintentional reversals;

(d) Treatment of uncancelled buffer ERs, including after the end of the last crediting period of the contributing activity;

(e) Specifications for ERs that cancelled for compensate for reversals, including in relation to ER vintages and contributing activity types or categories;

(f) Replenishment in case buffer cancellations exceed contributions; slide language on re-raising baseline level of storge before new crediting;

265. In the event of a reversal, what interactions and implementation aspects should be considered in respect of other elements of the activity cycle?

266. Below is a summary of public inputs received.

3.5.1. Risk of Non permanence and Permanence period

267. What type of mitigation activities are associated with material reversal risks? Material risks for reversals occur for any measures that preserve or reduce losses from biogenic carbon stocks. This holds for activities in the land-use sector, such as afforestation, forest landscape restoration, reducing emissions from deforestation or forest degradation, improved management of forests, rewetting of peatlands, enhancement of soil carbon, and so on. Moreover, reversals risks are material where carbon is stored in geological reservoirs, including different types of carbon capture and storage (CCS) activities, or in other types of reservoirs (e.g. in rocks through enhanced weathering). By contrast, the destruction of non-CO_2 gases or the reduction of fossil fuel consumption is not associated with material non-permanence risks within the horizons to address climate change. The EU believes that incentives for preventing reversals from occurring is critical for ensuring that mitigation activities contribute to the long-term goals of the Paris Agreement. We recommend that the Supervisory Body puts appropriate safeguards in place. These could, depending on the type of mitigation activity, include different measures, such as:

(a) Requiring mitigation activity proponents to conduct a reversal risk assessment for the specific mitigation activity, including an assessment of the impact of climate change, following a methodology to be developed by the Article 6.4 Supervisory Body;

(b) Using the outcome of the risk assessment to determine the stringency of the measures to prevent and compensate for reversals, such as (i) excluding mitigation activities with high reversal risks from eligibility under the mechanism or (ii) using the results from the risk assessment for determining the share of Article 6.4

emission reductions that must be set aside in a pooled buffer reserve, with higher shares for mitigation activities with higher reversal risks;

(c) Requiring mitigation activity proponents to have legal titles to the land and/or relevant carbon reservoirs on the land (e.g. timber rights), or requiring that legally binding agreements between the mitigation activity proponent and third parties require the mitigation activity proponent's consent to undertake any measures that may lead to intentional reversals;

(d) Assessing whether there are national or sub-national laws or regulations that would prevent carbon stocks from being lost (e.g. laws that prohibit forest land, once established, to be converted to non-forest land in some Not all of these measures may need to be place at the same time, depending on the type of mitigation activity. How many of these measures are in place could also inform the approaches required for compensating for reversals, as laid out in the following (e.g. where more of these measures are in place, lower contributions to a pooled buffer reserve may be necessary). [EU, 59]

268. Permanence is the most important concept in removal activities. Along this line, reversal, which is the cause of non-permanence, is something to be addressed. In this regard, the ROK thinks that this section on 'addressing reversal' needs to consider the specification of requirement on 'permanence' as well. [ROK, 57]

269. It is important to strengthen the principle that the climate benefit generated by removals should not be overshadowed by the risk of non-permanence, i.e. the risk that the carbon removed through such projects returns to the atmosphere for any reason, generating the eventual loss of removal ballast. The informative note circulated by the SB presents good examples of how to reconcile the need to stimulate removals with the principle of environmental integrity, especially through equivalence methods based on temporal criteria, discount rates and the factor of atmospheric CO2 decay, according to IPCC references. [ABU, 60]

270. The use of pooled buffers for the crediting of land-based removals activities has been widely employed in other crediting programmes without the need to apply discount factors, and we propose recommendations should be drawn from those experiences. For technology-based carbon sink enhancements, IETA welcomes the proposal to adopt the 'regulatory safeguards'-style approach for geological CO_2 storage, which draws upon approaches previously agreed under the CDM. In addition, IETA has developed a set of principles to govern the development of tradable reductions and removals through the High-Level Criteria for Carbon Geostorage Activities. These include six key core methodological components, as well as ten high-level criteria and supporting safeguards to identify and manage any potential risks associated with carbon geostorage (including reversals). [IETA, 70]

271. Require compensation for all types of reversals by either the carbon crediting program or the mitigation activity developer through the cancellation of other carbon market units. This can be achieved through landowner liability, pooled or non-pooled buffer reserves, and/or insurance. In addition, credits held in a buffer reserve at the end of a program's monitoring period should be cancelled. [...] Encourage the use of financial instruments for risk management, with a view to potentially mandating the use of these instruments at a later stage. This refers to the idea of making insurance or some other backstop (like a bond) mandatory for project managers under contractual design. To discourage risky practices,

insurance companies frequently set management requirements for insured projects. In theory, NCS project managers could purchase insurance to cover the risk of reversals, though very few insurers currently provide this service. [EDF, 80]

272. Only permanent net removals should be eligible for crediting under the mechanism. If removals are to be accounted for as an equal and opposite action of the emission of greenhouse gases, the quantified unit of removal must be the amount by which the level of greenhouse gases in the atmosphere has permanently decreased. This requires that:

(a) CO_2 is physically extracted from the atmosphere;

(b) The extracted atmospheric CO_2 is permanently stored out of the atmosphere;

(c) All direct and indirect greenhouse gas emissions associated with the extraction and storage processes are included in the emission balance;

(d) The net removal is what is considered: the amount of atmospheric CO_2 removed and permanently stored that exceeds the amount of associated greenhouse gases emissions. [BF, 63]

273. While different activities can achieve carbon dioxide removal, they will involve different storage timeframes and risks of storage reversal. For example, storage in products and carbon farming activities will typically store CO_2 out of the atmosphere for decades to centuries; while storage of CO_2 in geological reservoirs offers the opportunity to safely store CO_2 for thousands of years. The different timescales and reversal risks associated with the different activities should be reported, ensuring that the market is able to differentiate them (and price them accordingly), recognising the value of geological storage. [CCSA, 68]

274. Some proposed removal technologies come with a large energy penalty which, if produced through fossil fuels, leads to additional greenhouse gas emissions. Therefore, in our view, removal activities that have a medium to high risk of being reversed and not permanent should not be eligible for crediting under the Article 6.4 mechanism. Conservative assumptions must be applied when assessing the risks. Mechanisms must be built in to assess the risk of reversibility and leakage from a removal activity and to hold the proponents of the activity and certifiers of credits responsible for possible reversals and leakage, forcing greater care in the planning, implementation and maintenance of storage. [HBL, 65]

275. There are many reversal risks – fire, drought, disease, insects, logging – that can cause the temporarily sequestered carbon to be re-released to the atmosphere decades or even centuries later. Many of these risks are increasing dramatically due to the exacerbating impacts of the climate breakdown itself - this trend will continue in the coming decades even if emissions are rapidly reduced. Reversals undermine any offset claim made on the back of a credit involving temporary sequestration. Any recommendation on removals and/or methodological requirements would need to adequately address the issue of reversals if the underlying envisaged mitigation activity types bear impermanence and reversal risks. This should not be delegated to a future decision, since there is a risk that agreement may not be reached in the future and could be indefinitely stalled, possibly meaning no policy for reversals would be put in place. [CMW, 78]

276. Regulators can foster some of the required innovation at scale. The role of insurance as a regulated industry to guarantee risks can reduce the need for large balance sheets and time horizons beyond the capacity of smaller project level actors. [CFL, 85]

277. Reversals in CCS, CCUS and CCU need to be measured, reported and verified through advanced MRV mechanisms including maturing data on the lifecycle of carbon in key applications. Investing in reliable and independent ways to deliver measuring and reporting of engineered carbon removal pathways across CCS, CCU and CCUS will be imperative. It will be necessary to understand project level reversal, durability, additionality, carbon to value, PPP potential and stocktake across NDC's and regional, national and global GHG emission reporting. Reliable MRV will be required to tie into existing data infrastructure under the Climate Warehouse and Climate Action Data Trust across national and VCM levels. [AD, 86]

278. The permanence of storage, over centuries at least, and scalability should be taken into account when considering the full benefits of mitigation activities. The benefits of several of the land-based activity are more at risk of being lost due to natural hazards (e.g. wildfire). The permanence of the storage of engineering-based activities is hugely promising. [PML, 112]

279. The risks of carbon reversal and other risks of not delivering the removal require technical, financial and regulatory innovations such as insurance, which in turn requires coordinated activity among multiple actors and suggest the UNFCCC to establish a dedicated working group to explore removals risks and solutions like insurance. [CFL, 119]

280. Reject the tonne year crediting. Thus, any CO_2 reversal must be fully compensated for. Economic discounting-based method assume that impacts further into the future counts less, but this assumption is not in line with the Paris Agreement. [SEI+, 121]

281. Current discussions around the choice of a time horizon and an additional discount factor are not consistent with Decision 3/CMA.3, which specifying that reversals shall be addressed "in full". CDR methods should be evaluated based on a robust assessments and transparent reflections of climate benefits, including the storage durability. The European CRC-F framework allows for such assessment. [CW, 126]

282. Many engineered approaches result in permanent storage without exposure to natural hazard. Decision 10/CMP.7 can be referred for measures to safeguard against potential risks of geological storage. [NEP, 131]

283. The recommendation for time preference goes against the obligation to intergenerational equity and diminishes the value of permanent storage. To achieve net zero-emission, emission reductions/ avoidance and removals cannot be treated as equivalent. Unless the excess carbon remains stored for thousands of years, removals would only delay climate change impacts and push associated problems to future generations, which this goes against intergenerational equity, the polluter pays principle, and the sustainability of net-zero goals in the long term. The minimum storage period should take into consideration the duration of the lasting damage in the order of tens of thousands of years. Thus, the time horizon choice of 100 years is not justifiable. In addition, all costs of non-permanence must be internalized, including monitoring and remediation costs, which is likely to make temporary activities more expensive. A conceptual framework for the certification of carbon sequestration offers a possible option that explicitly includes temporary storage

without compromising future generations through responsibility and a chain of custody. (also “Accounting”) [CNCE, 137]

284. C-Capsule recognises the impact of potential non-permanence (uncertainties) from CDR activity over a 100-year time horizon. Reversal of GHG emissions in C-Capsule’s methodology requirements are recognised in two forms: (a) Leakage: predictable reversal events that are accounted for in calculating the eligible volume of certificates per CDR event or activity; (b) Event of Carbon Default (EOCD): unpredictable reversal events that are accounted for in the Insurance Buffer. The risk for an EOCD over a 100-year time horizon is a direct reflection of a CDR activity’s Expected Environmental Effect, which is a percentage-based likelihood for sequestration over a 100-time horizon. Example 500 tonnes sequestered with a 95% certainty for 100 years. By factoring in the risk of an EOCD over a quantified horizon of 100 years, C-Capsule acknowledges the tragedy of the horizon and provides a risk metric for insurance purposes. Normalized Environmental Effect measured with fixed time and certainty dimensions would allow for potential blending of mitigation approaches in portfolios of environmental effect to potentially meet compliance obligation. [ECP, 27]

285. A permanence period of 50 years should be applied. The credits accumulated in the permanence buffer shall be. [retained permanently in the buffer] [GCC, 4]

286. We agree that it will be important to specify a minimum duration of storage; we typically have seen 100 years as achieving this goal rather than 200 to 300 years, but support any of them. [BCG, 190]

287. We concur that durable storage be defined as 200 – 300 years. We emphasize that restored forest ecosystems do not just store carbon, but continue to accumulate it, over such timeframes. [PPI, 191]

288. It’s noted that the time horizon of 100 years is a commonly accepted normative choice in various climate policy instruments. In the context of bioenergy, however, it should be noted that the biomass industry has often argued that a 100-year timeframe should be utilized for assessing net emissions. Whatever the context for choosing the timeframe, in this context of biogenic carbon accounting, a 100-year time-horizon serves to incentivize logging and burning forests for fuel. [PPI, 191]

289. Tonne-year approach relates the benefit of removals directly to the effect on temperature, which is fundamental in the context of climate change. It will be important to clarify, at the project level, how the application of conversion factors will work (temperature effect and discount rate at economic level). The informative paper by the SB argues that there is no need for additional criteria for the treatment of non-permanence risk, as this is done by applying the factor. In our view, for this assertion to remain accurate, the method of determining the “removal factor” must be clearly specified. [ABU, 60]

290. Tonne-based approach requires the use of additional mechanisms to be discussed and agreed in order to guarantee permanence. It tends to have higher transaction costs, due to the need to ensure adequate treatment of the risk of non-permanence, but it can allow for greater leverage of projects. Among the three approaches, it is the most complex, but it can also be useful, provided adjustments are made. [ABU, 60]

3.5.2. Involvement of Host Parties

291. Certain Options are theoretical, untested, and require market/stakeholder testing: Recommendations such as host Party guarantees for buffers or commercial insurance, which are currently positioned as options to each other, need market testing and stakeholder (including host Party) testing. It is not clear that a host Party would be in a position, from a regulatory or policy perspective, to guarantee a buffer. It is not clear whether commercial insurance is or would be sufficiently available at commercially reasonable prices in all host Parties. Options such as these have a material impact on investment decisions as well as the choice of crediting programme and so this market/stakeholder testing is needed before such approaches are recommended for adoption to the CMA. (IETA-51)

292. Liability transfer, buffers & monitoring: We welcome the proposal for a "guarantee by the host Party or an entity designated by it could assume the liability for intentional reversals and the portion of unintentional reversals exceeding the capacity of the permanence buffer pool". Align the methodology to the stringent requirements which have been developed in leading jurisdictions, in particular: (a) Liability for reversals: Across the EU / UK / US there are incredibly stringent requirements on liabilities and remediation responsibilities faced by storage operators in case of CO_2 leaks. (b) National / state-level regulatory regimes often specify when / how liability for CO_2 storage is transferred from capture projects to storage owners / operators and eventually to national / state Governments; (c) The requirements in the voluntary carbon market should not cut across those national / state-level frameworks. To exemplify, a capture operator who is the project proponent / eventual credit owner, should not be required to include legal liability for leaks in its contracts with storage operators, as these storage operators are already liable to government to make good. [DG, 29]

293. Integration with ETS / Cap and Trade: As an addition to the above, in countries with ETS systems in place and CO_2 leaks included in these, there should be no necessity for any other recompense to be made in the voluntary carbon market in the event of a future leak from a storage site, since this would be double counting. As these overall ETS markets are capped, if a storage owner is required to purchase ETS allowances in the event of a leak, this will result in emissions being reduced elsewhere, because the volume cap on the ETS scheme will control the total number of emissions. This should be sufficient safeguard for a purchasers of carbon credits, knowing that in the event of a future leak, action will be taken by the storage owner / operator, that will ensure that the effect of the carbon credits purchased remains the same (the leak has been compensated for by emissions being reduced elsewhere, which will have been paid for by the storage owner / operator.) [DG, 29]

294. The MDB WG welcomes the addition of the compensation options (Permanence buffer backed up by host Party guarantee and Commercial insurance) but, in case of A6.4ERs that have been authorized for use towards international mitigation purposes, would encourage the supervisory Body to also consider options where the risk could be taken on by the Party that receives the A6.4ERs (so not just the Host Party). Moreover, MDB WG encourages the Supervisory Body to consider the use of a pooled buffer approach whereby buffers from different SDM project activities are pooled together, instead of having individual buffers. This would enable the SDM to better service any risk of reversal across the "portfolio" of registered SDM project activities and reduce the requirements with regard to host Party guarantees. [MDB WG, 53]

3.5.3. Reporting and Transparency

295. To date, there is lack of transparency and data on reversals which has led to arbitrary buffer pool contributions with little to no actuarial basis. It is our recommendation that the UNFCC mandates public disclosure of all Events of Carbon Default (EOCD). These could include volume, causal factor and remediation of the EOCD. Greater access to data would provide many benefits including: (a) Enable enhanced modelling of risks for actuaries and insurers/reinsurers alike to better understand likelihood; (b) Insurers create commercial insurance products for effective underwriting. Suggest reporting of EOCDs should be standardised, including but not limited to causal factors associated with default, magnitude, impact on future defaults etc. Ideally stored in a machine-readable public database. [ECP, 27] [CFL, 38]

296. Suggest reporting of EOCDs should be standardized, including but not limited to causal factors associated with default, magnitude, impact on future defaults, etc. Ideally stored in a machine-readable public database. The treatment of EOCD’s, i.e. recourse is to be determined. Call to action: (i) A body to formally recognize and declare EOCD events globally, (ii) Formal procedure for EOCD compensation or resolution at the NDC level should an EOCD occur within an expected declared time horizon 20,50 or 100 years. [CFL, 38]

3.5.4. Involvement of third-party stakeholders (including insurance)

297. We support the use of existing mechanisms (buffer pool approach) to facilitate insurance and compensation of reversals in the short-term but believe the conventional self-insurance approach adopted by issuers is outdated. Their monopoly on risk roles and responsibilities carries multiple conflicts of interest. The recommended solution is to disaggregate the roles by appointing independent, third-party actors to rate and underwrite against risk of reversal. Independence of roles would generate more trust amongst stakeholders and demonstrate the necessary rigour for adoption by governments. [ECP, 27]

298. Transferring administration of buffer pools to independent, third-party insurers would remove Issuers from liability concerns relating to the recourse for carbon default, claim settlement and dispute resolution. The presence of commercial insurance would increase user confidence for project developers exposed to risk of reversal and buyers concerned about the longevity of their CDR claims. Transition towards financial risk management best-practice would de-risk investments into voluntary carbon instruments and increase stakeholder confidence. [ECP, 27]

3.5.5. Buffer approaches

299. Across the EU / US there are already highly stringent buffer systems / post-closure funds / industry body funds that are required to set aside money for monitoring, mitigation and compensation. These should be taken into account in any standard to avoid unfair double penalization. There should be clear separation between the nature based and geological part of the methodology. This is particularly crucial for the buffer pools, given the vastly differing permanence performance of these two categories, we believe they need to have separately managed buffer pools as well. [DG, 29]

300. Risk mitigation and compensation mechanism: We support the use of existing mechanisms (buffer pool approach) to facilitate insurance and compensation of reversals

in the short-term but believe the conventional self-insurance approach adopted by issuers is outdated. Their monopoly on risk roles and responsibilities carries multiple conflicts of interest. Recommended solutions include disaggregating the roles by appointing independent, third-party actors to monitor, rate, declare, report and underwrite against risk of reversal (EOCD). Independence of roles would generate more trust amongst stakeholders and demonstrate the necessary rigour for adoption at scale by governments. Transferring administration of buffer pools to independent, third-party insurers would remove issuers from liability concerns relating to the recourse for carbon default, claim settlement and dispute resolution. The presence of commercial insurance would increase user confidence for project developers exposed to risk of reversal and buyers concerned about the longevity of their CDR claims. Transition towards financial risk management best-practice would de-risk investments into voluntary carbon instruments and increase stakeholder confidence. [CFL, 38]

301. Alternative solutions to buffer pools in the event of carbon default (EOCD) could include:

(a) Pre-agreed monetary compensation which could then be applied to Carbon activities;

(b) Pre-agreed carbon deliverables due at the vintage of time of default declaration. Insurer would purchase and then deliver;

(c) Existing buffer pool approach managed using like for like normalized effective carbon in order to create environmental effective fungibility. [CFL, 38]

302. We suggest further elaborating on the potential elements of commercial insurance schemes. In particular, there is need for better understanding of (i) how the risks for buyers would be mitigated with the use of insurance and (ii) the beneficiaries of insurance schemes, (iii) how the compensation will be used. The current wording of the explanation for this option seem to give no clear guidance on that and could only be seen as purporting that the Supervisory Body would be the beneficiary. [ICLRC, 24]

3.5.6. Inputs received for "removals" in response to the call for inputs on methodology requirements[18]

303. With respect to carbon capture and storage/sequestration, methodologies should take into account the specific attributes of mineralization (CO_2 elimination through subsurface mineralization) and separate the requirements appropriate for mineralization as opposed to conventional storage in geological reservoirs). [44.01, 142]

304. Article 6.4 mechanism should address the risk of non-permanence and reversals through the implementation of pooled buffers, which should be based on the actual risk for each specific activity and in each geographical area. [IETA, 143]

305. In REDD+, generally emission reductions are considered as non-permanent when the reported emissions are higher than the baseline at any time after units are issued. In REDD+, this risk is generally addressed through the use of buffers. For Article 6, it is important that a consistent approach is taken across all sectors when it comes to defining non-permanence and requiring addressing the risks (WB).

[18] These inputs were not specifically received in relation to removals, nevertheless, may be useful to consider due to overlaps in issues.

306. The 2005 Special Report on Carbon Dioxide Capture and Storage by the IPCC states that appropriately selected and managed geological reservoirs are ‘very likely’ to retain over 99 per cent of the sequestered CO_2 for longer than 100 years and ‘likely’ to retain 99 per cent of it for longer than 1,000 years. A variety of monitoring technologies have been successfully deployed to measure, monitor and verify injected CO_2 in the subsurface. Monitoring a CO_2 storage site occurs over its entire lifecycle from pre-injection to operation to post-injection. Operational and research experience over several decades demonstrates that injected CO_2 can be monitored to confirm its containment. [CCSI, 163]

307. Leakage risk is higher in nature-based credits, especially activities where the supply of particular goods is reduced by the GHG mitigation activity. Nature-based projects should be sited in areas with lower risk of reversal, when possible. Physical risks such as fires, hurricanes and droughts threaten nature-based projects. Siting carbon removal projects according to IPCC projections for climate impacts is key to reducing the risk of physical reversals in face of a globally changing climate. Buffer pools to account for non-permanence should be maintained throughout the duration of low-durability project lifetimes as should monitoring for reversals. Tonne-year accounting is not advised for low durability or nature-based carbon removals. Tonne-year accounting cannot be used to support an equivalence to permanent removal (MS).

308. Mitigation activities that lead to short-term sequestration of carbon should not be eligible to issue offsets under Article 6.4. This includes activities such as forest protection, afforestation, reforestation, soil carbon management, improved forest management, etc. (CMW).

309. Storage methods and products suited to utilizing CO_2 are heterogeneous. CO_2 stored in the biosphere is characterized by low permanence, while methods such as geological storage potentially lock away CO_2 for longer timescales. Similarly, utilization of CO_2 in some products (e.g. in fizzy drinks) lead to almost immediate re-emission, while others (e.g. in cement) are long-term. Storage and utilization methods including a high risk of re-emission must be treated carefully for real emission reductions to be achieved (CCSI).

310. Verra´s Non-Permanence Risk Tool for Geologic Carbon Storage establishes procedures to assess a project’s non-permanence risk and determine the project’s contribution to Verra´s buffer pool reserve for geological carbon storage. Depending on the risk assessment, a share of credits generated by the project is deposited in Verra’s Geological Carbon Storage buffer pool reserve to be available to equalize re-emissions should they occur (CCSI).

311. Carbon dioxide removal methods have different risks of reversal, thus biological and geological carbon cycles should be managed separately. Different approaches for carbon accounting shall ensure that carbon removed is not re-emitted at a later stage and that it leads to effective climate mitigation. Temporary storage will always have a climate benefit, even if reversals were to happen at a later point in time. There may be a need to calculate an “equivalence period”, after which storage for that period is deemed equivalent to an emission reduction. After the calculated period has expired the reversal would be no longer considered to have a negative impact on the climate (PCR).

312. Equivalence periods to emission reduction: many baseline and crediting mechanisms apply a 100-year period based on the global warming potential (GWP) for GHGs that is used in the Kyoto Protocol and Paris Agreement. However, other ranges have been

suggested: from as little as 30 years (TSVCM 2021) to 55 years (Moura Costa and Wilson 2000) and even as far as 1,000 years (Carbon Plan 2021) (PCR).

313. CARB has adopted two approaches for permanence in situations where there could be a potential reversal. All projects in this category contribute to a buffer pool. For intentional reversals, the party that surrendered a credit is obligated to replace any reversed credits to maintain environmental integrity. For unintentional reversals, the credits are replaced from the buffer pool to maintain environmental integrity (CARB).

314. Nature based solutions have avoidable and unavoidable reversal risks. Current approaches can be improved. Nature Based Solutions should make use of the data, technologies and methodologies that are fast emerging that take account of reversals risk and non-permanence. Companies buying credits to offset the damage of an emission should purchase sufficient credits upfront to achieve equivalent permanence (CCC).

315. Forest-based project reversals are typically dealt with through buffer reserves to mitigate the issue on the buyer end. In addition, legal paths for reversals should be made available to foresters. Bringing more transparency to the issue and providing support to the foresters would deter reversals in the long run (44M).

316. In the forest-based project sphere, the risks for non-permanence and reversals often lie in the duration of projects and the lack of collective accountability around the way reversals are handled (44M).

317. The physical longevity of carbon storage over time, or durability, can be grouped as low (fewer than 100 years), medium (100 to 1000 years) and high (thousands of years or longer). Each durability category has its own benefits and challenges, and the development of all three categories are needed to have a chance at achieving global net-zero goals by mid-century (MS).

318. When it comes to buffer pools, which are currently the most common way to purportedly address impermanence, the contribution rates are not necessarily scientifically robust and can risk leading to undercapitalisation of the pool. Research of California’s buffer pool suggests it is heavily undercapitalised. In addition, for buffer pools to work, one would need to monitor the project area well beyond the end of the crediting period (over 100 years) in order to actually detect any reversals, which is difficult (if not unrealistic) to guarantee and which also raises real questions of liability: reversals could occur many decades later (the project developer could be out of business), they could be on a huge scale (beyond the ability of a project developer to compensate for even if they’re required to do so in principle), they may not be detected (even by national GHG inventories depending on granularity of measurement), and it may not be possible for the Supervisory Body to legally require proponents to address reversals if they refuse. These issues raise significant integrity questions regarding the long-term viability of buffer pools to address impermanence of credits used to offset actual emissions (CMW).

319. Some projects on today’s voluntary carbon market operate without any permanence-risk mitigation measures despite presenting real permanence risks. That is the case, for example, of many cookstove activities which often aim to reduce the combustion of biomass. These activities aim to reduce forest degradation/deforestation levels and bear non-permanence risks since the credited emission reductions entail sequestration in natural ecosystems that are vulnerable to various reversal risks. The non-permanence risk tied to cookstove projects are typically not accounted for, however. Cookstove project

developers on the voluntary market (Verra and Gold Standard) and on the CDM do not need to contribute to a buffer pool. More generally, for efficient cookstove project types, the CDM, Verra and Gold Standard do not have "approaches for accounting and compensating for reversals [or] approaches for avoiding or reducing non-permanence risks" (Source: Carbon Credit Quality Initiative (May 2022) (CMW).

320. Tonne-year accounting must not be included under Article 6.4 as a method of addressing non-permanence since it creates a false equivalence between temporary carbon storage and (permanent) reductions or removals and is at odds both with the IPCC and the Paris Agreement's long-term temperature goals (CMW).

3.6. Avoidance of other negative environmental, social impacts

321. Discuss considerations to be given to core elements for avoidance of other negative environmental, social impacts; where possible, identifying the applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types.

322. Below is a summary of public inputs received.

323. We recommend that the Supervisory Body establish the following requirements for addressing negative environmental and social safeguards:

(a) Establishing a list of specific safeguards that must be considered by mitigation activity proponents in identifying, monitoring and mitigating potential negative environmental and social impacts, including with regard to:

(i) Violation of human rights;

(ii) Gender and women empowerment;

(iii) In the case of mitigation activities affecting Indigenous Peoples and Local Communities, ensuring their free, prior and informed consent to the mitigation activity;

(iv) Preserving and protecting cultural heritage;

(v) Health, safety and security;

(vi) Physical and economic displacement;

(vii) Labour rights;

(viii) Environmental issues, such as air pollution, water pollution, soil and land protection, waste management,

(ix) and biodiversity;

(b) Introduction of invasive non-native species;

(c) Clearly excluding from eligibility activities that do not fulfil these requirements (e.g. short-term rotation monoculture plantations);

(d) Requiring mitigation activity proponents, prior to the registration of the mitigation activity, to systematically identify potential negative environmental or social impacts, using a methodology to be developed by the Supervisory Body. The assessment should be audited by a designated operational entity and be made publicly available and address the safeguards described above;

(e) Requiring mitigation activity proponents to develop an environmental and social management plan to monitor and mitigate any identified potential negative environmental or social impacts, including by including relevant parameters on important potential negative impacts in the monitoring plan of the mitigation activity. The mitigation activity proponents should also be required to assign roles and responsibilities for implementing the plan and managing the relevant risks;

(f) Requiring mitigation activity proponents to demonstrate, prior to each issuance, that important potential negative impacts have been appropriately monitored and mitigated to the extent possible;

(g) Requiring mitigation activity proponents to identify and adhere to any national or local legal requirements which may be relevant to the project; and• Establishing an appropriate grievance mechanism that allows stakeholders to submit grievances throughout the lifetime of the project without any barriers (e.g. liability for expenses associated with the investigation). Such grievances should be duly considered by the Supervisory Body. [EU, 59]

324. The UK recognises the key role the Article 6.4 Supervisory Body can play in ensuring environmental and social safeguards are developed and implemented in practice for the Article 6.4 mechanism. Eligible Article 6.4 activities should have overall positive environmental and social impacts. Any guidance on removals developed should as far as possible actively promote the scaling of removal activities with positive environmental, social, and economic co-benefits. In addition to promoting co-benefits, guidance on removals must simultaneously ensure that removal activities that technologies do not create new environmental and social risks when deployed individually and at scale. For instance, feedstock production for BECCS, biochar and wood in construction have potentially significant land requirements which, if mismanaged, could pose risks to biodiversity, or misalign with other incentives and domestic schemes to reward environmental land management. Impacts on local ecosystems including soil, water and air quality must also be taken into consideration, to minimise any potential adverse effects. The UK considers that understanding and ensuring the sustainability of GGRs is crucial and will differ across the different types of GGR methods. A tailored approach to safeguards will be required. The UK has commissioned research on resource intensity for DACCS, and, relevant for biomass GGRs, is committed to publishing the Biomass Strategy in 2023. This will review the amount of sustainable biomass available to the UK and how this resource could be best utilised across the economy to help achieve the UK government's net zero and wider environmental commitments while also supporting energy security. This will outline the role that BECCS can play in reducing carbon emissions across the economy and set out how the technology can be deployed. These findings could help inform the work of the Supervisory Body (e.g. in incentivising the use of sustainable biomass). Regarding risks to biodiversity specifically, the UK believes the Supervisory Body should design guidance in a manner that ensures activities align and support the goals and targets of the KunmingMontreal Global Biodiversity Framework adopted in December 2022. In addition, the Supervisory Body's work should also look to conduct further work that draws from relevant parts of decisions by the Parties to the Kyoto Protocol and under the Warsaw Framework for REDD+ (incl. the Cancun safeguards). [UK, 54]

325. The ROK would like to suggest a new formulation by 'Consideration of environmental and social impacts'. With this new formulation, the ROK suggest that paragraph 21 needs to insert the efforts to pursue positive environmental and social impacts for a balanced approach between positive and negative effects. In addition, currently, the Supervisory Body reviews sustainable development tools in use in existing market-based mechanisms with a view to developing similar tools for the mechanism UNFCCC 2021, para 5(c). The ROK thinks that tools to be developed can be utilized to the removal activities. [ROK, 57]

326. The recommendations should take into account the necessity of safeguards with regards to biodiversity, natural habitat conservation, water conservation and security, soil conservation, food and energy security, employment, land ownership rights. The provisions for stakeholder consultations should be incorporated. Safeguards for biodiversity and adaptation co-benefits, as well as sustainable and responsible environmental management should be ensured consistently and durably. [RU, 53]

327. IETA recommends that more consideration be given to this issue in order to keep the Article 6.4 Mechanism aligned with best practices from other programmes. Whilst acknowledging that the enforcement of environmental and social protection laws is a national prerogative of the host Party, it is important to ensure that all activities under the Article 6 Mechanism are aligned with international principles on environmental and social considerations. If a country or region does not have specific guidelines or processes, an impact evaluation before project initiation may be a feasible option. Such evaluation should be verified by a third-party assessor and may lead to the modification or rejection of the project. To strengthen this aspect, an independent and well-defined grievance redress mechanism should be established in accordance with the RMP and remain accessible, robust and with clearly defined scope to do no harm. [IETA, 70]

328. To avoid negative environmental and social impacts, the Supervisory Body can draw from existing COP decisions on REDD+ (e.g. the Cancun Safeguards), as well as multiple international REDD+ programs, bilateral and multilateral agreements, and other experiences. While poorly designed or outright predatory projects have resulted in land grabs, forced resettlement, loss of resource access, and deceptive legal agreements, carbon credit standards have generally addressed these risks through a combined approach of avoiding negative social outcomes and ensuring positive ones. Most requirements to date have focused on the former, with more work needed on the latter, in addition to enhancing Indigenous Peoples' and local communities' right to own and transact carbon credits—or to opt out of carbon markets if they wish. [EDF, 80]

329. Preventing negative environmental and social impacts of any activity involving removals including impacts on biodiversity and natural spaces, land and soils, water, atmosphere, ecosystem health, as well as ensuring the protection of human rights, rights of local communities and rights of indigenous people is of the utmost importance for us. In this line, any recommendations provided by the Supervisory Body on removals to the CMA must include this issue as a central topic. For us, an added value could be generated if not only negative impacts associated with removal activities are avoided but also a fair distribution of social and economic benefits is promoted (through guidelines that the Supervisory Body could develop in this regard). [CO, 58]

330. All climate action measures, including activities under the Article 6.4 mechanism should respect and protect human rights including the rights of Indigenous Peoples and local communities, and safeguard the environment from adverse impacts of these activities. They also should respect and comply with international law and standards. Prior to

approval there should be meaningful public participation and consultation with rights holders that complies with international law and standards including complying with Indigenous Peoples' and local communities' right to free, prior, and informed consent. As such the Supervisory Body should present a complete governance package including modalities for all potential article 6.4 activities and recommendations on removals as well as establishing the policies necessary to protect human rights including the rights of indigenous peoples and safeguard the environment from the adverse impacts of these activities. The Article 6.4 mechanism must be equipped with robust rules for meaningful consultation and a robust, independent and accessible grievance redress mechanism, that provides affected rights holders with instruments that allow violations of human and social rights as well as violations of environmental integrity to be sanctioned or prevented in advance. [HBL, 65]

331. Land-based and engineering-based removals are known to pose significant negative environmental and social risks to the communities, including the infringement on human rights, particularly those of Afro Descendants and Indigenous Peoples. In addition, appropriate meaningful consultation processes prior and throughout action with rights holders and relevant stakeholders–particularly the local communities and Indigenous Peoples, and Afro Descendants, and marginalized groups–must be ensured. Compliance with international laws and commitments, including respecting and protecting the Indigenous Peoples' right to free, prior, and informed consent. Also, a robust and independent grievance mechanism must be established for the overall SDM, which is applicable for activities involving removals. [LESE, 67]

332. The climate benefit of carbon removal activities must be viewed together with wider sustainability objectives – from biomass use and biodiversity protection to land use and energy input requirements. It is essential that projects are designed and implemented in a manner that does not compromise environmental and sustainability safeguards. [CCSA, 68]

333. Key points: (i) climate action measures, including any activities approved under the article 6.4 mechanism, should respect and protect human rights including the rights of Indigenous Peoples, local communities and women; (ii) Activities should comply with international law and standards; and (iii) Prior to approval (and throughout the life of any given project) there should be meaningful public participation and consultation with rights holders that complies with international law and standards including complying with Indigenous Peoples' right to free, prior, and informed consent. [CLARA, 69]

334. Exclusion of sustainable feedstock. The note contends that only use of dedicated feedstock in a BECCS facility can deliver a CO_2 removal, and conversely that most sustainable feedstock, such as wastes, residues and by-products, lead only to avoided or reduced emissions. A sole reliance on dedicated feedstock for generating removals could place increased pressure on land resources. Drax would encourage instead that the mechanism includes the use of non-purpose grown feedstock where possible to leverage climate positive outcomes. [DG, 82]

335. Removal options that rely heavily on technology are not ready and we don't know if they would ever be in the timeframe and in scale we need to drastically reduce emissions (next 2-7 years) in order to avoid further catastrophic climate change impacts and to stay below the 1,5C limit, such as DACCS or BECCS and other forms of carbon storage are risky and pose considerable environmental and social risks as well as violations on human rights o technology is unproven and cannot scale up in time to remove the amount of carbon

expected. While removals are different from reductions, both can and do affect human rights and cause environmental harm, thus, there are overlaps in the requirements that all article 6.4 activities must follow:

(a) It is crucial establishing the policies necessary to protect human rights including the rights of indigenous peoples and safeguard the environment from adverse impacts, including establishing rules for meaningful consultation and a robust and accessible independent grievance mechanism;

(b) In general, Article 6.4 mechanism, which is supposed to facilitate increased ambition, should focus on incentivizing the increased reduction of emissions now rather than focusing on removals. [FoE/BUND, 83]

336. Removals adversely impact biodiversity, indigenous and human rights. Removals based on land, ecosystems, geoengineering or technological approaches all risk large scale undermining of human & indigenous rights and sustainable development as well as environmental degradation: Impacts on food systems and land rights - the amount of land required for tree-based carbon stores or growing monoculture bioenergy crops is huge and is likely to result in competition with cropland fuelling increased foodprices, and displacing peasant farmers. REDD+ type schemes and 'Nature Based Solutions' also mean a vast demand for land and will impact on land and food sovereignty especially in developing countries. [FoE UK, 84]

337. The texts fall extremely short in their requirements and guidance on avoiding negative environmental and social impacts. This is not surprising considering that the annex to decision 3/CMA.3 states that A6.4 activities "minimize, and where possible, avoid negative environmental and social impacts". This approach will not result in sustainable (permanent) mitigation outcomes. We propose that it is insufficient to "minimize impacts, if possible". Further, Local Communities and Indigenous Peoples (LCIPs) should not simply be consulted but take ownership of A6.4 activities in a larger framework of local sustainable development. The SB should draw from existing COP decisions on REDD+ (decision 1/CP.16) outlining social and environmental safeguards (which also apply to land-based removals). This is a relevant precedent under the UNFCCC; Article 6.4 must not fall below this level of safeguarding. Further, there are multiple international REDD+ programs, bilateral and multilateral agreements and other experiences that the SB may draw from to inform this section on environmental and social safeguards. (ALLCOT-48)

338. To address this, the SB may draw from the Information Note (paras 178-195), including: 1. Preventing monocultures, and promoting the re-growth or plantations of native species (para 181); 2. Managing trade-offs between food production, biodiversity conservation and forest restoration(para 182); 3. Planning mitigation activities as part of local sustainable development plans (para 184); 4. Ensure soil health and productivity (para 183); 5. Prioritizing local objectives for land use as defined by LCIPs (para 184); 6. Requesting an assessment –prior to activity registration– of potential impacts, trade-offs and how they were addressed in coordination with LCIPs (para 191); 7. Setting up dispute and grievance redress mechanisms and procedures as defined by IPLCs (paras 194-195); Additionally, we would like to propose the following principles to the SB when improving this section. Thus, removal activities: 8. Provide solutions to societal challenges that involve working with nature as prioritized by IPLCs; 9. Support a wide range of Sustainable Development Goals; 10. Do not cause additional costs to non-participants; 11. Promote food and income to increase resilience to climate change; 12. Are continuously adjusted to learn from current events, promoting adaptive capacity; 13. Are consistent with cross-sectoral goals

in an integrated strategy; 14. Are designed, implemented, managed, and monitored by IPLCs, promoting full ownership; 15. Incorporate risk identification and management beyond the intervention site; 16. Are economically viable and sustainable, costs and benefits are known ;17. Are cost-effective, considering alternative solutions and potential externalities; 18. Make use of a wide range of financial sources to increase resilience and sustainability; 19. Safeguards are jointly and periodically reviewed to ensure mutually agreed trade-offs limits and strategies; 20. Are designed with a view of long-term sustainability 21. Seek to enhance current policy and regulation frameworks; 22. Restore or manage natural, semi-natural or novel ecosystems; 23. Do not cause higher emissions, loss of biodiversity or social grievances; 24. Are not based on large-scale planting on monocultures; 25. Consider a wide range of ecosystems, not just forests 26. Promote the sustainable management of lands 27. Provide a quantifiable benefit for biodiversity 28. Make ecological sense and work with nature in-situ 29. Adopt a landscape approach that consider the connection of multiple habitats 30. Respond to the current state of ecosystems and prevailing drivers of degradation and loss 31. Focuses on increasing biodiversity at gene and ecosystem levels 32. Promote ownership, empowerment and well-being of local stewards 33. Tap into relational and moral values, including intangible connection to nature 34. Fully respect the rights of LCIP and local stewards, including tenure rights 35. Promote social organization and enhanced governance structures 36. Support and develop locally controlled enterprises 37. Promote the inclusion of women and disadvantaged groups 38. Are designed to build human capacity 39. Result from good faith negotiations among local stewards and stakeholders 40. Promote harmonious social change 41. Distributive (who gains, who loses), procedural (who decides), and recognition of justice are clear and just 42. The full range of benefits, trade-offs and conflicts are assessed and managed 43. A fully agreed upon feedback and grievance mechanism is available to all stewards and stakeholders 44. Participation is based on mutual respect and equality and upholds to Free, Prior and Informed Consent 45. Stakeholders who are directly or indirectly affected are identified and involved 46. Decision-making respond to the rights and interest of all participating and affected stakeholders This list is not exhaustive and helps illustrate how short the current text falls from providing safeguards against negative environmental and social impacts. (ALLCOT-48)

339. Avoidance of other negative environmental and social impacts: Over the past decade, many advances have been made in regard to the use of safeguards to minimize negative impacts and/or enhance the positive benefits of land-based projects. Standards such as the Climate, Community Biodiversity (CCB)s are widely accepted and have international legitimacy. Along the same line, significant efforts were put into adopting the Cancun Safeguards for REDD+, as well as promoting their understanding and implementation in countries. Also, Jurisdictional REDD+ methodologies recently created (e.g. Art TREES) require activities to be implemented in conformance with the Cancun Safeguards. We advise to build on the approaches developed in the VCM and REDD+ national programs for how to address these risks. The working group should consider whether i) certain existing methodologies, e.g. CCBs, could be suggested as an accepted approach/methodology to deal with environmental and social risk, and ii) whether it may recommend a list of risks/safeguards (following the REDD+ Cancun safeguards approach) that all removal methodologies would need to address and iii) explore how the requirement for addressing social and environmental risk in removal projects could interoperate with Safeguard Information Systems that countries are developing for REDD+. These approaches require more study – it is advisable for the SB to continue working on the matter of social impacts and safeguards throughout 2023. [PTV, 18]

340. The avoidance of negative environmental and social impacts should consider the full value chain, not just within the operations of the activity, with the same activity boundary as mentioned in the previous point. [VA, 10]

341. CCAP proposes to enhance the methodological requirements for maximizing local communities' welfare and improve the track of accurate mitigation results of forest actions. [CCAP, 34]

342. Part of avoiding the social impact is creating a mechanism that maximizes its functionality, performance, and tangible effects on terrain. The methodologies could offer concrete requirements to promote financial and social performance. This pass guarantees that the expected finance through Article 6.4 do not remain unnecessarily in the intermediation and bureaucratic steps. [CCAP, 34]

343. Methodologies should include a monitoring system to measure the avoidance of other negative environmental and social impacts over time and the actions to maximize social welfare throughout the activity implementation. The Reports shall be submitted soon enough after quantifying the achieved carbon stocks and social effects to allow the DOE to visit the site and conduct sample checks as needed. Avoidance of other negative environmental and social impacts: A removal activity shall maximize the community welfare through its implementation, based on fair agreements between communities and technical intermediaries (under just benefit-sharing models). [CCAP, 34]

344. Regarding the Ocean Alkalinity Enhancement experiments being carried in their local bay. The local community is concerned about the potential for funding related to carbon market resulting in numerous such experiments. More specifically, as such experiments rely on modelling and there are many uncertainties regarding the actual removal, as well as potential impacts on the ocean ecosystems, it is not clear whether it justifies the “possibility for millions of tonnes of materials to be added to the ocean”. In addition, it is not clear if there is any community consent for such process. [KOSCF, 116]

345. In reference to the land use required for DAC, it should be deployed in a manner that minimizes the impacts on local resources. Because DAC technology’s net CO_2 capture land efficiency is very high, it is able to capture large amounts of CO_2 from the atmosphere without imposing a large footprint. [1.5, 123]

346. Environmental and social risks associated with engineering-based CDR activities are different for each technology employed and suggests creating a mechanism for addressing them. In many cases, existing regulations and standards are generally applicable to CDR, in which case, UNFCCC may ensure that they are applied either through national law and/or international finance risk management requirements. [AC, 135]

347. We have conducted comprehensive studies on the environmental and social impacts to identify any potential adverse effects, devise strategies to mitigate them, thus Enhanced Rock Weathering (ERW) should not be considered as “unproven”. [MCR, 136]

3.7. Avoidance of Leakage

348. The SB 005 Information Note calls for discussing any further considerations to be given to the core elements for leakage avoidance in A6.4-SB003-A03; where possible, identifying the applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types.

349. Below is a summary of public inputs received.

350. Leakage should be avoided and minimized, where possible, and any remaining leakage should be deducted in the calculation of emission reductions or removals. The EU believes that all potential sources of leakage should be considered, including, inter alia, upstream and downstream emissions, activity-shifting, rebound effects or ecological leakage (mitigation activities that affect other areas that are hydrologically connected). Similarly, we believe that the consideration of leakage should not be geographically confined. Jurisdictional or sectoral approaches can reduce leakage risks, as any leakage within their scope would be fully accounted for; however, they do not address leakage beyond the scope of the jurisdiction, which can, for some type of activities, be significant. We further believe that smaller leakage sources may be excluded in the calculation of emission reductions or removals if overall conservativeness is ensured (for example, because some baseline emission sources are also excluded). This is common practice under all carbon crediting programs. Moreover, only net positive leakage should be accounted for, i.e. no additions should be made to emission reductions or removals to account for negative leakage. [EU, 59]

351. The issue of leakage should be addressed based on a presumption that although it should be avoided as much as possible, although under certain circumstances leakage is unavoidable. Therefore, the primary issue is proper assessment of leakage. After such an assessment is made, certain sources could be pronounced de minimis according to clear present conservative criteria, which could be activity specific. Under the CDM and several voluntary markets schemes the Tool for testing significance of GHG Emissions in A/R CDM Project Activities was used. This tool, or its revised version can be employed for the A6.4 Mechanism. The practice of tools for leakage risk assessment and relevant discounting estimations will be discussed further under the next section. Leakage monitoring needs to be included in the regular MRV procedures. [RU, 53]

352. We proposed that removal activities that are assessed to pose medium to high risk of leakage should be catalogued in the negative list. [LESE, 67]

353. When it comes to leakage caused by resource competition for technology-based removal activities, IETA recommends this to be reframed in the context of environmental safeguards and green energy procurement guidelines. In order to enable technology-based removal activities to scale up, criteria may require project developers to procure renewable power which allows them to be expanded into power grids where they have optimal climate conditions for generation. This guidance would allow project developers to rely on existing contractual frameworks, developers, and supply chains, and allow for flexibility in environmental accounting for climate-based mitigation systems on a broad yet still auditable scale. The need to consider the overall GHG effects across the whole lifecycle of some removal activities (e.g. embodied emissions in material usage) may also be an important aspect that warrants deeper consideration. [IETA, 70]

354. Leakage refers to the risk that mitigation actions displace production, and directly or indirectly increase emissions elsewhere. For example, a project developer of a peatland conservation project needs to ensure that the degradation drivers (e.g. palm oil production) do not simply move into peatland areas outside the project perimeter. Similarly, reforestation of productive agricultural land can lead to deforestation, if agricultural production shifts elsewhere. Leakage considerations are, among others, behind the drive to move from projects to jurisdictional programs and to find transformational solutions for structural degradation problems. They may be addressed

through conservative estimation, rather than calculations based on empirical data, or calculated and accounted for in the crediting process. Scale can be an important determinant of the environmental impact of credits, regardless of sector. Larger-scale programs are better positioned than individual projects that are not nested into jurisdictional-scale crediting to mitigate risks of leakage and non-additionality, as well as reversals. [EDF, 80]

355. The question of leakage can become very complex for industrial solutions, such as BECCS and DACCS. It is not recommended, at least for industrial solutions, that Art 6.4 develops its own LCA criteria. It should instead rely on the certification methodologies for CCS currently being in development [SE, 15]

356. We agree that carbon offsets should be credited net of leakage. However, leakage often cannot be directly quantified and deducted, and the language should not be so specific in this regard. Instead, we suggest that leakage shall be ‘mitigated’. We agree with the conservative leakage ‘adjustment factor’ approach. [ACR, 8]

357. IETA notes the recommendation to use of adjustment factors as a simplified method to account for leakage. However, we also note that there is limited experience with these factors, their use can present opportunities for regulatory arbitrage, and can impact upon the robustness of accounting of transfers against NDCs. IETA would therefore welcome a wider dialogue on the range of potential approaches to manage leakage risks. (IETA-51)

3.7.1. Inputs received in response to call for inputs on methodology requirements[19]

358. Carbon leakage has two definitions: (1) it can refer to the relocation of emission-intensive activities from jurisdictions with a higher cost to emit CO_2 to jurisdictions with a lower cost to emit, and (2) it can refer to an increase in fossil emissions outside the boundary of the project caused by the project activity itself. The Article 6.4 mechanism should be focused on minimizing any potential increase in fossil emissions outside the boundary of a project (with respect to the second definition of carbon leakage, above). In the case of removals, guidance on leakage can be specified as “Removal supplier shall assess all potential sources of leakage (i.e. increase of fossil emissions) outside of the project activity boundary but due to the activity as specified in the methodology. In the case where leakage potential is identified it shall be quantified and deducted from the CO_2 removals” (PE).

359. Leakage describes a situation where a project activity has impact outside of its boundary. This impact can be physical, economic, or social (44M).

360. The Article 6.4 mechanism should minimize the increase in emissions outside the activity boundary. Nesting of activities and jurisdiction-level crediting are proving to be effective approaches. A thorough lifecycle assessment of the impact of an activity should be the starting point to address the risk of leakage. Robust MRV systems and integrated registries are also key to identifying carbon leakage and reducing such risks across different types of activities and countries (IETA).

361. Leakage should be avoided where possible and discounts should apply when leakage risk exists. Methodologies can determine certain discount factors attached to different leakage

[19] These were not submitted in relation to removals nevertheless may be useful to consider as there are overlaps.

risks. Jurisdictional approaches can help tackle leakage within the borders of a territory. Market leakage is seen by economists as inevitable for any genuinely additional project, suggesting issuing entities must seek to accurately quantify and account for (i.e. apply discounts for) this (SR).

362. Innovation is needed to improve estimation of leakage, to better avoid leakage, such as increased emissions elsewhere due to displacement of food or timber production to non-project areas. At present many leakage assessments focus on rough estimates of local-scale (or “direct”) leakage and ignore or greatly underestimate longer-range (“market”) displacement of forgone production (CCC).

363. For forestry-based solutions, the greatest risks of negative leakage occur when a nation’s timber industry policies do not account for the industry’s intersection with the carbon market. On the other hand, a strong benefit of positive leakage is a shift in sustainability trends of the timber market. With lower barriers to entry, carbon projects provide an alternative to low-grade timber harvesting (44M).

364. On the project level, leakage can be addressed by thorough inspection of the area surrounding a project. Some project developers create a “leakage belt” to assess this element of a project over time and account for it through discounting of offsets. Providing foresters with a cost-effective alternative to timber harvesting reduces leakage in the long run (44M).

365. Activity carbon leakages should be addressed in cases where the effect is negative to the jurisdiction with less stringent climate policies. This is often the case when project developers from Annex I countries create projects in Non-Annex I countries, of a lower quality than they otherwise would. Stricter national policies outlining the parameters for which carbon projects by foreign entities can exist could help with this. Another approach, on a larger scale, could be to increase cross-national policies or matching commitment agreements as proposed by the authors of “Combating climate change with matching-commitment agreements” (44M).

366. Leakage involves the risk of displacing activities that cause GHG emissions from the project site to another geographic location (including across international boundaries) for economic reasons. Economic leakage occurs when the market demand for an emitting activity is sustained despite the development of a carbon dioxide removal project. Note: these concepts are distinct from physical leakage (reversals), which occur when carbon that is stored throughout the course of a carbon offset project is re-released into the atmosphere through either avoidable (for example, a failure to maintain sequestration wells) or unavoidable (for example, extreme weather events) means (MS).

367. Leakage occurs when efforts to reduce GHG emissions in one country or sector led to an increase in emissions in another country or sector. This can happen, for example, if a country imposes a tax on carbon emissions, which leads to the relocation of carbon-intensive industries to countries with less stringent regulations. In this case, the emission reductions achieved in the country that imposed the tax is offset by the emissions increase in the country where the industries have relocated. The greatest risks of leakage occur when mitigation policies are implemented in a way that is not globally coordinated or when there is a lack of global cooperation on climate change. For example, if a group of countries agree to reduce their emissions under the Paris Agreement, but other countries do not follow suit, the emission reductions achieved by the first group of countries could be offset by emission increases in the nonparticipating countries. Another risk of leakage

occurs when mitigation policies are not comprehensive and do not cover all sectors of the economy or all types of emissions. For example, if a country imposes a tax on carbon emissions from electricity generation but does not regulate emissions from transportation or agriculture, emission reductions in the electricity sector may be offset by emissions increases in the other sectors (CP).

Part II. Inputs received in response to the structured consultation launched by SB005

4. Elements for structured consultation – cross-cutting issues

368. *Discuss the role of removals activities and this guidance in supporting the aim of balancing emissions with removals through mid-century*

369. Quoting IPCC and IEA:

(a) The deployment of CDR to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO_2 or GHG emissions are to be achieved;

(b) DAC plays an important and growing role in net zero pathways and provides a way to balance emissions that are difficult to avoid. In the IEA Net Zero Emissions by 2050 Scenario, DAC technologies capture more than 85 Mt of CO_2 in 2030 and around 980 MtCO2 in 2050, requiring a large and accelerated scale-up from almost 0.01 MtCO2 today;

(c) Carbon dioxide removal (CDR) is not an alternative to cutting emissions or an excuse for delaying action but is part of a comprehensive strategy for “net” zero, and ranges from nature-based solutions (such as afforestation) to technology-based approaches underpinned by carbon capture and storage. DAC with geological CO_2 storage has several advantages as a CDR approach, including a relatively small land and water footprint, and high degree of assurance in both the permanence of the storage and the quantification of CO_2 removed. [IEAGHG, 267]

370. As reflected in the IPCC AR6 report, carbon removal alongside strong global efforts to reduce greenhouse gas emissions are indispensable. To ensure the effectiveness of carbon dioxide removal (CDR), clear national and international targets for large-scale CDR by 2035, 2040, and 2045 should be established, should be distinct from emission reduction goals and aligned with the objective of limiting global temperature rise to 1.5°C. [CFUT, 245]

371. To achieve the net-zero emission status by around mid-century, up to 10 Gt of removals will be required. Certain sectors pose greater marginal abatement challenges due to the inherent technical or economic difficulties in mitigating emissions and will have to rely on carbon removal to counterbalance their residual emissions. Many carbon removal technologies are in early development stages and need capital to research, develop, and scale, and Article 6.4 can play a pivotal role by creating a framework that promotes cooperation, stimulates investment, and facilitates access to capital and carbon markets. It is, therefore, essential that carbon removals are not perceived as a distraction from emissions reduction efforts, but rather as a complementary strategy that enables us to meet our ambitious climate goals. [CCAP, 246]

372. SB should follow the lead of the scientists and experts who contributed to the IPCC AR6 report and concluded that CDR is “unavoidable” and in fact will be required at Gt scale by mid-century to reach net zero and have a chance to limit warming to 1.5ºC or even 2°C –

this conclusion should be accepted as a foundation of the Article 6.4 deliberations, and not to relitigate the need for CDR. [NPBC, 253]

373. Carbon dioxide removal (CDR) at scale has become a necessity for the world to return to a 1.5°C or 2°C climate path. In fact, the latest IPCC report shows that for a 1.5°C world, we need to deploy CDR technologies starting now and increase volumes to 10-20 $GtCO_2$ removed per year until 2100 latest, but probably already until 2050. For that, we require long-term carbon removal technologies that prevent the release of the captured carbon for as long as possible; ideally for centuries to millennia. In addition to permanence, CDR technologies must be evaluated by their potential to already deliver significant removals in the near future. [ELG, 235], [REW, 219]

374. The need for carbon removals to reach net-zero GHG emissions at global level is a science-based fact. Carbon removals, including solutions such as DACCS, are required to achieve net-zero emissions by 2050 at global level, and are key contribution to neutralize residual emissions from hard-to-abate sectors, including aviation. It will play a critical role in the decarbonization of aviation by supporting in-sector measures aimed at avoiding or reducing emissions (including through the use of captured CO_2 as a feedstock for sustainable aviation fuels), by supporting the balancing of aviation's residual emissions – IATA estimates that more than 700 million tCO_2/year will need to be extracted from the atmosphere in 2050 with carbon capture technologies, either to produce sustainable aviation fuels or for permanent storage, and even if conventional aviation fuel was fully replaced by SAF by 2050, this SAF won't be fully carbon circular, so carbon removals will still be required to compensate for any residual emissions. [IATA, 255]

375. The operationalization and guidance on removal activities under Article 6.4 is expected to provide an international framework to trade carbon dioxide removals credits. Establishing such a framework will be instrumental in enabling the scale-up of carbon removal technologies, while guaranteeing environmental integrity. Ensuring that the framework includes technology-based removals will enable the necessary financial flows to scale-up promising technologies, so they can meet the demand required for meaningful impact on aviation decarbonization. [IATA, 255]

376. Tackling climate change will require a plethora of approaches. While removals must never be used as a substitute to emissions reductions, the development and deployment of carbon removals is an essential part of that portfolio and is necessary to counterbalance both residual and historical CO_2 emissions. The IPCC highlighted that carbon removals are crucial element on the road to net-zero, to enable net-zero and to achieve and sustain net-negative emissions, and that requires the deployment of large volumes of carbon dioxide removals, to be achieved through the various methods available – both land-based and engineered. The overwhelming proportion of IPCC scenarios compatible with the temperature targets of the Paris Agreement require the deployment of carbon dioxide removals, primarily BECCS and/or DACCS. [ZEP, 263]

377. Removals traded under Article 6.4 should not be allowed to impact NDC ambitions for emissions reductions. Thus, removals – land-based or technical – should only be applied towards dedicated removal trajectories which aim to neutralize the hard-to-abate emissions of the total volume of unabated emissions. A pre-requisite to acquire removals should be first to estimate the amount of hard-to abate emissions a nation or a company has and in what sectors. Land-based removals should only be applied towards hard-to-abate emissions in the AFOLU sector. For other sectors, permanent technical removals,

such as BECCS and DACCS, should be applied as a condition to claim net-zero. [SE, 244]

378. There should be explicit recognition of the primary role of emissions reductions, the risks of mitigation deterrence from removals, and the likely constraints on removals. Even with concentrated efforts, removal activities will be small relative to needed emissions reductions over the next three or four decades. While the IPCC clearly spells out the fact that CDR will be unavoidable, it also stresses the need for significant emission cuts as a pre-requisite. [BF, 252]

379. With regards to the availability of CDR to balance out residual emissions, the oft-cited range of 'required' CDR deployment from the IPCC's scenarios should be taken with a grain of salt since they often do not include real life constraints to the deployment of CDR approaches, such as limited biomass availability, energy requirements and infrastructural needs to achieve the temperature targets. These modelling exercises should not be understood as being prescriptive. With this in mind, Article 6.4 (and other climate governance frameworks) should ensure that removals are deployed on top of emission reductions and are not used to balance out emissions which could otherwise have been abated. [BF, 252]

380. It must be expected that a portfolio of CDR approaches will be deployed to reach net zero emissions. At this stage of research and development, CDR approaches have to be evaluated considering their interplay with all potential positive and negative side effect, e.g. the combination of biochar and enhanced weathering provides benefits exceeding the CDR potential from the single methods and including benefits beyond such as emissions reduction, increased permanence, implementing and cultivating traditional regenerative agriculture and driving positive environmental and social impacts by, e.g. increasing food security. At the same time the single but also combined methods are not in competition to the former land use but have the potential to improve the productivity and quality of a region. [UOH, 236]

381. This guidance is essential to provide clarity and credibility in carbon markets through the development of a well-designed, enabling, and transparent regulatory system, namely monitoring, reporting, verification and governance mechanisms – and can stand in as a gold standard guidance for carbon markets. It should also be noted that this guidance is being developed alongside other initiatives (e.g. European Union's certification scheme for carbon removal activities) and that consistency in carbon removal accounting is essential to build trust in carbon markets, establish a global level-playing field and unlock further opportunities for developers. [ZEP, 263]

382. We advocate for clear national and international targets for large-scale CDR by 2035, 2040, and 2045, distinct from emission reduction targets and aligned with the goal of limiting global temperature increase to 1.5°C. […] the need for the implementation of a range of regulatory and financial incentives, such as direct procurement, project-based support, or outcome-based subsidies. …clear quality standards for CDR credits must be established, based on the principles of permanence, verifiability, sustainability, additionality, and quantifiability, while being technology neutral. [NC, 206]

383. Both emissions reductions and emissions removals are essential to meeting the goals of the Paris Agreement and can complement one another through synergies. For example, using renewable energy to power our DAC facilities to the extent possible. Emissions reductions should be the primary response, however, emissions removals are also needed

to account for legacy CO_2 and emissions from hard-to-abate sectors. The IPCC has stated that carbon removals need to reach the 100-1,000 gigaton-scale over the 21st century to limit warming to 1.5°C above pre-industrial levels. To reach gigaton-scale carbon removal this century, both nature-based and technical carbon removal solutions, such as DAC, are needed. We firmly believe both carbon removal solutions should be pursued and included under the Article 6.4 mechanism, provided that technical carbon removal is fully measurable, reportable, and verifiable and contributes to the SDGs. [CAP, 207]

384. The Article 6.4 is widely expected to deliver a global standard for methodologies for carbon removal activities, especially for novel removal activities where a lot is still being developed. […] an increasing number of countries rely on engineered removals, to achieve their climate targets. Leaving such removals left out of the Article 6.4 mechanism scope makes it more difficult to achieve the increasingly ambitious NDCs over the coming decades. High-quality carbon removals play a crucial role to avoid overshooting climate targets and reaching net zero emissions. [CCE, 218]

385. More guidance on CDR projects on international waters is needed. One third of the world's ocean is in international waters, and as the ocean contains 93% of the carbon on Earth, an effective legal framework that can be applied to activities in these waters, will be important to scale of removals. We look to the UN to engage with the global community and set the tone for removals in international waters, taking lessons from legislation of international fishing and other existing activities. [SWG, 226]

386. CDR should be an avenue to invest and not for profit. An international CDR bank should be founded to control, monitor, diversify and approve CDR activities. We advise to promote CDR methods that are safer and more expensive. [CDR, 230]

387. The latest climate science shows the necessity of deploying carbon removals at scale to achieve net zero by mid-century. Removals should focus on activity types that offer permanent storage of CO_2 to yield the greatest climate mitigation benefit. This means that the Article 6.4 mechanism should incentivise projects offering durable storage of CO_2, such as through BECCS. The requirements for crediting periods, monitoring and reversals should:

(a) Be appropriate to the project characteristics;

(b) Be proportionate to project risks; and o Enable projects to be developed and financed. [DG, 271]

388. It is required to have a careful, conservative, and demonstrably rigorous approach to crediting mitigation from removals. In general, crediting practices in both voluntary and compliance markets thus far have not achieved either scientific or public credibility. To overcome this problem, policymakers must now focus on identifying and crediting only those removal activities that have a known and demonstrable mitigation impact. [GRI/LSE, 275]

389. Carbon Dioxide Removal from the atmosphere through the sequestration of biochar in soil is a critical "must have" for the planet. If carbon removal is seen as a way to offset emissions, it could lead to people and businesses believing that they can continue to emit greenhouse gases without taking action to reduce them. [CM, 277]

390. An exclusive focus on removal-based carbon offsets today could potentially result in less, rather than more, mitigation. This is for three reasons: nature-based carbon removals can

be less reliable than other offsetting options, geologic removal methods are unproven at scale, and avoiding emissions is just as important – if not more so – than removing them. Ideally, organizations (along with the rest of the world) will reduce their own emissions in line with what is needed to limit global warming to 1.5°C or 2°C. If they use carbon offsets to achieve even more mitigation, they should strongly consider investments that avoid GHG emissions – ideally prioritizing those that accelerate decarbonization. It does not make sense to limit investment to sequestration offsets based on an idealized notion of what "net zero" emissions should look like in 2050. Therefore, it is important to avoid prioritizing removals over emission reduction activities through Article 6.4 in the lead-up to 2050. Rather, activities that produce high-quality credits (i.e. credits for which there is high confidence in their environmental integrity) should be prioritized regardless of whether they reduce or remove GHG emissions from the atmosphere. [OI, 285]

391. While removals must never be used as a substitute to emissions reductions, the development and deployment of carbon removals is an essential part of that portfolio and is necessary to counterbalance both residual and historical CO_2 emissions. [CCSA, 287]

392. As different carbon removal activities can achieve different storage timescales, with different reversal risks involved, it may be difficult to establish one-size-fits-all rules, without implicitly prejudicing certain activities in relation to others. Therefore, it may be more prudent to make some elements of these definitions and applicable timeframes – particularly in the case of monitoring periods and timeframes for addressing reversals – activity-specific. [CCSA, 287]

393. Carbon removal solutions that can play a role in addressing our collective climate challenges are numerous and encompass a range of pathways, storage mechanisms and levels of technological maturity. There is a false dichotomy in presenting "land-based" and "engineering-based" solutions (often also referred to as "nature-based" and "technological" solutions) as distinct categories, and both will be critical at scale if we want to avoid the worst impacts of climate change. The time and maturity component of these solutions is an important consideration here; while many nature-based solutions are subject to reversal risk, thus limiting their mitigation value, they are available today and can be scaled up rapidly, which can help to buy time for durable solutions with little-to-no reversal risk to be iterated upon and deployed. [RT, 288]

394. Removal activities fulfil an additional, complementary role from emission reductions, but they remain critical for the achievement of the long-term temperature targets. This guidance should thus be safeguarding that removal activities are not treated as a substitute to unprecedented and fast emission reductions. To the contrary, it shall safeguard that removal activities are being treated as a complementary tool in climate change mitigation, following a distinct framework wherever needed to safeguard the achievement of the long-term temperature targets. Thereby, removal activities will be able to meaningfully fulfil their roles specified in e.g. the AR6. [CWORKS, 302]

395. The need for carbon removals to reach net-zero GHG emissions at global level is a science-based fact. The IPCC and the IEA both clearly state that carbon removals, including technology-based removal solutions such as DACCS, among other developing removal-based technologies, are required to achieve net-zero emissions by 2050 at global level, and highlight their key contribution to neutralize residual emissions from hard-to-abate sectors, including aviation. Carbon removals, and in particular technology-based removals, will play a critical role in the decarbonisation of aviation. [ICCAIA, 303]

396. In the near term, avoidance, removal and emissions reductions will all be necessary. A shift to removal in carbon markets is likely in the long-term. As outlined in the Oxford Principles for Net Zero Aligned Carbon Offsetting, not only is a shift to 100% carbon removal needed by the mid-century, a shift to long duration storage is also necessary. [BEZERO, 304]

397. Beyond 2050 we will need net zero emissions to the atmosphere, and probably even negative emissions. The IPCC recognizes that carbon dioxide removals (CDR) will be essential for this because even by 2050 we will not have developed sufficient technology to avoid 100% of emissions worldwide. Removals from both nature-based solutions (NBS) and technical-based solutions (TBS) will be needed. [SYRA, 305]

398. According to the IPCC, “Carbon dioxide removal (CDR) will be necessary to achieve net-negative CO_2 emissions”. Nature-based removals are particularly important in the near term as ready-to-go, proven climate solutions. The majority of existing removals activities are biological in nature and methodologies for these types of removals have already been widely tested and monitored over several decades and can deliver significant climate mitigation in the coming decades and can deliver additional benefits: “Reforestation, improved forest management, soil carbon sequestration, peatland restoration and coastal blue carbon management are examples of CDR methods that can enhance biodiversity and ecosystem functions, employment and local livelihoods, depending on context”. Other examples of co-benefits include increasing soil fertility and water security. [CI, 307]

399. There is a need to clearly distinguish between mitigation impacts/outcomes based on their expected durability. If the objective is to “balance” emissions with removals, then the guidance on the role of removals under 6.4 should ensure that only removals which have a high likelihood of very long-term storage (multiple centuries to millennia) can be considered as adequate activities under the article 6.4 mechanism. Medium-term storage has some value when it comes to climate mitigation. Some nature-based solutions deliver very valuable benefits that are far more important than their ability to sequester carbon, such as biodiversity or adaptation and resilience benefits. However, these activities should not be included under the article 6.4 mechanism because the quantification, and long-term guarantee, of their impact is extremely difficult, and to some extent impossible to achieve. Nature based solutions should not be used to meet specific GHG targets in a manner that implies their equivalence to GHG emission reductions. We therefore believe that any guidance on removals should clearly reflect the different ranges of durability associated with different types of storage, and no removal, particularly those with the shortest durability, should be considered as a way to “balance” emissions. In addition, mid-century is still several decades away, so this mechanism should not be aiming at balancing at all: no country, region or sector has reached low ‘residual’ emissions. The urgent focus for the coming days, years and decades is steep and sustained emission reductions. [CMW, 308]

400. Modelled mitigation pathways that limit warming to 1.5°C, and well below 2°C, involve deep, rapid and sustained emissions reductions. Both emission reductions and removals are needed to get on a Paris-aligned pathway. This limits the role and space for offsetting as aggregated NDCs are not currently consistent with 1.5°C-consistent pathways and total CO_2 emissions will need to go to net zero within the next thirty years. Due to the current insufficiency of mitigation ambition, to be consistent with Paris Agreement goals any use of Article 6 should come in addition to, and on top of, not instead of, rapid decarbonization and should target reductions that the Host Party cannot realize through domestic support alone. [CA, 312]

401. SB shall also consider that removal projects can be of multiple types, each with different characteristics and each may need to be treated differently (from one perspective or another). Some might even fit the existing RMP of CDM (e.g. CDM sectoral scopes) while other may warrant operationalization of newer sectoral scope (CCS). [SP, 313]

402. CDR counterbalances hard-to-abate residual emissions and include options such as DACCS and BECCS, where CCS provides the storage component of these methods. [GCCSI, 314]

403. This guidance will enable global markets to trade on removals credits, and should aim to ensure:

(a) Removals are not used as an alternative to reducing emissions;

(b) Removals are defined according to the IPCC Sixth Assessment Report (AR6);

(c) Monitoring, accounting, permanence and risk of CO_2 capture, transport and storage is handled appropriately, with reference to significant work done by experts. [GCCSI, 314]

404. Removals have an essential but limited role of meeting the Paris Agreement goals, including the goal of reaching a ‘balance of sinks and sources’. Removals include only activities that actually remove net carbon from the atmosphere, so that CCS attached to fossil fuels or CCU with re-release of carbon cannot qualify. BECCS that uses forest wood as a feedstock likewise is highly unlikely to deliver net removals in a timeframe consistent with the urgent need for climate mitigation. Removal activities need to be able to ensure the permanent storage of carbon in non-atmospheric carbon sinks; critical to ensure a precise and science-based definition of carbon removals so that activities that do not live up to these characteristics are not falsely identified as carbon removals. Speculative technologies where environmental and social impacts are largely uncertain or likely negative, or where carbon removal and its permanence are not demonstrated, should be eliminated. Any removal technologies or approaches with negative impacts on biodiversity, environment, climate and communities should be eliminated. There must be strict additionality criteria to ensure that the results of ongoing natural processes cannot be claimed and traded. [CLARA, 316]

405. As the world struggles to reduce emissions, carbon removal is seen as necessary by most scientists to mitigate climate change impacts. The IPCC has emphasized that carbon removal is "unavoidable" to offset challenging emissions and achieve net-zero goals. [VRT, 319]

406. SYNCRAFT strongly agrees with the scientific community's opinion expressed in the IPCC reports that emphasize the mandatory provision of carbon removals combined with relentless global greenhouse gas emission reduction efforts. The need for carbon dioxide removal (CDR) has to be accepted as common sense and must be included in any climate protection efforts. [SYNCR, 333]

407. This question assumes that removals are a viable way to balance emissions under the aim of keeping warming to 1.5 degrees. In order to reach this goal of the Paris Agreement, there should be a rapid phase out of greenhouse gas emissions. The crucial focus is not about balancing emissions with removals but rather how to phase out global greenhouse gas emission at source to their lowest possible level in a way that is globally equitable. [IEN, 337]

408. Removals are not a justification for continued pollution but rather a complementary piece of a larger transition that requires deep emission cuts across all sectors. They will require attention in the near-term to be part of the solution in the future. To ensure an adequate supply of removals credits to neutralize residual emissions, for example, policymakers must take care not to prematurely eliminate potential climate solutions as technologies move toward pilot scale and beyond. Similarly, they must not lose sight of the time lag between the initiation of forest restoration activities and the generation of significant volumes of emissions removals. For this reason, the 6.4 Supervisory Body must finalize robust and future-proofed recommendations on removals. In addition, as the effectiveness, impacts, risks, and co-benefits of CDR will be highly variable depending on the method and context, it is critical that the Article 6.4 mechanism Supervisory Body ensure high social and environmental integrity for any removals methodologies it approves. All CDR solutions require careful considerations around safe and effective deployment; monitoring, reporting, and verification; equity and justice; and innovation. [EDF, 331]

409. Although the Supervisory Body on Article 6.4 has repeatedly pointed to the IPCC's Sixth Assessment Report (AR6) as calling for using removals, in truth the role of removals in the AR6 report is addressed in a very limited way. In fact, the IPCC AR6 report states that removals should only serve as a tool to address "hard-to-abate residual GHG emissions," whereas the primary tool for meeting targets is emissions reductions (Pg. 28). Therefore, the role of removals is at best minor and supplementary. Removals are not a climate solution in their own right and are not a substitute for greenhouse gas emissions reductions. [IEN, 337]

410. In this context, a clear, universal and binding definition of "hard to abate residual emissions" is vital. Buck, et. al. 2023 find that, on average, Annex 1 countries classify 18% of their country's total GHG emissions as "residual." The United States claims 24.5% (Ibid.). Countries cannot allow inconvenient or costly excuses to take the place of actual emissions reductions. If the definition of "hard-to-abate residual GHG emissions" is not strict and universal, CDR and carbon markets will undoubtedly increase, along with the risks and concerns outlined here. [IEN, 337]

411. Article 6 is designed to allow Parties to the Paris Agreement to engage in cooperative activities "to allow for higher ambition." To date, carbon markets largely have proven to be inadequate mechanisms to increase ambition as offsets do not substantially reduce emissions. If the Article 6.4 mechanism wants to facilitate increased ambition and to contribute to the mitigation of emissions and supporting sustainable development, then its principal focus should be to incentivize and support enhanced reduction of emissions, urgently needed in the near term. [CIEL, 317]

412. Carbon markets, offsets schemes, and carbon removals cannot offer solutions to the climate crisis and instead further prop up a system that has enabled Big Polluters and rich countries to profit off of the crisis. They should therefore not be enabled under any provision of the Paris Agreement. Land-based removals do not result in emission reductions and further lead to unacceptable negative environmental and social impacts, and foster unsustainable development, which are contrary to the objectives of the Paris Agreement and to adequate climate action - they should therefore be rejected. Geoengineering removals are unproven, risky, and costly technologies that put the profits of Big Polluters above the protection of our communities and environment, and further distract and derail from the urgent, deep, real emission reductions needed - they should therefore be rejected. [OP CSO, 335]

413. If an offset is sold, resulting in emissions somewhere which are supposed to be ‘offset’ by a removal, then driven by a precautionary approach, is that the monitoring should last as long as the emissions enabled by the offset are in the atmosphere. That statement is likely to create a strong pushback among removal proponents as not being rational or reasonable. But reversals at any point in the future would ‘undo’ any supposed climate benefit. There is no point in the foreseeable future where the carbon budget will not be a concern, where reversals would have no wider impact. Therefore, it is perfectly reasonable to insist on monitoring for as long as the emissions the removal offset could be expected to be in the atmosphere (700-1000 years for CO_2). The previous information note in fact states that for removals to have any impact, they need to at least last the next 200-300 years, but even that more defined period would be profoundly challenging, when considering the fluidity within our institutions. It would be reasonable following this concern to not allow removals into Art 6.4 at all. [CLARA, 316]

414. Given the complementary roles, removals and reductions should be differentiated with separate accounting to ensure visibility over their roles in achieving net zero outcomes. [CENG, 318]

415. To avoid substitution, and hence ensure negative emissions deliver the necessary additional carbon removal, we suggest that targets and accounting for negative emissions should be explicitly set and managed separately from existing and future targets for emissions reduction. McLaren et al 2019 elaborate many more impacts of non-separation of emission reductions and emission removals, e.g. mis-conceptualization of BECCS, delay of climate action and socio-technological lock-in effects. [ATMO, 336]

416. The recommendations on removal activities being progressed by the Article 6.4 Supervisory Body (6.4SB) should ensure a net removal is being delivered, ensure no negative environmental or social outcomes, and be evergreen to allow for innovation as new durable carbon removal solutions are developed. The recommendations on removals referred to as “Removal activities under the Article 6.4 mechanism” is also linked to the “Requirements for the development and assessment of mechanism methodologies” amongst other items and we ask that clarity is given to stakeholders on how the different documents are linked. [PURO, 322]

4.1. Roles of entities

417. *What are the roles and functions of the following entities in implementing the operations referred to in this guidance: Activity proponent(s), Article 6.4 mechanism Supervisory Body (6.4SB), 6.4 mechanism registry administrator, Host Party, stakeholders?*

418. CDM examples are followed in the roles and functions of these entities. [IEAGHG, 267]

4.1.1. Activity Proponent

419. The activity proponent(s) are those fulfilling the role of the project owner(s) and have the overall control and responsibility for the project. This includes bearing the responsibility for ensuring the project meets the rules, modalities, and procedures set both in terms of project implementation and monitoring as well as project documentation to allow verification of results. [STX,282]

420. An ‘activity proponent’ is an entity that registers a carbon dioxide removal facility with an eligible 6.4 mechanism registry administrator against and accredited methodology. [CCAP, 246]

421. In regard to the roles and functions of entities involved in implementing Article 6.4 guidance, it is critical that carbon removal practitioners are actively involved in the decision-making process. Connecting these practitioners with academia, governmental and UNFCCC partners will help to break down information silos, enable shared learning and ground climate projections and models with real-world data and testing. We encourage the Supervisory Body to continue to provide avenues – such as meetings, webinars, learning sessions and smaller advisory groups – for direct engagement between the Supervisory Body, Activity Proponents and other key stakeholders. [RT, 288]

422. Activity proponents: Understand and follow the guidelines when designing and implementing activities to be traded under the Article 6.4 mechanism. [SYRA, 305]

4.1.2. Article 6.4 mechanism Supervisory Body (6.4SB)

423. The 6.4SB fulfils the role of control body ensuring that implemented activities sufficiently meet and follow the rules, modalities, and procedures set and ensures the removal claims are validated to ensure these are accurate and appropriate. As well as the role of defining, with input of stakeholders, what the rules, modalities and procedures should look like and ensure these are in line with the latest scientific supported standards. [STX, 282]

424. The Article 6.4 mechanism SB govern the Article 6.4 crediting mechanism and overall operations, including creation and approval of methodologies. [CCAP, 246]

425. The role of the SB, in other words, is not to be limited by self-imposed constraints of the best guess as to safe levels of eight years ago nor by offset markets or cap and trade or cap and tax systems but to assist those and go beyond those to restore the healthy environment to which all the world is entitled. The SB can fulfill its specific mandates from the Paris Agreement and go beyond in responding to current experience at the same time. [JMF, 270]

4.1.3. 6.4 mechanism registry administrator

426. The Article 6.4 mechanism registry administrator provides an accredited database that of Article 6.4 CDRs that includes records for the full lifecycle of ownership and use of such certificates. The registry administrator should be independent from the market and act as a single source of truth to support multiple types of removal certificates and end-user claims. [CCAP, 246]

427. The mechanism registry administrator fulfils the role of ensuring that there is a functioning platform in which removal activities, their underlying documentation and results including buffer pools accounted for are recorded. Furthermore, it should fulfil the function of preventing double counting of results through ensuring the removal activities registered are unique and do not overlap with existing implemented activities. [STX, 282]

4.1.4. Host Party

428. The host party should fulfil the function of providing guidance on how to develop removal activities within their country to ensure developed activities are in line with the host party's objectives of activity development. [STX, 282]

4.1.5. Stakeholders

429. The roles and functions of the stakeholders involved in implementing the operations can differ across types of removal activities. Hence, the categories of removal activities would need to be defined prior to defining the roles and functions that stakeholders fulfil in implementing the removal operations. [STX,282]

4.2. Interrelationships between monitoring and crediting period and reversals

430. *How are these elements understood, in particular, any interrelationships in their functions, timeframes, and implementation? (a) Monitoring period (b) Crediting period (c) Timeframe for addressing reversals*

4.2.1. General Aspects

431. Crediting period process also allows for the re-evaluation of the project within the latest climate context. [DG, 271]

432. … the EU's carbon removal certification framework's impact assessment report contains two points for permanence i) certainty in quantification, and ii) corresponding liability regime or insurance mechanisms to cover reversals. … [CCE, 218]

433. Use technology to monitor and report at a high level of detail and accuracy. Measurement of CO_2 removed should be accurate to the tonne. Proof of sequestration and measurement should be provided at issuance …Verification of the removal should be performed yearly, until permanence is proved beyond reasonable doubt…….a certified, peer reviewed life cycle analysis is critical. Every CDR solution and implementation should undergo a detailed LCA... …, insurance of reversal should be a requirement. [REW, 219]

434. Annual monitoring and reporting should occur if a long-term project produces carbon removal. In the case of one-off projects, one-time monitoring upon input and/or at certain time intervals depends on the ecosystem and environment of the project. [TFI, 214]

435. For monitoring, reporting, and verification (MRV) process for biochar several robust methodologies exist: Verra, puro.earth and European Biochar Certificate C-sink. [ECOERA, 209]

436. Combinations of carbon removal solutions can also offer more flexibility and greater impact in various ways, such as through "horizontal stacking" or replacement of mixtures of removals over time. … concept called the "blended tonne", which combines ex post soil carbon removals that have a guaranteed 10-year permanence with ex-ante long-storage duration removals is described. [NORI, 212]

437. MRV is a work in progress across the CDR sector… SB should engage with the EU Carbon Removal Certification Framework process, the work of the U.S. Department of Energy Office of Fossil Energy and Carbon Management, Japan's Joint Crediting Mechanism, … to create and advance a cohesive MRV framework across carbon markets ….[OAIR, 210][CBC, 211]: 1) all CDR projects must be verified by reputable independent third parties, with an openness to new entities and standards bodies that emerge as the sector develops; 2) the cost of MRV for any transaction be listed separately from the aggregate purchase price for credits; and 3) that MRV be contracted and paid for by the buyer (or receiving party) of the credits... streamline and systematize what is currently an opaque and muddled process, and critically, to align all parties' incentives towards the highest

possible quality standard. [OAIR, 210] CBC produced an issue brief on MRV of CDR [CBC, 211]

438. For creating a methodology for generating carbon credits from increased production, use and disposal of industrial wood.... submission proposes baseline, MRV, additionality, equations, permanence period for each parameter and pools, i.e. forest growth, forest operation, industrial/construction wood, biochar, soil stocking …. [RBI, 204]

439. An idealized MRV+ governed and engineered for marine CDR operation would have overlapping reporting time frames… real-time ship-to-shore communications can be made available for 24/7 data exchange to monitor ….every operational aspect, and a wide range of on-going environmental data streams ….suggests to follow what the NOAA mCDR team recommends.… The use of a NOAA/USDA approved MRV+ value scale by UNFCCC, can likely be approved by the other parties…. [MHS,200]

440. Monitoring must be continuous during the monitoring period. Some form of monitoring mechanism is required which is able to identify removals on short notice. All monitoring data for reversals should be made public in near real-time by all projects. [SE, 244]

441. More guidance on CDR projects on international waters is needed. One third of the world's ocean is in international waters, and as the ocean contains 93% of the carbon on Earth, an effective legal framework that can be applied to activities in these waters, will be important to scale of removals. We look to the UN to engage with the global community and set the tone for removals in international waters, taking lessons from legislation of international fishing and other existing activities. [SWG 226]

442. The monitoring period should begin with the initial capture of CO_2, continue through its storage and sequestration, and only finish if/when the CDR provider can demonstrate that it is no longer possible for the CO_2 to be re-released back into the atmosphere, for example after CO_2 has been mineralised. Exact monitoring requirements will vary across different carbon capture and sequestration technologies and the frequency of monitoring reports might decrease over time if the risk of reversal decreases, but some form of monitoring and reporting should always be required unless and until a sequestration provider can demonstrate permanent carbon disposal/removal. For carbon mineralisation, we would propose the injection site should be monitored continuously from the point of injection until all the CO_2 has been mineralised. Data from this monitoring should be reported once a year for verification purposes. Further a method is proposed for data confidentiality. [44.01, 248]

443. Performance based monitoring periods are recommended, safeguarding that i) monitoring is continued to the point where there is "proof of permanence" (e.g. via a transfer of liabilities as specified in the European CCS directive) whilst ii) not overburdening project developers following best practice that is following scientific assessments of what is happening to CO_2 once stored in a geological reservoir. Given that the A6.4SB is requested to allow for reporting of reversals and addressing them "in full" for all A6.4ERs, the above logic pertinent to geological storage could also be "transferred" towards CDR methods not reliant on geological storage. [CWORKS, 302].

444. High quality monitoring, reporting, and verification (MRV) is the key deliverable for any carbon removal project and essential for building trust in carbon markets. The Carbon Business Council recently published an Issue Brief outlining the key criteria for high-quality MRV. These Article 6.4 deliberations offer an opportunity to enshrine high-quality MRV as

foundational to global carbon removal markets, and we encourage the SB to take steps to engage with the EU Carbon Removal Certification Framework process, the work of the U.S. Department of Energy Office of Fossil Energy and Carbon Management, Japan's Joint Crediting Mechanism, and other key global public sector efforts (multilateral and bilateral) to create and advance a cohesive MRV framework across carbon markets – and avoid a fragmented, patchwork outcome that will be difficult for all stakeholders to navigate. [NPBC, 253]

445. Monitoring, reporting and verification mechanisms must take into account the characteristics of the different types of carbon removal methods as they vary greatly in terms of the storage timescales that can be achieved and in the reversal risks involved. These differences will result in different requirements for (i) monitoring periods, (ii) crediting periods and (iii) managing reversals:

(a) Crediting periods should be aligned with the achievable storage timeframe. Longer crediting periods should be assigned to activities that achieve permanent storage, recognising the longterm climate value of geological storage methods, capable of storing CO_2 for thousands of years;

(b) Monitoring periods must be in line with storage timescales and reversal risks. As general principle, the monitoring period should be at least as long at the crediting period (in the case of geological storage, monitoring continues after the end of injection). Monitoring requirements must be defined accordingly, taking into account the potential for reversal through time. [ZEP, 263]

446. Regardless of the sector of removals, monitoring is fundamental to ensure that GHG impacts are credible and verifiable, as it enables the detection of reversals. While the monitoring techniques and technologies needed to accurately quantify projected or claimed GHG impacts vary widely, the most robust systems usually use a combination of two types of approaches to monitoring: (1) ongoing/automatic monitoring, e.g. on-site and/or remote sensing to detect any changes and (2) site visits to validate ongoing monitoring, check equipment function, record in-person measurements. There is a minimum threshold of data and monitoring requirements that are set out by standards and carried out by the project proponents with support from the government and local communities. These should be vetted by the 6.4SB for every relevant methodology to ensure high quality. [CI, 307]

447. Monitoring capacity should be in place at the onset of any activity that is intended to generate credits to be used under Article 6.4. Under no circumstance should credits be generated for results that may have occurred before monitoring was in place. Monitoring should continue over the course of the period in which the activity seeks to generate credits, and it should be sufficiently robust to verify that the activity is ongoing and to detect and quantify any reversal that occurs. [CI, 307]

5. Elements for structured consultation – specific elements

5.1. Definitions

448. The SB 005 Information Note calls for a discussion on the role and potential elements of definitions for the guidance, including "Removals".

449. Below is a summary of public inputs received on these issues.

450. Removals are best understood as a measure to lower the concentration of CO_2 in the atmosphere. A permanent removal is a measure where, based on scientific consensus, the likelihood of reversal is very close to zero if industry best-practices are applied. A non-permanent removal is a postponed emission. [SE, 244]

451. In our view, "removals" should be defined as the process that effectively subtracts carbon dioxide from the atmosphere. Importantly, this definition must incorporate a long-term perspective. We propose that, to qualify as a removal, the action should result in the extraction of carbon from the atmosphere for a period of 100 years or longer. This definition sets a stringent standard that encourages meaningful and lasting efforts towards carbon dioxide removal (CDR). Further, the risk of reversal or, Event of Carbon Default (EOCD)— the potential for the stored carbon to re-enter the atmosphere — should be minimised to the greatest extent possible. This risk management is crucial to ensure the integrity and effectiveness of removal activities over the long term. C-Capsule views risk assessment agencies such as Sylvera and BeZero Carbon, as essential to the evaluation of risk. Moreover, it's important to recognise that "removals" should not be considered exclusively as a pathway towards storage, but also as an avenue to make use of captured carbon in a manner that continues to keep it out of the atmosphere in the long term. For instance, integrating captured carbon into construction materials such as cement could qualify as a removal, given that it results in the long-term sequestration of carbon. However, we need to draw clear boundaries on what constitutes a removal. For instance, while captured carbon can be utilised in various ways, its use as a fuel should not qualify as a removal. This is because burning captured carbon as a fuel would reintroduce it into the atmosphere, contradicting the requirement of the 100-year sequestration benchmark we propose. In summary, it is paramount to construct clear and robust definitions for terms like "removals" to ensure a common understanding and strict adherence to the long-term goals of carbon dioxide removal. By setting these high standards, we can ensure that every removal contributes effectively and enduringly towards the balance of emissions by mid-century. [CCAP, 246]

452. We encourage the Supervisory Body to consider including CO_2 captured from the ocean in its definition of removal activities, i.e. “Anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere or ocean and durably storing it in geological, terrestrial, or ocean reservoirs, or in products”. The ocean plays an important role in regulating Earth’s climate by absorbing 30% of anthropogenic CO_2 from the atmosphere and thereby slowing the rate of atmospheric warming. Without this, “atmospheric CO_2 would be approximately 450ppmv today, a level of CO_2 that would have led to even greater climate change than witnessed today”. However, this CO_2 uptake by the ocean has not been without consequence and has led to a decrease in seawater pH and carbonate ion concentration, in a phenomenon referred to as ocean acidification. Ocean acidification directly impacts marine calcifying organisms that use dissolved calcium and carbonate ions to build their shells and external skeletons. It is causing detrimental ecosystem changes that are, in turn, affecting ocean-dependent sustainable development activities, such as seafood farming. An equilibrium broadly exists between the atmosphere and shallow ocean with regards to CO_2 levels. “Air-sea gas exchange equilibrates surface water CO_2 to atmospheric levels with a timescale of approximately one year”. Marine carbon dioxide removal (mCDR) methods, such as Captura’s Direct Ocean Capture (DOC), can leverage this natural equilibrium to enable the removal of CO_2 from the atmosphere, while also helping to mitigate local ocean acidification. [..] As CO_2 is 150 times more concentrated volumetrically in the ocean than the atmosphere, Captura’s DOC has the potential to indirectly remove significant quantities of CO_2 from the atmosphere in an energy efficient

way. If deployed in semi-contained bays or inlets, it can also counteract ocean acidification on a local level, supporting the UNFCCC's broader sustainable development goals. [CC, 247]

453. We also see the Article 6.4 guidance providing clear differentiation between different types of carbon sequestration, and especially between truly permanent carbon removal and reversible carbon storage pathways. The 6.4SB can play an important role in helping clarify levels of permanence and setting appropriate monitoring and insurance requirements for technologies that provide reversible carbon storage. However, there are already competing measures being developed at national and multinational level, including the USA's Inflation Reduction Act and the EU's Carbon Removal Certification Framework. It is important that, as much as possible, all these frameworks are aligned, otherwise we could see CDR providers migrating to lower-standard jurisdictions. [44.01, 248]

454. With regards to the definition of Carbon Dioxide Removal, CDR must be considered a functional outcome, rather than an enumerated set of activities or processes: Any process, regardless of pathway, which results in a net reduction of CO_2 concentrations in the atmosphere must be considered carbon dioxide removal. Net carbon dioxide removals must be established by a comprehensive, cradle-to-grave life cycle analysis. We urge a definition of removals that is method-neutral, and criteria based to preserve latitude for emerging methods of removal. [XPZ, 249]

455. We strongly encourage the SB to follow the IPCC's lead in defining carbon removal as anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products." This definition is the consensus product of lengthy deliberation by thousands of scientists and other relevant experts and should be used by the SB as a foundation of the future Article 6.4 mechanism. We would like to reiterate that CDR encompasses a range of pathways, from land-based soil and forest carbon sinks; to biomass-based carbon removal and storage (BiCRS); to marine carbon dioxide removal (mCDR); to mineralization-based approaches; to direct air capture (DAC) – as well as emergent and potentially as yet undiscovered methods. Effectively all of these pathways and approaches are hybrids with varying degrees of nature and engineering, and we strongly encourage the SB to move away from labels such as "engineering-based activities" and adopt a definition of CDR that is method-neutral and criteria based. In a recently published Issue Brief, the Carbon Business Council draws upon IPCC recommendations and views from experts across the CDR sector to outline five key criteria for high-quality CDR: additionality, durability, net-negativity, verification, and equity and community engagement. (Note: Additionality can be challenging to assess with soil carbon sequestration and other regenerative agriculture practices that can nevertheless have meaningful climate value and offer important ecosystem co-benefits. Also, different CDR pathways offer varying levels of durability, all of which have the potential to contribute to meeting our climate goals.) We encourage the SB to adopt a similarly method-neutral, criteria-based approach to determine CDR projects' eligibility under the Article 6.4 mechanism. [NPBC, 253]

456. Definitions are extremely important. There is a need for differentiating between emissions reductions and removals in general. The removals definition should safeguard that such

differentiations will not become blurred. Two more important aspect for the definition of CDR are found in:

(a) The storage timeframe. Given that all reversal should be addressed in full, limiting the definition towards CDR methods that can safeguard storage permanence should be considered. Alternatively, the monitoring period should reflect options to safeguard addressing all reversals in full by coverage of a very long timeframe. The draft GHG Protocol Guidance for the Land sector and removals has specified the need for "ongoing monitoring" to safeguard that information about the carbon stock is never missing and thus allowing to address potential reversals;

(b) An active anthropogenic intervention. Given that A6.4ERs shall be designed to achieve mitigation of GHG emissions that is allowing for higher ambition, an "active anthropogenic" intervention should be required per the definition. [CWORKS, 302]

457. The definition of carbon removal should align to that by the IPCC which defines it as "anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products." Recognizing that CDR will need to be deployed at gigaton scale to achieve the 1.5°C or 2°C temperature rise targets, rather than delaying progress (by exclusion of emerging technologies) out of caution, the mechanism should focus on accelerating the testing and validation to reduce uncertainties that remain in technology-based CDR. [NC, 206]

5.1.1. General approach to definition

458. The Supervisory body may wish to define different types of removal activities. A high-level categorization could include the following two broad categories:

459. Temperature dependent feedback loops magnify the extend of methane increases, including biogenic methane production and methane release from melting arctic ice. Risk exists that these effects will outpace our efforts to reduce methane emissions, and that we will not see atmospheric methane decrease fast enough through point source emissions reductions alone. To allow for future generations to manage climate risk, it is important that 'carbon removals' or 'greenhouse gas removals' terminology be kept open:

(a) To all technologies which may be developed and proven with adequate MRV;

(b) To all greenhouse gases covered by the Kyoto agreement, including carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, perfluorocarbons, SF_6 and NF3;

(c) To greenhouse gases which may form a part of present and future agreements such as the Paris Agreement. Inversion Point's main concerns with the information note on removal activities are summarized as follows:

(i) The consideration of excluding non-CO_2 greenhouse gases from removal definitions on the basis of perceived likely contribution (Table 1, page 13, row 1, "Cons");

(ii) The exclusion of other Pros from non-CO_2 greenhouse gas addition removal definitions (Table 1, page 13, row 1, "Pros"), including: a. Air quality improvement co-benefits b. Increased impact on short-term warming effects relative to CO_2 c. Need for solutions capable of keeping pace with increased natural emissions (CH_4/N_2O);

(iii) Framing of CDR as either "engineering-based activities" or "land-based activities" (A);

(iv) Misrepresentation of the benefits of long-term storage and its foreseen role according to scientific assessments, e.g. via discount rates (B). [IPT, 284]

460. The definition of removals should be based on the following principles:

(a) Be technology neutral;

(b) Be neutral regarding whether removed GHGs are stored or destroyed;

(c) Avoid prescribing specific durations for storage (with the issue of temporary storage dealt with separately, and not in the definition);

(d) Apply to all relevant GHGs and not only CO_2. [OI, 285]

461. We suggest that the following definition of 'GHG removal enhancement' fulfills these criteria:

(a) Greenhouse gas removal enhancement: Anthropogenic activities that cause an increase in removals exceeding any increase in emissions caused by the activity. [OI, 285]

462. This definition addresses the issues related to temporal boundaries and removals versus avoided emissions in Information Note A6.4-SB005-AA-A09. For example, BECCS from biogenic waste would not meet the definition of 'greenhouse gas removal enhancement' as it does not cause an increase in removals but constitutes an emission reduction. The definition also addresses the issue raised in Information Note A6.4-SB005-AA-A09 on the need to include specification of 'net' removals, i.e. that activities which increase emissions more than they increase removals would not fulfill the definition of 'Greenhouse gas removal enhancement'. We suggest inclusion of the word 'enhancement' to distinguish between activities that enhance removals and the activity of solely removing GHGs. The definition also addresses the issue of durability of storage, as activities that have non-durable storage and therefore reversal emissions will not fulfill the definition if any increase in emissions caused by the activity exceeds the removals caused by the activity. [OI, 285]

463. Once again, a more complete definition and framing of eligible removals activities that could help achieve the objectives of the Paris Agreement would focus on carbon removal as *the intentional movement of carbon from the fast carbon cycle to the slow carbon cycle, where the total fast carbon removed exceeds the total slow carbon emitted within a given project boundary*. Such removal activities could shift carbon to rebalance natural carbon reservoirs by transferring carbon from fast cycling reservoirs (i.e. the biosphere, the atmosphere, and the upper ocean) to slow cycling reservoirs (i.e. the deep ocean and marine sediments, geologic storage). [RT,288]

464. A robust and thorough definition must reflect the following principles:

(a) CO_2 is physically removed from the atmosphere;

(b) The removed CO_2 is stored out of the atmosphere in a manner intended to be permanent;

(c) Upstream and downstream greenhouse gas emissions, associated with the removal and storage process, are comprehensively estimated and included in the emission balance;

(d) The total quantity of atmospheric CO_2 removed and permanently stored is greater than the total quantity of CO_2 emitted to the atmosphere. [ZEP, 263]

465. The concept of "permanence" should also be accurately defined in the proposed guidance. While different activities can achieve carbon dioxide removal, they will involve different storage timeframes and risks of storage reversal. For example, storage in products and carbon farming activities will typically store CO_2 out of the atmosphere for decades to centuries; while storage of CO_2 in geological reservoirs offers the opportunity to safely store CO_2 for thousands of years. The European Commission proposal for a Regulation establishing a Union certification framework for carbon removals defines "permanent carbon storage" as "a carbon removal activity that, under normal circumstances and using appropriate management practices, stores atmospheric or biogenic carbon for several centuries, including bioenergy with carbon capture and storage and direct air carbon capture and storage". [ZEP, 263]

466. Any definition of GGR eligible for crediting under Article 6.4 must be the outcome of processes that lead to a net reduction of greenhouse gases in the atmosphere. We welcome a broad definition of 'removals' that accommodates future innovation, but urge that different removal pathways have different considerations in terms of real carbon impact (i.e. additionality, leakage and permanence) that should be understood and taken into account when designing crediting and monitoring frameworks. [GRI, 275]

467. Any overarching definition of carbon removals should be written purely from a scientific perspective and be technology neutral as such a definition will serve to set the context before attributes for specific technologies are reviewed. Whether within the removal's definition or as a separate but connected component, how each removals technology relates to leakage, permanence, social impacts, governance impacts, and changes to biodiversity at a minimum should be reflected to provide better understanding of the overall implications of using one removal technology over another, beyond the carbon removal impacts. [KITA, 262]

468. Atmospheric methane removal involves breaking methane down via processes that mimic natural methane oxidation in the atmosphere and methanotrophs in soil. To include methane removal approaches, the definition of "removals" would need to expand to include processes that "destroy" or "convert" greenhouse gasses, not just "remove… and store" them. Carbon removal requires sequestration, but since atmospheric methane removal breaks methane down, storing or sequestering is not a consideration. A broader, more inclusive definition of removals could be: "*removals" are processes or outcome of processes via anthropogenic activities to reduce atmospheric levels from greenhouse gasses (GHGs) already emitted, inclusive of any activities necessary in order to ensure that the "removed" greenhouse gas is kept from re-entering the atmosphere and reversing the 3 removal, for example via durable storage in geological, terrestrial, or ocean reservoirs, or in products*." [SCL, 292]

469. We urge the SB to move toward standards-based definitions for removals, including notions of permanence/durability, additionality, leakage, etc., - as well as co-benefits - and move away from choosing any specific pathway. Further, we urge the SB to refrain from grouping pathways into different classes as much as possible as with any taxonomy there will be pathways that could be in multiple groups, and the name of each of the classes can be misleading or could cause biases. [PT, 295]

470. Ocean alkalinity enhancement is believed to have durability of approximately 100,000 years. The mean seawater residence time of alkaline dissolved carbon (bicarbonate and carbonate ions (charged-balanced by cations other than H+) is about 100,000 yrs, based on the annual input of alkaline carbon from rivers (0.3 GtC/yr), the alkaline pool of dissolved alkaline carbon resident in the ocean (about 34,000 GtC), and assuming steady state (Middelburg et al. 2020) [PT, 295]

471. We suggest the term CDR must be limited to what Mother Nature does without help from engineering-based ACDR solutions. Instead, the use of term ACDR (Accelerated CDR). [CAT, 220]

472. Greater clarity is needed on the definition of natural and engineered solutions. At some level, all solutions are effectively engineered, and all solutions use natural mechanisms. A better definition of nature-based carbon removal might be those approaches that store carbon in living ecosystems, including ocean and soil carbon, food production, and so forth, thereby specifically including co-benefits of natural habitat and biodiversity restoration. [OLAB, 222]

473. Artificial carbon removal allows us to very expensively rebalance the Earth’s carbon dioxide levels around a much lower proportion of natural habitat. We need to seriously question if this is the best solution to climate change that we can come up with. To be clear, many nature-based carbon removal technologies are on a substantial cost reduction curve and have a direct pathway to negative carbon removal costs, direct air capture is not and does not (there is no paradox here). [OLAB, 222]

474. In the nomenclature or definitions of 6.4 so far, removals tend to be ambient while reductions in emissions tend to cover near source removals. We suggest that 6.4 be used to support both in order to encourage the reduction of the presence of climate forcing agents overall and in order to avoid inefficient use of time drawing boundaries that may defeat that goal. [JMF, 270]

5.1.2. Using IPCC definitions vs going beyond IPCC definitions

475. IETA believes that the definition of removals should be clear and simple to avoid confusion and conflation with emission reduction or avoidance activities. It should clarify the relationship between anthropogenic actions and the atmosphere-Earth-ocean interactions in which removals form part of the Earth’s natural carbon cycle and active climate system. The definition should also remain open for potential methods of removal still under development. Based on this understanding, IETA agrees with the following definition from the IPCC SR1.5, namely that carbon dioxide removals (CDR) refer to “anthropogenic activities removing CO_2 from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological, geochemical or chemical CO_2 sinks, but excludes natural CO_2 uptake not directly caused by human activities.” We suggest that the Article 6.4 mechanism focus on outcomes of removal activities, as credits generated

should be based on robust quantification of the net CO_2 removed from the atmosphere rather than the specifics of the underlying process. Considering the limited experience with the removal of atmospheric GHGs other than CO_2, IETA does not see a need to explicitly address those in the definition of removals for the purpose of the Article 6.4 mechanism. Broadening the definition of removals to other gases can risk conflating emission reductions and carbon removals (e.g. destruction of CH_4 emissions from point sources). IETA considers it essential that the SB and market players continue to collaborate closely in developing a robust methodological framework for removals that ensures environmental integrity whilst minimising the administrative burden for project developers, host countries and other market participants alike. Large amounts of finance will be needed from the private sector for both land-based and engineered removal activities in the coming years. Clear rules and methodologies will need to be operationalised by market players, and undue burden on activity proponents must be avoided. Where rules present excessive administrative burden or lack of incentives, participants may be deterred from engaging in the Article 6.4 mechanism and instead utilise alternative crediting programs. By fostering a supportive and enabling environment, the Article 6.4 mechanism can play a key role in facilitating private sector investment towards carbon removal activities and low-carbon development. Guidance produced should, to the extent possible, be applicable to all types of removal activities without additional provisions or requirements which may favour/oppose specific activity types, creating further complexity for project developers and impeding investments. The science is clear – we need to rapidly scale up a diverse array of solutions to address climate change at the scale and urgency required. [IETA, 311]

476. The following definition of carbon removal by the IPCC should be used as the foundation for the A6.4 mechanism and its framework: “anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products.” [OAIR, 210]

477. Regarding the role and potential elements of definitions for this guidance, including “Removals”, please refer to the IPCC CDR Fact Sheet. [IEAGHG, 267]

478. The following definition of carbon removal by the IPCC should be used as the foundation for the A6.4 mechanism and its framework: “anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products.” [CBC, 211]

479. The Supervisory Body does not need to and shouldn´t attempt to articulate a scientific definition of removals, which is best left to the scientists such as the IPCC. Therefore, the definition of removals should be focused on defining what activities are allowed or not allowed under the 6.4 mechanism. [CLARA, 316]

480. We support the IETA request to use the IPCC definition of removals from IPCC SR1.5: that CDR refers to “Anthropogenic activities removing CO_2 from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. [VRT, 319]

481. “Carbon Twist” is developing a machine that will remove methane from the atmosphere from different sources of emissions. Our first machine, designed to be installed in cowsheds, will suck the methane-rich air from the shed and clear it from methane. [...] we request that methane emissions, especially removal, be included holistically and considered in the important forthcoming Article 6.4. [CTWIST, 320]

482. As a climate tech company that has developed a proprietary technology that converts agricultural organic waste into biofertilizers that restore soil's microbial life to farmland,we offer an innovative circular economy solution that prevents methane emissions by diverting waste from the landfill, [...] I'm writing to emphasize the urgent need for including methane removal, sequestration, and avoidance measures in Article 6.4. [REGEN, 323]

483. UBQ have developed a proprietary technology that converts unsorted waste, including all organics, into a thermoplastic material that serves as a substitute for fossil fuel-based resins like polypropylene and polyethylene. […] I'm writing to emphasize the urgent need for including methane removal, sequestration, and avoidance measures in Article 6.4. [UBQ, 324]

484. To highlight developing microbial feed additives to maximize feed efficiency and minimize methane emissions in bovine facilities. […] We request holistic consideration and inclusion of methane measures in Article 6.4. [LOCUS, 325]

485. By including methane removal and capturing technologies within our broader strategy, we can create a more time- and cost-efficient approach for companies striving to reach their emission reduction targets. Today, there are hundreds of brilliant innovative entrepreneurs - chemists, biologists and engineers who are all focusing on solving this huge problem. Many venture capitalists have already recognized this opportunity, and are eager to invest in methane removal technology - and many have already invested. Including Methane in Article 6.4 can stimulate more innovation and investments in critical technologies. Unfortunately, the opposite is also true: excluding Methane removal from Article 6.4 will prevent many significant technologies and innovations from being funded. [GROVE, 326]

486. As a company actively working to develop atmospheric methane removal technology, we are joined by several other companies actively engaged in development of similar technologies with varied deployment mechanisms, all of whom would similarly benefit from the inclusion of GHG removal credits for methane. This note seeks to make two recommendations to facilitate this: 1. A means of differentiating removal credits from offset credits based on emergent need in a net zero world, and; 2. An approach allowing growth of removal technologies for each GHG independent of technological price differences between gases and proportional to emergent need The note then closes with a list of catalytic benefits to society which might be offered by methane removal, along with a short cost calculation for our own technology for consideration. [IPT, 327]

487. ALBO emphasizes the urgent need to include methane removal, sequestration, and avoidance measures in Article 6.4. Methane accounts for 30% of global warming, with a short lifespan and radiative forcing over 80 times greater than CO_2. Including methane measures in Article 6.4 is crucial to address the climate emergency. We firmly believe that addressing methane provides valuable time to develop long-term solutions. Effective public policy is vital to motivate emitters, foster entrepreneurship, and attract private sector investment. We advocate for holistic consideration and inclusion of methane measures in Article 6.4. [ALBO, 328]

488. It is only through collective action that we can hope to safeguard our planet for future generations. We urge the United Nations to consider the implications of these points and to integrate Methane reduction and removal into Article 6.4. Such a move would pave the way for a flourishing market of innovative solutions that can address our planet's dire needs. [IGSP, 334]

489. Atmospheric methane removal (or destruction) is now required if we're to remain within a Paris Agreement trajectory. Which suggests excluding atmospheric methane removal from the Article 6.4 mechanism is a missed opportunity. Disincentivizing research and commercialization efforts into this activity is a potentially significant mistake with long-term and important ramifications. [RC, 338]

490. By including methane removal and reduction technology within our broader strategy, we can create a more time- and cost-efficient approach for companies striving to reach their emission reduction targets. Many venture capitalists and entrepreneurs have already recognized this opportunity, and are eager to invest in methane removal technology - or have already invested. [IGSP, 334]

491. In light of the current market dynamics and the prevailing emphasis on CO_2-based credits, we firmly advocate for a dedicated focus on N_2O emissions, drawing parallels to the importance placed on addressing methane emissions. It is essential to implement proactive public policies that encompass comprehensive measures for N_2O reduction and removal, serving as powerful incentives for emitters, catalysts for entrepreneurial ventures, and magnets for substantial private sector investments in N_2O mitigation initiatives. By recognizing N_2O and adopting a forward-thinking approach, we can drive meaningful progress towards a sustainable future. Without the inclusion of N_2O, ourselves and other companies addressing critical contributors to global warming might have a significant challenge in developing solutions that address global warming, as it will be significantly more challenging, if not impossible, to attract the capital required for the R&D and scale up required. [BOMV, 329]

492. Imposing a temporal boundary requirement that carbon removals occur going forward, subsequent to installation of carbon removals technology, is necessary to ensure that the technology actually draws down the concentration of CO_2. [CLARA, 316]

5.1.3. Definition of components (e.g. storage)

493. Carbon removal technologies are technologies at whose measuring point permanent storage applies, and the risk of re-release can be minimized up to a specific value. The installation or application of products is an essential point in determining the lifespan of the products. [TFI, 214]

494. Regarding A6.4-SB003-AA-A03's definitions of "Removal activities," we note that Option 2a is the most accurate description of carbon dioxide removals as a climate solution that provides truly durable, (i.e. 1,000 years or more), measurable and verifiable net removals. DACCS provides this type of permanent removal. We further note that the Supervisory Body's July 8, 2022, A6.4-SB001-AA-A05 Concept note: Removal activities under the Article 6.4 Mechanism (version 1.0) (the "Concept Note") describes DACCS as "[capturing CO_2 from ambient air through chemical processes with the subsequent storage of the CO_2 in geological formations." (Section 3.1.7, paragraph 26). This description of the capture process is too broad, and the description of the storage medium is too. limited. [DACC, 274]

495. Permanent carbon dioxide storage is inherent to DACCS. This makes DACCS the global standard-setter for permanent carbon dioxide removal and sets it apart from other forms of carbon dioxide removal (CDR). However, the Concept Note limits the medium of direct air carbon dioxide storage to "geological formations," and this does not reflect the breadth of DACCS applications that include formation of permanent materials, e.g. minerals and

products. As such, the description of storage should be revised to “storage of the CO_2 in geological formations or long-lived, durable minerals and materials, where the carbon can be conservatively assumed to remain stored within the material over the entire lifetime, including its end of life.”

496. The Concept Note too broadly describes the capture method of direct air carbon dioxide capture as a “chemical process,” which does not distinguish DACCS from other methods of removal. For example, virtually all forms of non-aquatic nature-based carbon dioxide removal require the chemical process of photosynthesis to remove carbon dioxide from ambient air. In addition, as described in the Concept Note, rock weathering is a form of removal based on a chemical process. In contrast, while direct air carbon dioxide capture can be achieved through a variety of chemical processes, it is more precisely described as “capturing CO_2 from ambient air through a technological or engineered method…” DACCS must be accurately defined, and distinguished from other removal activities, in order to achieve uniform implementation of national laws, rules and regulations, as well as voluntary contracts, regarding removal monitoring, reporting, crediting and accounting. [DACC, 274]

497. In Table 1 under Paragraph 33 of the information Note on removal Activities, version 4, we agree with the “Con” argument that “inert carbon products can store formerly atmospheric carbon for long periods of time and, in this case, should be underscored for biochar since biochar containing products can act as carbon sinks for long periods and biochar in a chemically inert material that can remain in the environment for time periods that can be considered permanent. [EBIC, 280]

498. In 34 (d) – the definition of Biochar as: “Stable, carbon-rich material produced by heating biomass in an oxygen-rich environment. Biochar may be added to soils to improve soil functions and to reduce greenhouse gas emissions from biomass and soils, and for carbon sequestration.” - is limited to agricultural uses. Biochar is carbon and carbon is used in various different applications. Many of those will yield to carbon removals of different durability, numerous to long-term and even permanent carbon removals.

499. Commenting on 37 (c) - *Storage in durable products:* - Biochar as a product, e.g. for agricultural use, can be durable for longer periods of time. The scientific disciplines of organic geochemistry and petrology are examining their persistence in the upper earth’s crust and a benchmark for “permanence” will be proposed. Industrially produced biochar, in most cases, are the most stable form of organic carbon and not prone to weathering. In products that are not subject to thermal oxidation (e.g. concrete), biochar will last for millennia. Thus, it is better suited as part of 37 (c) ii - Inert carbon products. [EBIC, 280]

500. The definition for removals in para 11 of the Information note A6.4-SB005-AA-A09, is too limited and seriously flawed. The term “*separating greenhouse gases”* implies that gases are physically separated. While this is true of CDR methods such as DAC where CO_2 gas is concentrated from the atmosphere, this does not describe CDR processes that react CO_2 from the atmosphere by chemical, geochemical or biochemical means such as enhanced rock weathering (ERW), ocean alkalinity enhancement (OAE) or photosynthesis. The definition therefore seems method-prescriptive rather than inclusive. [GHR, 299]

501. We suggest that both in the interest of accurately describing GHG/CO_2 removal, and not unwisely excluding any some beneficial CDR activities, that the definition be modified accordingly. For example: “As an uncountable noun, removal refers to the process

removing greenhouse gases (GHGs) from the atmosphere or from natural GHG emissions to the atmosphere (such as from soils, the ocean or geologic reservoirs), and durably sequestering from the atmosphere the removed GHGs for a climate-relevant period of time. [GHR, 299]

502. Paragraph 15a to 15c cite three attempts by the AR6, WGIII to define CDR. For the same reasons discussed above, these definitions, needlessly restrict CDR activities just to removal from the atmosphere. My suggested rewording is: "*Carbon dioxide removal (CDR) refers to human activities that 1) remove carbon dioxide (CO_2) from the atmosphere or 2) remove CO_2 from natural emissions to the atmosphere (such as from soils, certain regions of the ocean and geologic reservoirs) and 3) durably sequester from the atmosphere the removed CO_2 or products thereof for a climate relevant period of time. CDR includes enhancement of natural biological, geochemical or physical CO_2 sinks, the creation of artificial removal and sequestration methods, or some combination of the preceding. CDR excludes 1) natural CO_2 uptake not directly caused by human activities, and 2) removal of CO_2 directly from an anthropogenic CO_2 source emitting to the atmosphere.*" [GHR, 299]

503. Under the Article 6.4 mechanism, 'durable storage' and 'permanence' will need to be defined. [CG, 269]

5.1.4. Reductions vs removals

504. A clear distinction between emission removals on the one hand and emission reductions on the other hand is key. Definition of removals vs. reductions vs. delayed emissions should be based on the long-term outcomes of related activities, not on applied methods. Storage permanence should span a timeframe covering at least that targeted by the Paris Agreement´s long term temperature goals. [CCSI, 233]

505. Microsoft strongly recommends differentiating between removals and avoided emissions. In projects with both avoidance and removals occurring simultaneously, they should be tracked and labelled independently and not co-mingled for reporting purposes. [MS, 234]

5.1.5. Concerns about broad definition

506. Combination of solutions through measures such as horizontal stacking or replacement over time can offer flexibility and impact. For example, NORI's concept: blended tonne combines ex post soil carbon removal with 10-year permanence with ex-ante long-storage duration removal to address both immediate and long-term climate challenges. Such flexibility would foster innovation and accelerate scaling of CDR. [NORI, 212]

507. The CDR industry is a nascent and lacks financial incentives which in turn is preventing investment in new technologies. Governments are reluctant to provide permits for R&D in new CDR technologies. Agreeing on the right definition will help the industry in moving forward. [REW, 219]

508. A broad definition of removals has advantages, encouraging the development of as many removal pathways as possible and maximising the potential for innovation. However, different removal activities raise different risks, and each requires a different policy framework. For example, NbS removals that reduce the supply of economically productive land (such as afforestation of croplands) can have important leakage effects; given the current lack of robust methods for measuring leakage (Filewod and McCarney, 2023) the

climate impact of such removals is uncertain. Other NbS removals (such as restoration of degraded-but-unused lands or the development of green infrastructure) do not face this problem, and their impact can currently be quantified with higher certainty. Accommodating such differences is important to encourage high-quality projects (and build confidence and scale) within Article 6.4 activities. [GRI, 275]

5.1.6. Proposals to include specific technologies

509. Blueskieminerals is developing a process in which CO_2 in the atmosphere is reacted with mine tailings and additives the resulting carbonated tailings are stored for centuries. It can be deployed at megaton scale and expected to be commercially deployable by 2029 with cost range of $100-150/Ton CO_2. The mechanism should define the broad outline of valid solutions in terms of verifiability, permanence, additionality, rather than attempting to identify eligible activity types so as not to exclude emerging solutions such as this one. [BSM, 201]

510. Innovative carbon removal technologies such as River Alkalinity Enhancement must be incorporated into the framework. enhancing alkalinity in rivers promotes natural chemical reactions that sequester CO_2. [CR, 203]

511. Biochar that is produced at temperature above 600°C is exceptionally stable and can be considered a durable and permanent CDR that can sequester carbon for thousands of years. It also offers various co-benefits including sustainable agricultural practices, improved soil health, and enhanced resilience to climate change. [NC, 206]

512. Biochar Carbon Removal is an engineered removal method that stores carbon in a stable form for as long as 1,000 years, thus can be considered a permanent carbon removal method. Where ample agricultural and forestry residues exist, it can be deployed in large scale. The co-benefits include improved soil fertility and water retention, reduction of agricultural waste and use of synthetic fertilizers and thermal energy produced during the processing. [ECOERA,209]

513. Biochar based carbon dioxide removal (BCR) is a permanent carbon sink when processed at temperature above 650C. Co-benefit include energy generated during processing and byproducts that can be applied to soil, among others. The technology is ready to be deployed at scale. [Thn, 213]

514. “Electrolysis-assisted calcification” (electrochemistry) and “electrolysis-assisted shellfish calcification” (a combination of electrobiology and electrochemistry) are example of “Ocean-based biological removal” for “Ocean ecosystem reservoirs”. Both methods assist tropical coastal communities’ ocean resources to adapt to increasing greenhouse gas concentrations and increasing ocean acidity. At the same time, they are likely to produce some carbon dioxide removal (CDR) and/or seafood with zero to negative carbon footprint while doubling the shellfish growth rate, thus providing food to counter the decreasing terrestrial production. [OF, 216]

515. Takachar has developed a technology that removes CO_2 from atmosphere by growth of crops and stores carbon by converting its byproducts (agricultural waste) into carbon-based bioproducts such as biochar-based fertilizers, chemicals and biofuels. As the process renders a substantial portion of the plant-based carbon into recalcitrant form, it remains stored for hundreds of years. Such technology can be deployed in remote areas by smallholder farmers to improve their livelihood. [TAK, 217]

516. Biochar Carbon Removal is a permanent engineered removal solution that provide multiple benefits of nature-based solutions, as well as other co-benefits such as improved crop yield. It is safe and has a high TRL score (8-9) and is ready to scale at present. The risk of reversal is low, and it provides durable storage for thousands of years. [CCE, 218].

517. The Carbon/Hemp Blockchain, Inc. has developed and deployed innovative, agriculture-based carbon dioxide removal (CDR) and storage technologies on a global scale which that converts locally produced industrial hemp as a rotational crop biochar through controlled thermal decomposition, through which carbon is captured and stored in a stable form. When applied to soil, biochar not only sequesters carbon but also enhances soil microbial activity, reducing emissions of nitrous oxide (N_2O) and methane (CH_4). Biochar makes significant contribution to global emissions reduction and is scalable, while also generating multiple co-benefits for adopting communities. [IBI, 231]

518. Ocean-based carbon removal solutions utilizing the deep ocean or the ocean's bicarbonate reservoir that are not subject to risk of reversal are particularly interesting as they offer the near-term scalability of many traditional nature-based solutions with the durability and reversal benefits of many emerging technological solutions. These ocean-based approaches are designed to replicate and amplify the natural pathways by which the Earth durably stores carbon; if the objective of Article 6.4 of the Paris Agreement is to contribute to emissions mitigation and support sustainable development, solutions across a range of pathways must be supported and innovation must be encouraged. [RT,288]

519. Biochar is a carbon-rich material produced by heating biomass in a low-oxygen environment, through pyrolysis that stabilises the carbon absorbed by biomass throughout its lifetime, preventing it from returning to the atmosphere. Due to the maturity of pyrolysis technology, biochar is a frontrunner in carbon dioxide removal (CDR) technology and can scale to climate relevance. As the process generates heat, it can serve as a 'Net Zero boiler' on industrial sites. In addition, application of biochar to soil has multiple agronomic values. [BBB, 264]

520. We request that the Supervisory Body align with the consensus of the scientific community, as reflected in the IPCC AR6 report, and incorporate the equally important need to grow biochar-based CDR capacity in unison with global efforts to reduce greenhouse gas emissions. Increasing CO_2 reductions along with rapidly increased CDR to meet global Net Zero goals will be crucial for Article 6.4 deliberations. We request the Supervisory Body integrates biochar-based carbon removal in the implementation of Article 6.4. [SGI, 276]

521. The Note on removal activities does not envision that unlimited CO_2 sequestration can be accomplished by pumping wood chips underground in a liquid slurry. There is no functional limitation to how much carbon the ground can store when the storage is beneath the active and aerobic layers of the soil. Subterranean wood injection (SWI) is a hybrid technology storing biomass directly beneath intact geological formations at depths of 5-100 meters beneath the soil surface and will last millions of years based on geological and microbiological data. This "land-based system" IS an "engineering solution" that overcomes perceived.

522. Please include Subterranean Wood Injection in your Engineering-based removal activities and we suggest you leave a category for both injection-based and excavation-based wood burial in your Land-based removal activities as well. [LVI, 296]

523. Emphasises the potential of a third mechanism for carbon removal, or carbon management, occupying an intermediate space between offsets and removals. Offsets and emissions reductions are afflicted by a perceived abuse potential, in terms of double counting and false emissions mitigation claims. Removals are seen as safe mechanisms for application under Article 6.4, but require permanence of hundreds of years. The third Mechanism proposed requires rethinking of global supply chains as carbon pools – circular materials pools in which carbon can be suspended for relevant amounts of time or, alternatively, extracted and disposed of in permanent end-of-life sequestration. While this approach is gaining acceptance for mineralized materials such as concrete, it is not seriously considered, yet, for non-permanent applications, such as plastics, for a concern of reversals once even durable plastics applications expire after years to decades, at which point they may face incineration. [MOA, 300]

524. With sufficient monitoring with inventory management software, it can result in quasi-permanent carbon storage at a very large scale. Replacing 10% of global plastics with a material such as biochar or carbon black from renewable methane pyrolysis, or similar biogenic carbon materials, has the potential to draw-down and store up to 3.3 Gt of CO_2, annually. Chemical recycling processes will enable the permanent removal of these 3.3 Gt in a solid phase, after the carbon is split from the polymer fraction and safely sequestered underground. Alternatively, these materials can be stored as bio-oils or in a gas phase, if incineration is coupled with CCS. Horizontal stacking could incentivise recycling and permanent end-of-life removals. Creating a demand for atmospheric carbon in products has huge economic advantages. Through the benefit of a useful product life, carbon draw-down in many cases comes at no additional cost. If the material solutions are suitable for existing manufacturing processes, the demand for these solutions is already at the scale required, today. CDR capabilities will have to be scaled up quite rapidly from a few thousand tons p.a. to the required Gt scale. [MOA, 300]

525. On Pg. 11 of the Information Note A6.4-SB005-AA-A09, "Removal of CO_2 from oceans", paragraphs. 21 and 22, please include abiotic CO_2 removal from the ocean, for example, via the addition of CO_2-reactive alkalinity - OAE (Renforth and Henderson 2017) or via the physical/chemical extraction of CO_2 from seawater (de Lannoy et al. 2018). [GHR, 299]

526. Pg. 15 3.1. "Taxonomy of removal activities", para. 36 b) Please include ocean-chemistry-based CDR such as OAE. I can assure you that the massive retention of CO_2 by abiotic ocean chemistry (38,000 Gt C) is both proven and highly effective, and natural ERW and OAE currently removes about 1 Gt CO_2/yr from the atmosphere (IPCC 2021). By stating that such methods will not be available until 2030 and beyond, the SB is making an unfounded judgement that seemingly will make sure that is the outcome. Rather, the SB needs to provide a non-pre-judgmental, techneutral framework with which to encourage innovation and evaluation of CDR approaches as quickly as possible so as to determine which if any methods can provide the timely, safe, cost-effective, high-capacity CDR required. [GHR, 299]

527. On Pg.16, para. 37 "The following are broad categories of storage methods:" Storage of dissolve inorganic carbon in the ocean, by far the largest carbon reservoir on the Earth's surface, needs to be included here! Both ERW and OAE are well-describe methods of CDR (Campbell et al.2022, Renforth and Henderson 2017) that can lead to transfer of CO_2 from the atmosphere (or reduction of CO_2 transfer from soils or ocean to air) and storage in ocean seawater as dissolve alkaline bicarbonate and carbonate ions. Do not ignore this CDR and C sink – Mother Nature doesn't. [GHR, 299]

528. Pg. 17, Table 2 Please add ocean-chemistry-based storage, by far the largest C reservoir on the Earth's surface – 38,000 Gt C and on Pg. 19. Table 4. Ocean CDR is completely absent in this evaluation. Please see NASEM (2022)[20] and rectify accordingly and include it in the rest of the analysis in the document. [GHR, 299]

5.2. Monitoring and Reporting

5.2.1. B. Monitoring and Reporting 1 a.

529. *What timeframes and related procedures should be specified for these elements referred to in A6.4-SB003-A03?*

5.2.1.1. General

530. Advocating for a more flexible approach to permanence in carbon removal, we urge against setting an arbitrary time limit, such as 1,000 years, and instead emphasize the importance of considering timescales of at least several centuries. [CFUT, 245]

531. To safeguard that reversals are addressed "in full", the monitoring period for CDR activities should expand a very long timeframe. For activities involving geological sequestration, certain jurisdictions have set up frameworks, where the monitoring period can be understood as almost indefinite. Such decisions allow for an effective handling of reversal events, whilst lessening the burden for project developers as in some cases, the liability to monitor and cover reversals can be transferred to national entities, upon proof of permanence based on a performance assessment. [CWORKS, 302]

532. Carbon dioxide removed from the atmosphere will need to be monitored in perpetuity, as emissions to the atmosphere from reversals are harmful at any time. The monitoring period may nevertheless in practice end when there are adequate assurances that the CO_2 has been physically and permanently isolated from the atmosphere, but liability should remain to address any unforeseen risk of reversal. If the permanence of a removal activity is dependent on human intervention or management (e.g. the perpetual maintenance of a particular practice), the monitoring period should run at least as long as these activities—and the removals they provide—are required. If monitoring stops, the removed CO_2 should be assumed to be re-emitted to the atmosphere and treated in the same way as a reversal. [BF, 252]

533. Removals are only removals when storage is durable; otherwise, activities merely delay emissions, but do not remove them. The monitoring period therefore must ensure long-term storage (as close as possible to permanent). Different views on what constitutes permanent storage and how monitoring periods should be defined, and setup accordingly are currently under discussion (see for example here, here, here and here). Verra's standard and its requirements for geological carbon storage (GCS) acknowledge that assessing across such timescales is not feasible. Thus, they do not specify a fixed monitoring period for applications, which include underground storage or utilization in products. Instead, monitoring should continue until certain conditions are met. These conditions might include containment at the storage site(s), the absence of a significant risk that the injected CO_2 will have a significant adverse impact on the environment or human health, and the behavior of the CO_2. These periods ensure that carbon is removed

[20] https://nap.nationalacademies.org/catalog/26278/a-research-strategy-for-ocean-based-carbon-dioxide-removal-and-sequestration.

for the timeframe targeted by the Paris Agreement´s long term temperature goals. [CCSI, 233]

534. Timeframes should be tailored to the category and type of removal activity. Some countries may lack a consistent time series of emissions in relevant sectors, making it difficult to assess the impact of activities on NDC achievement. Some countries do not have land sector inventories. [CA, 312]

535. If an offset is sold, resulting in emissions somewhere which are supposed to be 'offset' by a removal, then the logical answer, driven by a precautionary approach, is that the monitoring should last as long as the emissions enabled by the offset are in the atmosphere. That statement is likely to create a strong pushback among removal proponents as not being rational or reasonable. But reversals at any point in the future would 'undo' any supposed climate benefit. There is no point in the foreseeable future where the carbon budget will not be a concern, where reversals would have no wider impact. Therefore, it is perfectly reasonable to insist on monitoring for as long as the emissions the removal offset could be expected to be in the atmosphere (700-1000 years for CO_2). The previous information note, in fact states that for removals to have any impact, they need to at least last the next 200-300 years (for which the activity should be monitored and ensured it maintains the carbon stock). Even that more defined period would be profoundly challenging, when considering the fluidity within our institutions (and the shorter-term nature of many companies). It would be reasonable following this concern to not allow removals into Art 6.4 at all. This principle should further inform decision making on the types of removals. Removals where reversal is likely, where monitoring is impossible, or where the unknowns around the technology create too many uncertainties, should not be allowed. [CLARA, 316]

536. The monitoring, reporting and crediting timeframes for removal activities should build on previously agreed provisions in the Article 6.4 Rules, Modalities and Procedures(RMP), past experiences from the CDM, and knowledge gained from other independent crediting standards. Different monitoring periods, timeframes for addressing reversals, and reporting requirements may be applicable for different types of removal activities. As credits(A6.4ERs) from removal activities may be used to offset long-lived CO_2 emissions, which may linger in the atmosphere for centuries, the monitoring period and timeframe for addressing reversals must be long enough to safeguard environmental integrity, yet realistic in order to not deter widespread uptake of removal activities under the Article 6.4mechanism. [IETA, 311]

537. It may be prudent to estimate a probability distribution of the amount of carbon held in a sink, then assume a percentile of the distribution rather than the mean or median value. In each case, application of MRV and subsequent choice of parameters will need to recognise:

(a) intrinsic variability: the difference in net removals in apparently similar cases. Variations might arise between sinks of similar type and circumstances, or in the same sink from year to year due to, for example, weather conditions, microclimatic conditions, or management practices. In some cases, this may lead to estimates that are systematically biased. In other cases, estimates may not be biased but there may still be substantial variance around the mean;

(b) measurement limitations, the limits in precision and accuracy with which actual net flows can be measured, even if the sink characteristics (e.g. soil chemistry, tree species, prevailing weather) are well understood;

(c) modelling limitations, the limits in precision and accuracy that can be achieved by projecting from existing and/or generalized data. [BF, 252]

5.2.1.2. Consistency with national requirements

538. Many elements related to monitoring, reporting and verification (MRV) for the geological storage of CO_2 have been laid out in national and regional regulations. It is important that the monitoring and reporting timeframes in the proposed guidance are developed in a manner that is consistent with MRV requirements for geological storage set out in those regulations which can be considered good/best practice. This is aimed at ensuring that a mismatch between the timeframes required by national competent authorities and the ones set by international frameworks. A mismatch could be particularly challenging as, in most circumstances, the final ‘mixture’ of CO_2 in storage reservoirs will comprise many sources of CO_2, potentially under different crediting frameworks. Moreover, alignment with those frameworks that already in place will allow for faster implementation and a lesser burden on developers. The storage of CO_2 in geological reservoirs is regulated by the CO_2 Storage Directive (CCS Directive6) in European Union Member States, Iceland, Norway and Liechtenstein (European Economic Area, EEA), and by the 2010 CO_2 Storage Regulations in the UK7, which establish a legal framework for the safe geological storage of CO_2. Both storage legal frameworks include provisions for site selection and characterisation which are designed to minimise the risk of leakage, conditions for permitting, as well as monitoring and reporting requirements to verify storage, including remediation obligations in case of reversals. Both frameworks require operators to carry out monitoring based on an approved monitoring plan which is updated every 5 years “to take account of changes to the assessed risk of leakage, changes to the assessed risks to the environment and human health, new scientific knowledge, and improvements in best available technology”. Operators are also required to report to competent authorities at least once a year. The frameworks also specify a minimum period of 20 years before all legal obligations relating to monitoring and corrective measures can be transferred to competent authorities. Notably, a degree of flexibility is maintained in those frameworks – i.e. a shorter transfer period can be agreed if evidence suggest that the stored CO_2 will be completely and permanently contained before the end of that period. This relatively short period (compared to the timeframe of millennia that geological storage can achieve) is made possible by a decreasing risk of reversal observed for geological storage, with sufficient scientific evidence for competent authorities to feel comfortable to take on the responsibilities. The development of MRV timeframes and procedures for the purposes of the Article 6.4 mechanism can benefit from building on the provisions laid out in the EU/EEA and UK CO_2 storage legal frameworks. [ZEP, 263]

539. For activities involving geological sequestration, the Article 6.4 mechanism should seek alignment with national requirements for the permitting of injections. Relevant legislations are e.g. in place in the US (EPA UIC class VI wells) or Europe (CCS Directive). [CWORKS, 302]

540. We encourage the SB to take steps to engage with the EU Carbon Removal Certification Framework process and other key global public sector efforts (multilateral and bilateral) to create and advance a cohesive MRV framework across carbon markets – and avoid a fragmented, patchwork outcome that will be difficult for all stakeholders to navigate.

Carbon Business Council's thinking on MRV is outlined in greater detail in our May 2023 Issue Brief: MRV [CBC, 339]

541. We further encourage the SB to take steps to set a clear precedent for how MRV is incorporated into carbon markets. Specifically, Carbon Business Council recommends that: a) all CDR projects must be verified by reputable independent third parties, with an openness to new entities and standards bodies that emerge as the sector develops; b) the cost of MRV for any transaction be listed separately from the aggregate purchase price for credits; and c) that MRV be contracted and paid for by the buyer (or receiving party) of the credits. These recommendations are intended to streamline and systematize what is currently an opaque and muddled process, and critically, to align all parties' incentives towards the highest possible quality standard. [CBC, 339]

5.2.1.3. For initial monitoring and submission of monitoring reports (paragraph 3.2.14)

542. The first monitoring report should be within 5 years. For activities such as biochar and in some cases of CCUS (CCUS such as production of concrete using CO_2 could have sectoral scope of manufacturing industry and/or construction)- it could be within 2-3 years of project registration Subsequent monitoring - monitoring report ideally should be submitted at least once every 5 years. [SP, 313]

543. "Initial monitoring" should commence at the beginning of the crediting period, with initial monitoring reports issued at a temporarily increased rate of frequency relative to "subsequent monitoring". [DG, 271]

544. Should be designed in line with the logic of the European CCS directive for activities involving geological storage. [CWORKS, 302]

545. The timeframes and procedures specified for monitoring and reporting elements should align with the Paris Agreement's reporting requirements. These timeframes should provide sufficient intervals for accurate data collection and reporting. [PACHA, 306]

546. First monitoring report within 5 years for land-based activities and other project activities (DACCS and BECCS) and within 2-3 years of project registration for activities such as biochar (biochar project could have similar sectoral scope of AMS-III.BG or AMS-III.L - as it uses similar technologies as those methodologies) and in some cases of CCUS (CCUS such as production of concrete using CO_2 could have sectoral scope of manufacturing industry and/or construction). [SP, 313]

547. All types of monitoring and reporting should be at least annual as this is similar to any company reporting their activities as part of regulation. This is from the perspective of needing to strike a balance between the costs, accuracy and early detection of issues such that corrective measures can be taken sooner, at lower cost, with better outcomes. Recognizing it is easier to report on some carbon projects annually than others, for the more difficult to monitor projects (ex. NBS) a simplified annual report could be utilized. The simplified annual report could reflect more of a general check-up on the project rather than a deep dive into what's gone on with a project over the last few years as current monitoring reports do. The simplified annual report would be used in the years where a full monitoring report is not available. [Kita, 262]

548. We suggest that initial monitoring and submission of monitoring reports must occur within a defined time frame after the start of the first crediting period. This is important for two

reasons. First, the Glasgow decision on Article 6.4 specifies that there should be maximum time periods. And second, any authorized Article 6.4 emission reductions must be used toward NDCs within the same NDC implementation period. Initial monitoring and submission of monitoring reports should occur prior to 3rd party verification and at a specified time interval from the project start to align with NDC implementation periods. Monitoring and monitoring reports should cover all crediting periods for which credits are issued. [IO, 285]

549. For land-based activities and other project activities such as DACCS and BECCS (terminology such as per table 4), the first monitoring report should be within 5 years. Such projects would take significant time in setting up (preparation of land / construction of DAC plant). For activities such as biochar ((biochar project could have similar sectoral scope of AMS III BG or or AMS III L - as it uses similar technologies as those methodologies) and in some cases of CCUS (CCUS such as production of concrete using CO_2 could have sectoral scope of manufacturing industry and/or construction)- it could be within 2-3 years of project registration[…] Simplified reporting for DACCS and BECCS could be once every 5 years post crediting period to ensure no reversal has occurred. This could end when there is sufficient data to support that CO_2 plume is stable and reservoir is stable. For land-based activities such as forestry, it may continue till 100 years to conclusively report about no reversals. [PDF, 321]

550. For initial baseline monitoring and submission of monitoring reports (paragraph 3.2.14); Must be carried out within one year of the activity start date. Baseline data may be incorporated into the development of the project design document, feasibility study or monitoring plan as opposed to a separate monitoring report. Subsequent monitoring reports will then report change against the initial baseline data. [ASPI, 330]

5.2.2. B. Monitoring and Reporting 1 (a).

551. *What timeframes and related procedures should be specified for these elements referred to in A6.4-SB003-A03?*

5.2.2.1. For subsequent monitoring and submission of monitoring reports (paragraph 3.2.14);

552. The frequency of subsequent monitoring and submission of monitoring reports should be consistent with the time frame of initial periods. [OI, 285]

553. Subsequent monitoring should then be delivered twice a year within the crediting period. Should the host country have in place monitoring obligations which require information that overlaps with that required by the mechanism’s monitoring reports, such information may be used in mechanism reporting. [DG, 271]

554. Separate monitoring periods are typically contiguous in practice for a given project. [DG, 271].

555. After initial monitoring and monitoring reports, C-Capsule requires a minimum of five years between monitoring reports. Within this timeframe, monitoring should not cease, and preference should be given to removals that have the capability to provide real time monitoring. C-Capsule and accredited Local Issuers reserve the right for ad hoc site visits and recommends the SB reserves the same right for registered removal facilities. Again, technologies with the capacity for real time monitoring should be treated preferentially to

enable closer monitoring after potential reversal events. Where this is not possible, a maximum of six months between reports for the following two years should be allowed. After the subsequent two years post-event, monitoring can return to normal timeframes. This should be reviewed on a case-by-case basis, however, as there is a variety of potential reversal events, and some may require more frequent monitoring. C-Capsule agrees with the SB's decision to tailor policy to methodological specifications, both for timeframe relevant queries and all other requests for guidance. [CCAP, 246]

556. Consistent with ex post tonne-year accounting, the "monitoring period" should span the time horizon of all sequential crediting periods for any specific project and is the time period over which the project is monitored. The monitoring period should end with the end of the final crediting period, after which no further credits will be generated. [SHC, 205]

557. Should be designed in line with the logic of the European CCS directive for activities involving geological storage. [CWORKS, 302]

558. Monitoring report ideally should be submitted at least once every 5 years. [SP, 313]

559. Subsequent monitoring shall be required within a period of two years or less from the date of the previous verification. Monitoring activities should align with the credit issuing body monitoring guidance and best available science and research. [ASPI, 330]

560. Two additional simplified monitoring and reporting events should take place five and 10 years after the end of the last crediting period of activities involving removals. [ASPI, 330]

561. Monitoring should not be limited to taking place following an observed event that could lead to a reversal nor should it stop with the last crediting period. Monitoring is essential to avoid not only reversal, but also other negative environmental and social impacts. And all of these impacts could take place after the end of the crediting period. [CIEL, 317]

5.2.3. B. Monitoring and Reporting 1 (b).

562. *What timeframes and related procedures should be specified for these elements referred to in A6.4-SB003-A03?*

5.2.3.1. For monitoring and submission of monitoring reports following an observed event that could potentially lead to a reversal (paragraph 3.2.14)

563. Events observed that could lead to a reversal must be submitted to the SB within eight weeks of the event having taken place. [DG, 271]

564. Without monitoring it is not known whether a reversal event occurred. For this reason, it is important that there is a regular monitoring requirement, the following principles for the course of action when a potential reversal event is observed is proposed:

(a) When the mitigation activity proponents become aware of a potential reversal event, they should be required to inform the Supervisory Body within a specified and brief timeframe (e.g. within one month after the event occurred);

(b) A monitoring report quantifying the reversal should then be submitted thereafter but could be allowed more time for preparation (e.g. within six months of the reversal event);

(c) Where a mitigation activity proponent does not submit a monitoring report or a notification of a potential reversal event, all emission reductions or removals from the mitigation activity shall be deemed as reversed and the necessary actions should be undertaken to compensate for that reversal. [IO, 285]

565. Following an observed event that could potentially lead to a reversal; Operational failures would be widely publicized and evaluated at length. Compensation for reversals can be deducted from other mCDR services, separate MRV+ accounts. A 'basket' of mCDR technologies can keep separate MRV+ accounts, and likely would need to do so to avoid double counting or under counting. [MHS,200]

566. Consistent with ex post tonne-year accounting, reversals do not need to be addressed and therefore no timeframe for addressing them is needed…. the maximum timeframe between monitoring should be the shorter of the crediting period and 10-years. This will ensure that there are not large fluctuations in carbon stocks which may not be measured if the maximum period between monitoring is greater than 10 years. There should be no minimum timeframe for monitoring, which may in the future unlock continuous monitoring as technology advances. Assuming the option of ex post tonne-year accounting, the crediting period should have a minimum of one year and a maximum of 10 years, in between which it is at the discretion of the project proponent. [SHC, 205]

567. The timeframe for addressing reversals should commence at the initiation of a project and possibly include a proportional time period post project closure. This latter period could be categorised as a post-project monitoring period. This period should vary depending on the project type, according to the scientifically assessed risk of non-permanence; the greater the risk, the longer the post-project monitoring period. For removals with high levels of permanence, such as those with geological storage, the post-project monitoring period should be low or nil. Where projects are subject to closure or monitoring requirements by domestic regulations, this should be considered and the post project monitoring period under the mechanism should be aligned to avoid duplication of requirements. [DG, 271]

568. Should be designed in line with the logic of the European CCS directive for activities involving geological storage. [CWORKS, 302]

569. When such an event is observed, the project proponent should immediately notify the Supervisory Body, within 2 months of the beginning of the event (some reversal events, e.g. fires, can last for multiple weeks). In this communication, the project proponent should communicate a timeline for the communication of a monitoring report focused on the impacts of the reversal event. That monitoring report should be submitted to the Supervisory Body not later than 6 months following the end of the reversal event. [CMW, 308]

570. Events leading to potential reversal (e.g. forest fire in case of forestry project or atmospheric leakage of CO_2 from reservoir in case of DACCS project) should be notified with 90 - 120 days (subject to further consultation), evaluation of such event could be submitted within 6 months of the notification. [SP, 313]

571. Regarding reversal events, Kita recommends splitting them into two reports. One an early incident report issued asap. The other a later investigation and corrective actions report which could be done within a month of the reversal occurring. Doing so provides two benefits: 1) early risk management actions - like financial planning; and 2) provides time for a detailed analysis and action plan. This approach is similar to current reversals

reporting seen within Verra and other large carbon standards. Existing ISO standards for incident reporting (e.g. ISO/IEC 27035:201) also provide a good blueprint for adapting & adopting such an approach as they are well tested. [Kita, 262]

5.2.4. B. Monitoring and Reporting 1 (c).

572. *What timeframes and related procedures should be specified for these elements referred to in A6.4-SB003-A03?*

(a) *For monitoring and reporting, including any simplified reporting, conducted after the end of the last crediting period of activities involving removals (paragraphs 3.1.10 and 3.2.13).*

573. The Supervisory Body should establish a specific frequency in which the occurrence of any reversals must be monitored (e.g. biennially). In exploring any simplified approaches, such as using remote sensing data, it is important that sufficient granularity is ensured and that effects such as degradation without significant changes in tree canopy are detected. In addition, we recommend that the Supervisory Body establishes an independent mechanism, using remote sensing data, to independently assess whether major reversals occurred with registered mitigation activities. [IO, 285]

574. What happens after the Monitoring period will be different for land-based and technology-based removal credits. Within the context of trade in project-based mitigation outcomes, land-based removals are non-permanent by default. The SB should apply different conceptual frameworks to land-based and geological storage. Ideally, credit periods depend on the pay-back period of a project (a credit period is here understood to mean for how long a project can issue credits based on the certification of the project). When the FID is taken, the whole project life cycle is assessed in the NPV calculation. A technical project typically has an NPV assessment of 25 years, and the credit period for technical projects should be extended to 25 years. [SE, 244]

575. Simplified reporting for DACCS and BECCS could be once every 5 years post crediting period to ensure no reversal has occurred. This could end when there is sufficient data to support that CO_2 plume is stable and reservoir is stable. For land-based activities such as forestry, it may continue till 100 years to conclusively report about no reversals. [SP, 313]

576. Monitoring and reporting after the last crediting period (“post-project monitoring”) must be done on an annual basis for a time period determined by the risk of non-permanence or substituted with appropriate domestic regulatory monitoring arrangements. For example, projects with geological storage subject to robust regulatory requirements for monitoring of said storage should have either a de minimis or no post project monitoring period at all within the context of the 6.4 mechanism. [DG, 271]

577. For post crediting period monitoring, timeframes for reporting should be informed by the expected durability of the removal pathway and the quantified risks of reversal or Event of Carbon Default (EOCD). [CCAP, 246]

578. Should be designed in line with the logic of the European CCS directive for activities involving geological storage. [CWORKS, 302]

579. The time between the end of the last crediting period and the moment in which the project no longer needs to report for reversals. In short, the amount of time that the carbon must remain sequestered. [SYRA, 305]

580. Simplified reporting once every 5 years post crediting period for DACCS and BECCS (to ensure no reversal has occurred, ending when there is sufficient data to support that CO_2 plume is stable and reservoir is stable), and continue until 100 years for land-based activities such as forestry (to conclusively report about no reversals). [SP, 313]

5.2.5. B. Monitoring and Reporting: 2.

581. Discuss any further considerations to be given to the core elements for monitoring and reporting in A6.4-SB003-A03; where possible, identifying the applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types.

582. A6.4SB should harmonize the stringency and requirements for all CDR activities, as competition between A6.4ER is to be expected, once the mechanism is fully operational. Thus, requirements for specific activities should not present a competitive disadvantage. By safeguarding a robust and science based framework, a race to the bottom in terms of quality should be addressed. Considerations of clear differentiations between reductions and removals, noting the different (but complementary) roles the two mitigation approaches have to fulfil is recommended. [CWORKS, 302]

583. The core elements for monitoring and reporting should consider the scope of relevance to all 6.4 mechanism activities, removals activities, and specific removal activity categories or types. Harmonization of monitoring and reporting requirements will facilitate comparability and consistency across different removal activities. To the extent possible, these elements should harmonize with major existing voluntary and compliance carbon market rules such as Verra, Climate Action Reserve, or California ARB. We would also like to emphasize that MRV mechanisms should evolve over time and include Digital MRV solutions where feasible. DMRV (Digital MRV) is a software solution or service capable of data collection, processing, analysis, or synthesis for any MRV application, including project development, validation, verification, and registration. DMRV platforms may use remote sensing techniques, machine learning or artificial intelligence algorithms, mobile device applications, smart sensors, and other digital technologies. [PACHA, 306]

584. Further elements for consideration: (i) alignment with existent good/best practice regulatory frameworks that can be considered good/best practice, also taking into account that a degree of flexibility must be preserved (see response to question 1 above); (ii) setting out robust MRV requirements for geological storage and other storage methods must be equally robust and confer an equivalent level of confidence that carbon dioxide continues to be stored out of the atmosphere. [ZEP, 263]

585. Measurement, reporting, and verification (MRV) in open systems is challenging but not impossible. Because research in the area of MRV for ocean alkalinity enhancement is nascent, Planetary has publicly published a protocol for MRV and has gathered comments from scientists and oceanographers from around the world. [PT, 295]

586. Over the past 20 years, it is observed that many integrity deficits in current quantification methodologies arise because essential principles for carbon crediting have not been followed. We therefore believe that it is important the Supervisory Body includes robust general principles for the quantification of emission reductions and removals in its guidance. We recommend that methodologies for all types of mitigation activities, including removals and emission reductions, shall adhere to the following core principles

and requirements for quantifying and monitoring emission reductions and removals. General requirements:

(a) **Systematic consideration of uncertainty**: Proposed new methodologies shall be accompanied by a comprehensive and systematic assessment of the overall uncertainty associated with the quantification of emission reductions or removals. In assessing overall uncertainty, all causes of uncertainty shall be considered, including assumptions (e.g. baseline scenario), estimation equations or models, parameters (e.g. representativeness of default values), and measurement approaches (e.g. the accuracy of measurement methods). The overall uncertainty shall be assessed as the combined uncertainty from individual causes;

(b) **Conservativeness**: Methodologies shall ensure that it is very likely (i.e. a probability of at least 90%) that the quantified emission reductions or removals from an individual mitigation activity are not overestimated, taking into account the overall uncertainty in quantifying the emission reduction and removals (i.e. the degree of conservativeness in quantifying emission reductions or removals shall be based on the magnitude of uncertainty in the estimation of emission reductions and removals). Methodology proponents shall justify how overall conservativeness is ensured in the light of the systematic evaluation of uncertainty;

(c) **Attributability of the quantified emission reductions or removals to the mitigation activity**: Quantification methodologies shall ensure that the quantified emission reductions or removals unambiguously result from the implementation of the mitigation activity and not from changes in exogenous factors that are not related to the mitigation activity. [IO, 285]

587. Reporting must be transparent with all reports made publicly available, at a minimum, on the Article 6.4 mechanism’s website. Additionally, reports must be easily accessible, including, for example, that they should be readable on mobile devices as well as computers, in multiple languages including in the languages of the area in which the project/activity is taking place, and easy to find. Reports also should be made available in the local area directly in the local language(s) and in a manner that is culturally appropriate. [CIEL, 317]

588. Reporting should be comprehensive. The default should be to be over-inclusive about the type of information included in reports. This is a non-comprehensive list of elements reports should include:

(a) Information on environmental and social impacts, including how any adverse impacts are being prevented or mitigated;

(b) Information on how rights-holders were consulted initially and how they are being consulted and/or included in the activity in an ongoing way, including how Indigenous Peoples’ free, prior and informed consent is being obtained;

(c) Information on any grievances that have been filed;

(d) Information about ongoing threats that may affect the duration or reliability of the activity’s climate impact;

(e) Information about the actual impact on CO_2, including an accessible and understandable explanation of the methodology used to verify carbon removed (suitable for a local community audience);

(f) Information on the CO_2 and other GHG emissions associated with the activity (e.g. mining activities needed for enhanced rock weathering, energy use for DACCS, etc.); and

(g) Information on additionality, meaning whether the activity would have happened in the absence of it receiving support through the carbon market (for example, if the forest would not have been conserved or not reforested). [CIEL, 317]

589. There is a fundamental conflict of interest on the side of the private corporations and organizations that provide MVR services. As they are paid for their services, they have an incentive to verify carbon removals projects so that they are re-hired for future projects. Effectively, regardless of a project's actual ability to sequester carbon, third party MVR providers are motivated to be lenient or even outright fraudulent in their legitimizing of carbon removal projects. This conflict of interest is built into the structure of how MVR is conducted and short of a significant restructuring of how and who does MVR, there is no clear way around it. [IEN, 337]

590. We also expect projects to move to digital solutions for monitoring and reporting enabling real-time information and ask that the 6.4SB recommendations support this approach. [PURO, 322]

591. From our point of view technologies like blockchain should not be mandatory or pre-set. Rather a well-defined set of requirements for the technology to be used should be defined and the technology itself kept open. From our experience the data input is the weak link rather than the data storage and tracking. In addition, the overhead linked to the technology used for the monitoring of a carbon project should be in line with its potential increased precision in comparison to other monitoring approaches (i.e. amount of energy used, manpower, natural resources involved). [ATMO, 336]

5.3. C. Accounting for removals

5.3.1. General

592. It is essential that the baseline has the same measuring point as the project activity and that it is the same carbon pool that ultimately leads to negative emissions through the project. [TFI, 214]

593. IETA takes the view that the specific nature of carbon removals, and the entwined need for country Parties to carefully manage enhanced sinks and reservoirs within their territories in order to avoid carbon reversals, calls for far greater involvement and the establishment of responsibilities for host countries relative to emission reduction activities (e.g. establishing strong policy and/or regulatory safeguards that protect enhanced sinks and reservoirs of carbon over the long-term). IETA also notes that these safeguards are likely to be specific to different types of sinks and reservoirs, and that in some cases they can draw upon precedents from the CDM (e.g. forests, geological storage), while in other cases there is no established precedent indicating a need for significant further deliberations including by SBSTA (e.g. ocean storage). The safeguards described above are also strongly correlated with the accounting that shall be applied to carbon removals. Maintaining the environmental integrity of the Paris Agreement, and the effective

measurement of progress towards its central goal, calls for any carbon reversals from enhanced sinks and reservoirs to be effectively identified, measured and reported in the national GHG inventories of the host country Parties. As such, it is incumbent on Parties to ensure that supported removals under the Article 6.4 mechanism are an integral part of the wider accounting framework for the Paris Agreement. A robust accounting framework means that the transfers of Article 6.4 removal credits between Parties, any related corresponding adjustments, and the stock take of progress against NDCs, should all seamlessly fit together. [IETA, 311]

594. Accounting will need to include the following elements:

(a) Lifecycle emissions and their scope. Accounting rules will need to address the scope of lifecycle emissions associated with each project activity to be accounted. For BECCS, for example, success in delivering net removals will depend upon full project activity lifecycle emissions, including emissions from growing, harvesting and transporting biomass, and emissions connected with the fuel and energy used for transportation, compression, injection and storage of CO_2. For DACCS, lifecycle emissions will include emissions in the fabrication of facilities and in energy used to power the process itself, in addition to emissions associated with the transport of emissions, compression, injection and storage;

(b) Paris aligned baselines as per the RMP;

(c) Accounting for BECCS under current IPCC Guidelines is complicated by the fact that reporting and accounting implicate more than one sector in Parties' GHG emission inventories (e.g. LULUCF and energy, LULUCF and industrial processes, agriculture and energy). Further, different biomass feedstocks have different carbon intensities when combusted, which would need to be estimated, reported and accounted for. Rules for accounting where multiple parties are involved. BECCS and DACCS can involve multiple Parties and actors along the value chain and accounting guidance will be needed to address these challenges. Rules to account for saturation. Where the uptake of CO_2 from an activity reaches equilibrium and CO_2 is no longer being taken up. Rules to factor out climate impacts and non-anthropogenic removals. All removals must be anthropogenic. Hence project activities cannot be credited for removals resulting directly or indirectly from greater concentrations of CO_2 in the atmosphere. Rules to address uncertainties. There are significant measurement uncertainties in connection with biogenically stored carbon that would need to be made visible for transparency, managed, and addressed, if biogenic removals were to be permitted. These include uncertainties in baseline establishment, measurement and monitoring. BECCS accounting rules require particular attention and development. As explained in Mace, et al. (2020) and Pulles, et al. (2022), the IPCC 2006 Guidelines recognize negative emissions from BECCS based on the zero-emissions factor applied to biomass combustion. The CRF tables used by developed countries for inventory reporting treat CO_2 emissions from biomass combustion as a memo item, with these emissions not counted toward energy sector emission totals. However, this zero emissions factor applied to biomass results from assumptions that have been heavily critiqued: that emissions from biomass will be reported in the LULUCF sector at harvest, that biomass is produced in a sustainable manner, and that where biomass is harvested at an unsustainable rate, net CO_2 emissions will be reflected and reported for as a loss of biomass stocks in the LULUCF sector. These assumptions may not be valid, for example, if the combusted biomass (whose emissions are captured and stored) originates in a country that reports land sector emissions using default emission factors (i.e. tier 1) that produce a less accurate estimate than use of country-specific emission factors, such that emissions at harvest are not fully reported. [CA, 312]

595. Standardisation and modularisation to maximise the ability to compare on an equal basis within and between types of removals technologies (and thus projects) is recommended. Some important characteristics to consider are scientific reproducibility, transparent operating, and public reporting in a standard machine-readable format. [Kita, 262]

596. Further element for consideration: Complete carbon accounting: the quantification of carbon removals must be robust, transparent, and complete. In this sense, a cautious and comprehensive verification of principle 3 (see above, in the definition for “removals”) is critical to make sure that all associated emissions are included in the lifecycle analysis (including energy/electricity input and activity taking place after the end of the life of the products).This also implies that while some technologies have the potential to lead to carbon removals, a case-by-case approach is needed to ensure that projects deliver real ‘net’ carbon removals. Importantly, this requires ER certificates to be issued on a net removal basis. [ZEP, 263]

597. To understand the full climate impact of any changes, activity and leakage emissions tracking should include all indirect greenhouse gasses and climate pollutants (hydrogen and black carbon, for example), in addition to direct greenhouse gas emissions. Any increase in the emissions of a climate pollutant due to a removal process should be accounted for in all relevant per-gas inventories. Different climate pollutants act on different timescales. GWP100 as a climate metric does not capture these dynamics and can mask that a process causes near-term warming over the next crucial few decades while calling it “net-zero”. This would, for example, be the case for a process that emits 10 MT CO_2e of methane and removes 10 MT CO_2e of carbon dioxide, due to methane’s stronger influence in the decade after emission. In all reporting, the activity and leakage emissions should be reported per pollutant, in units of mass, and the time-horizon of any CO_2e calculations should always be explicitly listed. Some methods of greenhouse gas removal may have net-negative impacts on multiple greenhouse gasses. This should be accounted for in order to value multiple climate benefits of such approaches. [SCL, 292]

598. There are already three independent bodies that have developed MRV methodologies for quantifying biochar based GGR – Verra, EBC and Puro. These provide robust guidance for calculating the permanence of the biochar stored carbon by considering its properties and end use, as well as guidance on defining the scope of a project’s LCA. Overall, the MRV methodologies outlined by each of the standards are similar across carbon storage calculations, LCA guidance, and validating the final biochar sink. They primarily differ in quantifying the biochar carbon stability and permanence. This discrepancy highlights the need for more work to be done by multilateral bodies such as the UNFCCC to align influence regulation on biochar carbon. [BBB, 264]

599. Current approaches to quantifying biochar’s permanence underestimate the carbon stability of high-quality biochar, as they consider the carbon content of biochar as labile or recalcitrant, simplifying the longevity of stable carbon pools. These approaches interpret the same data that extrapolates the observable degradation rate of the biochar in a lab context to 100 years. It is noted in the existing methodologies themselves that these are extremely conservative approaches, Schmidt et al. has also acknowledged this in the non-

indexed biochar journal. This is reflected in the low 100-year stability factors assigned by the EBC and Verra biochar carbon removal methodologies. [BBB, 264]

600. It is our opinion that solutions relying on storage reservoirs with a high or constant risk of reversal – traditional nature-based solutions such as reforestation or sustainable agriculture that are subject to disruption or fire risk, geologic storage in areas with high leakage potential, etc. – should have more stringent requirements around ongoing monitoring following the monitoring period compared to solutions utilizing storage reservoirs with low or no risk of reversal (the deep ocean, the ocean’s bicarbonate pool, chemical solutions such as enhanced weathering, etc.). Since the underlying mitigation benefit is constantly at risk with high-reversal or lower-permanence reservoirs, continued visibility into the stability and permanence of a given removal activity will be needed. By creating “tiered” ongoing monitoring requirements based on the expected stability of the carbon storage, the Supervisory Body can ensure that projects focus on (and invest in) the area’s most likely to impede long-term storage and climate benefit; as an example, ongoing monitoring requirements for a reforestation project may help to proactively reduce wildfire risk factors in the area where the project is conducted. On the flip side, lowering ongoing monitoring requirements for a low reversal risk approach such as Ocean Alkalinity Enhancement can allow the project to focus on (and invest in) reducing quantification uncertainties in the calculation of removals, rather than in potentially unnecessary long term reversal monitoring. [RT, 288]

601. Importance of aligned baselines and nesting for accounting integrity: Aligning baselines across scales, from projects to the jurisdictional (i.e. national, state, or provincial) level, is critical for upholding environmental integrity in crediting. Project-scale emissions reductions and removals must be accounted for within jurisdictional accounting and reporting (where jurisdictional programs exist). A jurisdictional program and/or projects nested into a jurisdictional program should set baselines in accordance with a jurisdiction-wide accounting methodology or, in the absence of one, an independently certified, jurisdictionally allocated baseline. Nesting-ready projects should also start the process to adopt an independently certified, jurisdictionally allocated baseline as soon as one is developed. [EDF, 331]

602. Accounting for removals should effectively involve a whole life cycle analysis (source to sink) and should include greenhouse gas release or lost carbon sequestration services associated with environmental impacts. In many cases these will have to be studied and monitored over long time periods. Most ocean-based carbon removal technologies (e.g. iron fertilization, macroalgal or crop waste sinking, ocean alkalinity enhancement, etc.) will disrupt finely balanced marine ecosystems in midwater and at the seafloor. Because these marine ecosystems play major roles in carbon uptake, transformation, transfer, storage, and burial (all part of sequestration) any changes that affect the carbon cycle or other greenhouse gasses should be understood, and accounted for, including long-term effects. [DOSI, 332]

603. For engineered removals such as CCS - DACCS, BECCS, CCUS, there could be projects that involve multiple sources of CO_2. Removals, in this case could be based on the source of CO_2 (or percentage). E.g. in case of CCS in Waste of Energy plants, a fraction of waste would be biogenic in nature, in such scenarios guidance at methodology levels would be required to differentiate between reductions. [PDF, 321]

5.3.2. C. Accounting for removals: 1.

604. *Discuss any further considerations to be given to the core elements for accounting for removals in A6.4-SB003-A03; where possible, identifying their applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types.*

605. We welcome considerations of clear differentiations between reductions and removals, noting the different (but complementary) roles the two mitigation approaches have to Confidential 4 / 6 Climeworks AG fulfil. Therefore, separate accounting of reductions and removals is encouraged. This logic has been implemented in the draft guidance for the land sector and removals issued by the GHG-Protocol. [CWORKS, 302]

606. Natural ecosystems are typically modelled on the timescale of 100 years as there is higher uncertainty the further into the future you project, which is not to say that carbon stored in natural systems will only be stored for 100 years. Relative risks and merits should be considered based on project type while also taking into account uncertainties. There are many unknown unknowns when it comes to TBS solutions and today's reporting is not as stringent as we see in the NBS space. Thus, there is a need to create a set of disclosures and transparency around the specific issues arising from TBS, including assumptions behind life cycle analysis that can contribute to over-crediting risk. [SYRA, 305]

607. In A6.4-SB003-A03 it is stated that “removals to be credited shall be those in excess of the baseline while deducting any activity emissions and leakage emissions.” The amount of removals in excess of the baseline is directly linked to the requirement of raising ambition over time. The operationalization of a Baseline Contraction Factor (e.g. the Paris Goal Coefficient introduced in the International Initiative for Development of Article 6 Methodology Tools (II-AMT)) is one option to ensure this requirement is met. For removals, the amount of removals already considered in the baseline would need to be defined, which could draw on the host Party´s national policies explicitly addressing and financing removals. [CCSI, 233]

608. All risks of non-permanence need to be minimised to the extent feasible. This can best be incentivised by obligations on holders of the certified removals. If the risk of non-permanence cannot be sufficiently reduced, these activities should not be included in this mechanism. The activities which can be certified as removals in this mechanism should meet robust and scientifically stringent criteria to ensure that all removals certified have equivalent climate impact. [BF, 252]

609. The core elements for accounting for removals should be comprehensive and applicable to all 6.4 mechanism activities. They should also consider the specific requirements for removal activities, all relevant sinks, sources and reservoirs, as well as all six Kyoto gasses and their respective categories or types. Utilizing accounting techniques, such as dynamic baselines to assess net GHG reduction ex post will improve the integrity of transacted credits. [PACHA, 306]

610. Activities involving removals that result in emissions reductions should align with the requirements for the development and assessment of major voluntary and compliance market methodologies. Clear guidance should be provided to ensure consistency and coherence between removals and emissions reduction activities, such as separation for reporting in terms of quantification of any reversal risk and potential buffer deductions. [PACHA, 306]

611. Alignment and harmonization with existing international approaches to emissions accounting, Measurement Reporting & Verification, sustainability criteria, and standards will be important. [ICCAIA, 303]

612. There is a need to further refine procedures and methodologies related to identification and mitigation of risks linked to reversals and leakages across carbon removal activities. The use of cradle to grave life-cycle assessments to account for activity boundaries and associated removal activity related emissions should support these assessments, with technology-based removal solutions already demonstrating low levels of risk for reversal or re-release of CO_2 and thus exhibiting high potential for quality of future credits generated by these technologies. [ICCAIA, 303]

5.3.3. C. Accounting for removals: 2.

613. *For activities involving removals that also result in emissions reductions, what are the relevant considerations, elements, and interactions between this guidance and the requirements for the development and assessment of mechanism methodologies, including.*

614. “Hybrid” activities should be contributing towards reductions and removal accounts based on a verified differentiation of the outcomes based on their relative shares/contributions. Further guidance could be requested from the IPCC, based on its vast experience via the provision of guidance for the establishment of national inventories. [CWORKS, 302]

615. “Removals/negative emissions” and “avoided emissions” should be accounted for separately. To avoid double counting, further clarity is required from A6.4SB on the definition of removal credits and how they are distinct from avoidance credits. This would recognise the uses of captured CO_2 both for storage and its use as a feedstock with corresponding distinct environmental attributes. [ICCAIA, 303]

616. Removals and avoided emissions must be accounted for and reported separately. Many CDR solutions may legitimately claim both removals and avoided emissions; it is critical that these are not conflated. Again, a comprehensive, cradle-to-grave life cycle analysis will elucidate many of the hazards related to removals vs avoided emissions discussed in the note. Durability must not be considered a ‘deterministic’ value inherent to any solution pathway. In fact, ALL CDR solutions carry some risk of reversal, which varies over time, and the probability of reversal is dependent not only by the solution type but the quality of execution and specific circumstances surrounding specific projects. Durability claims must be established and verified on a project by project basis. [XPZ, 249]

617. For engineered removals such as CCS (DACCS, BECCS, CCUS), there could be projects that involve multiple sources of CO_2 and removals, in this case, could be based on the source of CO_2 (or percentage):

(a) CCS in Waste of Energy plants, a fraction of waste would be biogenic in nature, in such scenarios guidance at methodology levels would be required to differentiate between reductions (CO_2 capture from fossil sources) and removals at the equation level in the methodology (or some other monitoring parameters). Similar guidance would also be required if a project is geologically storing CO_2 from multiple sources (e.g. CO_2 from natural gas processing and CO_2 from direct air capture). In case of BECCS (e.g. biomass to energy plants or bioethanol plants), only fraction of biomass that is demonstrated by to be sustainable biomass should be eligible as removals;

(b) Integrated project activities (e.g. agriculture land management) that combines multiple practices: methodologies should ideally provide requirements (where possible) to quantify benefits from each measure, e.g. GHG benefit of reduced fertilizer use and GHG benefit in terms of SOC increase due to reduced tillage);

(c) A6.4 registry should consider having an optional label for A6.4ERs that are classified as removals, as removals might be required to comply with net zero pledges. Alternatively, removals can be called as A6.4 CDR/A6.4 RR [SP, 313].

618. Removals and reductions are two different currencies as are ex-ante and ex post carbon credits. We ask that A6.4 credits are either reductions or removals and not a mixture. [PURO, 322]

5.4. D. Crediting period

619. *Discuss any further considerations to be given to the core elements for accounting for removals in A6.4-SB003-A03; where possible, identifying their applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types*

620. Industrial CDR approaches like DACS require high upfront investments that need to be amortized over longer timeframes (10-30 years). Whilst the choice of a short crediting period can safeguard the principles of encouraged ambition, methodologies allowing for longer crediting periods should be considered for activities such as DACS. The upper boundary of 15 years should be considered for industrial CDR activities. [CWORKS, 302]

621. Considering the timber construction …. The crediting should happen at once after construction... Incremental crediting is not practical... It must be considered that, over time, the owners can change. For each new project, the most current methodology must be used. [TFI, 214]

622. The crediting period should enable long-term planning and investments and at the same time avoid risks to lock-in emission intensive practices with the promise of addressing such practices´ emissions with Article 6.4 based removal activities. The monitoring period should exceed the crediting period by far to avoid non-permanent activities participating in article 6.4 cooperation. [CCSI, 233]

623. For CDR activities that offer truly permanent removal, for example by mineralising CO_2 or converting it into another inert state, this period should last forever, once permanent carbon removal has been demonstrated and verified. For CDR activities that offer temporary or reversible sequestration, the crediting period would need to be renewed periodically in line with monitoring data confirming the CO_2 was still sequestered. [44.01, 248]

624. Crediting period should be 15 years renewable. The requirements for monitoring and reversals under the mechanism should be consistent with the regulatory regimes for CO_2 storage in [the respective jurisdictions, i.e. Parties at the forefront of delivering carbon capture and storage technologies, such as the US, UK and EU, jurisdictions]. [DG, 271]

625. The crediting period is closely related to the discussion of fossil fuel emissions lock-in. Any contribution to LT-LEDS should be reflected in the respective crediting period. The lock-in discussion relates to the Article 6.4 requirement for activities to contribute to LT-LEDS. In the long term, fossil fuel-based production (which comes with residual emissions) is expected to be minimized. Removal activities will have to be evaluated with regard to their contribution to LT-LEDS. This means that only activity types which are described in the respective country´s LT-LEDS as indispensable to offset residual emissions should be eligible for Article 6.4. [CCSI, 233]

626. The crediting period will need to run in perpetuity. Credits should be issued when there is a physical removal from the atmosphere and not before. For example, reforestation projects should generate credits as the forest grows once there is a consequent and observable net removal. The credit accompanying the removal will then need to be monitored and, where necessary, replaced. This monitoring will need to continue in perpetuity (see previous question), even for a fully mature forest. [BF, 252]

627. The length of the crediting period might be adjusted to different project types. When using historical baselines; the time between historical baselines and the start of the crediting period needs to be defined (the shorter the better, to ensure the baseline is still relevant). [SYRA, 305]

628. The core elements for crediting periods should be designed to ensure the integrity and accuracy of credit issuance. These elements should be applicable to all 6.4 mechanism activities, removals activities, and specific removal activity categories or types. [PACHA, 306]

629. Crediting periods should be sufficiently short to ensure a ratchet in ambition over time, e.g. through a review of baseline levels and ongoing financial need at each crediting period renewal. [CMW, 308]

630. Crediting period is proposed as 15 years, renewal twice, i.e. total of 45 years [SP, 313]. The Crediting period should be based upon the removal activity (land based / engineered) and also specific project activity (e.g. biochar or DACCS):

(a) NBS (forestry, agriculture, mangroves): crediting period is appropriate although reassessment of baseline should be ideally more frequent (due to changing landscape of policies, incentives, etc at national and regional level), e.g. similar requirements in the VCM (5-10 years);

(b) Removals such as biochar and long-term product storage (CCUS e.g. CO_2 storage in Concrete/cement): come under the existing sectoral scope (or equivalent);

(c) Biochar: crediting period similar to other as proposed by A6.4 (e.g. 5 years, renewable twice);

(d) CCUS: same crediting period of 5 years, but renewed 3 times (total 20 years);

(e) Ocean fertilization/alkanisation: crediting period determined after resolving all the major concerns (health, safety, environment impact and MRV) through scientific evidence and further evaluation of project types. 3 x 5 years may not be appropriate at this stage;

(f) Geological carbon sequestration Projects for removals (DACCS, BECCS): renewed 7 or 8 times (40-45 years total) to allow checking regulatory surplus and updating of methodological requirements more often;

(g) Renewal of crediting period: proving on-going financial need, project must demonstrate how it still require carbon financing. [SP, 313]

631. Setting a maximum grace period before a project must transition to the latest methodology is recommended. Once the grace period expires, projects that didn't transition to the latest methodology would see credits from that point forward no longer valid. [Kita, 262]

632. It is critical that innovation is encouraged so that both new methodologies representing novel solutions can be readily integrated into the Article 6.4 mechanism, and so that existing projects regularly update their approaches and quantification guidance as solutions are tested and iterated upon. We would suggest two additional considerations in regard to the proposed language:

(a) New versions of methodologies should be required to highlight and explain any changes from previous versions of applicable methodologies. This will provide visibility for all stakeholders into what changed, implications for monitoring and measurement, and how the project is adapting to respond to real-world learnings;

(b) Removals previously "issued" under applicable methodologies within the Article 6.4 mechanism should not be changed retroactively when an updated methodology is released. A desire for backwards-facing adjustments to account for new information or uncertainty factors (whether positive or negative) is understandable, but potentially sets a dangerous precedent that could undermine the confidence in past Article 6.4 activities and "issuances". Eligible removals issued under an applicable methodology as part of Article 6.4 should represent the best available science we have at that time and should be issued and transacted on that basis. [RT, 288]

633. We support a crediting period as defined in the RMPs which is twice renewable crediting period of 15 years which could help access to project finance for durable carbon removals. In addition, some durable industrial carbon removal methods are solely reliant on carbon finance and Baseline Correction Factors (BCFs) during the lifetime of a project could have consequences on the project investment decision. Under the "Requirements for the development and assessment of mechanism methodologies", the 6.4SB will make recommendations on baseline setting and we ask that the deliberations on BCFs for durable industrial carbon removals requires further and extensive consultation. [PURO, 322]

634. Crediting period is proposed as 15 years, renewal twice, i.e. total of 45 years. The Crediting period should be based upon the removal activity (category - land based/ engineered) and also specific project activity (e.g. biochar or DACCS). [PDF, 321]

5.5. E. Addressing Reversals

5.5.1. General

635. Following the GHG protocol most standards guarantee a permanence in the credit for 100 years…. We advocate a more flexible approach to the permanence of carbon removal and oppose arbitrary time limits, e.g. 1,000 years, emphasizing instead the importance of

considering periods of "at least several centuries." This is in line with the recommendations of the European Union.… [NC,206]

636. All activities that rely on the storage of carbon should be subject to specific rules on monitoring for reversals, as well as provisions to minimise the risk of reversals and address these reversals when they occur. This includes activities that primarily aim to reduce emissions, including, for example, cookstove projects which generate mitigation benefits by lowering deforestation. [CMW, 308]

637. The approaches depend on the project type due to the different time frames, economics and carbon removals of the projects. …timber construction is a one-time project completed after 1 to 5 years…. The project creates a one-time storage and should be handled with a non-permanence risk buffer or emission reduction offset.… Furthermore, the regions, locations, and legal conditions have to be considered in the permanence analysis. For quick implementation, activity-specific is the right approach, especially insurance models must first be developed based on empirical values…. Another approach/measure can apply to projects that show emission reductions and carbon removals, e.g. timber construction. The emission reductions can be used as "insurance," which is not monetized/credited. …. [TFI, 214]

638. The risks depend on the technology. Under the timber construction can occur the following risks: • non-completion of the project …: • Demolition of the building within the first 100 years without reuse of the materials … • Environmental disasters …. [TFI, 214]

639. No reversals from underground storage have ever been reported globally. A benefit of DACCS, therefore, is that it minimizes the need for buffer pools or other forms of non-permanent risk buffers, and this should be recognized by the Supervisory Body. DAC Coalition members are currently negotiating contracts that do not offer insurance or buffer accounts because of the inherent low-risk of reversibility in DACCS. [DACC, 274]

640. Advocating for a more flexible approach to permanence in carbon removal, we urge against setting an arbitrary time limit, such as 1,000 years, and instead emphasize the importance of considering timescales of at least several centuries. Scientific evidence must be synthesized into a commonly accepted understanding of the durability of the carbon sequestering material in storage environments that do not cause significant reflux of CO_2 into the atmosphere. [CFUT, 245]

641. In the event of a reversal, various aspects of the activity cycle will require careful consideration and adjustment, irrespective of the specific carbon dioxide removal (CDR) technology used. [CCAP, 246]

642. Intentional reversals, such as the deliberate mishandling of carbon, and unintentional reversals, like a forest fire, each bring unique challenges to risk management and should be treated accordingly in terms of buffer pool contributions and mitigation strategies. [CCAP, 246]

643. Potential reversals or leakages can be calculated as factors applied to carbon removal or mitigation claims. For each use case, data can be generated during trials regarding leakage models, which can be applied as factors to any carbon removal claims. The methodologies can be developed to create safer and higher quality carbon mitigation in the world's material supply chains. We hope some of these, with sound tracking approaches, should also be considered under Article 6.4. [MOA, 300]

644. To minimize the risk of non-permanence of removals over multiple NDC implementation periods, it is essential to have a robust framework for addressing reversals. The guidance should emphasize the full and timely. [PACHA, 306]

645. ...the misconception that nature-based removals are at higher risk of reversals than removals from other sectors. In fact, removals from all sectors carry a certain risk of reversals (…) and should therefore be treated equally under Article 6.4 guidance on removals. This misconception is fuelled by two factors: (i) Reversal events in nature, like deforestation or wildfires, are dramatic and visible, while forest regrowth or compensatory policy measures are difficult to readily perceive. Reversals in other sectors are not as visible. (ii) At the same time, there is a widespread misunderstanding of the difference between carbon stocks and carbon flows in all sectors. This is exacerbated by a misunderstanding about accounting for forest carbon, which builds in a certain amount of natural forest dieoff. Please find more information under Annex 1. Technical Note: Understanding Risk of Reversals in Nature Based Removals Regardless of the sector or activity type where removals come from, climate policy mechanisms have been designed to address potential risks (e.g. buffer pools, insurance among others) …. The same approach should be followed to deal with reversals from any sector given that they all carry an inherent risk of reversals. [CI, 307]

646. The 6.4 mechanism methodologies should require activity proponents to consider, measure, and address all risk categories of non-permanence, including internal risk (i.e. project risk such as management or financial risk), external risk (e.g. political risk) and natural risks (fires, pests, droughts, etc.). Quantification of those risks should be based on the latest available science. We recommend that the secretariat prepares a report summarising the current best-available science on risk quantification for carbon storage, taking into account the variability in risks for various storage types and various regions/locations. This could serve as a basis for defining specific risk quantification approaches in 6.4 methodologies. We strongly advise against relying on existing risk quantification methodologies from the VCM, as many projects report very low risks of reversals by exploiting flexibilities in VCM methodologies. In fact, reporting of very low reversal risks is incompatible with additionality requirements in some cases, such as for conservation projects, as projects would be arguing at the same time that they are protecting a threatened area, and that the area they are protecting faces a low risk of releasing the carbon it is storing. [CMW, 308]

647. When considering how to address reversals it is important to factor in both likely increasing risks to biogenic carbon storage from escalating climate change impacts and the long lifetime that CO_2 has in the atmosphere. Land-based removals cannot guarantee long-term sequestration on the necessary timescales and should not be used to compensate fossil fuel emissions. Mitigation activities that have a high reversal risk should be excluded from eligibility under Article 6.4. Examples include afforestation / reforestation, and soil carbon sequestration.

648. The risks of both unintentional and intentional reversals need to be addressed. Reversal risks include seepage from transportation, compression, injection or storage sites (e.g. BECCS, DACCS). As stated above, non-permanence risks render land-based removals problematic for inclusion in Article 6.4, as a result of the potential for reversals related to natural disturbances (e.g. fires, pests, storms), climate impacts themselves, feedback loops and land use decisions. Uncertainties in measurement and monitoring only amplify these elements. [CA, 312]

649. In terms of updating the quantification of emission reductions and removals, it is important that all parameters that were fixed for a crediting period are reevaluated based on the latest available information. Further, the latest approved version of the relevant methodology and any tools should be used. [IO, 285]

650. We recommend monitoring and assurance of removals be appropriate to the specific activity or mechanism. Buffer pools are a well understood structure, and whilst some mechanisms may not require buffers; for others insurance products may be a more suitable form of redress in event of reversal. Other insurance products may be developed by the private sector and can be complementary to any buffer contributions. The Supervisory Body should consult expert scientific opinion to determine non-permanence risks for each removal mechanism. Following the well-known Oxford Principles for offsetting, shorter-term storage is useful and necessary, but must be monitored and valued appropriately. We suggest any A6.4 activity must be aligned with the time-horizon under the Paris agreement, and future amendments to Paris or successor agreements will need to consider responsibility for reversals. [VRT, 319]

651. Ideally, there should two separate non-permanence risk buffer (pooled) - one for land-based activities(e.g. forestry, ALM, mangroves, other wetlands) and other for engineered solutions (as of now - only for DACCS and BECCS or any other form of geological sequestration - like sub surface mineralisation). Permanence risk for solutions such as OF, OA and ERW still needs more scientific conclusions. This is due to differentiating nature of the CDR in terms of impacts and durability/permanence. [...] Level of non-permanence risk assessment would depend on the removal project type. The one with non permanence risk tool, risk assessment should be a project level. As each project is unique on its own. [PDF, 321]

5.5.2. E. 1.Addressing Reversals:

652. *In order to minimize the risk of non-permanence of removals over multiple NDC implementation periods, and, where reversals occur, ensure that these are addressed in full.*

653. *Discuss the applicability and implementation aspects of these approaches, including as stand-alone measures or in combination, and any interactions with other elements of this guidance:*

5.5.2.1. E 1.a. Non-permanence risk buffer (pooled or activity-specific)

654. The use of buffers should not be a requirement for projects with geological storage because of the negligible risk of reversal. Buffer requirements would likely be disproportionate to the real risk of reversal. In addition, given the multibillion-dollar investment required in BECCS projects, any pooling of risks between projects could make them unfinanceable. [DG, 271]

655. Ideally, cases of reversals of CDR should be addressed whenever they occur. The monitoring period determines whether reversals are detected and can, thus, be addressed. The monitoring period therefore is key to enable addressing reversals. The Verra requirements, which CCS+ is aligning with, includes a system for managing such reversals. Buffer credits are deposited in the GCS pooled buffer account based on the non-permanence risk report assessed by the validation/verification body. In the event of a reversal, the project proponent follows the buffer account reconciliation requirements set

out in the VCS Program document Registration and Issuance Process. This ensures that any storage issue is reflected in the country's inventory, transferring responsibility to the states. [CCSI, 233]

656. Buffer contributions should be reflecting the overall risk profile of activities. For activities involving geological sequestration, previous work under the CDM should be taken into account. From the Durban CCS decisions, we applaud that buffer credits are refundable per design, as it incentivizes safe operations and rewards project proponents accordingly. Given this refundability of buffer credits for CCS activities under the CDM, options for pooling with other activity types might be limited. [CWORKS, 302]

657. Risk buffers fall short of providing adequate system-wide insurance of all the risks posed in their current design. Project-specific risk assessments vary considerably, e.g. standardisation and robust assessments of all natural, internal and external risks are required. [BEZERO, 304]

658. Project-specific risk assessments typically support the identification and mitigation of key risks. However, recent data indicates that even such best-practice measures may have resulted in under-resourced buffer pools. For example, natural risks, such as fires, have led to the California Air Resources Board's buffer pool to indicate that 95% of the credits deposited to insure against fire risk have already been depleted. [BEZERO, 304]

659. Disclosure and information risk. We find significant gaps in disclosure of these reports in the VCM: 74% (25 out 34) of NBS projects with a BeZero Carbon Rating present at least one non-permanence risk report (NPRR) although only 3 projects present NPRR for all the vintages (9%). [BEZERO, 304]

660. It is our recommendation that the UNFCCC supports a high level of transparency regarding how percentages applied for natural, internal and external risks are reached. BeZero Carbon proposes that any cap placed on the maximum level of risk allowable should be disclosed/highlighted in the UNFCCC's risk assessment documentation. Similarly, where the approach required a minimum risk buffer allocation in cases where projects assess low risk, this or the lack of a minimum allocation should be specified. We also recommend that any project documentation detailing how risk buffer allocations are calculated be made publicly available. This allows a greater level of disclosure that brings greater indication that project risks are mitigated appropriately. [BEZERO, 304]

661. Buffer pool allocations should be based on scientific assessment and empirical evidence of reversals for different forms of sinks. Buffer pool allocations should not be introduced into the regulatory framework surrounding permanent negative emissions and geological storages. For geological storage, if there are obligations under law to address reversal emissions, then there should be no need for further measures. After the Monitoring period, only host nation obligations and reporting and accounting should apply. The notion of intentional reversals is immaterial for geological storage. Significant intentional reversal would result in loss of license to operate under credible jurisdictions and methodologies, which is a strong enough incentive not to make a distinction. [SE,244]

662. Buffer pools are typically only used for NBS projects, which have a more material risk of reversal than TBS. However, with the development of CDR projects with geological storage and their exposure to losses risks, there is room to further investigate a percentage risk buffer based on the ground formation or the project location with a timeline threshold (i.e. less than 200 years. etc.). It is important to note that, if the reversal is

extreme, and exceeds the carbon project's contributions to the buffer pool or the project is terminated, the liability of the project should vary. In this instance, buffer pools need to be complemented with other measures (for example, purchasing carbon credits from other projects). [SYRA, 305]

663. Tying up removal certificates ex ante in a buffer pool is simply not a rational reflection of the risk of reversal and would only be an additional financial burden for the climate to carry. From a methodology approach, the focus should rather be on securing that credits for geological storage are only issued in jurisdictions with state-of-the-art legislation for licensing, monitoring and liabilities, such as the EU set-up with the ETS and CCS directives. [SE,244]

664. In order to ascertain the extent of contributions towards the buffer pool, it is imperative to understand the inherent non-permanence risk of the removal activities. For example, when examining biochar as a method of carbon removal, the risk of non-permanence lies in the potential degradation or "leakage" of carbon from the biochar over time. This can be modelled by an exponential decay, with a Mean Residence Time (MRT) indicating the effective half-life of the biochar. The difference between the initial carbon value and the value at the end of a 100-year period can be expressed as a Leakage Buffer value, effectively determining the potential contributions to the buffer pool. This value is influenced by the nature of the feedstock and the pyrolysis process conditions and can be determined through proximate analysis of representative samples. Each removal method would therefore require its own protocol for calculating non permanence risk and, subsequently, the appropriate buffer pool contributions. The buffer pool's composition should be reflective of the various types of removal activities and the corresponding non-permanence risks. [CCAP, 246]

665. Buffer pool approaches to removals are inadequate in cases where potential reversals include emissions of 100% of stored CO_2-equivalent – in such cases, buffer pools must equal 100% of issued credits, unless the accounting methodology explicitly accounts for temporary storage, in which case no buffer pool is necessary because emissions are also credited. In contexts in which there are limited physical potential for reversals (e.g. some carbon sequestration in the built environment, most geological storage technologies), buffer pools should equal the expected value of future reversals (evaluated conservatively at some confidence interval of the distribution of possible future values, rather than the mean). [GRI/LSE, 275]

666. In our understanding, the risks of non-permanence, also known as reversal risks, stem from the possibility that carbon, once removed from the atmosphere, might be unintentionally or intentionally released back into it. These risks can be broadly divided into four categories:

(a) Natural, Unintentional: This includes risks arising from natural occurrences or disturbances such as forest fires, pest infestations, or extreme weather events that could potentially release stored carbon back into the atmosphere. These risks can be minimised by diversifying removal methods, promoting ecosystem resilience through adaptive management, and ensuring that removal projects are strategically located to minimise exposure to these disturbances;

(b) Natural, Intentional: This involves human actions that intentionally interfere with natural carbon removal methods, such as deforestation or land-use changes. To address these risks, it is crucial to uphold strong regulatory frameworks and to promote sustainable land-use practices;

(c) Unnatural, Unintentional: These risks might occur when a technological failure or accident in an engineered carbon removal process leads to unintentional carbon release. Mitigation strategies could include maintaining rigorous safety protocols, regular equipment checks, and backup systems in engineered removal facilities;

(d) 4) Unnatural, Intentional: This includes risks arising from deliberate human actions, like the misuse of removed carbon, for instance, using carbon captured for long-term storage as a fuel source. To minimise these risks, clear guidelines on acceptable uses of captured carbon should be established and enforced, and the adherence to these guidelines should be regularly audited. [CCAP, 246]

667. In 2011, Decision 6/CMP.7 was adopted which formulates Rules, Modalities and Procedures (RMP) for CO_2 storage. These RMPs should closely inform the current work related to addressing reversals and avoidance of leakage. The RMPs propose a refundable project specific buffer pool approach. [CCSI, 233]

668. There is merit in the creation of a non-permanence risk buffer. Whether pooled or specific to an activity, this buffer would serve as a safeguard against the risk of carbon reemission. As with all safeguards, its applicability should be tailored to the specific characteristics and risks of each removal activity. We propose the adoption of an insurance model, such as the one outlined in the C-Capsule guidelines (Product Code), where registrants can contract with insurance bodies (commercial or sovereign) to provide independent risk management services against the risk of Event of Carbon Default (EOCD). This would act as a guarantee for replacement of removals where reversals occur. Such an insurance account should be regularly monitored by the Article 6.4 SB, ensuring effective risk management and adding an extra layer of security against non-permanence. [CCAP, 246]

669. The applicability and implementation aspects of measures such as non-permanence risk buffer, insurance/guarantees for replacement of ERs, and other measures for addressing reversals should be assessed on a case-by-case basis. [PACHA, 306]

670. Appropriately sized buffer pools tend to effectively address the risk of reversals, by withholding an amount of credits from being traded and setting them aside to form a “buffer pool” which is later used when a reversal occurs. In many cases, the amount withheld is not based on any actuarial assessment of the risk of reversal and it can vary. However, to be most efficient, the percentages of credits allocated to the buffer should match the actuarial risk of reversal for all activities covered by the buffer. The allocation should then take into account how reversals are detected, quantified, and reported. [CI, 307]

671. Buffer pools do not constitute a robust way of guaranteeing the permanent storage of carbon in a sink. At best, they can strengthen the credibility of guaranteeing storage for a medium duration of time, if properly constituted and managed. It is not credible to expect buffer pools to be operated for more than a few decades, as there are many factors (political, economic, etc.) that could lead to the discontinuation of the buffer pool management. “Monitoring and compensation” approaches that rely on buffer pools and claim to guarantee the durability of storage for 100 years or more are simply not credible from an institutional point of view. In addition, buffer pools can only be used to compensate for reversals if these reversals are observed. They are therefore inherently limited by the monitoring period tied to the projects that are covered by the buffer pool. If the Supervisory

Body chooses to rely on buffer pools to address reversals, these should be clearly communicated as a medium-term risk-mitigation strategy, and not as a long-term durability guarantee. [CMW, 308]

672. It is noted that buffer pools have been implemented to address risks of reversals for removal activities in several independent crediting standards as well as during the CDM (for projects involving carbon geostorage). In addressing the questions raised in the structured consultation, IETA recommends that different design considerations for the use of buffer pools be drawn the different approaches employed by existing independent crediting standards. It is also recommended that the SB consider these various approaches and the implications of using them in the Article 6.4 mechanism, including any participation requirements for host Parties, their interaction with NDCs, application of corresponding adjustments and national GHG inventories and potential variations in design according to different types of sinks and reservoirs. To appropriately address risks of reversals, any buffer pools should be designed in a highly robust manner based on a scientifically aligned risk assessment. These risk assessments should be developed before the registration of the project by activity proponents, updated over time, and carefully reviewed by third-party designated operational entities (DOEs) to ensure contributions to the buffer pool are adequate. The level at which the buffer contribution should be determined requires further consideration. It may be possible to set the buffer contribution at:

(a) The mechanism level (probably to be avoided give the wide variation in durability between sinks and reservoir types);

(b) The level of specific type of sink and reservoir; or

(c) The level of specific activities

(d) It is noted that the application of various risk assessment tools can have environmental integrity implications for the resultant units. Therefore, we urge careful consideration in potentially relying on these approaches, especially where they involve non-technical risk elements (e.g. financial or political risk). Arbitrage between lower reversal risk activities (e.g. high durability stores) and activities with higher probability of reversals should be avoided. Buffer pools should also consider, rather than duplicate existing domestic regulations that require collateral for addressing reversals. For technology-based carbon sink enhancements, IETA welcomes the proposal to adopt the 'regulatory safeguards'-style approach for geological CO_2 storage, which draws upon approaches previously agreed under the CDM. In addition, IETA has developed a set of principles to govern the development of tradable reductions and removals through the High-Level Criteria for Carbon Geostorage Activities. These include six key core methodological components, as well as ten high-level criteria and supporting safeguards to identify and manage any potential risks associated with carbon geostorage (including reversals). IETA recommends that the SB further deliberates on the potential of similar "regulatory safeguards" approaches to be applied to other types of sinks and reservoirs. Furthermore, in deliberating on means to address non-permanence and carbon reversals, we refer to our above observation regarding the responsibility of host country Parties to monitor, report and account for any emissions from enhanced sinks and reservoirs within their national territory, including any arising from Article 6.4 mechanism activities. Thus, IETA feels that there is an urgent need for a more wide-ranging discussion of how the risks and rewards associated with removal activities be effectively balanced across project developers, host countries and buyers, cognisant of the need to maintain environmental integrity of the Paris Agreement and to avoid moral hazards [IETA, 311].

673. Currently, standards have buffer pools in place for both nature-based, hybrid, and geological carbon removal projects. Kita encourages a crossover between buffers and insurance products, to cover reversal risk in totality. There is significant potential for a hugely complementary and collaborative approach between Carbon Standards and insurers to:

(a) enhance the financial resilience of existing buffer schemes;

(b) enable high-quality new buffer schemes;

(c) increase market liquidity;

(d) build trust.

674. Insurance for carbon credits, independent of the buffer, can provide:

(a) A creditworthy financial wrapper;

(b) A smoothing strategy to help manage downside risk of unexpected failure (where actual losses are higher than those modelled);

(c) Confidence that investors (i.e. carbon buyers) will receive expected returns; and

(d) Certainty of contractual expectation for underlying asset owners (i.e. carbon sellers).

675. Kita recently published a report on carbon buffers and insurance which is relevant to question 1. [Kita, 262]

676. ZEP encourages the Supervisory Body to consider existent national and regional regulations when defining the approaches to minimise non-permanence risks. Notably, the CO_2 storage legal frameworks mentioned above require operators to have an approved corrective measures plan which must be implemented in case of leakages. Furthermore, operators are required to surrender emission allowances equivalent to leaked emissions. In this context, risk buffers and insurance/guarantees could result in extra obligations on EEA and UK storage operators, as well as have potentially significant implications on revenue streams. It would thus be sensible to consider existent legal frameworks so as to avoid conflicts with existent legislation while keeping the essence of the requirements. Furthermore, liability frameworks for other types of carbon removal activities must be as robust as the ones in place for geological storage. [ZEP, 263]

677. The use of non-permanence risk buffers is a common approach to address non-permanence among existing voluntary and regulatory carbon crediting programs. This is a viable approach for governments to adopt to devolve responsibility for reversal compensation to market actors. However, it should be noted that buffer reserves are simply an insurance mechanism. As with any insurance mechanism, buffer reserves can only be effective if it is clear who bears the primary liability for addressing reversals when they occur (i.e. who is being insured, which should be either the primary seller or the buyer

of credits); for how long they bear this liability; and what the level of risk is for reversals over the time period being insured. [OI, 285]

678. These proposed measures are unlikely to be able to actually address the problem of major reversals. [CIEL, 317]

679. We do not see any of these proposed solutions to the problem of impermanence. Non-permanence buffers: tension between economic feasibility and ensuring the buffer is large enough; increasingly difficult to predict the reversibility risk, in particular of land-based carbon sequestration with a fast-changing climate; buffer pools often undercapitalized. Insurance: increasingly more difficult to actually achieve additional removals, problems with insuring that these removals actually can take place after reversals; Bottom line: none of the proposed approaches to deal with reversals can actually address the problem. [CLARA, 316]

5.5.2.2. E.1.b. Insurance / guarantees for replacement of ERs where reversals occur (commercial, sovereign, other)

680. in-kind reversal liability insurance is feasible… losses are measurable, …premiums ae affordable…- … any reversals are immediately made good … by compensating reversals with a new removal from the insurance pool. …. allows a removal to be credited indefinitely, … eliminating the need to regulate permanence.... annual contracts suffice to cover reversal risk... It is impossible to provide insurance for very long periods… short duration contracts are necessary for new learnings and environmental changes to be incorporated into risk modelling and pricing for insurance products**…**only modest changes to existing insurance regulations. …. [CPOOL, 215]

681. Insurance products, alongside carbon credit ratings, are likely to dominate the future risk allocation in carbon markets. Where such alternative reversal mitigation options are applied (such as the replacement of credits from another project), we recommend that the projects detail which projects and vintages credits are sourced from. Transparency across project specific buffer pool accounting methods would also provide greater opportunity for end users to ascertain that any reversals that may occur are accounted for with credits of similar characteristics and effectively mitigate the risks presented. [BEZERO, 304]

682. If other insurance mechanisms are utilised, transparency regarding the sources of insurance and how such mechanisms would be applied in the case of a reversal are necessary. [BEZERO, 304]

683. Insurance schemes may offer an alternative to buffer pools. This could include shared responsibility whereby selling platforms have initial liability, but this is underpinned by government-backed carbon insurance schemes that sellers must procure. There is precedent for this in the UK government’s FloodRE reinsurance scheme, which ensures flood insurance is available in high-risk areas that may be classed as uninsurable. [LSE/GRI, 275]

684. A pool or insurance could be an appropriate instrument for the Monitoring period for non-permanent removals. [SE,244]

685. This approach would be similar to the letter of credit process (when a bank guarantees the risk of default of a company or of another bank). This will need new actors on the market to be involved: insurers and banks. While insurers are already active in carbon markets, banks would need to get up to speed. However, the size of the market and the

potential gains are likely to attract the banking sector. This approach would require heavy, and as a result pricy, monitoring processes to justify and use the insurance or the guarantees for the replacement of ERs when reversals occur. [SYRA, 305]

686. The applicability and implementation aspects of measures such as non-permanence risk buffer, insurance/guarantees for replacement of ERs, and other measures for addressing reversals should be assessed on a case-by-case basis. [PACHA, 306]

687. Financial instruments like insurance can also be used to address risks of reversals. Insurance mechanisms are designed to incorporate information about the statistical risks to an asset, using actuarial techniques. Therefore, these types of approaches may be preferable in some circumstances. Insurance is one way to guarantee that the liability for any reversal will be addressed in full, and the insurance industry has established ways of assessing risks and developing insurance tools to account for them. To discourage risky practices, insurance companies frequently set management requirements for insured projects. In theory, removals from all sectors could purchase insurance to cover the risk of reversals, though very few insurers currently provide this service. In many cases, a requirement to provide proof of insurance for any credit transaction under from activities outside NDCs might be appropriate. Parties may even require proof of insurance as a precondition for authorization of transacting credits, as a way to minimize their own liabilities. [CI, 307]

688. While we welcome the SB's progressiveness in considering the role of insurance to address risks of reversals, IETA urges careful consideration before relying on these emerging approaches. As noted above, the implementation of buffer pools is a type of risk pooling instrument variously employed today by independent crediting standards. Insurance by third parties could potentially provide a similar risk pooling service, which may be seen as an alternative or complementary approach to that of implementing pooled risk buffers. To date, insurance providers have offered policies to underwrite credit non-delivery risk on registered project activities, but to the best of our knowledge have not systematically offered policies that underwrite the risk of carbon reversals from carbon sinks and reservoirs of registered project activities (e.g. against the loss of stored carbon from forests or geological stores). Such approaches were previously considered for forestation activities (so-called "iCERs"), which did not achieve widespread support among Parties (e.g. at COP6-bis). They may be complex instruments that could be tied to other forms of insurance products relating to carbon reservoirs (e.g. forest fire risk; geological well risks) that require specialist knowledge to define and elaborate on. However, as such approaches mature and the number of providers who can showcase well-functioning insurance products expand, the SB might reassess their potential to contribute to the development and growth of high-integrity projects under the Article 6.4 mechanism. [IETA, 311]

689. Insurance mechanisms via private parties (insurance agencies or re-insurance agencies) may not be mature enough to completely replace buffer mechanism. However, they can be complimentary to the buffer mechanism. They also have risk of bankruptcy or insolvency for 100 years period (assuming permanence is considered for at least 100 years). Insurance may take up some of the risk associated with the project based on the appetite of the insurer and other variables associated with projects and project proponents, e.g. insurer might take up risk associated with fire or extreme weather events (similar products occur in case of crops to protect them from natural risks). [SP, 313]

690. Other forms of insurance or guarantees (commercial, sovereign, or otherwise) might also be effective in addressing non-permanence risk. However, for these instruments to be effective, they would need to meet the same essential criteria as buffer reserves, i.e. clear assignment of primary liability for reversals to market actors, clearly defined risk obligations over discretely defined time horizons, and the avoidance of any moral hazard. Sovereign guarantees, in particular, could be valuable as a backstop to cover reversal liabilities where it is not possible to enforce obligations on private market actors (e.g. if an actor ceases to exist or goes out of business), but should not be the primary means to address reversals because of the moral hazard this would create. [OI, 285]

691. A buffer pool and insurance could work separately or together. They could be complementary for a project where the buffer pool covers low-risk but high probability events like climatic variations while the insurance covers high-risk but low probability events like a catastrophic wildfire. This approach optimizes cost savings but still provides comprehensive coverage of reversals. In some cases the buffer pool itself can be insured to ensure that it is adequate to cover major reversal events. [ASPI, 330]

5.5.2.3. E.1.c. Other measures for addressing reversals in full

692. A nature-based removal must therefore always be considered reversed at the end of the Monitoring period. The Monitoring period for land-based approaches should thus correspond to the timeframe the project is committed to keep the land as a removal. In effect, non-permanent removals are postponed emissions. Again, it follows that for land-based credits, the timeframe for addressing reversals is during the Monitoring period (as they should be considered released after that period). For permanent removals (BECCS/DACCS) as well as generically for CCS, the permanence is confirmed by the scientific consensus and the fact that the CO_2 is sent permanently to the geosphere. During the Monitoring period, reversals should be monitored and addressed according to the applicable jurisdiction as well as counted as an emission by the storage company. At the end of the Monitoring period, there should be a transfer of responsibility to the host nation. If there is a reversal after the transfer of responsibility, the host nation should count the reversal as an emission and take measures according to the applicable jurisdiction. [SE, 244]

693. Transfer of responsibility to the host nation of land-based projects would also be to give up the idea of monitoring and blur the line between the system and project view, since the state cannot at reasonable cost monitor all the land-based project areas. This is not the case with permanent removals, where the state can continue to monitor the individual storage complexes. Finally, it would in practice constitute a way to introduce a version of Ton-Years, but financed by the tax payer rather than credit buyers. [SE, 244]

694. The applicability and implementation aspects of measures such as non-permanence risk buffer, insurance/guarantees for replacement of ERs, and other measures for addressing reversals should be assessed on a case-by-case basis. [PACHA, 306]

695. We emphasize the need to proactively minimize risks of reversal as a means of addressing the potential for reversals. We believe that the burden of systems to address reversals should be proportionate to the quantity of carbon at risk, and there may be a de minimis level that requires no international measures. [CI, 307]

696. REDD+ and other land-sector activities have a long record of empirical studies and analyses that identify and quantify the risks (or “drivers”) of deforestation, degradation,

and other activities that could generate a reversal event. Methods for most activities are mature and widely accepted, and some are included in IPCC guidance for national inventory reporting. New, more accurate and efficient technologies for detecting and monitoring changes in land-based carbon stocks and fluxes are emerging all the time. These emerging approaches should be supported and made available to host countries, as they may make the delivery of mitigation activities more cost-effective. [CI, 307]

697. We favour assessments that are specific to activities, and we would discourage a sectoral or broad categorical assessment of risk. A host country should always be aware of the amount of credits that have been transferred and the risk profile associated with that quantity of credits. Insurance, diversification, and other risk management measures should be applied by host countries. C… Qualified experts in the activity should be employed to assess risk, with protections in place to avoid conflicts of interest. Once quantified, these risks should be assessed through actuarial techniques, and the management of risks should be addressed through the range of available risk management approaches. [CI, 307]

698. Another approach for addressing reversals in full would be to implement temporary crediting (as was adopted for A/R projects under the Clean Development Mechanism). The effectiveness of temporary crediting approaches depends on the enforceability of credit replacement obligations on the part of buyers. This could be challenging the case of private actors or other non-state credit buyers, although potentially achievable through cooperative agreements among Parties engaged in the transfer of Article 6.4 emission reductions or removals. Note that temporary crediting approaches could also, in principle, be combined with buffer reserves or other insurance mechanisms to cover residual risks where replacement obligations are not enforceable. [OI, 285]

699. CCSA encourages the Supervisory Body to consider existent national and regional regulations when defining the approaches to minimise non-permanence risks. Notably, the CO_2 storage legal frameworks mentioned above require operators to have an approved corrective measures plan which must be implemented in case of leakages. Furthermore, operators are required to surrender emission allowances equivalent to leaked emissions. In this context, risk buffers and insurance/guarantees could result in extra obligations on EEA and UK storage operators, as well as have potentially significant implications on revenue streams. It would thus be sensible to consider existent legal frameworks so as to avoid conflicts with existent legislation while keeping the essence of the requirements. [CCSA, 287]

700. We do not see any of these proposed solutions to the problem of impermanence. Non-permanence buffers: tension between economic feasibility and ensuring the buffer is large enough; increasingly difficult to predict the reversibility risk, in particular of land-based carbon sequestration with a fast-changing climate; buffer pools often undercapitalized. [AAI, 289]

5.5.3. E. 2. Discuss the appropriate timeframe(s)

701. *Discuss the appropriate timeframes for applying the approaches, including any interactions with other elements of this guidance and the applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types*.

702. For Non permanence risk tools assessment - it should be done at the time of validation/registration of the project to understand the overall risk associated with that particular project in the next 100 years. It should be updated at every verification and based on the risks analysed at the time of that verification, the amount of credits should be contributed to the buffer. [SP, 313]

703. Insurance mechanism may be added as an extra/complimentary either at the start of project or for that specific monitoring period [SP, 313].

704. Flat deductions happen at the time of issuances, but the percentage must be specified either at the standard level or at that specific methodology. [SP, 313]

705. Insurance for carbon credits can be applied at any point of a sale or investment including after contracting has concluded. However, where insurance is applied it's always better to bring the insurer in earlier rather than later. [Kita, 262]

706. Once again, ZEP would encourage the Supervisory Body to consider existent national and regional regulations when defining these approaches. For example, under the EEA and UK regulatory frameworks mentioned, operators remain liable for leakages and must apply the necessary corrective measure (as set out in the corrective measures plans and by surrendering emission allowances equivalent to any leaked emissions) for the minimum period of 20 years. After this period, responsibilities relating to monitoring and corrective measures are transferred to national competent authorities. [ZEP, 263]

707. Activity types (meaning a specific technology or strategy such as reforestation) should be evaluated for risk assessments before projects can be proposed. The activity risk assessment should be conducted by a third-party expert with stakeholder / right holder consultation and comments. The Supervisory Body will then need to act on the report and decide to approve the activity or not. Then, individual projects should also be submitted to a risk assessment (which should be expected to respond to risks identified in the activity level assessment). This should once again include stakeholder consultation. [AAI, 289]

5.5.4. E. 3. What risks of non-permanence need to be minimized

708. What risks of non-permanence need to be minimized, and how can these risks have identified, assessed, and minimized and how can these risks identified, assessed, and minimized?

709. Removals with a relatively greater risk of reversal such as those not involving geological storage of CO_2 should be subject to appropriate requirements for collateral, such as through a buffer. These risks should be identified and assessed through a non-permanence risk assessment prior to project implementation. Periodic reassessment of the risk of reversal may be necessary for these removals activities to ensure that appropriate mitigation is in place. For removals activities involving geological storage, the risk of non-permanence is negligible. A non-permanence risk assessment should still apply, but periodic reassessment of the risk of reversal would not be necessary in light of the negligible scientific risk. [DG, 271]

710. The monitoring of some removal activities must cover carbon capture, transport, and storage/utilization. Reversals can occur during all steps of the respective value chain (depending on the capture method). Monitoring methodologies should cover all steps of the value-chain, and enable different combinations of capture, transport, storage and utilization modules. Monitoring equipment and methods to quantify both captured and re-

released CO_2 are described in detail in the CCS+ Initiative´s methodologies, tools, and modules. The CCS+ initiative draws on Verra's Non-Permanence Risk Tool for assessing the risks associated with geological carbon storage of a storage site and for determining the appropriate buffer withholding to ensure the permanence of credited emissions reductions and removals. [CCSI, 233]

711. All risks of non-permanence need to be minimized, as they shall be “addressed in full” based on Decision 3/CMA.3. Therefore, they should be identified upfront to the extent possible, or immediately assessed and minimized (in full?) upon occurrence. [CWORKS, 302]

712. Physical non-permanence: Stronger scientific consensus around dissolution rates at sea and on land is needed (for enhanced rock weathering and ocean alkalinity enhancement). This needs to be supported by robust MRV practices. [BEZERO, 304]

713. Non-permanence risks in general can be minimised through contractual permanence measures: commitment periods for projects need to be in human relevant timeframes, combination of modelling and field testing in MRV (e.g. for enhanced rock weathering, digital modelling could be twinned with practices such as soil, water and gas sampling). [BEZERO, 304]

714. Non-permanence risks differ for different types of mitigation activities. The CCQI methodology, for example, identifies the following overview of relative reversal risks for different types of mitigation activities:

Mitigation activity	Non-permanence risk	Example activities
Destruction of non-CO_2 gases	No risk: No reservoir involved. The destruction cannot be physically reversed.	HFC-23 destruction from HCFC-22 production
Avoidance of formation of non-CO_2 gases, without effecting the amount of carbon stored in reservoirs	No risk: No reservoir involved. The process cannot be physically reversed.	Reducing CH_4 emissions from rice cultivation, ruminant livestock or organic waste diversion
Reducing demand for fossil fuels	No material risk within time horizon relevant for avoiding dangerous climate change (except for possible lock-in effects in the case of activities that lead to a long-term increase in energy or feedstock demand).[1]	Adoption of renewable energy; energy efficiency measures
Reducing demand for non-renewable biomass (thereby reducing forest degradation)	Material risks: natural disturbance risks and anthropogenic factors.	Efficient cook stove projects
Enhancing, preserving, or slowing depletion of terrestrial carbon reservoirs	Material risks: The size of the risk depends on spatial scale, how underlying drivers are addressed, and stability of the reservoir(s) affected by the mitigation activity.	Afforestation/reforestation; improved forest management; avoided deforestation/conversion; soil carbon enhancements; peatland preservation or "rewetting"; etc.
Storing carbon in geologic reservoirs	Material risks: The size of the risks mainly depends on reservoir stability.	Carbon capture and storage (CCS BECCS, DACCS, or other)
Preventing or extinguishing accidental uncontrolled burning of fossil fuels	Material risks: The size of the risks mainly depends on reservoir stability.	Extinguishing or preventing ignition of fires at waste coal piles

715. Determining and mitigating risks for individual mitigation activities requires an assessment of activity-specific circumstances, along with tailored mitigation solutions. Multiple independent carbon crediting programs have developed methodologies for conducting these assessments. [OI, 285]

716. Non-permanence risks of all kinds can be identified, assessed, and minimized via insurance products. [Kita, 262]

717. Non permanence risk would differ based on the project activity. E.g. for forestry, drought could be a great risk, however for CO_2 stored in concrete, drought, exposure to fire and other natural (biotic/abiotic factors) may not be that relevant. [SP, 313]

718. The non-permanence tool (specific for NBS and other for geological sequestration) must identify relevant reversal risk at the tool level, however, these risks must be valuated at the project level, as risk and subsequent relevance maybe different for same project type but other different scenarios. E.g. a forestry project near the coastline may face risk of sea level rise during its project period, however, this may not be a risk for a forestry project near mountains. [SP, 313]

719. The terms of the buffer pools must be clear, in the case the permanence is for 100, 200 or 300 years. And if the buffer pool can be claimed at different stages if no reversals had happened [SP, 313]

720. When evaluating an activity type, any major risk of non-permanence should be disqualifying. Carbon markets are not the only means of climate action, nor should they be a main one. Any activity type that does not qualify due to possible impermanence can still be pursued, but not via a market mechanism where an offset will be sold. This should be a major point of consideration for both activity type and project approval. [AAI, 289]

721. When evaluating an activity type, any major risk of non-permanence should be disqualifying. Carbon markets are not the only means of climate action, nor should they be a main one. Any activity type that does not qualify due to possible impermanence can still be pursued, but not via a market mechanism where an offset will be sold. This should be a major point of consideration for both activity type and project approval. [CLARA, 216]

722. General risk factors include financial failure, technical failure, management failure, rising land opportunity costs, regulatory and social instability, and natural disturbances. Project-specific risk factors vary by project type. [ASPI, 330]

723. Risk assessments must be conducted in advance of the project's registration and be included in the PDD and the Monitoring Plan. The risk analysis should be revisited at regular intervals (5 years) except in the case of a reversal event in which case the risk category and Minimum Buffer Contribution shall be immediately re-assessed and re-verified. [ASPI, 330]

724. The activity proponent is responsible for carrying out the risk assessment and a VVB must assess whether it has been conducted correctly. [ASPI, 330]

725. During the project design process, project developers and technical consultants evaluate the different risks the project faces throughout its lifetime. These risks can include natural risks, financial risks, socio-political risks, and other external risks. Once these risks are identified, the project will design and implement mitigation measures to minimize the potential impacts of these risks. For nature-based carbon sequestration projects, these risks inform a calculated risk profile for the project and assign a percentage of credits to go to the buffer pool maintained by the carbon standard (i.e. carbon credit issuer/registry). If there is damage to the project, the standard can use the credits in the buffer pool to make up for the difference. We'll then work with the project partner to determine the appropriate steps to take to restore the project or identify mitigation mechanisms for any future risks. [ASPI, 330]

5.5.5. E.4. Level of risk assessment

726. *In respect of risk assessment, how should the following elements be considered in the implementation of the approaches in (a) and any other relevant elements in this guidance?*

5.5.5.1. E. 4. a. Level of non-permanence risk assessment, e.g. activity- or mechanism-level

727. Activity level. [CWORKS, 302]

728. Level of non-permanence risk assessment would depend on the removal project type. The one with non-permanence risk tool, risk assessment should be a project level. As each project is unique on its own. [SP, 313]

729. Regarding the use of insurance, risk assessments should be done at the activity level and at least annually. Completion of the risk assessment(s) is the responsibility of the insurer. [Kita, 262]

730. Activity types should be evaluated for risks and then there should be a second project specific assessment. Both assessments should be conducted by independent, third-party analysts with input from stakeholders, before decisions are made by the Supervisory Body. [CLARA, 316]

731. The level of non-permanence risk assessment should be activity-specific, as different activities will have different reversal risk profiles and require different monitoring tools. The identification of risks should take place prior to certification/accreditation and be updated regularly. Activity proponents should be responsible for risk assessment, subject to the approval of competent authorities. [ZEP, 263]

732. Ultimately, however, what matters for insuring against (unintentional) reversal risk is whether reserves are sufficiently capitalized across the entire mechanism. Any buffer reserve should be regularly stress-tested to evaluate its potential to withstand systemic reversal risks. Where potential shortfalls are identified, activity-level risk assessments and buffer contributions should be adjusted accordingly. [OI, 285]

733. Activity types should be evaluated for risks and then there should be a second project specific assessment. Both assessments should be conducted by independent, third-party analysts with input from stakeholders, before decisions are made by the Supervisory Body. [AAI, 289]

5.5.5.2. E.4. b. Timing for risk assessment(s)

734. i) Upfront; ii) in case of a reversal event; and iii) upon each renewal of the crediting period. [CWORKS, 302]

735. At the time of validation/registration, repeated at every verification. [SP, 313]

736. Activity type risk assessments should be conducted before projects of that type can be proposed, so the Supervisory body may make a decision on if that type of activity is eligible. Specific project risk assessment should be evaluated before any work begins and before the credits are sold. [CLARA, 316]

737. At the activity level, risks should be assessed at the time an activity is registered and be re-evaluated periodically over time (e.g. at each credit issuance, or every five years). System- or mechanism-level stress tests should be conducted at a minimum every five years (e.g. in line with NDC cycles). [OI, 285]

738. Activity type risk assessments should be conducted before projects of that type can be proposed, so the Supervisory body may make a decision on if that type of activity is eligible. Specific project risk assessment should be evaluated before any work begins and before the credits are sold. [AAI, 289]

5.5.5.3. E.4.c. Entity(ies) responsible for risk assessment(s), e.g. activity proponent, 6.4SB, actuary

739. Non permanence risk assessments should focus on scientifically substantiated risks owing to the given technology of the project and its CO_2 storage. They should be: conducted at mechanism level and assessed prior to initiation of the project in a scientifically robust manner. Geological storage has a range of supporting scientific literature assessing the risk of reversal of a variety of CO_2 reservoirs. The Supervisory Body should consider how these may be taken into account in assessing non-permanence under this element.

740. The 6.4SB is encouraged to define activity specific risk assessments included within methodologies. Activity proponents should thereby become required to undergo the risk assessment in case they want to be issuing A6.4ER. [CWORKS, 302]

741. Development of requirements, RMP 6.4, conducting risk assessment - activity proponent, DOE - evaluation of risk assessment at the time of validation/verification. For insurance - actuary - should be backed by reinsurer. [SP, 313]

742. The risk assessment must be conducted by an independent third-party entity that is not answerable to the activity or project proponent. Furthermore, the risk assessment must be made public. [CLARA, 316]

743. As indicated in the CCQI methodology, best practice would be for activity proponents to conduct activity-level risk assessments in line with methodological guidelines provided by the Article 6.4 SB. These assessments, however, should verified by independent validation and verification bodies. Mechanism-level stress tests could be conducted by the A6.4 SB in collaboration with qualified independent risk experts. [OI, 285]

744. The level of non-permanence risk assessment should be activity-specific, as different activities will have different reversal risk profiles and require different monitoring tools. The identification of risks should take place prior to certification/accreditation and be updated regularly. Activity proponents should be responsible for risk assessment, subject to the approval of competent authorities. [CCSA, 287]

745. The risk assessment must be conducted by an independent third-party entity that is not answerable to the activity or project proponent. Furthermore, the risk assessment must be made public. [AAI, 289]

5.5.6. Buffer pools

746. *How should the following elements be considered in the implementation of the approaches in (1) above and any other relevant elements in this guidance?*

5.5.6.1. 5.a. Methods for determining the level of buffer pool contributions

747. The CCS+ initiative draws on Verra’s Non-Permanence Risk Tool for assessing the risks associated with geological carbon storage of a storage site and for determining the appropriate buffer withholding to ensure the permanence of credited emissions reductions and removals. [CCSI, 233]

748. Methods should science based and allowing for periodic updates. [CWORKS, 302]

749. Some standards currently allow those projects which are insured to have lower buffer contributions. If insurance becomes more widely adopted, it could play a part in increasing market liquidity. [Kita, 262]

750. Buffer pool contribution by each project must be based on the individual risk assessment. Level of contribution can be achieved by the risk scoring methods - e.g, those adopted by VCS, ACR, GS, etc. [SP, 313]

751. The buffer pool contributions should be based on the outcome from an activity-specific risk assessment. It is important that the buffer pool contribution takes into account future climate change and provides a very high level of assurance that reversals can be compensated for. We recommend that a minimum contribution applies to all activities with material reversal risk and that higher contributions are required from activities with higher reversal risks. Activities with high reversal risk should be excluded from eligibility. [OI, 285]

5.5.6.2. 5.b. Composition of buffer pool

752. *5.b. Composition of buffer pool, including in relation to ER vintages and contributing activity types or categories.*

753. Buffer pools should be designed activity specific. [CWORKS, 302]

754. Buffer pool contribution should be deducted from the net issuance possible. ERs being contributed to buffer pool, should not have serial number. NBS buffer pool could have contribution from forestry, agriculture and other land use projects (including mangroves, seagrass, etc). CCS buffer - to have contribution from BECCS, DACCS. Vintage contributed would be the same as that of issuance- equally divided. [SP, 313]

755. The buffer pool should be as diverse as possible. However, this will be determined by the location and type of mitigation activities being registered under the Article 6.4 mechanism, which is beyond the control of the Supervisory Body. We therefore believe that contributions to the buffer pool should be adjusted over time, based on regular stress tests of the buffer pool, which should consider the diversity of activities and mitigation activity locations contributing to the buffer. [OI, 285]

5.5.6.3. 5.c. Intentional and unintentional reversals

756. The atmosphere doesn’t care if it is intentional or unintentional. [CWORKS, 302]

757. 5c. Intentional reversals should be compensated for by the entity that initiated the reversal. [Kita, 262]

758. We recommend following an approach that assigns an enforceable, primary liability for intentional reversals to mitigation activity proponents. Unintentional reversals may be compensated through a robust buffer reserve (or other insurance) mechanism. Note that any discontinuation of monitoring prior to the end of an activity’s commitment period should be treated as an intentional reversal. [OI, 285]

5.5.6.4. 5.d. Treatment of uncancelled buffer ERs

759. *5.d. Treatment of uncancelled buffer ERs, including after the end of the last crediting period of the contributing activity.*

760. Uncancelled units in any buffer following the end of the last crediting period of a project should be made utilisable for transfer by the project proponent, subject to any post-project monitoring period applied commensurate with the level of the risk of reversal. [DG, 271]

761. Should be made refundable to award project proponents and incentivize safe operations. [CWORKS, 302]

762. For geologically sequestered removal projects, the American Carbon Registry accounts for reversals after the end crediting period: 'Reversals post-Project Term are compensated as outlined in the legally binding Risk Mitigation Covenant, filed in the real property records of each county, parish, and other governmental subdivision that maintains real property records, which prohibits any intentional reversal unless there is advance compensation to ACR.' Just as a nuclear plant has a decommissioning fund, buffers could have a similar structure whereby an organization, such as a charity, takes on responsibility of said fund and the management of the remaining buffer pool credits. [Kita, 262]

763. One way to treat them is to cancel the buffer at the end of crediting period to compensate for any future reversals that may happen. However, with this approach, it is not sure if and how much reversal would happen after crediting. Another approach could be that buffer could be allocated back to the activity proponent over the years if they continue the monitoring of the project and the project does not have any reversals. The latter might be the preferred one as it would incentivise the proponent beyond the just the rules to continue monitoring. [SP, 313]

764. Note that it is essential for integrity that required periods for monitoring and compensation of reversals ("commitment periods") extend beyond the end of the last crediting period for an activity. This is the approach followed under California's regulatory carbon offset program, for example, as well as other programs. Best practice would be to cancel all buffer credits at the end of the required commitment period, in order to compensate for any reversals that might occur beyond the commitment period. If the carbon credits in the buffer pool were not cancelled but instead were used to compensate for reversals from other mitigation activities, the approach would effectively not compensate for any reversals beyond the commitment period time horizon for monitoring and compensating for reversals. [OI, 285]

5.5.6.5. 5.e. Specifications for ERs cancelled for compensation for reversals

765. Specifications for ERs that cancelled for compensate for reversals, including in relation to ER vintages and contributing activity types or categories.

766. We welcome considerations of clear differentiations between reductions and removals, noting the different (but complementary) roles the two mitigation approaches have to fulfil. Therefore, separate accounting of reductions and removals is encouraged. Following this logic, Climeworks encourages not to mix buffer contributions from reductions and removal activities. [CWORKS, 302]

767. The ERs cancelled should be in the chronologically order of vintages i.e, older vintages should be cancelled. [SP, 313]

768. Kita agrees ERs cancelled for reversal compensation should be tagged as such in a registry. To help increase transparency, it would also be relevant for the registry to provide specific information as to what reversal the cancelled ERs apply to such as:

(a) Project;

(b) Reversal event and if it was intentional or unintentional;

(c) Size of the reversal event;

(d) Date of the reversal event. [Kita, 262]

769. In general, there is no need to match the vintages of buffer credits with reversed tonnes of mitigation. However, a diverse mix of credits (vintage, activity type, category, geography, etc.) contributed to the buffer reserve can help to ensure the robustness of the reserve (e.g. with respect to the potential reversal of the buffer credits themselves). [OI, 285]

5.5.6.6. 5.f. Replenishment in case buffer cancellations exceed contributions

770. 5.f. Replenishment in case buffer cancellations exceed contributions; slide language on re-raising baseline level of storge before new crediting.

771. In case of a reversal, where the buffer contribution of the specific project exceeds the reversal occurred, the buffer can be replenished in two ways: Transferring any remaining ERs in the activity proponent account to the buffer; and proponent buying additional ERs from the market (preferably of the same activity or the category) to compensate for additional ERs cancelled to compensate for reversals. [SP, 313]

772. Insurance could play a role if buffer cancellations exceed contributions by managing downside risk of unexpected failure (where actual losses are higher than those modelled). [Kita, 262]

773. It is typically not an issue if buffer cancellations for an activity’s reversals exceed that activity’s contributions – that is how insurance mechanisms are designed to work. This is because, ideally, not every activity contributing to the buffer will experience significant reversals. A well-designed, pooled buffer reserve should be able to compensate for large activity-scale (not systemic) reversals when they occur. While in some cases it may be justifiable to adjust an activity’s baseline after a large reversal. However, this can pose integrity risks if not approached conservatively. Best practice would be to disallow baseline adjustments after a reversal or only to allow the baseline to be adjusted to a lower level. [OI, 285]

5.5.7. Implications of a reversal

774. *6. In the event of a reversal, what interactions and implementation aspects should be considered in respect of other elements of the activity cycle?*

775. Buffer contributions should not apply to projects with >99% chance CO_2 remaining after >125 years, such as those with geological storage. Where they do apply, buffer contributions should be determined by a scientifically substantiated level of risk of reversal. To aid buyer certainty, intentional reversals may need to be addressed or compensated in a different manner to unintentional reversals, potentially one which increases the scope for remediation. [DG, 271]

776. For activities involving geological sequestration, the Article 6.4 mechanism should seek alignment with national requirements for the permitting of injections. Relevant legislations are, e.g. in place in the US (EPA UIC class VI wells) or Europe (CCS Directive) [CWORKS, 302].

777. In the event of reversal, ER credits must be cancelled, up to the amount of the net reversal, and the necessary adjustments must be made in national registries. [ZEP, 263]

778. Reversals should be evaluated each time, in order to determine if the risk assessment for the project or the activity type missed important information. A report which includes ‘lessons learned’ should be developed for each instance and be made available to the Supervisory Body and ultimately made public. Should a majority of the activity types for removals result in reversals at any given point, extra scrutiny should be applied in project risk assessments. If this is the case for five years in a row, the activity should lose its eligibility to generate credits. A new risk assessment could be conducted but only after a period of time (such as five years) to allow understanding, strategies and or the technology to further evolve. [CLARA, 316]

779. Best practice would be to cease credit issuance until the reversal has been remedied and compensated for. [OI, 285]

780. Reversals should be evaluated each time in order to determine if the risk assessment for the project or the activity type missed important information. A report which includes ‘lessons learned’ should be developed for each instance and be made available to the Supervisory Body and ultimately made public. Should a majority of the activity types for removals result in reversals at any given point, extra scrutiny should be applied in project risk assessments. If this is the case for five years in a row, the activity should lose its eligibility to generate credits. A new risk assessment could be conducted but only after a period of time (such as five years) to allow understanding, strategies and or the technology to further evolve. [AAI, 289]

5.6. F Avoidance of Leakage:

781. *Discuss any further considerations to be given to the core elements for leakage avoidance in A6.4-SB003-A03; where possible, identifying the applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types.*

782. The guidance to avoid leakage or otherwise adjust for it in the level of net removals should apply to all removals activities. Any estimations of leakage should be based on scientifically substantiated modelling. [DG, 271]

783. As mentioned in Microsoft’s submission to the March 16th call for input, Microsoft suggests stronger inclusion of leakage considerations related to nature-based credits. Sufficiently accounting for activity and market leakage within, and beyond, the jurisdictional boundary of the project scope is required to meet Microsoft’s criteria for high-quality carbon removal. The most robust way to address leakage is for project developers to work with other producers to replace the supply displaced by the project (e.g. cattle, wood, etc.). [MS, 234]

784. Leakage is counter-factual and very uncertain and difficult to ascertain. Modern methodologies should as far as possibly avoid counterfactual assessments and instead base themselves on factual outcomes. Here leakage is interpreted as indirect emissions

outside the project boundary. Methodologies should avoid counterfactual assessments and instead base themselves on factual outcomes. [SE, 244]

785. Since all Leakage will be appearing in nations' emissions reporting, it is suggested that a new approach to Leakage is applied. The approach is to:

(a) Account for Land Use Change and Indirect Land Use Change Leakage beyond the baseline of the project;

(b) Not to account for other leakage if it can be established that the territory(-ies) where the leakage is likely to occur has/have a reduction trajectory for the emissions, for instance in relation to possible leakage due to electrical usage. [SE, 244]

786. Strictly speaking, a binding reduction trajectory sets the net total amount of CO_2 emissions allowed with or without the project, and it could in this case be argued that the notion of Leakage loses its meaning. [SE, 244]

787. Define activity shifting leakage discounts for all activities under the 6.4 mechanism. For jurisdictional approaches, market leakage should be considered. Market leakage refers to an increase in GHG emissions resulting from the change in supply and demand equilibrium outside the program's jurisdiction (for example a country). This type of leakage is extremely challenging to track and account for. [SYRA, 305]

788. All types of leakage should be considered, measured, and addressed under the article 6.4 mechanism. This includes activity-shifting leakage and market leakage and should not be limited to domestic leakage. [CMW, 308]

789. IETA highlights the importance of clearly defining leakage while noting how the term "carbon leakage" is used to indicate two distinct phenomena in carbon markets:

(a) The relocation of emission-intensive trade exposed (EITE) activities from jurisdictions with a higher cost of carbon to jurisdictions with a lower one;

(b) An increase in emissions outside the boundary of an emission reduction or removal activity as a result of activity implementation (e.g. indirect land use change arising from the afforestation of agricultural land, which may lead to the clearance of other forested land outside of the activity boundary for agricultural purposes).

790. IETA considers that a thorough leakage risk assessment and/or other tools and methods can be employed ex ante to assess the impact of an activity in respect of potential sources and the scale of leakage risks (e.g. environmental and social safeguards, national and regional laws and regulations on land development and land covenants; lifecycle assessment). Secondly, methodological design is critical. For instance, methodologies for land-based removals must not allow for the opting in and out of specific land parcels over the course of a project activity, especially where jurisdictional approaches are allowed. Rather, project boundaries and participating entities should remain fixed throughout the crediting and monitoring periods. IETA also notes that the use of standardised adjustment factors has been discussed as a simplified method to account for leakage. While IETA recommends that leakage be assessed at the project level using project-specific information, in the case that adjustment factors are used, any standardised leakage measure should include periodic verification of historic leakage post implementation of projects to ensure a high level of environmental integrity of projects. [ITEA, 3011]

791. In addition to use of jurisdictional level programmes, cross-boundary leakage risks need to be considered. [CA, 312]

792. It is essential that the mechanism establishes an appropriate allocation of liabilities for all types of carbon removal activities. [ZEP, 263]

793. Regarding SB005-A02 section 2E &F, reversals and leakage are briefly discussed above and are easily mitigated against because sequestration is within a solid, accessible material, above ground. It's worth contemplating that sequestration in solid, elemental carbon is a potentially viable and more rapidly scalable alternative to geologic sequestration. Cost could ultimately become a non-issue because the solid carbon can be used as a feedstock for a high-value product (battery-grade-graphite) that simultaneously sequesters carbon. A financial mechanism that cannot be leveraged if you sequester the carbon deep underground. [RC, 266]

794. We believe that this section needs considerably more elaboration. We recommend establishing the following principles:

(a) Methodologies for emission reductions or removals shall consider all potential sources of leakage associated with the type of mitigation activity and not limit the consideration to a particular boundary (i.e. not be limited to national boundaries);

(b) All material sources of leakage shall be included in the quantification of emission reductions or removals, except where the omission of leakage sources is conservative;

(c) The consideration of leakage sources shall include, where relevant: upstream or downstream emissions; emission increases due to direct or indirect shifting of activities, services or products; and ecological leakage (e.g. mitigation activities affecting emissions in nearby areas that are hydrologically connected);

(d) Methodologies shall establish requirements to minimize any material sources of leakage (e.g. through requirements that avoid leakage);

(e) Any material remaining leakage shall be estimated and deducted in the quantification of emission reductions or removals;

(f) The estimation of leakage emissions shall be robust and conservative in light of the uncertainties, taking into account the choice of assumptions, models, parameters, data sources, measurement methods, and other factors. [OI, 285]

795. Carbon leakage has two definitions: (1) it can refer to the relocation of emission-intensive activities from jurisdictions with a higher cost to emit CO_2 to jurisdictions with a lower cost to emit, and (2) Carbon leakage can also refer to an increase in fossil emissions outside the boundary of the project caused by the project activity itself. We believe that the Article 6.4 Mechanism should be focused on with minimising any potential increase of fossil emission outside the boundary of a project, the second definition of carbon leakage as stated above. [PURO, 322]

796. Avoiding leakage is difficult but steps can be taken to mitigate it. The first key step is careful project design and planning that takes into account potential sources of leakage. This should involve conducting a comprehensive assessment of the local socio-economic and environmental context to understand where leakage may occur. For example, in a reforestation project if you restrict logging in one area loggers may just move to a different

area and resume their activities there. To mitigate this the project design should include initiatives to support sustainable livelihoods and alternative employment to logging. Linked to that is stakeholder engagement. When people understand and benefit from a project, they are more likely to support it and to refrain from activities that could cause leakage. This could go beyond employment opportunities to direct sharing of revenues from sales of carbon credits. Another way to reduce leakage is by implementing projects on a larger scale. These larger scale projects can cover the entire area in which the leakage may occur, making it easier to control or at least quantify. For instance, in REDD+ projects instead of focusing on a single tract of forest the project could cover an entire jurisdiction such as a county or state, making it harder for deforestation activities to simply switch to another area. Policies and regulation have a role to play in creating disincentives for activities that increase emissions. For example, if a DACCS project were to draw significant amounts of power from the grid, government policies that support the deployment of renewables to make up the shortfall can prevent the deployment of fossil fuels to supply that electricity. [ASPI, 330]

797. One method to quantify leakage is to use mathematical models that predict how emissions might change in response to a project. The most accurate method is through direct monitoring and verification. This often involves the use of remote sensing technologies to detect changes in land use beyond the project boundaries that might point to increased emissions. Another approach is to compare emissions in the project area to a control group and any differences in emissions between the project area and the control area could be attributed to leakage. In some cases market effects must be taken into account. Projects that produce goods or stop the production of certain goods can cause leakage if the production of goods shifts to a different area in order to meet market demand. [ASPI, 330]

5.7. G. Avoidance of other negative environmental, social impacts

798. *Discuss considerations to be given to core elements for avoidance of other negative environmental, social impacts; where possible, identifying the applicable scope, i.e. relevance to all 6.4 mechanism activities, to removals activities, or to specific removal activity categories or types.*

799. CDRs should be (a) scientifically (not just theoretically) proven to be effective; (b) Based on thorough research prior to any ocean ecosystem trials. …(c) have a biodiversity net gain (but …no negative impact on relevant ecosystems…); (d) Have robust key checks and balances in place to ensure that any potential change to the marine environment is detectable when ocean trials go ahead. [SRT,202]

800. … it is not sufficient to “minimize and where possible avoid” adverse human rights impacts. They should not be accepted at all. … more specific guidance is needed …. refer to the global authoritative standard on business and human rights: UN Guiding Principles on Business and Human Rights (UNGP)... the carbon-crediting activities should be required to have in place: 1) A policy commitment to meet their responsibility to respect human rights; 2) A human rights due diligence process to identify, prevent, mitigate and account for how they address their impacts on human rights; 3) Processes to enable the remediation of any adverse human rights impacts they cause or to which they contribute. … take note of the … wording by the Nordic Code developed under the Nordic Dialogue. …[FNW,208]

801. …….A method-neutral, criteria-based Article 6.4 mechanism should absolutely include strong guardrails for equity, ecosystem safety, and environmental justice, but should not preclude individual carbon removal pathways, or deployment in specific geographies…..[OAIR, 210]][CBC, 211]

802. For activities involving geological sequestration, the Article 6.4 mechanism should seek alignment with the CDM decision on CCS activities made in Durban 2011. [CWORKS, 302]

803. When applicable, mandate consultations with local stakeholders; establish safeguards, and adapt them to the project type. Some project types have an especially high risk of resulting in negative impacts; consider existing international frameworks, such as the Cancun Safeguards for REDD+; establish requirements that go beyond safeguards, such as monitoring and reporting of co-benefits and benefit-sharing plans. [SYRA, 305]

804. Climate change has and will continue to impact communities differently. Microsoft believes carbon removal projects should exceed the “do no harm” principle and actively advance economic and social development as well as other non-carbon benefits. Microsoft prioritizes projects that provide more than just carbon removal, such as advancing sustainable livelihoods, environmental justice, climate resilience and biodiversity. At a minimum, in order to avoid negative social impacts, local communities must have free prior and informed consent related to any market activities or Article 6.4 Emission Reductions (A6.4ERs) produced within their territories. Going beyond the minimum of doing no harm, local communities should economically benefit from the production of A6.4ERs through revenue sharing. A6.4ERs should ideally be produced in a manner that advances procedural justice (fairness in decision making) as well as distributive justice (equitable allocation of project risks, benefits and impacts). 5Stakeholder engagement must occur throughout the duration of the project lifetime. [MS, 234]

805. Responsible and equitable deployment of CDR can help to achieve our climate goals while also delivering co-benefits to ecosystems and communities. As noted in the Carbon Business Council’s May 24, 2023, letter to the SB, we strongly dispute the notion that CDR is incompatible with sustainable development, and not to be deployed in developing countries. On the contrary, responsibly deployed CDR can serve as an engine for sustainable and equitable development worldwide, and we would be pleased to connect the SB with CDR companies and projects already hard at work in the Global South, including in least developed countries and small island developing states. A method-neutral, criteria-based Article 6.4 mechanism should include strong guardrails for equity, ecosystem safety, and environmental justice, but should not preclude individual carbon removal pathways or deployment in specific geographies. [NPBC, 253]

806. …it is important to identify and assess the potential environmental and social impacts associated with removal activities. This includes considering the direct and indirect effects on ecosystems, biodiversity, water resources, air quality, land use, and local communities. The scope of these considerations should encompass all 6.4 mechanism activities to maintain consistency and coherence in the implementation of avoidance measures. To effectively avoid negative environmental and social impacts, it is essential to establish clear guidelines and safeguards. These may include conducting environmental and social impact assessments, implementing mitigation measures, and promoting the participation of local communities and indigenous peoples in decision-making processes. Additionally, mechanisms for grievance redressal and monitoring of impacts should be incorporated to ensure accountability and transparency throughout the project lifecycle. Furthermore,

specific attention should be given to identifying and addressing potential disproportionate impacts on vulnerable groups, including marginalized communities and indigenous peoples. Adequate measures should be implemented to safeguard their rights, traditional knowledge, and livelihoods, and to prevent any potential harm resulting from removal activities. [PACHA, 306]

807. Considering the diverse range of removal activity categories or types, it is essential to tailor the avoidance measures accordingly. Different activities may present unique challenges and require specific considerations to mitigate their environmental and social impacts effectively. Therefore, it is important to analyze the characteristics and potential risks associated with each removal activity category or type and develop appropriate mitigation strategies accordingly. The avoidance of other negative environmental and social impacts should be a fundamental aspect of activities involving removals. By integrating robust environmental and social safeguards, conducting impact assessments, promoting stakeholder engagement, and addressing the specificities of different removal activity categories or types, the mechanism can ensure that removal activities contribute to sustainable development while minimizing any adverse consequences. [PACHA, 306]

808. Experience can be drawn from the COP decisions on REDD+, specifically the Cancun Safeguards and from international REDD+ programs. The Cancun Safeguards are a precedent under the United Nations Framework Convention on Climate Change (UNFCCC), therefore these should be used as a starting point and Article 6.4 mechanism safeguards must not fall below this standard. [CI, 307]

809. The prior consideration and avoidance of negative environmental or social impacts of any types of projects under Article 6.4 is of utmost importance for the trust and integrity of the mechanism and its contribution to sustainable development. Social safeguard provisions should be ensured through both:

(a) Ex-ante consultations; and

(b) Ex post mechanisms to report and address any grievances. [IETA, 311]

810. Whilst acknowledging that the enforcement of environmental and social protection laws is a national prerogative of the host Party, it is important to ensure that all activities under the Article 6.4 Mechanism are aligned with internationally agreed conventions and principles on environmental and social considerations, including the free, prior, and informed consent (FPIC) of Indigenous Peoples and local communities. If a country or region does not have specific guidelines or processes, an impact evaluation before project initiation may be a feasible option. Such evaluation should be verified by a third-party assessor and may lead to the modification or rejection of the project. As agreed by the SB at its latest meeting (SB005), all projects should undergo a mandatory sustainable development assessment. This applies to all projects under the Article 6.4 mechanism, including activities involving removals. For each project, depending on the scale, location and activity type, there may be specific additional concerns which has to be considered at the activity level. [IETA, 311]

811. Under the CDM, additional environmental and social safeguards were adopted in the modalities and procedures for both afforestation/reforestation and geostorage activities. In these respects, IETA urges the SB to review these previous requirements and consider, inter alia: whether they can be adopted for use under the 6.4 mechanism, whether any

additions or omissions are necessary, and whether the same conditions could be applied to all types of removal activities:

(a) Whether they are suitable for use today under the 6.4 mechanism;

(b) Whether any other additions or omissions are necessary; and

(c) Whether the same conditions could be applied to all types of removal activities. The establishment of an independent and well-defined grievance and appeals mechanism as mandated by the RMP will further strengthen the environmental and social integrity of the mechanism. This should remain accessible, transparent, robust and with clearly defined scope to do no harm. Design considerations of such a grievance mechanism have been further elaborated in numerous previous submissions. [IETA, 311]

812. The potential for negative environmental and social impacts needs to be addressed at the mechanism and project levels. There is a need for broad stakeholder consultations during the project development stage and a grievance process should be established before the Article 6.4 mechanism is up and running. [CA, 312]

813. In order to ensure that all 6.4 mechanism activities are sustainable and have a positive impact on both the environment and society, it is crucial to develop and implement environmental and social safeguard approaches. By doing so, potential risks and negative effects stemming from these activities can be minimized. Additionally, a majority of carbon removal projects require consultation with local stakeholders prior to approval and the establishment of grievance mechanisms to address any issues that may arise following the project's implementation. In order to avoid the negative environmental and social impacts of 6.4 mechanism activities stepwise approach need to be followed.

(a) Who need to conduct Environmental and Social Risk Assessment for 6.4 mechanism activities?

  (i) The environmental and social screening serves as a preliminary measure in the environmental and social due diligence process carried out by accredited organizations;

(b) When to conduct Environmental and Social Risk Assessment for 6.4 mechanism activities?

  (i) This screening takes place at the very beginning of proposal development, specifically during the Concept Note creation. As a result of the screening, it may be necessary to explore alternative options, such as varying methodologies, schedules, scopes, or locations;

(c) Which type of 6.4 mechanism activities require Environmental and Social Risk Assessment?

  (i) An environmental screening must be completed for all activities proposed for all 6.4 mechanism activities. [ETS, 261]

814. All activities under 6.4 mechanism must be conducted in accordance with respect for and protection of human rights, especially the rights of indigenous peoples, the rights of local communities and the rights of women. All activities must comply with international law and standards. Credits under this mechanism must not be allowed to be generated by activities

that have negative environmental and social impacts, especially those that have caused a rights violation. To implement this, there must be meaningful public participation and consultation with rights holders before a project is approved and throughout the life of the project. This should include complying with indigenous peoples' right to free, prior and informed consent. As part of the project approval process, if a project is impacting indigenous peoples' territory, the tribal government must have given permission after a meaningful stakeholder consultation and risk assessment. Removal credits issued under the Paris Agreement should not be generated from activities that have negative environmental and social impacts. It is also essential that an independent grievance mechanism is in place prior to any article 6.4 mechanism activities taking place, to help provide a remedy if those risks that are not avoided and harm occurs. For this grievance process to be effective, the 6.4 independent grievance redress mechanism must be aligned with the UN Guiding Principles on Business and Human Rights effectiveness criteria, including that it be legitimate, accessible, equitable, transparent, predictable, rights-based, and a source of continuous learning. [CLARA, 316]

815. BBB produces biochar tailored for high quality GGR and integration into dairy farms. The biochar is designed to be added to slurry, farmyard manure (FYM), or bedding which is then cleared and added to FYM. Routine application of biochar at a low dose (200 kg-1000 kg ha-1 yr-1) within existing farming practices and the current regulatory landscape allows for the valorisation of high-value benefits including:

(a) Rapidly build soil carbon;

(b) Improve nutrient cycling in soil;

(c) Promote root and mycorrhizal development;

(d) Increase soil plant available water and macronutrients;

(e) Enhance crop resilience to climate-related stress;

(f) Boost crop productivity;

(g) Reduce emissions and nutrient leaching from stored manure;

(h) Elevate nutrient content of organic fertiliser;

(i) Suppress bacteria in livestock bedding;

(j) Works as a sorbent/desiccant in bedding.

816. The social impacts of using biochar as a GGR are clear. To name a few, biochar helps the world meet its Net Zero targets in a cost-effective manner; reduces harmful pollutants from the agricultural sector e.g. by reducing ammonia emissions from dairy farms; provides new jobs to citizens; and diversifies our energy landscape, transitioning industrial sites away from fossil fuels. [BBB 264]

817. Regarding SB005-A02 section 2G, because the end use case is within an industry (stationary storage batteries) that already includes feedstock graphite produced thru an environmentally unfriendly process, any transition toward a battery use case will be a social and environmental improvement. Battery production will be performed within areas already deemed as appropriate for industrial activities as designated by local planning and zoning authorities – helping ensure facilities don't locate near residential neighbourhoods.

A carbon negative manufacturing process and a carbon negative product will both be promoted. Additionality is ensured because no carbon-negative graphite is currently being used within the stationary storage battery industry. Carbon-negative graphite within batteries should be considered as a co-benefit in that reducing humanity's reliance on fossil fuels means a transition to more renewable sources of energy, in combination with batteries, which can now be partially made out of carbon-negative materials. In the short term, bio-graphite derived from waste biomass will be considered as a potential feedstock. As a long-term solution, this could pose resource competition concerns. However, as soon as economically feasible, the intention is to move to a DAC + conversion processes that does not require waste biomass. Meaning resource competition concerns are limited to the scaling of facilities that make batteries. Battery manufacturing is an endeavour the world currently can't build fast enough. Developing a dual carbon battery architecture that ensures a high carbon concentration per volume translates to less land area being needed for sequestration (taking up the same land area being used for current stationary battery storage installations). Securing sufficient feedstock carbon means the potential to easily sequester GT's of CO_2-e, annually, with less than 20% of this emerging and rapidly growing market. The envisioned battery architecture eliminates a reliance on less environmentally friendly metals and ensures a nationally secure, abundant feedstock (atmospheric CO_2) for any country wishing to help develop this technology. I envision no new negative side-effects from the development and scaling of our technology - on ecosystems, biodiversity, people, land, water, energy or food security. I envision no negative impact from waste products as a result of our process. I do envision both job and wealth creation for locals that embrace our approach - either in aiding the manufacture of our batteries or in deploying them. [RC, 266]

818. Depending on the circumstances, jurisdiction, or activity type, the extent to which activities should actively monitor and report on demonstrable social and environmental co-benefits – rather than merely avoiding harms – may also merit consideration. Engineered removals bring about important co-benefits – for example, they can be an important contributor to wider economies of scale for the CCUS industry, helping to de-risk CO_2 networks and thus reducing wider societal costs, notably impacting those industries most reliant on CCS for decarbonising (e.g. cement). [CCSA, 287]

819. Coastal communities are experiencing a rapid decline in the health of the local ocean, riverways and waterways tied directly to the impacts of anthropogenic emissions. Heat, acidification and increased climate volatility are directly impacting livelihoods and economies reliant on working with natural resources, such as fishing and aquaculture. This decline threatens coastal communities and food security. It puts the natural processes that regulate our climate systems at extreme risk of collapse. Without positive interventions including ocean-based carbon removal, the capacity of the ocean to sequester and store atmospheric CO_2 will likely continue to diminish, accelerating the increase in atmospheric CO_2 and the resulting acidification of surface seawater. This "negative baseline" of rapidly declining ocean health provides critical context when considering ocean climate solutions, as there is no solely conservation-focused strategy that provides a realistic pathway towards earning fully maintaining or improving ocean health at a global scale. While conservation and preservation of at-risk areas will be a critical component of combating climate change and maintaining a healthy, productive and biodiverse ocean, taking positive action to restore degraded ecosystems, reverse acidification, and remove excess carbon are necessary to counter the irreversible changes faced by marine ecosystems and to protect against negative environmental and social impacts. Simply put, there is no

path to effectively combating the climate crisis that does not include taking positive action to address ocean acidification and warming. [RT, 288]

820. All activities must comply with international law and standards. Credits under this mechanism must not be allowed to be generated by activities that have negative environmental and social impacts, especially those that have caused a rights violation. To implement this, there must be meaningful public participation and consultation with rights holders before a project is approved and throughout the life of the project. This should include complying with indigenous peoples' right to free, prior and informed consent. As part of the project approval process, if a project is impacting indigenous peoples' territory, the tribal government must have given permission after a meaningful stakeholder consultation and risk assessment. Removal credits issued under the Paris Agreement should not be generated from activities that have negative environmental and social impacts. While the independent grievance redress mechanism will not help avoid negative environmental and social risks, it can play a role in providing remedy if those risks are not avoided and harm occurs. As evidenced by the history of the CDM, market activities can negatively affect people and the environment. Therefore, it is essential that such a mechanism is in place prior to any article 6.4 mechanism activities taking place. [AAI, 289]

821. Impact assessments, both before and after activities commence, can play a key role in ensuring that environmental and social safeguards are being met. The potential for negative impacts will vary depending on the context and unique circumstances of the activities. Post-activity evaluation and reporting can help document issues and increase credit integrity for other crediting efforts in the future, as new best practices and potential pitfalls are identified and shared. Meaningful impact assessments rely on investing in and understanding local environmental and social contexts, particularly of groups whose livelihoods and cultures are deeply intertwined with the landscapes where NCS activities take place. Activities may have wide-ranging impacts that must be taken into account. For example, as it scales, direct air capture will require significant land, energy, and other resources. If deployed at the level most modeling indicates is required, one estimate characterizes direct air capture as responsible for a quarter of global energy demand by 2100, and another suggests it could account for 9-14% of electricity in 2075. The type of energy used to power direct air capture matters too—the environmental calculus is very different if these plants are powered by natural gas than if they are powered by renewable energy. Any activities credited under the Article 6.4 mechanism must adequately monitor, report, and verify the emissions, calculated on a lifecycle basis, associated with the project and adequately mitigate the environmental impacts (including impacts on biodiversity, land use, and air and water quality) associated with the activity. [EDF, 331]

822. Third-party monitoring and/or participatory monitoring are essential as monitoring should not only be done by the entity that proposed or implemented the removal activity or even the buyer of the credits. Participatory monitoring involves engaging with those in the area where the project is taking place (i.e. near the forest being conserved or reforested), for example Indigenous Peoples. Similarly, third-party monitoring involves having independent people, some of whom may be living in the project/activity area, but also experts who can review the activity and verify the claims being made. Both are vital as it avoids relying solely on self-reporting or monitoring only by those who stand to benefit from the activity taking place. This is all the more critical in the face of recent studies that have shown that offset credits are not always what they seem and have not actually done what was claimed. [CIEL, 317]

823. CO_2 Removal Supplier shall be able to demonstrate Environmental and Social Safeguards and that the Production Facility activities do no significant harm to the surrounding natural environment or local communities. This may be done through one or several of the following:

(a) Environmental Impact Assessment (EIA);

(b) Environmental permit;

(c) Other documentation approved by the Issuing Body on the analysis and management of the environmental and social impacts;

(d) When applicable, the Production Facility activities shall be developed with informed consent from local communities and other affected stakeholders and have a policy in place to address potential grievances. [PURO, 322]

824. Before any project is initiated, a comprehensive Environmental, Social Impact Assessment (ESIA) should be conducted. This process identifies potential environmental and social risks and impacts (both positive and negative) associated with a proposed project, and provides a plan to mitigate potential negative impacts. [ASPI, 330]

825. In cases where the project does not go as planned, effective monitoring can help to detect any negative impacts at an early stage and take corrective action. Grievance mechanisms provide a way for individuals and communities affected by a project to voice concerns or complaints and have their issues addressed. [ASPI, 330]

826. Additionally, negative environmental and social impacts may not occur during a crediting period but arise later in the life of a project/activity and monitoring could help to avoid or minimize these. Thus, a monitoring period cannot be limited to a crediting period. [CIEL, 317]

827. Stakeholder Engagement and Free, Prior and Informed Consent (FPIC) are crucial to ensure the rights and interests of local communities are respected. Projects should involve meaningful consultation with all relevant stakeholders, especially indigenous peoples and local communities who are directly impact ed by the project. FPIC is a principle protected by international human rights standards that states that all communities have the right to give or withhold consent to proposed projects that may affect their lands. resources, or territories. [ASPI, 330]

828. IEN has serious concerns about the increasing use of satellite and other technological methods of monitoring on or near Indigenous Peoples' territories (Mitchell et al., 2017). These types of monitoring systems violate Free, Prior and Informed Consent (FPIC) because Indigenous Peoples are rarely informed that their territories will be monitored by technologies they are unaware exist. [IEN, 337]

829. Meaningful engagement is an essential element of crediting program design. A good engagement process allows stakeholders to learn from each another to understand real needs and concerns and to incorporate these lessons into project or program design. This should include learning from the traditional knowledge and practical experience of Indigenous Peoples and Local Communities (IPLCs) who manage the landscapes that may be the focus of NCS activities. In addition to prioritizing the holistic management of forests and Indigenous territories, any proposed methodologies should not only ensure respect for territorial and land rights and the Free, Prior and Informed Consent (FPIC) for

IPs, but also the effective participation of IPs as active partners and fair distribution of benefits. In addition, ex ante consultation should always be accompanied by ex post mechanisms to report and address grievances. Stakeholders need to be aware of and have easy access to the grievance mechanism—this is a key factor for ensuring the integrity and credibility of mitigation activities. [EDF, 331]

830. Projects should aim to achieve multiple benefits beyond carbon sequestration or emission reduction. This can include benefits like improving local livelihoods, conserving biodiversity, protecting water resources, or maintaining cultural heritage. Projects should ensure that the benefits (not just the costs) are shared with local communities. This could involve financial payments, employment opportunities, or improvements to local infrastructure. Certain areas, such as those with high biodiversity, culturally important lands, or densely populated areas, may be at higher risk for negative impacts. Avoiding projects in these areas can be a way to minimize potential harm. [ASPI, 330]

831. Equitable benefit sharing Since crediting is fundamentally an effort to provide incentives to suppliers for the implementation of NCS activities, the ethical and effective distribution of these incentives is a core element of high-integrity crediting. Practical considerations that suppliers should take into account when designing equitable processes and outcomes include, but are not limited to:

(a) Direct allocation of funds and/or other benefits to IPLCs, and especially women, whenever possible;

(b) Where direct allocation of funds is not possible, processes to ensure that the costs of transactions and intermediary services are transparent, and fully understood and agreed upon in advance by all parties;

(c) Recognition of the critical role IPLCs play in forest protection, and compensation levels that fairly value these contributions;

(d) Fair and effective dispute resolution mechanisms that are perceived as fair and impartial. [EDF, 331]

832. Establishment of a robust and accessible independent grievance redress mechanism that can provide remedy to those harmed by any activities registered by the Article 6.4 Supervisory Body, and address fraud, misrepresentation, or greenwashing related to the generation, use, or exchange of an Article 6, paragraph 4, emission reduction (A6.4ER) is critical especially if negative environmental & social impacts are not avoided. [CIEL, 317]

833. It is also essential that an independent grievance mechanism is in place prior to any article 6.4 mechanism activities taking place, to help provide a remedy if those risks that are not avoided and harm occurs. For this grievance process to be effective, the 6.4 independent grievance redress mechanism must be aligned with the UN Guiding Principles on Business and Human Rights effectiveness criteria, including that it be legitimate, accessible, equitable, transparent, predictable, rights-based, and a source of continuous learning. [CLARA, 316]

834. In many cases there are international standards such as the UN's REDD+ Safeguards or the world Bank's Environmental and Social Framework provide guidelines for avoiding and mitigating negative impacts. These can include measures to protect biodiversity, ensure the rights of local communities, and prevent displacement or land grabbing. [ASPI, 330]

835. It is imperative that the 6.4 Supervisory Body develop strong safeguards for removals activities. In doing so, it can draw from existing COP decisions on REDD+ (e.g. the Cancun Safeguards), as well as multiple international REDD+ programs, bilateral and multilateral agreements, and other experiences. The Cancun Safeguards constitute precedent under the United Nations Framework Convention on Climate Change (UNFCCC), and the Article 6.4 mechanism safeguards must not fall below this standard. Regarding NCS removals, to minimize negative environmental impacts, the eligible removal activities should be required to demonstrate appropriateness and diversity of species selection to ensure efforts focus on restoration to natural ecosystems. Environmental integrity must also be upheld in order to ensure efforts positively contribute to restoration of biodiversity and/or adaptation, resilience, and food security. [EDF, 331]

836. Ensuring that all activities respect human rights and the rights of Indigenous Peoples is core to avoiding negative environmental and social impacts as well as having sustainable outcomes. And it is critical that there are not caveats on national prerogatives, such as those included in the recommendations presented to the CMA at COP27, that could undermine both the Supervisory Body's ability to set rules and also the integrity of the Paris Agreement by allowing activities that harm the environment or people from being approved if a country says that it does not enforce a specific environmental or social protection. Given the foreseeable harms of certain proposed credit-generating activities and the history of market activities undermining human rights including the rights of Indigenous Peoples, this could prove devastating for many communities around the world. [CIEL, 317]

837. Additionally, it is a step back from the commitment Parties made at COP26 when they approved the Article 6.4 rules, modalities and procedures and included that the Supervisory Body would need to take steps to establish the necessary rules and processes to ensure respect for human rights including the rights of Indigenous Peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations as well as the right to health, right to development, gender equality, empowerment of women, and intergenerational equity, and "the application of robust, social and environmental safeguards. [CIEL, 317]

838. As the principles of sustainable development must be applied to the local context, we suggest that national regulations be respected (which already result from the domestic debate on possible trade-offs on land use) and, in addition, that the principle of "no net harm" be observed. It states that, as a rule, a project should not worsen the context of sustainable development in which it is inserted, but it should not have additional obligations or costs in the sense of generating improvements in other thematic areas or in relation to potential trade-offs already addressed by national laws and principles. [ABU, 60]

5.8. Other inputs

839. Of the 104 responses received to the prior information note, only 18 commented on tonne year accounting. It is immediately apparent to us that the "silent majority" consenting to tonne-year accounting through its omission of commentary has been ignored in favor of the "vocal minority"…. A Better Yardstick for Carbon Markets (attached), a white-paper specifically addressing the shortfalls of our current tonne year accounting system, the solutions provided by tonne-year accounting, and answers to its common criticisms …. a time horizon of infinity is recommended (or the effective mathematical equivalent of one

million years), in lieu of the 100-year or 200-300-year time horizon. Because of the adoption of a discount rate, there is no need to arbitrarily limit the time horizon considered. [SHC, 205]

840. We note three additional areas where clarification is needed to maximize the effectiveness of implementation of the Article 6.4 mechanism: 1. Alignment or harmonization with existing global frameworks. We would encourage reference to or alignment with existing global frameworks for accounting systems or metrics, such as the GHG Protocol, with a view toward supporting harmonization of disclosures globally to the extent possible. 2. Clarity on corresponding adjustments. Clarity on corresponding adjustments is needed to provide the certainty needed for the market to develop and scale successfully. 3. Clarity on relative treatment of projects not certified under Art. 6.4. It will be essential to clarify that credits issued under Article 6.4 are not characterized de facto as more or less beneficial as credits from projects accredited by other bodies. [JMP, 301]

841. We acknowledge that the supervisory body has taken into account the stakeholder feedback on tonne-year accounting. We would still like to reaffirm that the tonne-year crediting method should no longer be considered by the Supervisory Body due to several fundamental flaws. This method creates a false equivalence between temporary and permanent carbon storage, which goes against the concept of a carbon budget and cumulative emissions. By counting short-term carbon storage as equivalent to permanent reduction or removal, tonne-year accounting undermines the goal of the Paris Agreement. Tonne-year accounting methods, whether physical or economic, fail to consider the science of temperature stabilization and the need to compensate for any CO_2 reversal to achieve temperature targets. These deficiencies have been recognized for a long time, and it is important to prioritize permanent mitigation over short-term storage to effectively address climate change and adhere to a global carbon budget. [CFUT, 245]

842. Commercial-scale DAC projects can serve as long-term electricity offtakers and encourage the development of new renewable energy assets... We encourage the SB to establish monitoring, reporting, and verification (MRV) frameworks that ensure DAC projects are truly carbon negative to encourage these types of partnerships. …[CAP,207]

843. A nature-based removal must therefore always be considered reversed at the end of the Monitoring period. The Monitoring period for land-based approaches should thus correspond to the timeframe the project is committed to keep the land as a removal. In effect, non-permanent removals are postponed emissions. Again, it follows that for land-based credits, the timeframe for addressing reversals is during the Monitoring period (as they should be considered released after that period). For permanent removals (BECCS/DACCS) as well as generically for CCS, the permanence is confirmed by the scientific consensus and the fact that the CO_2 is sent permanently to the geosphere. During the Monitoring period, reversals should be monitored and addressed according to the applicable jurisdiction as well as counted as an emission by the storage company. At the end of the Monitoring period, there should be a transfer of responsibility to the host nation. If there is a reversal after the transfer of responsibility, the host nation should count the reversal as an emission and take measures according to the applicable jurisdiction. [SE, 244]

844. We urge the Supervisory Body to consider that engineering-based carbon dioxide removal (CDR) methods, including BCR, have the potential to contribute significantly to addressing both environmental and societal impacts, notably through the production and utilization of biochar. [CFUT, 245]

845. Regarding SB005-A02 section 2E &F, reversals and leakage are briefly discussed above and are easily mitigated against because sequestration is within a solid, accessible material, above ground. It's worth contemplating that sequestration in solid, elemental carbon is a potentially viable and more rapidly scalable alternative to geologic sequestration. Cost could ultimately become a non-issue because the solid carbon can be used as a feedstock for a high-value product (battery-grade-graphite) that simultaneously sequesters carbon. A financial mechanism that cannot be leveraged if you sequester the carbon deep underground. [RC, 266]

846. The CMA should clarify that for Art 6 projects that are in line with NDCs, nations should welcome VCM purchases by corporations and their positive impact on the achievement of their NDCs, keeping reduction trajectories and reduction projects separate from removal trajectories and removal projects. In other words, in those cases, where co-funding has taken place, both the host nation and the co-funding corporations can legitimately and with maintained integrity co-claim a mitigation outcome towards their respective climate objectives which are kept track of in two separate accounting systems. Of course, no two nations or no two corporations must ever account the same outcome. This is how emission reductions already are treated by nations, irrespective of whether they are based on compliance measures, voluntary measures or supported by government aid schemes. Of course, for cross-border corporate compliance purchases, a Corresponding Adjustment between nations must always take place to avoid double counting between nations. [SE, 244]

847. Where the risk of reversal is high (e.g. soil organic carbon), the ton-year currency should provide a solution where payment is performed yearly, as long as no reversal has occurred. [REW, 219]

848. We suggest the term CDR must be limited to what Mother Nature does without help from engineering based ACDR solutions. Instead, the use of term ACDR (Accelerated CDR). [CAT, 220]

849. There are two ambiguities related to the process of removals that have to do with the rate at which the removals occur and the amount of time over which those removals are stored…an equation is provided to define removal…. At a fundamental level, tonne-year is simply a unit of measurement that quantifies a concept involving mathematical integration of mass over time. Because it is a unit of measurement, it is very likely that very different methodologies would produce very different outcomes but in the same units of measurement. It would be preferable if methods that are currently called tonne-year accounting are referred more specifically. [MPI, 227]

850. Instead of releasing the plant carbon back into the air through open-air burning or anaerobic decomposition, process rendering a large portion of the plant-based carbon into a recalcitrant form that stays inert (e.g. in the soil) for at least hundreds to thousands of years is described, over 10000 small farmers are covered. [TAK, 217]

851. Instead of focusing on MRV we need to focus on diversifying food production and habitat restoration, with the objective of achieving carbon removal that is too cheap to meter. [OLAB 222]

852. CO_2 Removal must be performed simultaneously with atmosphere energy removal. CO_2 Removal and CO_2 Emission Reduction without energy removal cannot reduce Atmosphere CO_2 concentration due to the laws of physics. [ELI, 221]

853. We encourage the Supervisory Body to consider including CO_2 captured from the ocean in its definition of removal activities, i.e. “Anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere or ocean and durably storing it in geological, terrestrial, or ocean reservoirs, or in products”. The ocean plays an important role in regulating Earth’s climate by absorbing 30% of anthropogenic CO_2 from the atmosphere and thereby slowing the rate of atmospheric warming. [CC, 247]

854. The note’s framing of CDR as either “engineering-based activities” vs “land-based activities” is arbitrary. In fact, many high qualities carbon dioxide removal proposals are hybrids of engineering and nature based solutions. The statement that “Engineering-based removals are technologically unproven”, as a blanket statement, is false. Furthermore, many “land-based activities” can result in durable carbon removal with proper risk management and project oversight. We encourage the Supervisory Body to move away from labels such as “nature-based” and “engineering-based,” which can be counterproductive to taking action: Any discussion that frames CDR policy as a choice between one or the other fails to recognize the urgency and rate at which Gigatonne-scale CDR deployment is required. In fact, we will likely require massive deployment of projects across all solution pathways (provided they meet guidelines for quality and safety) in order to meet our climate obligations. [XPZ, 249]

855. Removals traded under Article 6.4 should not be allowed to impact NDC ambitions for emissions reductions. Thus, removals – land-based or technical – should only be applied towards dedicated removal trajectories which aim to neutralize the hard-to-abate emissions of the total volume of unabated emissions. A pre-requisite to acquire removals should be first to estimate the amount of hard-toabate emissions a nation or a company has and in what sectors. Land-based removals should only be applied towards hard-to-abate emissions in the AFOLU sector. For other sectors, permanent technical removals, such as BECCS and DACCS, should be applied as a condition to claim net-zero. [SE, 244]

856. Projects for removing carbon dioxide from the atmosphere must take account of other goals. These include:

(a) Creating co-benefits for greenhouse gas emissions mitigation beyond those taken account of in calculating the net removal;

(b) Enhancing adaptation and resilience to climate change, for example increasing resilience against flooding;

(c) Protecting and enhancing biodiversity;

(d) Promoting other environmental goals, including safeguarding water quality, and avoiding excess burden on the nitrogen cycle; and

(e) Improving the wellbeing of local communities, including by providing leisure, employment and educational opportunities, as part of a just transition.

857. As a condition for removals being certified, projects should be required to meet the specified standards and to follow the required procedures relevant to these goals. [BF, 252]

858. There is a need to further refine procedures and methodologies related to identification and mitigation of risks linked to reversals and leakages across carbon removal activities.

The use of cradle to grave life-cycle assessments to account for activity boundaries and associated removal activity related emissions should support these assessments, with technology-based removal solutions already demonstrating low levels of risk for reversal or rerelease of CO_2 and thus exhibiting high potential for quality of future credits generated by these technologies. [IATA, 255]

859. “Removals/negative emissions” and “avoided emissions” should be accounted for separately. To avoid double counting, further clarity is required from A6.4SB on the definition of removal credits and how they are distinct from avoidance credits. This would recognize the uses of captured CO_2 both for storage and its use as a feedstock with corresponding distinct environmental attributes. [IATA, 255]

860. The info note’s conclusions are inconsistent with current IPCC accounting guidance and acknowledgement of the need for gigatonne scale CDR in coming decades. The info note’s framing of CDR as either “engineering-based activities” or “land-based activities” is arbitrary and not science-based. [RTTO, 256]

861. We encourage the Supervisory Body to adopt the definition of CDR provided by the IPCC: "anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products." [USBC, 257]

862. we want to emphasize to the SB is the importance of codifying Monitoring, Reporting, and Verification (MRV) into Article 6.4. MRV aims to develop the standards to quantify the impact of the different solutions that exist to mitigate climate change and remove atmospheric CO_2. [CLLA, 259]

863. Carbon removals go beyond ‘nature vs engineered’ to span a very wide spectrum of approaches that involve the application of both natural resources and human ingenuity. Though it is hugely tempting to put carbon removals into two neat, tidy categories – ‘nature-based’ and ‘engineered’ – this no longer represents anything close to the full range of carbon removal approaches. Already we have biochar, bioenergy with carbon capture and storage and enhanced rock weathering, all of which combine nature-based benefits with enhanced CO_2 storage through engineering processes. And this is a fast-moving industry, with many new technologies and approaches in development. [RRDC, 260]

864. In order to ensure that all 6.4 mechanism activities are sustainable and have a positive impact on both the environment and society, it is crucial to develop and implement environmental and social safeguard approaches. By doing so, potential risks and negative effects stemming from these activities can be minimized. Additionally, a majority of carbon removal projects require consultation with local stakeholders prior to approval and the establishment of grievance mechanisms to address any issues that may arise following the project's implementation. In order to avoid the negative environmental and social impacts of 6.4 mechanism activities stepwise approach need to be followed. [ETS, 261]

865. Who need to conduct Environmental and Social Risk Assessment for 6.4 mechanism activities? The environmental and social screening serves as a preliminary measure in the environmental and social due diligence process carried out by accredited organizations. When to conduct Environmental and Social Risk Assessment for 6.4 mechanism activities? This screening takes place at the very beginning of proposal development, specifically during the Concept Note creation. As a result of the screening, it may be necessary to explore alternative options, such as varying methodologies, schedules,

scopes, or locations. Which type of 6.4 mechanism activities require Environmental and Social Risk Assessment? [ETS, 261]

866. An environmental screening as above must be completed for all activities proposed for all 6.4 mechanism activities. [ETS, 261]

867. Kita believes this guidance, particularly the definition of certain key terms, can be quite influential in how removals are utilized through mid-century. In terms of providing carbon insurance to unlock additional financial flows for carbon projects, Kita is technology agnostic. We believe all removal technologies will be necessary to achieve a 1.5C world. However, Kita also recognizes that stance only addresses carbon and finance. It does not address necessary social, governance and biodiversity improvements. While all removal technologies are important, some perpetuate more co-benefits than others (ex. Forestry projects that work directly with IPs and LCs). This is where how removals are defined by the Supervisory Body will matter; whether it be a catch all definition or one that breaks technologies out into subcategories (ex. NBS, hybrid, engineered). [KITA, 262]

868. Kita would like to put forward that any overarching definition of carbon removals should be one written purely from a scientific perspective and technology agnostic. Such a definition will serve as the basis for context setting before one reviews attribute for specific technologies. Whether within the removal's definition or as a separate but connected component, how each removals technology relates to leakage, permanence, social impacts, governance impacts, and changes to biodiversity at a minimum. This may help decision makers better understand the overall implications of using one removal technology over another beyond simply the carbon impacts. [KITA, 262]

869. Mechanisms such as the Article 6.4 can support the development of carbon removals at scale, notably, by creating early demand and providing the needed predictability for prospective carbon removal developers and buyers. This guidance is essential to provide clarity and credibility in carbon markets through the development of a well-designed, enabling, and transparent regulatory system, namely monitoring, reporting, verification and governance mechanisms – and can stand in as a gold standard guidance for carbon markets. It should also be noted that this guidance is being developed alongside other initiatives (e.g. European Union's certification scheme for carbon removal activities) and that consistency in carbon removal accounting is essential to build trust in carbon markets, establish a global level-playing field and unlock further opportunities for developers. [ZEP, 263]

870. It is important to clearly define "removals", avoiding misconceptions and confusion with carbon dioxide reductions. A robust and thorough definition must reflect the following principles:

(a) CO_2 is physically removed from the atmosphere;

(b) The removed CO_2 is stored out of the atmosphere in a manner intended to be permanent;

(c) Upstream and downstream greenhouse gas emissions, associated with the removal and storage process, are comprehensively estimated and included in the emission balance;

(d) The total quantity of atmospheric CO_2 removed and permanently stored is greater than the total quantity of CO_2 emitted to the atmosphere. [ZEP, 263] [CCSA, 287]

871. The concept of “permanence” should also be accurately defined in the proposed guidance. While different activities can achieve carbon dioxide removal, they will involve different storage timeframes and risks of storage reversal. For example, storage in products and carbon farming activities will typically store CO_2 out of the atmosphere for decades to centuries; while storage of CO_2 in geological reservoirs offers the opportunity to safely store CO_2 for thousands of years. The European Commission proposal for a Regulation establishing a Union certification framework for carbon removals defines “permanent carbon storage” as “a carbon removal activity that, under normal circumstances and using appropriate management practices, stores atmospheric or biogenic carbon for several centuries, including bioenergy with carbon capture and storage and direct air carbon capture and storage”. [ZEP, 263]

872. At the moment, the most urgent, simplest, and most cost-effective intervention to implement is to plant trees, shrubs and other vegetation in semi desert areas or prairies, in addition, obviously, to all peri-urban areas (both small and large cities). [DEMO, 265]

873. We object in the strongest terms to the notion that engineered CDR solutions are inconsistent with sustainable development goals for the Global South. We object to the notion that engineered CDR methods are unproven or unsafe. [OC, 268]

874. Elemental solid carbon (graphite, graphene, diamond, etc.) is widely regarded in the literature as both non-biodegradable and non-photodegradable for thousands of years. These materials are chemically inert in nature. Making sequestration within them an attractive pathway assuming MRV is regularly performed, and an end-of-life protocol is tightly followed to ensure safe recyclability. [RC, 266]

875. Regarding SB005-A02 section 2B, since the use-case is a stationary storage battery, 3rd party MRV – based on industry best practice or as the Article 6.4 SB deems appropriate – will have physical access to the sequestration material because it will reside “above ground”. Effectively stacked like blocks at a client site. The material (envisioned as a composite made of roughly 80% graphitic-density-carbon) can also be sent in small batches to various labs for testing to ensure permanence claims. Because sequestration occurs within the material itself, the only risk of reversal is if (1) the material is not as permanent as implied (which can be determined via lab testing and on-site verification) and if (2) the storage blocks are structurally damaged such that they need recycled / replaced (a process that can be controlled internally). [RC, 266]

876. We quote the IPCC and IEA for the roles of removals. We suggest the CDM examples are followed in the roles and functions of these entities: Activity proponent(s), Article 6.4 mechanism Supervisory Body (6.4SB), 6.4 mechanism registry administrator, Host Party, stakeholders. [IEAGHG, 267]

877. A process to store “megaton quantities of atmospheric CO_2 in mining waste” is described. [BSM,201]

878. At a minimum we would urge:

(a) Removals include only activities that actually remove net carbon from the atmosphere, so that carbon capture and storage (CCS) attached to fossil fuels or Carbon Capture and Usage (CCU) with re-release of carbon cannot qualify. BECCS that uses forest wood as a feedstock likewise is highly unlikely to deliver net removals in a timeframe consistent with the urgent need for climate mitigation;

(b) Removal activities need to be able to ensure the permanent storage of carbon in non-atmospheric carbon sinks; critical to ensure a precise and science-based definition of carbon removals so that activities that do not live up to these characteristics are not falsely identified as carbon removals;

(c) Speculative technologies where environmental and social impacts are largely uncertain or likely negative, or where carbon removal and its permanence are not demonstrated, should be eliminated;

(d) Any removal technologies or approaches with negative impacts on biodiversity, environment, climate and communities should be eliminated;

(e) There must be strict additionality criteria to ensure that the results of ongoing natural processes cannot be claimed and traded. [CLARA, 316]

879. Ocean Fertilisation is already governed under decisions within the London Convention / London Protocol (2007) and the Convention on Biodiversity (decision X/33, 2010) and other marine CDR are being investigated. Ocean Fertilisation (OF) could inflict severe impacts on marine life. Given the limited governance and oversight of the high-seas and deep-seas, including Ocean Fertilisation in a carbon market would undermine the decisions of other UN bodies and could permit practices without control or oversight with likely abilities to hide harms by intended projects. Some of the risks and impacts associated with Ocean Fertilisation are disruption of marine food chains and causing anoxia in some layers of the ocean, through nutrient redistribution; restructuring of the ecosystem; enhanced oxygen consumption and acidification in deeper waters; potential for return to the atmosphere of nearly all the extra carbon removed; and risks of unintended side effects. [CLARA, 316]

880. Ocean Alkalinity Enhancement (OAE) is a conceptual technology, and with note of the London Convention/ London Protocol, has “the potential to cause deleterious effects that are widespread, long-lasting or severe” as there is “considerable uncertainty regarding the effects on the marine environment, human health, and other uses of the ocean”. Ocean Alkalinity Enhancement involves the extraction, processing, and dissolution of minerals and addition to the ocean where they “enhance” sequestration of CO_2 as bicarbonate and carbonate ions in the ocean. OAE has been subject to a small number of laboratory experiments but not in real conditions. [CLARA, 316]

881. Marine CDR techniques have limited feasibility and threaten marine life, and it is difficult to verify the carbon removed. These techniques include ocean fertilization, ocean alkalinity enhancement, and macro-algae sequestration. The risks of these techniques have been highlighted by scientists, rights-holders (including namely fisherfolk who rely on the oceans), and international conventions. Already, over 20 ocean geoengineering projects are selling carbon credits even though there is little consensus on the ability to monitor, verify, and report on the actual carbon removed. [CIEL, 317]

882. Ocean Fertilization could have negative consequences for eight sustainable development goals (SDGs) as well as severe impacts on marine life and can cause nutrient redistribution, restructuring of the ecosystem, and enhanced oxygen consumption and acidification in deeper waters, and has the potential for decadal-to-millennial-scale return to the atmosphere of nearly all the extra carbon removed. Additionally, it is already regulated under the Convention on Biological Diversity and the London Convention/London Protocol (2007) 57and other marine CDR is being investigated. In

2010, the London Convention/London Protocol (LC/LP) adopted the “Assessment Framework for Scientific Research Involving Ocean Fertilization” to ensure that any proposals on ocean fertilization are not contrary to the aims of the LC/LP and that they are only for scientific purposes 58and in 2013 adopted a broader decision to regulate marine geoengineering. [CIEL, 317]

883. Ocean Alkalinity Enhancement, which has been demonstrated only in a small number of laboratory experiments, involves the extraction, processing, and dissolution of mined minerals and addition to the ocean to enhance sequestration of CO_2 as bicarbonate and carbonate ions in the ocean. Its biological impacts are largely unknown and likely to vary depending on the location. Of the limited studies that have considered elevated alkalinity’s impacts on ocean ecosystems most have been limited to single species experiments. Large scale OAE practices could also have significant risks, related to associated sharp increases in ocean acidification or decreases in surface pH. [CIEL, 317]

884. N_2O, is the third most impactful anthropogenic emitted greenhouse gas. It is also a highly potent greenhouse gas with a radiative forcing over 300 times greater than CO_2 and a lifecycle of 100 years, it significantly contributes to global warming. Every year, billions of CO2eq tons of N_2O are emitted globally. Given its substantial contribution to climate change, addressing the reduction of N_2O emissions is crucial in mitigating the impacts of global warming and working towards a more sustainable future. Bomvento's mission is to prevent irreversible climate change. We are developing a scalable (>50 million tCO2eq by 2030), economical (cost <$50/t CO2eq removed) solution for removing N_2O from the atmosphere. [BOMV, 329]

885. The Indigenous Environmental Network (IEN) would like to express deep concern regarding the content and the process through which this consultation was conducted. The timing of the call for submissions release, the short period allowed for input, as well as the narrow and biased questions, have undermined meaningful engagement, particularly for Indigenous Peoples and grassroots organizations representing communities that are most affected by climate change, carbon pricing, carbon offset and carbon dioxide removal (CDR) projects. [IEN, 337]

886. The CMA rightly decided to mandate a structured public consultation process; however, the current timeframe does not align with that mandate. A two-week period in which to provide comments on a multi-page questionnaire and on topics as critical as whether and how to include removals in the Article 6.4 mechanism without undermining the integrity of the Paris Agreement is wholly insufficient (which the Supervisory Body recognized in explicitly allowing late submissions). This is especially true given that many potential submitters were also engaged and participating in the meetings of the UNFCCC subsidiary bodies in Bonn during the same two-week period. [CIEL, 317]

887. We also express our disappointment in the way the additional June 19th consultation process was carried out. The short turnaround time offered for rights holders and civil society to provide additional and more specific feedback - while in the heart of the SB58 negotiations - is on the verge of improper consultation that privileged time to the Carbon Dioxide Removal (CDR) industry. We are concerned that the unbalance of this process could lead to a disproportionate influence of the CDR industry on the process going forward, which would put into question the credibility of the Supervisory Body and the whole process. [OP CSO, 335]

888. We would like to suggest that the Article 6.4 Supervisory Body consider a refreshed approach for removals. We ask that this approach could include: (i) ensuring that Parties are aware of the significant choices presented in this information note through a wider dialogue, including workshops and information exchanges between experts, market actors and Parties; and in particular (ii) a deeper discussion on approaches to address non-permanence and reversals in the context of a mechanism where the outcome will count towards Nationally Determined Contributions and to enable the world to reach net zero-emissions and stay within the long-term temperature goal of the Parsi Agreement. We believe that a refreshed approach is required to fulfil the mandate given to the Article 6.4 Supervisory Body by the CMA (Conference of the Parties Meeting as Parties to the Paris Agreement). [PURO, 322]

889. An independent scientific body can advise the 6.4 Supervisory Body, including through facilitating an assessment report. [DOSI, 332]

Part III. Inputs received in response to the structured public consultation launched by SB006

5.9. Monitoring and reporting

890. 5. Should the activity proponent be required to periodically update its monitoring plan every five years and/or at the end of the crediting period?

5.9.1 Update every five years

891. The activity proponent should be required to update its monitoring plan every five years given the evolutions in monitoring capabilities and expectations. [NB, 344]

892. Monitoring plans should be updated every 5 years during the crediting period. [CCPLE+RECS, 354]

893. The activity proponent should be required to periodically update a project's monitoring plan every five years. Updates may also be required at the host country NDC review process, to confirm the ITMOs authorization process for the next NDC period will not require changes in the monitoring plan. [CRCY, 350]

894. Given the significant R&D into monitoring tools, and advances in machine learning and satellite data, the activity proponent should review its monitoring plan annually, and then update it every five years. [PARIGI, 357]

895. The monitoring plan should be updated periodically, at minimum, every 5 years, in conjunction with the submission of the monitoring report, taking into account any developments and improvements in monitoring technologies and methodologies that affects the monitoring plan, thus ensuring the monitoring plan stays up to date. Moreover, it should reflect any changes in reversal risks that depends on global as well as local social and environmental circumstances. It should also be a requirement for monitoring plans to be updated following any reversal event (activity-level risk assessment must also be reassessed after a reversal event). [CMW, 360]

896. Monitoring plans should be updated at least every five years due to the continuing evolution of MRV practices, taking into account recent developments to improve the accuracy and efficiency of the monitoring, with particular attention to ensuring the validity of any models (e.g. for calculation of baselines or for remote sensing). [BF, 362]

897. The period of 5 years is reasonable for projects based on NBS removals [NBS, 373] [REGREEN, 374]

898. CDR project developers and MRV liaisons should update the monitoring plan per injection site every five years, whether it be at pilot or commercial phase. [CLLA, 375]

899. Every five years. [CARBI, 376]

900. The monitoring plan should be updated every five years at least. [PURO, 378]

5.9.2 Updates in relation to the crediting period

901. As the monitoring plan is defined when the project is validated, it should be update at the end of each crediting period unless there is a change in the project in between in which case it should be reviewed and amended accordingly. [NEUST, 364]

902. For those projects with crediting periods longer than 5 years, it should be required to update the monitoring plan in between the crediting period to ensure that they are still suitable in terms of potential new standard requirements regarding monitoring and in that the best available approach is used. [SYLV, 367]

903. The activity proponent should be required to periodically update a project's monitoring plan every five years and/or at the end of the crediting period, whichever is sooner, in alignment with any advancements in Measurement, Reporting & Verification (MRV) to ensure that the correct MRV approaches are applied. To the extent these advancements make it possible to update monitoring plans more frequently than 5 years, that would be desirable. [KITA, 347]

904. Periodic updates should be required at least every 5 years and at the conclusion of each crediting period to incorporate any improvements in the MRV. More frequent updates may be appropriate, given the pace of advancement in monitoring technologies, depending on the type of removal project and its monitoring requirements that depend on the volatility of the monitored environment. For example, a geologic reservoir has a different level of change / risk compared to carbon being stored in carbon products or an ocean with an open monitoring environment. There should also be a mandatory review period during a change of project ownership (physical or legal) to ensure continuity of monitoring and reporting for the project. The frequency of monitoring should scale relative to the size of the project. A scaling principle linked to frequency of reporting is in line with basic risk principles. Smaller facilities with infrequent monitoring can be subject to random sampling in line with standard ISO quality sampling practices. This reduces monitoring burdens on smaller projects while hopefully maintaining environmental integrity and effectiveness. [CFL, 365], [1.5,366]

905. For permanent removals, monitoring plan should be updated when need arises during a given crediting period. For instance, any indication that the monitoring is insufficient or that new technologies that improve monitoring are established as industry standard, may mandate an update of the monitoring plan. [SE, 345]

906. Updates should be triggered by events that necessitate a change to the monitoring plan, rather than an arbitrary time threshold. Such events may be the end of the crediting period, a reversal, a change in roles or leadership at the proponent or one of its partners, MRV technological change, or a change to the standards. [SH, 346]

907. The monitoring plan should be updated whenever a cause arises, not just mechanically at fixed intervals. Each methodology should specify conditions under which the monitoring plan is required to be revised. The project proponents may revise the monitoring plan any time they wish so long as they can provide a transparent and verifiable justification for this. [SCC, 356]

5.9.3 Other inputs

908. For all activities involving storage in geological formations, the modalities and procedures for carbon dioxide capture and storage in geological formations under the CDM (CDM

M&P) should be applied under Article 6.4, as they were negotiated over many years and are a UNFCCC-approved precedent. (Applies to paragraph 5-10 of "*Questions for structured call for inputs on recommendations for activities involving removals*" (hereinafter referred to as "*the Questions*".)) [PCR, 348]

909. Monitoring, reporting and verification (MRV) requirements including the timeframe should build on and aligned to existing national and regional regulations, such as the EU/EEA and UK CO_2 storage legal frameworks - the CO_2 Storage Directive (CCS Directive) and the 2010 CO_2 Storage Regulation in the UK to allow faster implementation and reduce reporting burden on the developers. Under this framework, activity proponents are required to periodically update their monitoring plan every five years, "to take account of changes to the assessed risk of leakage, changes to the assessed risks to the environment and human health, new scientific knowledge, and improvements in best available technology". Operators are also required to report to competent authorities "[a]t a frequency to be determined by the competent authority, and in any event at least once a year". [CCSA, 370], [ZEP, 371]

910. The monitoring plan should not be periodically updated by the activity proponent. Instead, National Authorities or the SB should establish a guideline that reflects the best practices and update it periodically. The monitoring plan should be reviewed by national authorities and/or the SB and updated only if it is not aligned to the latest guideline. Through such reviews, made publicly accessible, the activity proponents are held accountable. [44M, 351]

911. A monitoring plan should reflect the latest scientific assessments, instruments and best practice for projects, wherever applicable. There is little need to update it as long as it achieves correct, robust and science-based quantification of A6.4 projects. Instead, project proponents could be required to periodically review the need for an update and update when deemed necessary. [CW, 358]

912. It should be considered whether the activity proponent should be the entity responsible for the monitoring plan, or whether this should be the responsibility of a third party, where activity proponents are responsible for providing the information/data as requested by the third party responsible for the monitoring of the project. [NB, 344]

913. The requirements to update the monitoring plan should depend on the [type of] activity in question and reflect the durability of the removal. Those activities that are expected to last two decades and might be more prone to reversals may require further monitoring and more frequent updates than those expected to be stored for hundreds or even thousands of years. [NEP, 359]

914. With each monitoring period, the project proponent should re-evaluate whether the current monitoring approach is still in line with best practices. However, changes to the monitoring plan should only be required if best practices significantly change and as a result also require methodology updates. To ensure monitoring reports remain comparable, proponents should select, compile and report information consistently to enable an analysis of changes in the projects' impacts over time. If updating monitoring plans affect the consistency in methods used to measure and/or present project impact, the project proponent should be required to clearly explain the changes in methods and assumptions used and ensure data is comparable, for example, by adjusting previous figures under updated method or by presenting new figures under both new and previous method to transparently disclose the impact of the change in method. [STX, 363]

915. ***6. Should monitoring reports be submitted within the first [2] [5] [X] years of activity implementation? After the first report, at least once every [2] [5] [X] years?***

5.10. Within the first 2, 5 or X years

916. It should be submitted within the first 2 to 5 years and at least once every 2 years there on. Distinct MRV protocols tailored to the specific characteristics of each carbon removal approach would ensure accurate and reliable reporting. [NEUST, 364]

917. Annual or in sync with the issuance frequency. The time constant and ability to verify and issue credits will be the rate limiting step for these time periods. The key is to issue credits at the rate which maintains the environmental integrity of the removals. [CFL, 365], [1.5,366]

918. Requiring monitoring reports every 2 years with first monitoring report being submitted 2 years after activity implementation seems like the most secure option as frequent reporting requirements would exert greater pressure on the activity proponents to have better control of the project and to anticipate any reversal risks. [SYLV, 367]

919. The requirement of the timing of an initial report should depend on the relative volumes produced over time by that project type and the associated monitoring costs. For nature-based projects like REDD, where there are significant crediting volumes at the initiation of the project and monitoring oversight can be achieved more cost effectively using remote sensing approaches, reports should be submitted within the first 2 years. For other nature-based projects like an ARR project that is based on forest/tree regrowth, given the small initial volumes and the challenges of remote sensing monitoring of smaller trees, the first monitoring report should be submitted within the first 5 years. After the first report, monitoring should occur at least every 2 years and as monitoring technology and processes become more cost effective, annual by 2030 and possibly more frequently. [NB, 344]

920. Monitoring reports be submitted within the first 2 years of activity implementation. Subsequent monitoring reports should be submitted in line with every point of approval for credit issuance. For projects that receive approval to issue credits multiple times in a single year, monitoring reports can be done annually to avoid undue administrative burden. [KITA, 347]

921. For permanent removals, monitoring reports should be submitted every year. [SE, 345]

922. Monitoring of ER reversals should occur on a daily or monthly, not annual basis, so as to quickly undo the damage caused to the atmosphere by such ER reversals. Insurance companies have long been engaged in remote monitoring of weather that is used for products such as parametric crop insurance, where the insured party will automatically receive a payout if the insurance company’s weather monitoring has detected an event which will adversely affect the insured party’s crops, for example a shortage or excess of rainfall. Such insurance technology, which relies on real time monitoring elements like satellite imagery, geothermal imaging, weather data, and remote soil monitoring, allow s for the monitoring of removal projects remotely. To avoid any conflict of interest, monitoring should be done by an independent third party acting as a custodian which tracks all issued ER credits and monitors them via a technological solution already in use by insurers. [CPOOL, 355]

923. The first monitoring report should be submitted within the first year of activity to get an early indication of the robustness of a project as the emissions it leaks, or any reversals that occur, at the earlier point in time, will lead to increased cumulative radiative forcing even if in 5 years' time that reversal is addressed. Subsequent monitoring reports should be submitted annually. This also enables robust information for the emerging carbon credit rating agencies to also update their own risk ratings of the same credits. [PARIGI, 357]

924. The first submission should be made within 5 years. Generally, frequent submissions of monitoring reports should be encouraged. However, industrial CDR facilities will undergo a commissioning and ramp up phase that can be assumed to take 1-3 years, which could be reflected in the first monitoring report by giving 5 years. Thereafter, submission could be made every 2 years. [CW, 358]

925. The first monitoring report can be submitted between 5 and 10 years after the implementation of the activity. Areas of commercial plantations with native species that in 4-5 years some species already reach a high amount of biomass. The interval of 10 years after implementation is reasonable for NBS removals and is a good timeframe to ARR project based on forest growth and the variability resulting from restoration method and ecosystem type. Before 10 years, the trees may be too small to be measured. The interval of 10 years for the next verification events is also reasonable since the stock change in a short time is difficult to measure due to the low growth rate of forests. [NBS, 373], [REGREEN, 374]

926. Within two (2) years and at least once every two (2) years. [CARBI, 376]

927. Under the Puro Standard, performance monitoring reports are submitted annually and carbon removal credits (Carbon Dioxide Removals Credits, CORCs) issued after the removal has occurred. [PURO, 378]

928. The frequency at which monitoring report should be submitted could be determined by the level of estimated reversal risk: every 2-3 years for activities with high reversal risk; every 5 years for those with no reversal risk. Independent of the activity type, the monitoring report should be submitted before the end of the NDC implementation period in which the ERs covered by that monitoring report were achieved since all authorised A6.4ERs must be used within the same NDC implementation period as when the mitigation outcomes occurred. [CMW, 360]

929. Monitoring reports should be delivered for all projects within the first two years of activity implementation as risks are higher at initial implementation including that of reversals. The frequency of the subsequent monitoring reports should reflect the risks of reversal of CO_2 storage. For a project with geological storage, subsequent monitoring reports could be submitted every five years while for those that uses less durable forms of storage, it should be more frequent. The complexity of monitoring and reporting may be eased for projects utilising permanent storage, for example, by allowing projects to submit information submitted to the host country, in compliance with relevant regulations in order to avoid duplication. In all cases the responsible entity for submitting the monitoring report should be the project developer. [DG, 361]

930. The initial monitoring report should be submitted within one year of implementation to provide proof of validity of the monitoring plan. Monitoring reports that are inaccurate or incomplete should be grounds for revoking credits. The frequency of additional detailed monitoring reports may vary with the type of removal activity, with the primary variable

being the fragility of the carbon sink. Annual monitoring reports may be appropriate given the risk of adverse consequences if removals are reversed or if too many removals are accounted for. Additionally, as large-scale carbon removal is a nascent human activity, frequent monitoring reports can promote knowledge exchange in MRV practices and associated challenges, unexpected consequences (e.g. social or environmental) of the removal activity. Removals to geologic sinks, such as subsurface storage of CO_2 become less risky after the injection period closes and the sink is closed, and thus over time are likely to require reduced monitoring, at which point monitoring reports every 5 years may be acceptable if real-time reversal notifications is in place. Removals to biologic sinks, such as forests or soils, should continue to require annual reporting, as the carbon uptake rate (and reversal) of these sinks are dependent on local conditions and are likely to become more fragile with increasing climactic changes. [BF, 362]

931. The appropriate interval at which monitoring reports should be submitted should be determined according to the types of removal activities, depending on the timeframe between activity implementation and significant removal generation as well as risks affecting project performance. In case of an afforestation/reforestation activity the actual activity does not immediately result in removals at implementation. However, over time, once the trees start to grow, the carbon is removed from the atmosphere. Thus, submitting the monitoring report five years after activity implementation is often more suitable to be able to assess the project impact. For biochar production and application, for which the timeframe between activity implementation and generation of carbon removals is much shorter, it could be submitted within the first 2 years of activity implementation. Setting a maximum timeframe ensures the project timely reports on its impacts generated, however still gives the project developer flexibility to optimize its cost and revenue structure. [STX, 363]

932. Emerging technologies require close monitoring during and after activity implementation. Initially, while DAC processes evolve and accounting methodologies become established, reporting would take place frequently (for example, within two years of activity implementation and for at least biennially during the crediting period) and monitoring plans would be updated frequently during this time. Overly frequent or complicated reporting may unduly burden the project proponent. To avoid this, reporting parameters, metrics and cadence should be established in close collaboration with removal companies. As DAC storage can be in geological reservoirs, thousands of meters below the earth's surface or in the formation of permanent materials, e.g. minerals and products, DAC is poised to be the global standard-setter for permanent carbon dioxide removal. Therefore, in the medium to long term, once DAC processes and accounting becomes recognized as state of the art for removals the need for regular reporting diminishes. [DACC, 369]

5.11. Other inputs

933. The timing of the submission of monitoring reports should be defined case-by-case, possibly set by the host country DNA. [CRCY, 350]

934. There should be no requirement for monitoring plan to be submitted at either a fixed point in time or at a fixed interval of time. Project validation ensures that the baseline is correct, and it is recorded. Monitoring should happen whenever it is convenient, cost-effective, and practical for the project proponents. The monitoring data, and their continuity and integrity, will be verified during the verification of the monitoring report whenever it is submitted. The relevant monitoring requirements would be specified in the methodology. Reversal

reporting should be required whenever a reversal is detected. Separate procedures for reversal reporting should be specified in the methodology. [SCC, 356]

935. The need for a monitoring plan is inherently problematic. It implies that credits have been issued prior to the impact they represent (ex-ante) and consequently carry a risk of never realizing the climate benefit attributed to them. A better solution is to issue credits ex post, once the climate benefit has been delivered. While this may be more challenging for developers at first (though prices will adjust to accommodate this), it is the only approach to ensure the integrity of climate impact. [SH, 346]

936. Depending on the activity an initial inventory/monitoring report should be required to start an activity and the report be submitted within the first year. It should be prohibited for activities in the AFOLU sector to issue removals before the first monitoring report has been published. An initial assessment of current carbon sinks and the activities potential to produce additional emissions removals should be assessed, referencing the first monitoring report. Assessing the potential for emissions removals without data from the activity area would result in highly inaccurate results, likely misrepresenting the area’s true potential. In addition, removals should not be issued ex-ante. Issuance of ex-ante removals, as in removals issued before the first monitoring report has been published, would significantly increase the risk for over issuance of removals, which in turn would make removals issued by the SB less trustworthy. After the first report, a new monitoring report should be submitted at least once every five years. The exact time period should depend on the available technology to track statistically significant carbon fluxes specific to the activity. The time period required should be as short as possible. Again, removals should only be issued after each newly published monitoring report, to ensure only emissions removed and quantified are sold. Removals based on predictive models would encompass a high risk for over issuance of removals. 44.moles tracks fluctuations of silvicultural above-ground carbon sinks using terrestrial laser scanners to identify statistically significant changes in biomass within a five-year period. [44M, 351]

937. Where possible, monitoring reports should be submitted earlier. For types of activities where monitoring is less feasible given the characteristics of the carbon removal process alternative arrangements can be considered. For example, uncertainty discounting involves quantification of potential uncertainties in the net negativity and future leakages of a carbon removal approach and credits would be issued after discounting for this uncertainty. Such approach ensures that credits issued are a conservative estimate of the amount of carbon removed. [ISOMERIC, 352]

938. Activity-specific requirements need to be established that reflects the varying storage duration and risk of reversals of the different activity types. The MRV for shorter-term carbon removals tends to be more complex due to the dynamic nature of ecosystems and the influence of various environmental factors on carbon sequestration. On the other hand, engineered methods offer more straightforward MRV procedures, as the capture and storage processes reflect “closed systems” and/or can be closely controlled and monitored. Developing distinct MRV protocols tailored to the specific characteristics of each carbon removal approach is essential to ensure accurate and reliable reporting. [NEP, 359]

939. Credits should not be issued before a credible monitoring plan is in place; standards must be developed for each removal type to ensure that monitoring plans meet minimum criteria. [BF, 362]

940. Frameworks for monitoring and reporting should be activity specific, reflecting different storage timescales (permanence vs temporary) and reversal. [ZEP, 371]

941. Different types of removal activities using different sequestration mechanisms would require vastly different amount of monitoring requirement to achieve the same high confidence of sequestration. “High durability” activity types provide greater confidence than “low durability” ones, thus should be subject to different sets of requirements. [PT, 372]

942. 7. Do the “reversal notification” reports referred to in SB003 recommendations involve, e.g. digital notification of an observed event that could lead to a possible reversal of removals; submission of notification within [90] [120] [X] days of the observation; follow-up submission of a full monitoring report within [6 months] [1 year] [X timeframe]?

943. The submission of notification of a possible reversal of removals should be required within 60 days, with a confirmation of the reversal (monitoring report) required within 120 days of the observed event. Instead of “an event that could lead to a possible reversal of removals”, we recommend “digital notification of an observed event that has resulted in possible reversal of removals” to focus on whether there was a reversal and a timely accounting response that is most important. A 3rd party should be responsible for monitoring reversals and reversal events rather than the project proponent. [NB, 344]

944. Notification should be faster than 30 days and a full report within 6 months. However, a system relying on self-reporting by project proponents against their financial best interests is inherently problematic and must be reconsidered. [SH, 346]

945. The reversal notification reports should require digital notification of an observed event that could lead to a possible reversal of removals where possible. Project developers should be required to submit notification of a reversal within 30 days of a reversal being known. A follow-up submission of a full monitoring report should be submitted by the project developer within 6 months where a significant reversal event occurred. For reversals less than significant, project developers may continue to follow their existing monitoring reporting schedule. Significant may be defined as 20% of the total project area or two standard deviations of the average delivery performance for each methodology. [KITA, 347], [CFL, 365], [1.5,366]

946. To allow flexibility based on project types and reversal magnitude, initial digital notification within 30 days of a detected reversal and a full report within 1 year for reversals exceeding a threshold such as 20% loss or 2 standard deviations from project baseline. [CFL, 365], [1.5,366]

947. Separate guidelines may be need for different technologies. For example, an afforestation project may require more time to submit a full monitoring report after a significant reversal event is detected due to its remote and/or geographically spread nature compared to a Direct Air Capture plant that is location defined. [KITA, 347]

948. Reversal notifications should be submitted as soon as the activity proponent or the national authority has been notified of occurred reversals and has verified the news, e.g. within 24 hours. The follow-up submission of a full monitoring report should occur within one year to quantify the exact amount reversed. The activity proponent should be required to re-sequester the reversed amount within a realistic time frame defined by the national

authority if the reversals are found to have been caused by the proponent intentionally. [44M, 351]

949. First or preliminary notification should be within 30 days of the observed event and a detailed, quantified report on the event within 90 days of the observed event. [SCC, 356]

950. Reversal notification should be submitted within 30 days of the observation, and follow-up within 6 months to ensure that end-users have sufficiently long-lead time to adjust to ensure the reversal is addressed, and any claims made on the back of them do not cause legal and/or reputational risk to them. [PARIGI, 357]

951. The reversal notification without quantification should be given as soon as possible, and no later than 30 days after discovery of the start of the potential reversal event. Following that, the mechanism registry account of the project developer should be temporarily frozen as a precautionary measure so that no ERs can be transferred or retired until the account is unfrozen after assessing the situation. The follow-up, full monitoring report should be submitted within 3 months of the submission of the notification. In case the reversal event is still ongoing, the proponent should be required to continue to submit follow-up monitoring reports every 3 months until the reversal ceases, at which point, a final monitoring report should be submitted. If the proponent fails to deliver monitoring reports according to the above schedule and in case the SB had unfrozen the proponent's mechanism registry account after its initial temporary freeze upon submission of the reversal notification, then the mechanism registry account should be frozen again, and any credits they have been issued from the activity in question or from other activities should be blocked from being transferred or retired until the relevant monitoring reports have been submitted and reviewed. In case the reversal event occurs while a DOE is in the process of verifying ERs, or while ERs are in the process of being certified for issuance by the SB, then the reversal notification must occur immediately upon discovery of the potential reversal event. Discovery of a potential reversal event during the verification/certification process must temporarily suspend these processes until the reversal event is adequately assessed and corrective actions are taken where necessary. [CMW, 360]

952. The activity proponent should immediately notify a reversal that occurs within their project boundary, also referred to as an Event of Carbon Default (EOCD). Where an EOCD has been identified, the activity proponent should appoint, at its expense, an independent third party to verify the characteristics of an EOCD to determine the magnitude and causal factor(s). An EOCD Report should be submitted no later than sixth months after the EOCD has occurred. The activity proponent may appeal for an extension to the Issuer, or Insurer (if relevant), with reasonable justification. Where an EOCD report has not been submitted within the allocated timeframe, and no extension has been permitted, the activity proponent's account on the registry should be suspended and be unable to submit further facility registrations or issue requests. A standardised public disclosure of all EOCDs should be mandated through the mechanism's accredited certification schemes. [CCPLE+RECS, 354]

953. The reversal notification reports should be submitted as soon as possible, such as within 30 or 60 days. A full monitoring report should be required within 3 months. This monitoring report should also include an action plan on how to rectify any reversals that have occurred and reduce the risk of reversals occurring in a similar manner in the future. Subsequent corrective measures and lessons learned should be made available to the public. [BF, 362]

954. The initial notification of the observed event should be submitted as soon as possible but no later than 90 days from the observation and should include, at minimum, the date of the event, the location and a short description of the event. No impact assessment should be required at the notification stage. A reversal report should be submitted as soon as possible but no later than 6 months after the notification and should include, at minimum, a conservative estimate of previously verified reversals lost based on the area affected by the event, a clear explanation of the cause of the event and evidence of follow-up actions taken to prevent further losses from occurring. The impact of the forecasted ex ante credits would be covered in the next monitoring report. In case the proponent justifies why the report cannot be prepared within 6 months, an extension of 6 months could be granted. An example of such a cause could be that an afforestation/reforestation project area is affected by floods which makes collecting the required data within the default timeframe unfeasible due to safety or accessibility reasons therefore additional time would be required. [STX, 363]

955. The notification should be made within100 days of the observation and a full monitoring report within 1 year. [NEUST, 364]

956. The notification may happen within 120 days after the reversal event, and a full monitoring report should be submitted within 1 year. [NBS, 373], [REGREEN, 374], [CARBI, 376]

957. A notification reversal should be submitted within 90 days of observation. A full monitoring report should be released within one year of notification upon completion of a thorough analysis. [CLLA, 375]

958. Reversal notification reports should be notified as soon as possible with a full monitoring report within 1 year. [PURO, 378]

959. Reversal notification reports must be made within 60-90 days of an observed event digitally and followed-up with an updated monitoring report within three months of the notification being served. [DG, 361]

960. As soon as practicable. [ISOMERIC, 352]

961. If ER reversal events are detected, the monitoring entity would a) notify the project proponent so that the proponent may take mitigating actions immediately, and b) trigger the insurance claim to replace the reversed ER credits with new ER credits from its reserves. [CPOOL, 355]

962. Reversal notifications should focus on the actual reversal events ex post to gain detailed insights on the processes of the reversal and the quantification of the reversal event rather than expanding to include events that could potentially lead to reversal. A full monitoring report could include a section on “near misses” and outline what events could have led towards reversals over the reporting period. To ensure a timely reflection of reversal events, reversal events should be fully quantified, third party validated and reported in the subsequent monitoring report, within 6 months of the reversal event [CW, 358]

963. The activity proponent should be required to inform of any observed event that could lead to a reversal as soon as it is noticed or within a few days. All the quantification/mitigation details may be reported in the following monitoring report, indicating whether it was avoidable or unavoidable, which would be key to determining if it was an intended reversals and to penalise them accordingly (see also [response to] paragraph14 [of *the Questions*]). [SYLV, 367]

964. Requirements for “reversal notification” follow that of the CO_2 Storage Directive (CCS Directive) which requires, “in the event of leakages or significant irregularities, the operator immediately notifies the competent authority, and takes the necessary corrective measures”. [CCSA, 370], [ZEP, 371]

965. Planned harvesting activities should not be considered as a "reversal" event to be notified, because variations in carbon stocks due to harvesting will be calculated in each verification event. [NBS, 373], [REGREEN, 374]

966. The removals are part of the host country NDC achievements, and if authorized for ITMOs transfers, the DNA oversees issuing the authorizations and proceeding with the corresponding adjustments in the national inventory. Therefore, the occurrence of reversals shall be part of the DNA regulatory system for authorizing projects implementation and ITMOs first transfers, and for including the reversals occurrences as part of the national inventory and BTRs communications. The methodology approved by the SB shall have provisions not only related to the rules and procedures to be followed by the project participants in the validation and verification, but also the conditions to be attended by host countries DNAs for issuing letters of authorizations for project implementation and for ITMOs first transfers. The arrangements to treat unintended reversals occurrences should be part of the DNA authorization process. There might be options for the DNA to decide, for example, if the authorizations are bound to guarantees from its side to implement buffer approaches, or to issue provisional ITMOs, with the obligations at the side of the project participants or the final users to replace the ITMOs in the case of unintended reversals, etc. In this sense, we believe the SB is not in charge of ensuring the final use of the ITMOs at NDC achievements or other international purposes, the SB is only responsible for the consistency of the reported removals/reversals occurrences, whenever they occur. The NDCs transparency framework process (BTR and national inventory, and technical reviews) will take care of the consideration of the achieved removals/reversals certificates in the national inventories and in the global stock take processes. These external processes, related to the 6.2 and Katowice NDC implementation process are to be in line with the A6.4 MRV, and all of them in line with the IPCC Guidelines for National Inventories, which is the basis to make the measurement and report (at projects, national inventories, and any other framework) about the mitigation impacts of removals by sinks, and emissions by sources (including the reversals, whenever they take place). [CRCY, 350]

967. For permanent removals, there is no need to report events that could lead to a possible reversal. Any actual reversal should be reported in the yearly report. The annual report should also include an incident survey where events that could have resulted in reversals are identified. [SE, 345]

968. 8. To ensure and demonstrate the continued existence of removals, are activity proponents required to undertake monitoring and address reversals

- ***8 (a) Only during active crediting period(s); or***
- ***8 (b) Also [15] [X] years after the last active crediting period?***
- ***8 (c) The longer of [8(a)] [8(b)] or a timeframe specified by the host Party (e.g. communicated in LoA or earlier).***

5.12. Inputs on 8a (during active crediting period(s))

969. Only during the crediting period, because in some cases, the maintenance of carbon stocks after the crediting period may be out of control for the project proponent. [NBS, 373], [REGREEN, 374]

5.13. Inputs on 8b (during active crediting period(s))

970. A dynamic accounting system could be used in which all removal credits are continuously monitored until they are no longer being used for a climate mitigation claim. Nature-based removals should be required to continue to be monitored for reversal events as long as they are being used for a climate mitigation claim within a carbon credit framework, possibly at a reduced frequency (every 5 years) after the crediting period. For removal solutions with durability, specific monitoring expectations and timelines should be set up based on the type of removal and the feasibility and costs of continued monitoring, but no less than every 5 years for at least 30 years after the crediting period. The monitoring costs should be borne by the purchaser of the credit that has retired that credit as a part of a climate mitigation claim. [NB, 344]

971. Monitoring must be extended well beyond the end of the final crediting period to ensure any reversals are accounted for accurately and in a timely manner, as well as to address perverse incentives for project proponents to not maintain the impact over a period longer than the crediting period. The responsibility and requirement for monitoring should be with the project proponent for a period of at least 100 years, with additional measures in place to guarantee permanence over a longer duration thereafter. California’s Compliance Offset Program requires monitoring for a period of 100 years following the final issuance of any ARB offset credits. The costs associated with the project proponents’ long-term monitoring responsibility could be reflected in the A6.4ER sale price, since this approach to monitoring would provide a more credible guarantee to the buyer and since the buyer should also be liable to contribute to long-term monitoring. Thus, part of the cost of long-term monitoring could be covered by the buyer. However, even 100 years do not cover the lifetime of atmospheric CO_2: therefore, after a 100-year period, there must be continued monitoring and liability for reversals, for which however, solutions are not obvious given the complexities involved (see also [their responses to] paragraphs 10, 14 and 15 [of *the Questions*]). [CMW, 360]

972. Activity proponents should be required to undertake monitoring and address reversals up to 100 years after the last active crediting period for all technologies to ensure a minimum level of permanence. Climate Action Reserve requires monitoring reports submitted annually until 100 years following the final issuance of credits to a forestry project. It would then fall to each standard with CDR methodologies to include this in the design and project developers to appropriately capture this additional effort in subsequent pricing. Application of this approach would likely raise nature-based projects’ prices and more in line with other CDR approaches. For some CDR technologies, the time range could be defined to correspond their durability. Either approach should ensure activity proponents maintain adequate oversight for their carbon removal projects long after their financial interests are satisfied. Such responsibility could be passed on to a government or other body (similar to a decommissioning fund) subsequent to the project’s conclusion of issuing credits or over the project's lifetime. (see also [the response to] paragraph 10 [of *the Questions*]). [KITA, 347]

973. The proponents should be required to monitor reversals for more than 1,000 years after the crediting period, because the credits were sold to offset emissions that will be in the atmosphere for at least that long. A 1,000-year monitoring period is, of course, infeasible and unenforceable. [SH, 346]

974. Continued storage of removals should be monitored until year Y+100 where Y is the year when removals occurred, assuming that 100 years is the minimum storage period required for issuing 1 credit. If another minimum period is required, then that would apply. [SCC, 356]

975. The timeframe should be specified, at minimum as 25 years based on a crediting period of 15 years as indicated previously by the SB and the Integrity Council for Voluntary Carbon Markets (ICVCM)'s guidance of a minimum 40 years. All projects require much longer-term monitoring and obligation to fulfil their ultimate climate impact, and this should be priced accordingly. The ICVCM has indicated that it will shift to looking at 100-year permanence levels, and potentially extend MRV obligations until the latest date of expiry of the monitoring and compensation period of all registered and completed mitigation activities. This may be, for example, when the carbon- crediting program ceases to exist or is otherwise prevented from operating the pooled buffer Reserve. [PARIGI, 357]

976. [CFL, 365], [1.5,366] recommended that:

(a) Minimum 15 years of monitoring post-crediting, provided by a public entity with an economic lifetime longer than the specific project or its developers;

(b) Longer timeframes where national regulations are lacking;

(c) Development of mechanisms for oversight to continue beyond the initial monitoring period (e.g. government bodies, funds);

(d) Flexibility in requirements based on removal risk and durability factors;

(e) Standards and methodologies should account for extended time frames in project design and pricing. [CFL, 365], [1.5,366]

977. Regarding 8 (b). The number of years during which reversals need to be addressed should be based on project type (i.e. depends on required permanence and the typical timescale that type of project is modelled on). Allowing the host Parties to define the timeframe should be avoided, as it would add an extra layer of complexity for buyers that try to compare projects in their sourcing processes. [SYLV, 367]

5.14. Inputs on 8c (longer of [8(a)] [8(b)] or a timeframe specified by the host Party)

978. [CARBFIX, 353] supports either 8 (b) or 8 (c) of *the Questions*, with the provision that monitoring requirements may be stopped if "all available evidence indicates that the stored CO_2 will be completely and permanently contained" as it is stated in Article 18 in the EU Directive on the geological storage of carbon dioxide. [CARBFIX, 353]

979. To ensure and demonstrate the continued existence of removals, 8 (c) the longer of 8 (b) or a timeframe specified by the host Party should be used. Previous UNFCCC decisions on modalities concerning geological storage stressed that, monitoring shall: "(d) Only be terminated if no seepage has been observed at any time in the past 10 years and if all available evidence from observations and modelling indicates that the stored carbon dioxide will be completely isolated from the atmosphere in the long term (paragraph 16 of

Appendix B to 10/CMP.7 Annex). Following this precedence, the monitoring obligation should be performance-based to ensure that all reversals are addressed in full. [CW, 358]

980. It should only be during active crediting period(s) for mineral waste carbonation project/mineralization and the longer of [8(a)] [8(b)] or a timeframe specified by the host Party (e.g. communicated in LoA or earlier) for geological storage when specified by the host Party. [NEUST, 364]

981. 8 (c) - the longer of 8 (a) and 8 (b) or a timeframe specified by the host party. [CARBI, 376]

5.15. Inputs on Differential treatment

982. The approach has to be differentiated depending on the type of removal activity. A land-based removal credit is inherently non-permanent in that the carbon stays above the geological layer and that the ownership of the land can change hands over short periods of time. As such, a nature-based removal must therefore always be considered reversed at the end of the Monitoring period. Therefore, the monitoring period for land-based approaches should thus correspond to the time-frame the project is committed to keep the land as a removal. The implication of this is that at the end of the Monitoring period, the acquirer of land-based credits must prolong the credits or acquire new credits if it wishes to maintain the climate position achieved based on the original purchase of the land-based credit. It follows that for land-based credits, the time-frame for addressing reversals is during the Monitoring period, as the CO_2 should be considered released after that period. For permanent removals, the permanence is confirmed by the scientific consensus and the fact that the CO_2 is sent permanently from the biosphere/atmosphere to the geosphere. Permanent removals should be monitored indefinitely. During the Monitoring period, reversals should be monitored and addressed according to the applicable jurisdiction as well as counted as an emission by the storage company. At the end of the Monitoring period, there should be a transfer of responsibility to the host nation of the storage. If there is a reversal after the transfer of responsibility, the host nation should count the reversal as an emission and take measures according to the applicable jurisdiction. Applying this approach within the EU, as an example, would rely on the ETS and CCS directives which prescribe that any CO_2 emitted from a storage site shall be addressed by the purchase of an EU ETS EUA (Annex I activity). [SE, 345]

983. The monitoring period must be longer than the crediting period. A categorization should be established depending on the permanence of storage based on IPCC findings and the duration be differentiated accordingly. For storage in biological systems (e.g. forests, soils, aquatic ecosystems etc.), it could be minimum 30 years after the end of the last crediting and for geological storage, 20 years following CDM M&. Monitoring may cease only when no reversals occurred during the preceding 10 years and no reversal is expected based on historic matching and modelling. Host countries should have the option to set a longer monitoring period. [PCR, 348]

984. What entails a robust and practical monitoring plan will depend on the type of activity: those that that claim to have higher durability should present evidence of such durability, for example: evidence that a geochemical process has occurred meaning the reversal risk of CO_2 is negligible; biogeochemical models in addition to relevant uncertainty discounts to reach a conservative estimate of the amount of leakage expected in an open system; ongoing project specific monitoring. [ISOMERIC, 352]

985. Monitoring guidelines should be methodology specific and dependent on the type of removal activity. All monitoring activities should ensure the continued existence and durability for a removal. Monitoring should continue until the reversal risk is eliminated or deemed negligible. [CCPLE+RECS, 354]

986. If a removal is reversed at any point during or after their crediting period, the re-emission of greenhouse gases to the atmosphere means that they lose their climate benefit, therefore removals must be monitored in perpetuity so that any reversal can be addressed. On the question of how long after the end of the crediting period should the liability to monitor and rectify reversals remain with the activity proponent, the desirability of monitoring and liability being transferred to the state entity depends on the risk profile of carbon storage. The EU CCS Directive provides a model for risk transferring for geologic storage after the close of the injection site “if and when all available evidence indicates that the stored CO_2 will be completely and permanently contained.” In addition to this, the handover of responsibility is to be accompanied by a financial contribution to cover the expected cost of monitoring for 30 years. For other forms of carbon storage, private insurance (e.g. for enhanced weathering, whose primary risk is that removals may occur slower than anticipated), or a [non-]governmental trust (e.g. for storage in biotic sinks that will require ongoing maintenance). [BF, 362]

987. To ensure and demonstrate continued existence of removals addressing of reversals and monitoring should be extended beyond the crediting period. The amount of time it should be extended should depend on the type of removal activity and the non-permanence risk associated with it over time. Hence, even after an activity is no longer eligible to earn new credits, obligations remain to monitor and address any reversals that affect previously issued credits. It could be simplified, while maintaining the reversal notification requirement in place, for example for an afforestation/reforestation activity consist of a pure GIS analysis to demonstrate permanence of removals is maintained. For engineered solutions, such as Direct Air Capture and Storage, evidence to support that the reservoir in which removals are stored is stable could be sufficient. [STX, 363]

988. The active monitoring period for a removal project should depend on the type of removal project, the declared environmental effective duration of the project activity, the reversal risk, and the standard of proof required to close the monitoring period. These should be in line with standard risk management practices found in other long term environmental exposure environments and scaled relative to the size of the project C@R (carbon at risk). For smaller projects, random statistical audits analogous to quality sampling should be used to ensure compliance while balancing cost effectiveness. The timeframe required to monitor long term storage projects, such as geologic carbon storage, can often outlast the companies/proponents that create them. A more suitable approach could be a shared liability framework between the local governments and the project proponent. [CFL, 365], [1.5,366]

989. In order to demonstrate the proof of permanent and durable geologic sequestration of injected CO_2 through carbon mineralization, project developers or activity proponents should be required to address reversal risks and continue MRV practices later throughout the project’s life cycle. For removal by mineralization through injection, project developers should have a cradle-to-grave analysis of the site’s reversal potential with a dual-proxy monitoring approach of two independent geochemical and geophysical datasets to cross reference for storage success. The host parties should set their own timeframe specific to their own CDR methodologies. [CLLA, 375]

5.16. Inputs on Responsible entity

990. Removals should be monitored by the activity proponent during the crediting period. Further monitoring beyond the crediting period is crucial to ensure permanence and should be undertaken by the host party's national authority, financing of which should be shared between the host Party and the buyers, specified by the host party. [44M, 351]

991. Long-term monitoring is essential to ensure durability of removals, but responsibilities will need to transfer to capable entities as projects conclude. [CFL, 365], [1.5,366]

992. The CO_2 Storage Directive (CCS Directive) specifies a minimum period of 20 years before all legal obligations relating to monitoring and corrective measures can be transferred to competent authorities. A shorter transfer period can be agreed if evidence suggest that the stored CO_2 will be completely and permanently contained before the end of that period. It may be appropriate for the Article 6.4 to allow such flexibility to operators regarding the monitoring periods and timeframes for addressing reversals that they must observe in situations where governments voluntarily assume responsibility for long-term monitoring and reversal risks. As such, the required timeframes for activity proponents to ensure and demonstrate the continued existence of removals would be more appropriately set host Parties, based on pre-defined criteria guiding transfer of responsibilities. [CCSA, 370], [ZEP, 371]

5.17. Other Inputs

993. The host country DNA shall be responsible for issuing the authorization of ITMOs related to the removals projects, and once a land area is included in the UNFCCC registration of A6.4 projects, the removals achieved in that area will be reported by the host NDC as achievements by the host country, and if ITMOs are first transferred for international utilization, the conditions for those issued ITMOs shall be set out by the arrangements between the host DNA and the project participants, and pertaining to the use of these ITMOs for foreign NDCs achievements or for other mitigation purposes. For example, if the ITMOs authorization are destined or only eligible for a voluntary market utilization, or for voluntary cancellation, the addressment of the reversals, if they occur, maybe a minor issue, and the conditions for this are engraved in the ITMOs letter of authorization. If the ITMOs are allowed to be used by a foreign NDC only for certain implementation period(s), this is also acknowledged by the host DNA when issuing the transfer authorization and will be known by the foreign NDC that acquire the ITMOs for its achievement. However, if the ITMOs are issued as permanent achievement, the DNA will be responsible for their replacement in case of intentional or unintentional reversal occur in the future. The arrangements for these replacements shall be set by the DNA and may involve the participation/co-responsibility by the project proponents, investors, or the depositary of the ITMOs after their issuance. Anyway, these arrangements will not be under the regulatory domains of the SB, and more at the A6.2 and NDC implementation processes. [CRCY, 350]

994. In addition to during and after operation, there should be requirements for addressing the risk before the project is operational. Before: we ensure through our requirements in the methodologies that the risk of reversal is minimised and that activities can deliver durable storage of CO_2. Compliance with the requirements on the chosen storage sites is verified in Facility Audit through independent 3rd party verification before issuing credits to the removal activity. For post-closure requirements, we support a timeframe of 20 years or less, dependent on the risk of reversal of the activity. Pre and post-closure requirements

to address the risk of reversal are CO_2 Removal methodology specific as the risk depends on each technology and the CO_2 removal supplier must provide a risk assessment and mitigation plan for the risks related to the permanence of the CO_2 sequestration and potential re-emission of CO_2. In the Terrestrial Storage of Biomass methodology, the CO_2 Removal Supplier needs provide a monitoring plan for early detection of a reversal and to demonstrate the ownership of land title for 100 years and a fund to cover financial requirements. For Biochar, there is a pre-issuance deduction based on degradation curves as a function of biochar quality, soil temperature and expected reversal after a time period of 100 years has lapsed. Geological storage methodology follows the post-closure monitoring requirements of the EU Carbon Capture and Storage (CCS) Directive which is 20 years or less, or other national legislation such as the US Environmental Protection Agency Class VI injection wells. [PURO, 378]

995. 9. Is simplified annual reporting required to ensure and demonstrate the continued existence of removals? In what cases and how long?

5.18. Inputs on “should be required”

996. It should be required throughout the crediting and monitoring periods, as is the norm in accounting elsewhere. [SH, 346]

997. We support an annual reporting requirement for maintaining the continued performance of removals. The frequency of reporting does not dictate if the removal exists; rather, the frequency of reporting informs the performance of the removals project and provides the necessary transparency to allow these types of markets to function. Simplified annual reporting provides ongoing assurance of sustained removals, particularly for less frequently monitored projects. Remote monitoring technologies should be leveraged where possible to minimize burdens. [CFL, 365], [1.5, 366]

998. Simplified annual reporting should be required unless it can be demonstrated that the stored CO_2 will be completely and permanently contained. [CARBFIX, 353]

999. For at least 100 years. Preferably this would be set based on the crediting project, with the objective to stabilise emissions to the atmosphere. [PARIGI, 357]

5.19. Inputs on “could be required”

1000. Within the crediting period, simplified annual reporting could be installed, as long as it does not impose excessive burden on project developers considering that monitoring reports may need to be submitted at least every two years once a first report has been authored. Beyond crediting period, see [their response to] paragraph 8 [of Questions]. Storage monitoring should reflect the likelihood of reversal events of each activity to ensure that reversals can be addressed in full wherever necessary without excessive monitoring burden. [CW, 358]

1001. While simplified annual reporting could be required, this must not replace detailed and regular monitoring reports verified by an independent third-party. [CMW, 360]

1002. Simplified annual reporting is an option in cases where the stored atmospheric carbon is permanently bound, such as stored in geologic formations or bound into minerals. As such forms of carbon storage have a low risk of reversal, simplified reporting may be justified, such as after the closure of injection of CO_2 in a geologic sink. In the future, improvement of remote sensing (e.g. via satellite or LIDAR) may allow for simplified annual reporting to be possible for removal options such as afforestation if the reporting is paired with active remote monitoring. [BF, 362]

1003. Simplified annual monitoring for reversals is ideal for as long as that credit is being used as part of a climate mitigation claim. The cost and responsibility of monitoring and reporting should not be borne by the project owner/developer, but by a 3rd party and paid for by the entity that is using that credit for a climate mitigation claim. In practice, credits that are at a higher risk of a reversal, should be assessed more frequently than those at a lower risk. The temporality of reversal monitoring being more frequent for projects that are at a higher risk of reversal and less frequent for projects with a lower risk of reversal. [NB, 344]

5.20. Inputs on “may be redundant”

1004. In cases where a project is submitting monitoring reports annually or biennially, simplified reporting would be redundant while if the monitoring reports are submitted every three to five years for a nature-based solution, submitting simplified reporting may be cumbersome (e.g. ARR). As dMRV become more readily available, simplified annual reporting may be feasible. [KITA, 347], [CFL, 365], [1.5, 366]

1005. If every aspect of the project is declared in the monitoring report, there is not much additional benefit of such report. [NEUST, 364]

1006. If a notification system for potential reversals is put in place, requiring annual reporting would be redundant. [SYLV, 367]

1007. It depends on the format of the Simplified Annual Reporting. If this form requires low field measures and can be based on secondary data and/or remote sensing techniques, annual reporting would provide more transparency in the demonstration of GHG removals. [NBS, 373], [REGREEN, 374]

1008. Provided that the removals project is frequently audited, the auditing alone will demonstrate continued existence of removals, simplified annual reporting should not be required. [CARBI, 376]

1009. For Performance monitoring and issuance of CORCs, we require annual reporting. Post-closure monitoring depends on the type of removal activity (see also [the response to] paragraph 8 [of the Questions]). It is not clear what additional information the annual reporting would bring during when the activity is post-closure. [PURO, 378]

1010. Full monitoring reports submitted in appropriate intervals and risk reversal notifications and reports in place, the non-permanence risk should be sufficiently addressed. Therefore, simplified reporting would only be recommended for monitoring after the crediting period has ended while maintaining the regular monitoring intervals. Annual reporting, albeit simplified, would add costs to the project without a significant decrease in the non-permanence risk. [STX, 363]

5.21. Inputs on “should not be required”

1011. Simplified annual reporting should not be required if the removals are issued consecutively after each monitoring report, issuing only ex post emissions removals. Only if the activity is associated with a “high-risk for reversals” should simplified annual reporting be required. [44M, 351]

1012. For permanent removals, no simplified reporting should be allowed. A robust reporting standard should be established. (See also [the response to] paragraph 6 [of *the Questions*]) [SE, 345]

5.22. Inputs specifying methodology requirements

1013. Continued storage of the removals should be verified periodically, not necessarily annually, until 100 years of storage is verified. Each methodology should specify the frequency at which this should be reported, and the conditions under which such period can be longer or shorter. [SCC, 356]

1014. The reporting during the crediting period will be in the frequency and level of report and verification that could demonstrate the achieved removals amounts in consistent manner to the monitoring plan. The methodology will cover the technical aspects for mitigation outcomes reporting at the NDCs, and the conditions for the first transfers and ITMOs authorization are set by the DNAs and the project participants in regard to the use to be done by the ITMOs after their issuance, and these are not under the responsibility of the SB, but under the technical review process related to the NDC BTR auditing processes. [CRCY, 350]

1015. Are measures required to address the residual risk of reversals beyond the monitoring timeframe? If so, for how long, and what are the options for, e.g. the mechanism(s), responsible entity(ies), oversight?

1016. Measures are required to address the residual risk of reversals. Options include poorly sized and managed buffer pools, the UN assuming a permanent liability, or a much simpler solution (See 2.3.4 Accounting for removals). [SH, 346]

1017. The residual risk of reversals beyond the monitoring timeframe is inevitable, especially for nature-based solutions. Such risk should be communicated, and distributed fairly so that the buyers are aware of the potential reversal of the purchased removals, beyond the monitoring timeframe. [44M, 351]

1018. Upfront characterization and quantification of the sources of uncertainties around the net negativity of a process can be a comparably rigorous alternative to monitoring for certain types of activities. (see also [their response to] paragraph 6 [of *the Questions*]] [ISOMERIC, 352]

1019. Yes. As it may be difficult to place a 100-year obligation on the project developer (at least without the inclusion of insurance to manage situations of bankruptcy etc.) an independent and expert Reversal Commission should be created who can act as both investigators and as an ongoing buffer pool of the last resort. Contributions to the Reversal Commission should be funded as a levy on a carbon credit, with the levy rate adjusted based on the risk of reversal of the project type which the SB or Reversal Commission could revise annually as scientific understanding evolves. The objectives of a Reversal Commission are two folds: 1) to undergo the monitoring once the period past 25 years past the crediting period has ended; and 2) to compensate for the reversals using their own buffer stock of durable removals [PARIGI, 357]

1020. To address the residual risk of reversals beyond the monitoring timeframe, a “post-project monitoring period” could be established that commence at the end of the final crediting period and be performed on an annual basis for a time period determined by the risk of non-permanence or substituted with appropriate domestic regulatory monitoring arrangements. For example, projects with geological storage subject to robust regulatory requirements for monitoring of said storage should have either a de minimis or no post project monitoring period at all within the context of the 6.4 mechanism. However, projects utilising less durable storage should be subject to a longer post-project monitoring period, with more detailed reporting requirements. [DG, 361]

1021. By requiring reversal notification reports and simplified reporting beyond the crediting period the risk of not accounting for occurred reversals is already greatly mitigated until the end of the monitoring timeframe. The cancellation of the ERs deposited in the buffer pool should then be sufficient to address the residual risk of reversals beyond the monitoring timeframe. [STX, 363]

1022. The monitoring period could be extended with a procedure similar to the monitoring, i.e. activity proponent monitors reversals, VVBs are responsible for approving monitoring (see also [their response to] paragraph 8 [of *the Questions*). [SYLV, 367]

1023. To prevent the residual risk of reversals, the project proponents may monitor the permanence of the carbon stocks using remote sensing and/or secondary data for a period of 10 years for NBS removals. This could be demonstrated through a simplified verification by an accredited third party in the 5th and 10th years after the monitoring timeframe. [NBS, 373], [REGREEN, 374]

1024. Residual Risk of Reversals should apply for only 5 years. Oversight by two post-reversals-period audits after the return period, one in year 2 and one in year 5. [CARBI, 376]

5.23. Inputs on Differential treatments

1025. Measures should be required. A performance-based monitoring timeframe could be enacted *a priori* and whether a burden of monitoring for project developers can be eased, can be considered if another entity is willing to take on a “highly limited” possibility of reversals. This logic is enshrined within the European CCS Directive, where a project operator can apply to transfer the liability towards national entities. Such entities will be held responsible for further losses, in case they accept to incorporate said activity towards its accounts in the first place [CW, 358]

1026. Such requirements should be made activity specific depending on the removal process and timeframe. For example, mineralization does not need additional measures while geological storage, the host party could specify it. [NEUST, 364]

1027. The required monitoring time frame should reflect the risk profile and duration of the credit. Exceptions can be made for highly regulated projects, such as geologic carbon storage projects, in jurisdictions with relevant experience and mandatory requirements for managing residual project risk post closure. However, for less regulated project types, after the monitoring time frame, only residual reports required for health and safety should be expected. Mechanisms should be established to manage reversal risks beyond initial monitoring periods, such as national regulations, liability funds, and transfer of oversight responsibilities to recognized and capable entities. [CFL, 365], [1.5,366]

1028. See also the response to] paragraph 8 [of *the Questions*]. Requirements for addressing the risk of reversal should recognise the varying degree of the risk, as in the categories and approach defined by ICVCM in the Core Carbon Principles. The timeframe for addressing the risk of reversals needs activities to occur before, during and after the operation of the project. Before: we ensure through our rules/ methodologies for the validation audit of the project, and through independent verification that the chosen storage sites and activities can deliver durable storage of CO_2, and therefore risk of reversal is minimised. During: we have annual performance monitoring when the project is operational therefore carbon credits are only issued after the removal has occurred (e.g. ex post carbon credits) and ensures permanence is continuously met. After: post-closure requirements to address the risk of reversal is methodology specific. For example, with geological storage this covered by legislation in some regions. [PURO, 378]

5.24. Inputs on Responsible entity

1029. The responsible entity should be the entity using the removal as part of a climate mitigation claim and should cover the costs of 3rd party monitoring of that project for reversals. The project developer is only responsible for ensuring the permanence of the credit and should not bear responsibility for the monitoring of that permanence. For nature-based credits, minor reversals (<1%) will likely occur and will be hard to monitor without incurring significant monitoring costs. But most nature-based carbon credit projects should be able to be monitored for major reversal events (>5%) using remote sensing tools at a low cost. The tracking and reporting will need to be fully digitized and automated to ensure continual reporting and monitoring of all projects. For tech-enabled removals that are designed for greater durability, the frequency of monitoring should depend on the costs of monitoring those projects and the risk of reversals but the duration should continue to be for as long as the credit. [NB, 344]

1030. Such responsibility could be taken up by a government or other body (similar to a decommissioning fund) once the project stops generating credits. Such fund can be used to safely maintain the project in the long term with long term MRV plans operationalized of its own in place. [KITA, 347]

1031. If risks can be addressed beyond monitoring period, this assumes reversals can be detected without monitoring and it is not clear how that can happen. However, if it is a question of change of the entity responsible for monitoring of reversal, this can happen: for example, the private entity is required to monitor during the crediting period; the host Party can assume responsibility for continued monitoring and reporting from there onwards, presumably in perpetuity. However, it is not clear what would be the rationale for this. For continued monitoring in perpetuity, the change of entity needs only happen when an entity no longer can function or goes bankrupt. The responsibility of ‘oversight’ should always rest with the SB. The responsibility for enforcement of liability in the event of not receiving the required monitoring report should rest either with the host Party or with the Party acquiring and retiring the credits. [SCC, 356]

1032. Transferring the monitoring and compensation obligation to host Parties at the end of the project proponent’s monitoring period and allowing buyers to claim neutrality or meet emission reduction targets with credits that are associated with mitigation outcomes facing a risk of reversal could be unfair, especially where many of the host Parties are developing countries while buyers are typically wealthier Parties or organisations. Two possible solutions are: i) introduction of a top-off fee at issuance that goes to the host Party, and serves to cover the costs of future monitoring and compensation, amount to be set depending on the level of reversal risk of the activity; ii) the UNFCCC secretariat to support the Parties in monitoring for reversals following the end of the monitoring period of a project. The Secretariat could establish and manage a long-term monitoring system operating on satellite imagery (and/or other methods depending on activity type), funded through a share of proceeds levied on the issuance of credits that involve carbon storage, which could be tied to the expected durability / risk rating of an activity (See also [their responses to] paragraphs 14 and 15 [of *the Questions*]). [CMW, 360]

5.25. Other inputs

1033. An approach that imposes ongoing, indefinite liability for any reversal of credited removals should be adopted that is likely to achieve greater permanence of removals than any approach that defines a given minimum time period of sequestration as “permanent” and allows reversals after that period to occur with no liability arising. Maintaining liability for reversals over an indefinite period provides an incentive to protect carbon sinks over the long term. New Zealand employs this approach within its NDC and domestic ETS. For example, in the New Zealand system carbon stocks (including reversals) are monitored and accounted for over time both within New Zealand’s NDC and domestic ETS. Liability to surrender ETS units in the event of reversal generally remains with the landowner. Liability should follow the beneficiary, and/or the party best placed to manage reversal risks, with appropriate arrangements and safeguards for the long-term (i.e. potentially indefinite) nature of the obligations. [NZ, 342]

1034. Instead of withholding a “pool” of removals from being sold, buyers should buy enough removals to build their own buffer, depending on how heavily they depend on the removals to reach their climate goals. Multiple buyers could build a common buffer pool, distributing the risk among themselves. We do not believe that the buffer pool should be maintained by restricting activity proponents in the number of removals they are allowed to sell. The financial incentive for activity proponents to sequester and remove emissions should at no point be sacrificed as this would limit the Mechanisms potential to scale and to impact the climate. [44M, 351]

1035. The conditions for temporal boundaries and validity of the ITMOs are set in the authorization letters by host country DNA, and if the ITMOs are issued without an expiration date and without any limitation as to what is the final uses they may have, there will be a need to the host country to report in the national inventory at any time in the future the reversals, if and whenever it takes place, in intentional or unintentional manner, and making the corresponding adjustments/inventory report. For example, consider that the host country “A” has issued in 2028 the authorization of ITMOs for a removal project activity that demonstrated “X” tons of CO_2 have been removed by the atmosphere by an A/R project in the area “H”. If the authorization letter allows for the use of this “X” tons of CO_2 by any foreign NDC as its achievement at any NDC period (not only to the 2025-2030 period, but for any future NDC implementation period), the responsibility to the permanent validity of the ITMOs are at the responsibility of the host country NDC implementation framework. The foreign NDC that make use of such ITMOs are demonstrating the NDC achievement in permanent manner, in the same way as any emission reduction (A6.4ERs, which are additional and permanent at the global stock takes). Therefore, if a country “B” uses these ITMOs to demonstrate its achievement in the 2025-2030 period, this demonstration is finalized, and need not to be revisited in the future. However, if the host country has issued the ITMOs bound to an expiration date of 2035, the user NDC will be able to use them for the target’s demonstration up to this year of 2035, and will be required to replace these ITMOs in that year by another ITMOs, either by implementing domestic mitigation to replace them, or by purchasing the replacement units at the ITMOs market. In other words, the arrangements related to permanence of the ITMOs are bound to their validity date, and the host country NDC may set a validity (expiration date) or not. This will of course be also part of the market valuation of the ITMOs: if they have a face stamp with limited application for final uses (e.g. they are only for voluntary corporative uses, and not for NDC achievements), and whether they have a limited validity in terms of temporal insurance by the host DNA, their market value will reflect this handicap. The way/process a host country uses to ensure the temporal validity of the removal activity in the long terms depend on the kind of remuneration/taxation, or internal system in the country to ensure there will be a continued enhanced ambitions to achieve national contributions to the global stock takes of mitigation outcomes, while not changing its AFOLU inventory on removal/reversals balanced accounting. For example, if a host country considers the area "H" may be kept as a forest area for long terms in the future (2070 or beyond), without the change in the land use at that point of the territory, it will be able to issue the "X" tons of CO_2 removals in the year 2028 as a permanent (guaranteed ITMOs, valid for any time in the future). What is worth to mention, is that any removal project related to A/R for forest conservation are natural candidates for being converted in the future in projects related to production of renewable energy/biomass by sustainable harvesting of forest based biomass, either to use for energy or for carbon removals in geological storages (e.g. BECCS or BCCS, see our previous input available at https://unfccc.int/sites/default/files/resource/Carbon_Recycling.pdf). In other words, the issuance of permanent ITMOs for an afforestation or reforestation land area, may give rise in the future, when the saturation of the forest is achieved, in a production project where the sustainable forest management is adopted for the continued harvest of the net primary productivity of the forest stands, and the use of these harvests for bioenergy or biocarbon. [CRCY, 350]

6. Addressing reversals

6.1. General

1036. 11. What type of risk rating is used to calculate an activity's buffer contributions?

- ***a) The results of an individual activity's risk assessment;***
- ***b) A standard rate determined by the 6.4SB;***
- ***c) Either measure could be appropriate, depending on the circumstances (in this case, what factors should determine the use of an activity-specific or standard risk rating)?***

6.1.1. Buffer contributions results of an individual activity's risk assessment

1037. A project specific risk assessment with a dedicated methodology for the process is more desirable as one-fits-all would not work. [NEUST, 364]

1038. To calculate an activity's buffer contributions an individual activity's risk assessment should be used to promote active risk management and the construction of portfolios that diversify the risk, lowering risks for all. Verra's use of non-permanence risk reports are a great example for an individual activity's risk assessment. Blanket reporting of averages hide risks, lowering confidence and integrity. Where risk is lowered by project level improvements, credits may be released from the buffer pool which provides an incentive to improve risk scores and increases liquidity of credits. 'Over buffering' reduces liquidity in the market. This can be avoided by assessing risk appropriately at a project level at the start. [KITA, 347]

1039. Any method used to quantify a risk adjustment in the number of credits issued from a project should be specific to the type of project activity. Depending on the process the specific set of measurements taken might lead to different project level uncertainties being appropriate. [ISOMERIC, 352]

1040. An activity level risk assessment is preferred which would be based on both the durability of the removals and the risk of reversal associated with the particular activity. [CARBFIX, 353]

1041. Standardised rates determined by the SB should be avoided as they could give rise to projects addressing reversals beyond the true risk of their occurrence. To ensure that measures remain proportionate, individual activities should be required to supply their own risk assessments based on a standardised assessment method to ensure quality and consistency. The outcome should be a set of requirements which vary according to the risk of reversal identified by the project, with such requirements becoming less onerous the lower the degree of identified risk is. [DG, 361]

1042. All types of removal systems are sensitive to how and where they are implemented, and risk rating should be assessed on an individual project level. Projects that have greater risks of reversal, e.g. due to human interaction or sensitivities of storage to the environment, have a greater need for their risk profile to be individually assessed. While standard rates are administratively less burdensome, they also risk moral hazard, where projects are designed in more risky ways such that the standard rate underestimates the risk estimate. However, risk calculation can reasonably include standardized formulas and ranges based on the identified risk profile of the individual project for a given removal activity type. Following considerations may be given:

(a) Geologic storage of atmospheric CO_2: characterization of the storage site; susceptibility of the region to tectonic instability; track record of the operator of the storage site;

(b) Storage of CO_2 in standing biomass: diversity of the biomass; suitability of biomass to the regional climate (including under projections of climate change) and the corresponding need for human intervention to maintain storage; the risk of disease, fire, drought in the region (including under projections of climate change); fire management practices; local social stability; track record of the operator;

(c) Enhanced weathering: [projected] changes in climatic conditions; erosion conditions; stability of land use practices in the region (e.g. risk that the land will be backfilled or repurposed); risk of modelling vs real world inaccuracies; track record of the operator. [BF, 362]

1043. To calculate an activity's buffer contributions, the results of an individual activity's risk assessment should be used which should be conducted in the same manner for all project types, following a risk assessment tool/methodology to be developed by the 6.4SB to ensure consistency. [STX, 363]

1044. Regarding 11 (a): Even in the same country or region, different project developers may have different risk ratings. Therefore, the individual activity's risk assessment may be more appropriate. [NBs, 373], [REGREEN, 374]

1045. If a buffer is required, it should be 11 (a) as different activities have different risk of reversal. [PURO, 378]

6.1.2. Buffer contributions results from a standard rate determined by the 6.4SB

1046. Regarding 11 (b), a standard risk rating would be appropriate for removal types that have similar risks of reversal and are not affected by unique geographic or socioeconomic circumstances, for example, direct air capture sequestered into concrete. For activities that have specific geographic or socioeconomic circumstances that could cause reversal, unique to each project, the buffer contributions should be dependent on the individual activities risk assessment, for example, reforestation activities. [NB, 344]

1047. Regarding 11 (b), standard rates determined by the SB should be used. Activities could be grouped according to associated risk and potential impact that could be reflected on the rate for respective groups. By discriminating projects simply based on reversal risk, investments in activities with high potential for large quantities of removed emissions, additionally associated with a high reversal risk would be less attractive to buyers and activity proponents. Forests can potentially remove vast amounts of emissions, due to the activities large area of potential implementation, but with rising global temperatures the reversal risk for forest projects will increase. Standard rates should reflect not only the current and future risk of reversals, but also the potential callable alternatives and their associated risk. We believe an expert group should be tasked to establish a scheme for risk rating of removal projects. [44M, 351]

1048. The calculation method should provide a standardised way of calculating buffer pools while capturing risks specific to each project type. A default buffer pool could be provided that is adjusted downward if certain mitigating factors exist. Alternatively, a project-specific risk assessment as it would provide an incentive to control risk at the design phase (e.g. through optimal site selection and design of preventative controls) which may reduce the likelihood and impact of loss events. [SYLV, 367]

1049. Regarding 11 (b), standard rate determined by the 6.4SB. [CARBI, 376]

1050. It is difficult to create a method to objectively standardize risk ratings by individual type of removal activity or by country. It would not be easy to reach a consensus on this within the time frame for the SB to make recommendations on removals. Furthermore, there is currently no international standard for risk assessment of reversals. Nevertheless, out of the options, “11 (b) A standard rate determined by the 6.4SB” is the fastest way to agree in the current situation. [NFS, 377]

6.1.3. Variable buffer contributions

1051. 11 (c), more specifically, regional differentiation could be used. A list of risk-factors should be established based on the latest scientific knowledge that could be used for this purpose. For ecosystems, it could include impacts of climate change exacerbating fire-hazards, droughts, floods, etc. and for geological storage, seismic activity and pertinent geological properties. [PCR, 348]

1052. Risk rating should start from a default risk depending upon activity type/ category/ sector, then be adjusted upwards or downwards for depending upon the specific circumstances of the activity. Each methodology should provide for the method of calculating activity-specific adjustment, whereas a global default risk rating for different types of activity can be pre-determined by the SB. [SCC, 356]

1053. A combination of 11 (a) and 11 (b) could be used. A minimum standard rate should be set for each activity type that can be revised and adjusted as needed. Based on an individual’s activity's risk assessment, project developers can be encouraged to top up the buffer pool as necessary, and as well as an incentive to induce more purchasers. [PARIGI, 357]

1054. The risk rating to calculate an activity proponent's buffer contributions should be defined by the likelihood to deliver 100 years of effective durability. Durability is time-based effectiveness, also referred to as the Expected Effect, which is the defensible likelihood for a tonne of CO2e removed to remain outside the atmospheric cycle for 100 years. The Expected Effect provides a framework to rate risk and for insurers/reinsurers to measure their risk exposure. Calculating the Expected Effect could be either methodology specific ((11(b)) a standard rate determined by the 6.4SB), although the site of activity and risk management procedures in place may also affect risk so individual assessments should be accommodated ((11(a) The results of an individual activity's risk assessment). [CCPLE+RECS, 354]

1055. Regarding 11 (a): These should be rated by a regulatory body established to review and acknowledge recognized risk raters analogous to the OCR recognized credit raters found in the US. https://www.investopedia.com/terms/b/bondrating-agencies.asp These rating agencies use agreed statistical approaches to risk yet have the latitude to interpret data within some qualitative bounds. This allows for innovation and divergence of opinion while limiting ratings to "recognized authorities". [CFL, 365], [1.5,366]

1056. Regarding 11 (b): Risk of a certain rating can be made risk equivalent using insurance products, back stops or other mechanism for fungible equivalence to the compliance delivery standard that may be proscribed. Fungible equivalence means environmental effect in GWP year terms that is equivalent on a duration of effect, likelihood of outcome and impact expected. [CFL, 365], [1.5,366]

1057. Regarding 11 (c): Best practice should be used whenever possible. It is important to acknowledge that removals as a new technology evolving over many domains will constantly be facing new loss history data (reversal data) and scientific research on performance. As such, it is vital that the regulatory statutes not be overly prescriptive but may be petitioned for revisiting and review by stakeholders to assure the most accurate assessments of the risks involved, innovations for managing those risks and changes in the actors, technologies and roles that may evolve to manage those risks. [CFL, 365], [1.5,366]

1058. Either measure could be appropriate in the case of determining which type of risk rating to assign to a removal activity's buffer contributions. Every project developer is working at the intersection of differing geographies, methodologies, and policies to govern their activities, so having a standard rate determined by the 6.4 SB may not be widely applicable in all cases. However, if the 6.4 SB develops a standard base rate for risk calculations that could present a smaller threshold for evaluating risk of reversal, that could be very useful to let projects exist on a case-specific basis. [CLLA, 375]

6.1.4. Other inputs

1059. All options are problematic: 11 (a) because of the obvious conflict of interest; 11 (b) because of the generic nature of the rate that will inherently lead to over and under calculation across various types of projects, favouring specific projects and methodologies over others; and 11 (c) because the proponent will attempt to "game" the system in their financial interest. Across all three solutions and buffer pools in general, there is no principal agent that must bear the risk of miscalculation creating an inherent conflict of interest that jeopardizes the climate integrity of any credit issued under a buffer pool schema. This cannot be addressed by buffer pools. [SH, 346]

1060. A standard assessment does not sufficiently address the probability of the risk occurring (e.g. of natural disasters and technology breakdowns), its variability due to the differences in geographies, project types and the changing nature of risk (for example, due to impacts of climate change over time). Critically, standardized rates for buffer pool contributions are often set arbitrarily (e.g. 10% buffer), creating unintended arbitrage opportunities and distorting incentives, as the riskiest project buffer pool contribution is the same as the most prudent project's buffer pool contribution. [CPOOL, 355]

1061. Insurance companies possess expertise in modelling of risks such as natural disaster and technology breakdown and are best placed to insure ER reversal risk and hold a risk based insurance reserve strengthened by additional capital from risk based capital requirements in order to pay out in ER credits on a one for one basis. Even in the event of unexpected outcomes, insurance companies' reserves are closely regulated and continuously stress tested by insurance regulators to ensure that they are sufficient to compensate for the risks carried by the insurance company. The composition of ERs in an insurer's reserves will also reflect a prudent, diversified portfolio of ERs mirroring the investment management principles implemented by regulated insurers today. In contrast, unregulated carbon credit buffer pools undergo no such testing they are simply an approximation. [CPOOL, 355]

1062. For permanent storage, buffer contributions should reflect the project specific risk profile. This contribution should also take into account of existing regulations in the host country, For example, in Europe, a geological storage operator is regulated by the EU ETS and legally required to compensate for reversals via the purchasing of European Union allowances (EUA). Mandating additional buffer contributions will result in double coverage of the same risk and thus additional financial burdens to advance mitigation activities. [CW, 358]

1063. No buffer should be instituted for permanent geological removals where the storage site is constructed, operated and monitored in accordance with the most stringent rules, such as the EU 2009/31/EC directive on the geological storage of carbon dioxide, the UK's storage of carbon dioxide regulations and the US EPA's Class VI rules. [SE, 345]

1064. The term "buffer" does not necessarily need to be applied to removal activities as there are other risk management tools, such as insurance, that could replace and/or work in collaboration with buffer entities. [KITA, 347], [CFL, 365], [1.5,366]

1065. Buffer contributions should not apply to all kinds of removals activities. In the case of removals involving geological storage, the risk of reversal is negligible. If the likelihood of reversal in a project is extremely low, any buffer contributions beyond the degree of real risk may act as a barrier to deployment, particularly for capital intensive projects. A more proportionate tool would be to rely on the existing regulatory framework within the host country, assessing whether it provides appropriate monitoring requirements, incentives to maintain storage and remediation mechanisms, to avoid duplication. Where buffer mechanisms apply, they should be proportional to the scientifically substantiated level of risk of reversal. For example, if the likelihood of reversal of totality of CO_2 storage over the determined timeframe stands at 1%, then projects should be required to make buffer contributions equating to 1% of credit issuance over the crediting period. Beyond this contribution, the modalities of operating the buffer pool must not add any additional burden on projects, lest their deployment be negatively affected (especially within the context of the broader mechanism requirements which reduce credit returns and constrain project viability such as contributions for OMGE or Share of Proceeds). This would entail limiting a project's liability for remediation of reversals to the quantum of 6.4ERs contributed to the buffer pool by said project up to the date of the reversal event. This will ensure that the liability is commensurate with the risk of reversal of the project. Making a project liable for full remediation of CO_2 reversals on a 1:1 tonnage basis effectively renders the buffer a liquidity pool for uncapped liability; making capital intensive projects unfinanceable and reducing deployment of removals. [DG, 361]

1066. DAC, which is an engineered and industrial approach to removals, has minimal to no risk of reversals, even at this early stage of development. Buffer pools for DAC significantly increases capital requirements by requiring DAC operators to hold credits in reserve, it will hinder the growth of the DAC industry as a whole. Given the minimal risk of reversal, DAC removals should require lower or no risk buffers. [DACC, 369]

1067. Guidance should not be overly prescriptive with rules around long-term prohibition on and use change and/or intentional reversals (e.g. by deforestation of plantation forests). Landowners or project proponents who wish to reverse removals for which credits have been issued should be able to do so, provided they surrender credits equal to the volume of any resulting reversal (plus additional penalties in some cases). [NZ, 342]

1068. [KITA, 347] provided examples of the potential benefits of insurance including the following:

(a) Efficiencies of scale around risk modelling, data analysis and MRV;

(b) Increased liquidity by enabling additional management of risk-assessed buffer contributions;

(c) Third-party assessment of fungibility between credits; and

(d) A financial backstop, enabling resilience in the face of outlier loss and protecting against default.

1069. Buffer pools do not constitute a robust way of guaranteeing the permanent storage of carbon in a sink. Risk assessments determining the share of buffer pool contributions are not necessarily set in a scientifically robust manner in certain systems, which can lead to undercapitalisation of the pool, as for the case of California’s buffer pool. At best, buffer pools can strengthen the credibility of guaranteeing storage for a medium duration of time, if properly constituted and managed, but they cannot guarantee permanence. Before further consideration, a concept paper on the subject could be prepared, analysing risks and drawing on a range of literature. In case buffer pools is chosen as a way to address impermanence risks inherent in removal activities, then a combination of 11 (a) and 11 (b) should be used. The risk rating should be stabilised by a baseline (standard rate) and adjusted to each activity depending on activity-specific risk factors. A standard minimum rate ensures that a minimal level of risk for all removal activities is incorporated into the rating, serving as a baseline. This baseline can then be adjusted upwards if the reversal risk measured at activity-level is higher than that baseline. A standard rate alone is not enough to account for the highly varied risks associated with different removal activities, and geographies. Therefore, on top of a standard rate, activity-specific risk assessments must also be conducted, acknowledging and capturing the risk variation of different removal activities. As this risk assessment tool is being developed by the SB, it is essential that it includes mandatory independent verification of the risk assessment results by a DOE, who must verify site-specific information/data as well as relevant literature when conducting validation/verification/monitoring of the activity. The risk rating should be completed and made public before the issuance of credits. [CMW, 360]

1070. These ratings are to be set up by the project proponents and the host country DNA and will be part of the conditions of validity of the ITMOs issued from removal projects: the ITMOs may be subject to limited validity in terms of the kind of final use it has been issued, and to the time limitation (expiration date). If the host country issues the ITMOs without any restriction of type of use they may have, and utilization time they keep valid, there will be a system in place by the internal arrangements either at the part of the DNA or by its coordinated action with the project participants (private investors, financing institution, foreign country NDC, insurance policy, buffer plots, etc.) to make the replacement of the ITMOs when there is an intended or unintended reversal. Any reversal taking place in the future will be acknowledged by the host country inventory as emissions and will need to be covered in the NDC implementation process and the host country progressive contribution to the global stock take. [CRCY, 350]

1071. 12. What are the options for circumstances/triggers and/or periodic milestones for reviewing and possibly updating activity baselines, risk assessments (so, risk ratings), and monitoring plans, including in relation to:

a) Verified reversals of removals; and

b) The stages of activity cycle implementation?

1072. Certain activities, such as ecosystem restoration, may require dynamic baselines, with appropriate selection of a reference region and identification of new reference regions over time if certain local conditions change that may cause a particular reference area to no longer be applicable. A periodic review and possible update of activity baselines and monitoring plans every 5 years is desirable. Risk assessments would not need to be updated as the buffer contribution will have already been set and financial transactions completed based on the original buffer pool estimate. A risk assessment would only inform of the likelihood of a reversal and possible mitigation options, but it should not change the crediting yields of the project itself at this stage. Once the initial buffer contribution is determined and credits are pre-sold or used as collateral in a financial transaction, any adjustments of the buffer contribution, regardless of how risks change, could violate the original contracts. [NB, 344]

1073. Events that might trigger such circumstances include: (i) reversals, (ii) the advent of new monitoring technology (e.g. availability of higher resolution satellite data in the forestry context), (iii) regular reassessment of any buffer pool's sizing versus its potential liability and retirement rate, (iv) change in geopolitical circumstances. There is an inherent risk in ex-ante credit issuance; there are many risks that may affect the project's ability to deliver the purported impact that are unforeseeable at the outset of the project, when the buffer pool is sized. Issuing credits prior to delivery of the impact unnecessarily creates a liability that must be borne by someone. Rather than adding layers of complicated bureaucracy and cost to manage the risk marginally better, the risk should be eliminated in the most obvious way. [SH, 346]

1074. [KITA, 347] proposes the following options to be implemented alone or in combination:

(a) A fixed schedule of reporting linked to the methodology / lifecycle with mandatory quantitative and qualitative data verified by a third party;

(b) Dynamic reporting linked to a risk metric or loss above a threshold that has a mandatory reporting period;

(c) The project publishes sufficient details on the activity (project areas, planned activity, loss locations etc.) such that third parties can offer digital MRV services that can be paid for by buyers or later made public. [KITA, 347]

1075. Baselines may be updated in case of new policies altering the overall economic emissions trajectory, including, for example, of grid emission factors. Risk assessment and rating may be reviewed in case of occurrence of extreme events or alteration in key risk factors (see [the response to] paragraph11 [of *the Questions*]). [PCR, 348]

1076. Activity baseline should be updated according to the general methodological principles/requirements. Risk assessment update should be required whenever relevant new information comes to light or when a reversal happens that is larger than or different from what was already foreseen in original risk assessment. [SCC, 356]

1077. Monitoring plan update should be required when new risk factor comes to light that is not already included in monitoring plan, or when a verification event reveals a need for revision of monitoring plan. Voluntary update of the monitoring plan should also be allowed whenever a new opportunity/ cause has arisen such that the project proponents wish to leverage for lowering cost of monitoring or doing more effective monitoring. [SCC, 356]

1078. Risk ratings/categories should be reassessed based on each new monitoring report. When removals are issued consecutively after each monitoring report the number of reversals issued should reflect the most recent assessment of reversal risks. Risk ratings should not be allowed to fluctuate beyond a certain threshold to ensure activity proponents can reliably forecast potential income through the activity and hence whether it will be financially feasible. [44M, 351]

1079. Baseline updating for certain activity types should be tied to the size of the removal industry itself and conducted periodically. For example, if the SB will be considering the counterfactual usage of certain biomass feedstocks there should be a periodic re-evaluation of how certain feedstocks are used. This becomes particularly important if the carbon removal industry will create a new revenue stream for certain types of feedstocks which could lead to direct or indirect land use effects. [ISOMERIC, 352]

1080. Certain activity types (e.g. BiCRS) should be required to undergo periodic re-evaluation of potential market drive leakages being brought about through the introduction of new revenue streams from carbon removal activities. These re-evaluations should ideally be geographically scoped and become more pressing the larger the overall market is. [ISOMERIC, 352]

1081. For permanent removals, in case reversals are identified, there should be a review of the storage project and its monitoring. This is already covered by the existing laws and rules and no extra rules should be created that would duplicate them. [SE, 345]

1082. For (a) Verified reversals of removals, annual reporting should be the norm, and enable it to feed through to published risk ratings enabling purchaser information. For (b) at minimum renewal of the crediting cycle should be a milestone to reassess all documents.

The 6.4 SB should retain the right to 'call-in' a project type or category for assessment before this, should best practice shift to avoid unnecessary lock-in of harmful project types. [PARIGI, 357]

1083. Methodologies and project monitoring plans should be periodically reviewed to ensure alignment with the latest scientific findings. Verified reversals of removals shall trigger an overall re-assessment of the project to demonstrate: i) how the project can continue to operate without facing similar reversal events; ii) how the project has addressed reversals in full; iii) how the project has incorporated future risks. For geological sequestration, updates should be made in each of the following project phases: pre injection, during the crediting period/injection, post closure requirements. [CW, 358]

1084. The review should occur on a regular basis, regardless of specific triggers or milestones to ensure that the process is consistent across activities and that an activity with a longer crediting period (i.e. fewer milestones) does not result in less frequent review. Complementary to the regular periodic review, [CMW, 360] lists specific triggers and milestones that could give rise to additional review:

(a) Region-, country- and/or activity- specific circumstances, such as natural disaster for example: unprecedented drought, intense rainfall and heightened probability of landslides; invasive species or diseases or other risks are newly introduced; increase in seismic activities;

(b) Publication of relevant studies (e.g. in scientific journals) that project an increase in a given risk or that indicate a risk has previously been underestimated;

(c) A reversal event. [CMW, 360]

1085. In relation to 12 (a) Risk assessments and monitoring plans should be reviewed and updated after any extreme weather event, such as fire activity, drought, typhoon, regardless of whether that event could reasonably be expected for the region, e.g. due to climate change, or outbreak of disease. Economic and sociopolitical shocks should also be taken into consideration (e.g. price shocks or political instability in a region) as these may disrupt governance and increase risk of human-led reversal. Activities that are deemed to be at a higher risk should be required to update their baselines and risk assessment more often. In relation to 12 (b), milestones that should trigger updating baselines, beyond updates occurring on a regular basis (e.g. every 1-3 years) include any change in ownership or management; change in methodology; change in the magnitude of production/sale of credits. Periodic reviews and updates are necessary to allow for calibration of appropriate MRV, baselines, and risk assessments as data availability and models will improve as removal activities scale. Furthermore, changes in relevant legislation (e.g. monitoring requirements, mandated practices that change what should be considered "baseline activities") are also triggers that should cause a review and updating baselines and risk assessments and monitoring plans. [BF, 362]

1086. In relation to 12 (a), whether a review/ update would be required depends on the project activity type. For example, baseline updates make sense for project types that base the monitoring ERs on them. However, updating the baseline for plantation project does not seem necessary once the project has been implemented. Unless some trigger significantly changes the baseline for subsequent inclusions of project instances, the baseline does not need to be updated. In regards with engineered removals, it should be evaluated per project type, for example, for a biochar project, if the type of use application changes during the project lifetime, a project design update is needed and that could be a trigger to review the baseline. The risk assessments should be updated at every monitoring event to include possible new risks or exclude/reduce risks that are no longer to be considered. [STX, 363]

1087. In relation to 12 (b) some triggers that should be considered to review project design, performance, risk rating...are loss events (planned or unplanned), updates on the methodology applied, innovation or updates in the technology applied to the project (if applicable). The project owner should pay extra attention to loss events that occurred during monitoring periods notifying and following the procedures set by the 6.4SB. [STX, 363]

1088. [CFL, 365] [1.5,366] list three options that can be implemented alone or in cooperation:

(a) A fixed schedule of reporting points linked to the methodology / lifecycle with mandatory quantitative and qualitative data verified by a third party (or at least some fraction is verified);

(b) Dynamic reporting linked to a risk metric or loss above a threshold that has a mandatory reporting period;

(c) The project publishes mandatory details on the activity (project areas, planned activity, loss locations etc.) sufficient such that third parties can offer digital MRV services that can be paid for by buyers or later made public.

1089. Reviews of baselines, risks, and monitoring should occur on fixed schedules and in response to trigger events such as: start of crediting period; verified reversals; milestones per methodology; changes in ownership or project parameters. Advance public reporting and dMRV can also strengthen oversight. In relation to 12 (a), material thresholds for reversals in excess of statistically expected variance should force an event of report. Most likely a 2 standard deviation variance should trigger a report and re-assessment of the project. In relation to 12 (b), risk is unlikely to be a linear temporal function. Project types likely vary in terms of risk profile. It is important that regulation acknowledges the need to adapt risk profiling and monitoring to be in line with different types of projects and the ongoing discovery of changes to the temporal risk horizons. As new technologies, monitoring, and understanding emerge, more accurate risk weightings over the lifetime of a project may be assigned. [CFL, 365] [1.5,366]

1090. Significant events including political (e.g. regime change), physical (e.g. significant loss of carbon stock), or governance (i.e. project has changed hands / is at risk / there are disputes etc). [SYLV, 367]

1091. Updating the activity baselines, risk assessments (thus, risk ratings), and monitoring plans may be an option for the project developer if necessary. For example, the baseline scenario may remain the same during the project crediting period, while the monitoring plan can be updated to reflect best practices and more precise methods. [NBS, 373], [REGREEN, 374]

1092. For 12 (b) baseline, risk assessments and monitoring plans should be reviewed at the start of each crediting period. Furthermore, an activity proponent would need to notify the A6.4 of any changes to their activity during the crediting period that would have a significant impact on operations. [PURO, 378]

1093. Post-reversal-period audits should pick this up (see also [the response to] paragraph 10 [of *the Questions*]). [CARBI, 376]

1094. Third-party verification for removal activity may have different incentives for certifying successful removal methodologies and MRV approaches. Gold Standard, Verra, Puro, C-Capsule, and CCS+ are all private sector initiatives that have completed their own removal rating and verification processes. However, some removal project developers, like Charm Industrial and Project Vesta, have developed their own rating and monitoring plans. Different interests inherently will have different modes of codifying verification processes for proof of safe, durable removal. Reversal risk calculations should be performed at the initiation, midterm, and conclusion of a removal project's timeline in order to mitigate overall risk of undermining durability. [CLLA, 375]

1095. The role of the SB is not related to the accounting of the removals and reversals in the national communications, because these are followed and enforced by the A6.2 and the Katowice Transparency Framework for transparency in the NDC implementation process, and the BTRs. Further, we also highlight that the A6.4 and A6.2 cooperative approaches for the project design, implementation, and MRV, are not only a matter for the regulation of private actors and stakeholders, there is in Paris also a framework for the financial flow of public assistance (Article 9), and these resources may be part of the technical and risk related investments. This is especially the case when the host countries are developing parties, and require assistance in keeping their progressive mitigation contributions, while also issuing authorization of ITMOs based on A6.4 and A6.2 project activities as an exchange for the financial flows received2. It is also part of the Paris financial framework that the host countries as developing parties may implement a system to impose taxations and or tariffs or shares in the initiatives related to generating A6.4ERs or A6.2 units, thus, taking care of the consistent implementation of guarantees for the cases of unintended or intended reversals that the short, medium and long-term. As such, the national development planning of the developing parties, and the official development assistance from developed parties, and from multilateral facilities, may also be part of the A6.4 implementation process, assisting host countries to the abbreviation of the time until their national inventories achieve the peaking of the rising emissions and reducing the time for the achievement of the Paris long term targets related to the global neutrality. [CRCY, 350]

1096. 13. On what basis could requirements provide for the use of simplified / standardized elements or mandate the use of more frequent, full, or activity-specific elements and what are the requirements that may be relevant?

a) Activity type or category;

b) Risk rating level (e.g. above versus below a given %-based threshold);

c) Risk assessment contents (e.g. nature, number, variety of risk factors);

d) Monitoring plan (e.g. complexity, frequency, responsible entity).

1097. Activity type or category could provide the basis for the use of simplified/standardized elements vs activity-specific elements for determining risk rating. Some activity types do not have reversal risk factors that are materially different or unique, but for those of which the factors are different or within factors have unique characteristics that would inform the risk rating level. The risk assessment itself and the monitoring plan should be consistent for all activities within a particular activity type. [NB, 344]

1098. Activity type and risk rating level. Activity type could be the minimum with risk rating level superseding those minimums where a substantial risk is anticipated. [KITA, 347]

1099. According to 13 (c) the permanence of storage (see also [the response to] paragraph 8 [of *the Questions*]). [PCR, 348]

1100. Activity specific elements must be taken into account when designing any fit-for-purpose framework around monitoring and reporting. [ISOMERIC, 352]

1101. The risk rating level of the activity type should be the basis. For example, reporting for longer-term geological storage is likely to be significantly more pro forma than that of other types. [PARIGI, 357]

1102. Performance based monitoring obligations require both scientific assessment and empirical data. Thus, the real-world circumstances should be the basis for simplified or standardized elements. According to the storage timeframes outlined by the IPCC, removal methods could be broadly categorized by activity types (e.g. terrestrial vs. geological storage). [CW, 358]

1103. See [their response to] paragraph 11 [of *the Questions*]. [CMW, 360]

1104. 13 (a), as removal activities involve often involve a combination of system components, a modularized requirements may be made. For example:

(a) Removals involving standing biomass (e.g. reforestation, bioCCS): standards for caretaking and sustainability of the forest;

(b) Removals that consume electricity (e.g. DACCS, grinding of rock for enhanced weathering): standards for additional and renewable energy generation;

(c) Removals that require transport of CO2 (e.g. bioCCS, DACCS): requirements for pipeline transport safety and minimized landscape disruption;

(d) Removals with limited human intervention to maintain storage (e.g. enhanced weathering, mineralization) can have more passive monitoring requirements that focuses on preventing disruption rather than upkeep of storage. [BF, 362]

1105. 13 (a) and (c): The requirements for the use of simplified/standardized elements may be developed for each activity type and/or category to be evaluated in a project-specific manner, using a risk assessment context. [NBS, 373], [REGREEN, 374]

1106. 13 (a), (b) and (d) can be the basis but not 13 (c) as it is too complex and open to subjective assessment. [CARBI, 376]

1107. 13 (b) Given the uncertain nature of risk rating, the use of a numeric risk threshold is not recommendable as a primary means to determine whether MRV requirements can be simplified, particularly given the susceptibility of many risks to climate change (e.g. increased heat could affect risks such as the stability of biomass, the rate of enhanced weathering, and transport conditions of CO_2 pipelines) [BF, 362]

1108. 13 (c) Projects with a large number and variety of risk factors should be assessed whether it should be certified as a removal activity at all. Such risk is not limited to physical risk (e.g. choosing an unstable geologic site for CO_2 storage or a drought-prone area for a forest) but also risk of being unable to accurately quantify and monitor stored carbon (e.g.

carbon stored in soil or carbonate precipitation rate of enhanced weathering) and governance risk (e.g. track record of the responsible entity; capability of the liable party; strength of local institutions). [BF, 362]

1109. 13 (d) A robust monitoring plan with verified implementation, a responsible entity with a proven track record, and a clearly identified and capable liable party could be a reason to allow the use of simplified reporting. Audits should be conducted regularly to ensure that high standards are maintained to allow the continued use of the simplified reporting. [BF, 362]

1110. The likelihood is greater for shorter-term activities to be impacted by reversals, particularly those removal solutions that are subject to natural disturbances or climate variability. Permanent storage of CO_2, on the other hand, is not usually exposed to natural hazards and therefore less prone to reversals. By creating separate streams for shorter-duration CDR activities and highly durable removals, targeted risk management strategies can be adopted for each category and better reflect on the requirement to address all reversals in full. [NEP, 359]

1111. Low-risk and low-frequency monitoring based on robust evidence or literature require simplified reporting. Balance must be sought between the burden of reporting in terms of frequency, cost, and complexity and the scale and magnitude of the risk presented. Small risk, light reporting. Large risk should require heavy reporting. Risk should be weighted proportionally to the duration of exposure, likelihood of event (failure/reversal etc.), and magnitude of event (scale of failure). While not a perfect form of equivalence, risk could be managed in portfolios of exposure using such an approach. Quantitative risk factor-based frameworks will be required for the multi-trillion dollar carbon removal market of the future. Example 2040 5gt/yr x $100/ton= $500bn. With likely 30-40 GT cumulatively removed beforehand representing Trillions of C@R. [CFL, 365], [1.5,366]

1112. It Is difficult to set universal MRV standards for compliance due to the variable nature of each removal projects' activity-specific methodology. Standardized verification of removal and durability should be evaluated on a methodology-specific basis, with set standards applicable to each mode of removal. For example, DAC and electrochemical approaches to mCDR shall not be beholden to the same criteria. However, the structure for each activity type/category of CDR methodology should be similar, with a baseline set of standards for each. [CLLA, 375]

1113. No simplified rules can be applied to permanent removals. [SE, 345]

1114. CDR methods that are above a certain risk-threshold should not be included in the first place. Additional simplifications could be considered if a pre-determined percentage-threshold is met in a performance-based risk assessment. [CW, 358]

1115. Given the wide variation in the risk of reversal between CDR activities, activity-level risk assessments is desirable. The measures and actions taken to mitigate the risk of reversal should span across different stages: before the project starts (e.g. in the rules/ methodologies for the validation audit of a project), during its operation (e.g. regular monitoring), and even after it has been implemented (e.g. post-closure requirements) to allow for a mechanism that complies with the RMPs adopted in Glasgow. [NEUST, 364]

1116. There is not a need for the SB to regulate this system of accounting outside the project boundary, the project alone is not contributing to the global stock take. The project is just a part of the national contributions from the host party, and from the involved stakeholders, involved public or private institutions. The implications of the project to the NDCs outcomes (host or user parties) are enforced by the Katowice Modalities and Procedures for the NDCs and global stock takes, by means of the BTR and annual inventories of all parties to the Paris Agreement. The methods at the SB regulatory mandate are related to the appropriate technical MRV of the achieved A6.4ERs and of the reversals, whenever they occur during the crediting period. The issuance of ITMOs is part of the host DNA authorization process and requires the implementation of corresponding adjustments in the national inventories, and these will be assessed by the BTR and global stock takes regularly. Any reversals occurring during the crediting period will also be part of the project accounting and will give rise to national inventory reporting as emissions, affecting the already issued ITMOs in a manner that is not under the SB mandate to follow and correct for their consequences. The conditions of time and type of utilization for which the A6.4ERs are authorized as ITMOs are not followed by the SB, it is part of the arrangements between the DNAs and project proponents, and of the final users for that ITMOs. [CRCY, 350]

1117. 14.Should procedures take the same or different approaches to instances of reversals that are (a) intentional/planned versus (b) unintentional / unplanned?

(a) How / would other tools to address reversals involving direct credit replacement (including use of insurance / guarantees) be used in combination with a buffer pool?

1118. The standard procedure should be the same regardless of whether the reversal is intentional or unintentional. However, if an entity with financial interests in the outcome of a reversal event intentionally caused it, there should be disciplinary measures. If project owners are responsible for the long-term monitoring of reversals, there needs to be a financial incentive for project developers/owners to continue to avoid a reversal event, especially after the crediting period of a project. Alternatively, the buyer/retirer who has the financial incentive after the crediting period to avoid a reversal event would need to take over management of the project. Insurance may be a more efficient tool than buffer pools for ensuring buyers/retirers can meet the mitigation claims they originally made with the credit purchase. The key is for insurance to pay out at a price that would cover the cost of a credit of equal quality and impact as the credit that was reversed. Although a buffer pool is necessary to ensure that project developers do not forward finance/sell a volume of credits as a % of total project credits such that across the entire industry, reversal events result in the total volume of credits used for claims that have been reversed being more than credits available for claims. [NB, 344]

1119. Procedures should take the same approach, regardless of intentionality. The goal is to change outcomes, not intentions. Proponents are fully capable of assessing and pricing the risk of unintentional reversals. More importantly, the complexity of these interrelated mechanisms (buffer pools, insurance, guarantees, issuance hold-backs) add cost, time, barriers to participation, and the inevitability that they will be gamed to the detriment of the climate and the public. A simpler, more effective solution is to eliminate the risk of reversals by not allowing ex-ante issuances. [SH, 346]

1120. Intentional and unintentional reversals should be treated differently. Where there is an intentional reversal, the project proponent must be required to rectify the situation, for example, by retiring some of their own credits, providing money directly to the SB (or other appointed body), or buying credits from another project with similar characteristics. Insurance could be combined with a buffer pool to manage reversal risk while providing a guarantee for credit buyers. A sufficiently diverse buffer pool is cost-effective and a prompt way to cover frequent but minor reversals. Larger events require larger buffers that lowers project revenue, slowing the rate of new developments. Insurance can offer cover for unlikely extreme reversals, but it becomes expensive as the coverage increases and it typically does not go above 90%. By combining the two, the buffer can take the “first loss” up to a percentage, for example, 15%, with the insurance covering the remaining 85%, thus providing 100% cover. The buffer handles the most frequent small claims entirely, while incentivizing project developers to minimize the risk of reversal, thus, buffer contributions. Part of the buffer, for example, 5% out of a 20% buffer, can be set aside as a contingency (the remaining 15% taking the first loss on any reversal). This helps restore buffer levels quicker after a loss and eliminates the risk of exhausting the buffer entirely, even in the case of multiple extreme events – raising the scheme’s integrity against failure. Adding insurance can lower buffer contributions while still offering 100% protection. It also significantly reduces systemic risks where buffers at the level of a single standard or region often contain many projects with shared risk factors, for example, wildfire risk. This raises the risk of extreme losses where many projects suffer major reversals simultaneously. In this case, a buffer alone runs the risk of exhaustion. [KITA, 347], [CFL, 365], [1.5,366]

1121. Intentional reversals should not be compensated via insurance solutions nor via buffer pools as both options would generate moral hazard and facilitate undesirable behaviour. Preventing intentional reversals would require specifying a host country liability, where the reversal once found intentional is accounted for in the national emissions balance. This would put some pressure on the host country governments to regulate activity developers in a way that intentional reversals become unlikely. [PCR, 348]

1122. Reversals should be treated differently depending on their cause. Whether reversals are intentional/planned should be assessed by an independent third-party. If it was found to be intentional, the activity proponent should be required to re-sequester the reversed amount within a given timeframe or finance the removal of said amount through an already established activity of different independent activity proponents, proposed by the national authority. If reversals are deemed unintentional/unplanned the reversal should be communicated to the removal owner. The owner should not be compensated for said reversal. The risk of reversal should be communicated before the purchase of removals and the buyer should ensure its own buffer is in place. By ensuring buffers are maintained independently by the buyers, investing in a diversity of activities, with differing risk ratings would lower the risk and in turn ensure a variety of activities are supported through the Article 6.4 Mechanism. [44M, 351]

1123. Procedures should be different for intentional vs planned reversals. Penalties for such actions could include increasing the percentage of buffer contributions or increased premiums in the case of independent insurance. [CCPLE+RECS, 354]

1124. Intentional reversals (resulting from project proponents’ intention) should not be compensated from the risk buffer. Instead, they should be compensated by replacement of credits from outside the buffer pool, e.g. real (unencumbered) credits purchased from the market, such as credits from irreversible removals or credits from emission reductions. Risk buffer should be used for events that are beyond the control of the project participants. Credits in the buffer pool are not real credits. They may represent short storage period and thus worth little mitigation value that are only good for filling gaps that are created in continued storage of the removals underlying the credits already in the market. The credits in the market are also not real, these are encumbered with the condition of 100-year storage which is to be met in future. [SCC, 356]

1125. While the fundamental atmospheric balance is indifferent to whether it was unintentional or planned, the latter should be factored in with appropriate liability procedures, including the use of Offset Insurance. [PARIGI, 357]

1126. If intentional /planned reversal occurs during the crediting period, it should be reflected in the quantification. After a crediting period, intentional reversals must be eliminated altogether. Unintentional reversals should also be reflected in the amount of A6.4ERs credited as long as they happen during the crediting period. Post crediting period, they should be addressed via separate procedures, but in a manner that incentivizes long term storage and effective management and monitoring of unintended reversals. Additional pools could be incorporated, as long as a clear responsibility and liability to address a reversal in full is maintained. [CW, 358]

1127. Different approaches should be taken for intentional versus unintentional reversals. In the event of any reversal, the corresponding amount of ERs should be drawn from the buffer pool. In case of unintentional reversals, the project proponent must replenish the buffer pool equivalent to any reversals in excess of the share of ERs it initially contributed. In case of intentional reversals, the project proponent must fully replenish the buffer pool equivalent to all reversals. Moreover, in the event of an intentional reversal, the mechanism registry account of the project proponent must be frozen such that all issuances/ transfers/ retirements of any credits from the project proponent, including those from other projects and previously issued ERs, are halted until all reversals are fully addressed, a follow-up investigation is conducted to determine the reason and nature of the intentional reversal, and appropriate disciplinary/corrective measures taken. Such measures may include, for example, banning the proponent from Article 6.4, to cancel any unused credits issued, and to replenish the buffer with the equivalent of any of their credits that have been used previously. In addition, a public notification/tag should be made available on the mechanism registry regarding the project proponent (and any activities they are involved in) that has caused an intentional reversal, including the outcome of the investigation. [CMW, 360]

1128. In case a buffer pool is established, direct credit replacement should also be required such that the project proponent replenishes the buffer pool continuously after a reversal occurs. The details of direct credit replacement are complex and may raise following questions:

(a) Would the project proponent be required to replace credits from their own project only, or from a project of the same activity type, or a different activity type with a lower reversal risk rating?

(b) Would there be provisions to require that the replacement credits are acquired from a different country/region in case the two projects are both of the same activity type? [CMW, 360]

1129. It is also important to consider what would happen if a massive reversal event impacting a large-scale activity (or several activities) wipes out the buffer pool, and the project proponent cannot afford to replace all the reversed ERs with ERs from another activity. In such a scenario, a need may arise for legally-enforceable guarantees that the reversed ERs will be replaced. This would imply attributing clear liability over very long time-frames, which is neither clear to determine, nor realistic to guarantee, nor even perhaps possible to enforce. These lead to the question of whether activities with a high reversal risk should even be credited. Can the SB legally require proponents or insurance companies to address reversals if they refuse or are unable to? And if that fails and the liability falls to the host Party, is it fair or even possible for the SB to require the Party to address the reversals? [CMW, 360]

1130. A backstop guarantee from the host Party raises new set of problems since it risks passing on all liability to the host Party rather than distributing it between the proponent, the buyer and other private actors. It also raises equity questions since many host Parties may be developing countries with conditional NDCs and more limited resources compared to developed countries, who are likely to be the main source of demand, whether towards their NDC or for use by their companies (OIMP). Therefore, when units are authorised for NDC use, the SB should formulate rules passing on the responsibility for future monitoring and compensation to the acquiring Party, ideally in full, since this can mitigate some of the equity issues detailed (though not all). The buyer Party would hence be liable if a reversal is detected in a project from which it has purchased a unit. This will incentivise the acquiring Party to purchase credits from activities with a lower reversal risk. When units are authorised for OIMP, a different method must be explored for distributing the liability between the buying entity and other private actors, such that the backstop guarantee does not fall entirely to the host Party. [CMW, 360]

1131. A separate add-on commercial insurance would need to be paid for by the project proponent (and perhaps indirectly reflected in the price of the ER and thus passed partially on to the buyer), and is not a simple or compelling solution given the multi-century time frames required as well as the fact that many reversal risks are likely to increase in the future due to climate change, consequently threatening underwriters' long-term financial resilience. For example, in May 2023, State Farm, the largest car and home insurer by premium volume in the US, halted the sale of new home insurance policies in California due in part to "rapidly growing catastrophe exposure" as a result of wildfires. In addition, the risk of a large-scale reversal event (or events) capable of wiping out the entire buffer pool should not be underestimated. If this were to occur it must clearly constitute a trigger to review and completely overhaul its rules on reversals and permanence, but at that stage it may be too late to correct the damage. If buffer pool is to be used as an approach to purportedly guarantee permanence, a robust risk assessment/management approach both standard and activity-level risk ratings that is regularly updated is essential to ensure the resilience of a buffer. If direct credit replacement in combination with insurance/guarantees is considered, a thorough analysis on the risks posed by these different options should be considered. [CMW, 360]

1132. An Intentional reversal Implies that an activity is not a removal and unless replaced with carbon storage equivalent or greater net quantity and quality, should be considered a violation of contract and strictly penalized on top of requiring the rectification of the reversal, e.g. by another party. However, in some cases, it may make sense to allow for certified removals to transfer locations, e.g. if a particular area of forested land becomes ecologically unstable or interferes with economically or socially just activities. In this scenario, the removal certification could be transferred to another carbon sink, assuming that the carbon in that sink is of equal or greater quality and stability, of similar or more recent vintage, and that the quantity of net removal does not diminish even with the additional activities of establishing the new sink. All removals have risk of unplanned/unintentional reversal with profiles that vary primarily by the characteristics of the carbon storage sink. The mechanism and quantity of insurance needed to protect against these risks will therefore vary, but in all cases any reversals must be rectified by additional removals of equal or greater quality and net quantity. It must be noted that not all risks are insurable; some may be too high or too uncertain. If an unintentional reversal risk is uninsurable, the removal activity should not be certified. [BF, 362]

1133. Any insurance mechanism must be designed around replacement of removals that is the cost of providing equivalent amount of removal today, rather than financial compensation which is the cost of the original removals in the past. Insurance could be used, for example, as a backup to a well-designed buffer pool (that accounts for climate change risks), e.g. requiring that the buffer pool operator take out reversal replacement insurance from a third-party actor, so as to spread liability. In cases where the risk is quantifiable and stable, governments can potentially act as the insurance provider (e.g. as in national mortgage insurance schemes). One important aspect of any buffer pool or insurance scheme is that it needs to account for the difference between gross carbon storage and net carbon removals. For example, a stand of trees storing 1200 tonnes of carbon may result in only 1000 tonnes of net removal, due to emissions from cultivation, decomposition, monitoring, etc. However, if that stand burns down, and those 1200 tonnes of carbon are re-released into the atmosphere, the correct amount that must be replaced is 1200 tonnes of net removal, which, assuming similar associated emissions would require 1440 tonnes of gross removals. [BF, 362]

1134. An assessment should be carried out to highlight possible planned/intentional and unplanned/unintentional risks and measures should be taken to minimize those identified risks. A buffer pool should be created to ensure the maintenance of the carbon benefits. Intentional and unintentional reversals should not be treated in the same manner. Different procedures should be taken for planned and unplanned, for example, updating the project information and numbers for the affected part if a catastrophic natural disaster happens, but updating the whole project if a planned reversal occurs. Another example is giving the option to compensate for the loss by taking the same number of ERs reversed from the buffer pool or from other project owned by the same entity if an unintentional reversal occurs. Regarding planned and/or intentional reversals, they should be analyzed case by case to plan accordingly and apply the appropriate management as some of these planned/intentional situations are out of the project owner’s control. [STX, 363]

1135. An insurance scheme could be developed to allow the recover’ of reversals. The credits for the insurance could be allocated from the buffer pool account. The insurance scheme could be mandatory depending on the project type and optional for all project types. [STX, 363]

1136. Different approaches should be taken. Buffer pools are suitable to compensate for unintentional reversals for which the activity proponent should not be penalised beyond cancelling credits from the buffer pool. For intentional reversals, a mechanism is needed to penalise intentional reversal and deters such behaviour. [SYLV, 367]

1137. Direct replacement guarantees/insurance could be used for reversals beyond the buffer. The risk tool could provide a risk profile based on the aggregated probability specific to the project. A probability threshold could be set by the SB above which it is considered “likely” and should be planned for directly with buffer pools allocated to cover the magnitude of likely loss events specific to the project. Below threshold (lower probability) loss events could then be covered by direct replacement guarantees and/or insurance. [SYLV, 367]

1138. The procedures should take the same approaches to Instances of reversals that are intentional/planned versus unintentional / unplanned. [NBS, 373]

1139. The buffer pool should be used to address the reversals as its works like a “insurance” for all projects. Specific bank insurance requirement could make many projects financially unfeasible, as insurances for NBS removal projects may be very costly. [NBS, 373], [REGREEN, 374]

1140. Whether intentional or unintentional, all reversals should be subject to the same set of procedural criteria to evaluate environmental impact and address credit replacement. [CLLA, 375]

1141. Same approach should be taken as the impact on the sequestration is the same. (a) It would be unwise to combine insurances and guarantees as it increases the net cost. [CARBI, 376]

1142. For the climate impact any reversal, intentional or unintentional, has the same effect to global warming. The procedures in place need to ensure that crediting programs and activity proponents are incentivised to minimize the risk of reversal. [PURO, 378]

1143. The notions of intentional or unintentional do not apply to permanent removals. There is always a climate consequence if there is an emission from the geological storage site, and in the case of the EU ETS, there will be a requirement to acquire EUAs. [SE, 345]

1144. On the risk of reversals, there is a greater likelihood that shorter-term activities could be impacted by reversals, particularly those solutions that are subject to natural disturbances or climate variability. Permanent storage of CO_2 like for our solution, on the other hand, is not exposed to natural hazards and therefore less prone to reversals. By creating separate streams for shorter-duration CDR activities and highly durable removals, the SB can adopt targeted risk management strategies for each category and better reflect on the requirement to address all reversals in full. For our solution, the probability of reversal is low and highly controllable and controlled thus the utility of a buffer pool is questionable. It is also based on an iron clad life-cycle assessment validated by external parties and end-project boundaries. In case of leakage, a replacement of credits is applied. [NEUST, 364]

1145. Even before the SB dealt with non-permanence measures in relation to removal activities, CMP7 requested SBSTA to develop non-permanence measures for LULUCF activities under the CDM and related modalities and procedures (para. 7, Decision 2/ CMP.7). Accordingly, SBSTA discussed ‘Land use, land-use change and forestry under Article 3, paragraphs 3 and 4, of the Kyoto Protocol and under the clean development mechanism’ as a sub-agenda of ‘Methodological issues under the Kyoto Protocol’. [NFS, 377] believes that when considering options for addressing the reversal of removal activities under Article 6.4 mechanism, the outcome of previous discussions by Parties over several years should be fully taken into account. SBSTA39 requested Parties and approved observer organizations to submit their views on how to deal with non-permanence of LULUCF activities under the CDM and related modalities and procedures. According to a technical paper prepared by the SBSTA (FCCC/TP/2014/2), most Parties proposed the option of creating a permanence buffer of credits backed up by host Party guarantee (para. 57-61). In addition to this, comments were submitted such as insurance, tonne-year crediting, a combination of buffers and state guarantees, etc. In the last submission on removals by the Republic of Korea, it was stated that common approaches on addressing reversals should be applied to all removal activities. The permanence buffer of credits backed up by host Party guarantee option is almost similar to the method treating non-permanence applied to the Carbon dioxide capture and storage (CCS) based activities in CDM. In this context, [NFS, 377] advocates the permanence buffer of credits backed up by host Party guarantee as an appropriate common approach to address non-permanence risk for all removal sectors. [NFS, 377]

1146. We deem this question has been sufficiently answered by our previous responses. [CRCY, 350]]

6.2. Reversal risk tools—General: Buffer pools, direct credit replacement, insurance / guarantees

1147. 15. Regarding reversal risk buffer pools, direct credit replacement, and insurance / guarantees:

(a) What is the current practice with these reversal risk tools, including the extent and nature of their use (respectively and in combination), transaction costs and how these are financed, and potential roles of the Host Party in multi-decadal compensation requirements;

(b) The circumstances under which the use of a given tool may be required or supplemental—for example, for intentional versus unintentional reversals, or during versus beyond the last active crediting period—and rationales.

[See [the response to] paragraph 14 [of the Questions]. [SH, 346]]

1148. Carbon insurance can, in the near-term, support buffers in increasing its resilience, enabling optionality in protection against losses, and enhancing trust against quality and reversal concerns (see also [their response to] paragraph 11 [of *the Questions*]). For New buffers, insurance can help manage near-term delivery risk of buffers, which is the risk that they do not hit critical scale and/or become insolvent in the timeframes required for their carbon stores to grow. Low-supply, high-durability carbon removal solutions currently lack sufficient buffers. Low supply of this market and differences between types of solutions (for example, biochar vs enhanced weathering vs direct air capture) create difficulties. For new CDR methods, insurance helps prevent too much systematic risk building up (buffer with just one type of CDR). Instead, the risk is shared across the whole insurance industry hence raising integrity for the whole sector. For existing buffers, insurance can play a supportive role:

- It can provide a protective wrapper around the buffer to increase financial resilience and a backstop in the case of catastrophic loss. In a market where the buffers have not yet been widely tested, protection from the insurance industry could be a beneficial tool in the instance of a large -scale loss event;
- Climate Action Reserve and American Carbon Registry allow third-party insurance for project developers to enable lower ‘premium’ payments into the buffer pool. If insurance becomes more widely adopted, it could play a part in increasing market liquidity;
- Insurers could utilize their long-term asset management experience and risk assessment and claims payment processes, to provide third-party administration of the buffers. Potential benefits could be wider assessment and collaboration in terms of fungibility of carbon for paying ‘insurance claims’ from the buffer pools to enable more like-for-like replacements, and cost efficiencies in terms of MRV. [KITA,347]

1149. Insurance should not be required today as there are no comprehensive insurance products that cover all aspects of this specific request. However, the requirement of insurance could be introduced in the future. As carbon insurance evolved, it can even be used to protect project developers from default by a buyer or investor on a forward purchase with a pay at delivery approach and to protect post project permanence. [KITA,347]

1150. On 15 (a), within the wider voluntary carbon market, current practice is linked to buffer pool contributions, either on a flat or risk adjusted basis, with that risk managed by issuer bodies. While some Carbon Standards, e.g. Climate Action Reserve and American Carbon Registry, allow third-party insurance for project developers to enable lower 'premium' payments into the buffer pool, insurance is not yet a commonly proposed tool. This historically useful approach to risk has crowded out the innovation space for traditional risk management to emerge leading to little incentive for insurance companies to develop insurance products, dMRV specific to this space, and as such there is little insurance currently available. It is important to recognize that an evolved regulatory environment can enable global best risk practices to be applied to carbon risk management with significant outcomes for safer, better carbon risk management. (See also [KITA, 347]) (See also [their responses to] paragraphs 11 and 14 [of *the Question*s].). [CFL, 365], [1.5,366]

1151. On 15 (b) How insurance could become required or supplemental: Current practice relies heavily on buffers, limiting innovation in risk management. Insurance brings expertise, data analytics, financial resilience and incentive alignment that could strengthen the system. [CFL, 365] and [1.5,366] recommend:

(a) Allowing flexible, risk-based use of buffers, insurance, guarantees and other mechanisms of risk transfer, diversification, management, monitoring, and governance;

(b) Developing clear guidance on supplemental and mandatory use cases;

(c) Ensuring reversals are fully addressed but encouraging diverse protection mechanisms. [CFL, 365], [1.5,366]

1152. On 15 (a), buffer pool credits are not real credits but are provisional credits, as are the credits in the market that are based on the same storage period. These will become real after the required length of storage, 100 years for example, is verified. The buffer pool credits can only fill the gaps in continued storage of removals that form the basis of the credits in the market. In the case of no monitoring or walk out by the project proponents, for example, the credits issued must be replaced with permanent real credits such as those from emission reductions or from irreversible removals. [SCC, 356]

1153. On 15 (b), intentional reversal should be compensated by direct replacement of the lost credits with real credits from market, that is, credits from emission reductions, or credits from irreversible removals (e.g. mineralized carbon). Credits in the market that are based on reversible removals cannot be used for direct credit replacement purpose. [SCC, 356]

1154. On 15 (a), insurance is very nascent but needed. (see [KITA, 347]). See also proposal for Offsetting Insurance. On 15 (b), legal liability that is attached with an insurance claim triggering and recovery procedures are vital. [PARIGI, 357]

1155. On 15 (a), [BF, 362] gives examples of reversal risk tools in place are:

(a) California's forest offset buffer pool for their cap-and-trade system (substantially undercapitalized relative to the risk of wildfire);

(b) The EU's CO2 Storage Directive allows for the transfer of liability for reversals from geologic CO2 storage to the competent authority, provided all available evidence indicates that the stored CO2 will be completely and permanently contained, and a financial contribution sufficient to cover 30 years of monitoring after the closure of the storage site. [BF, 362]

1156. On 15 (b), intentional reversals must not be allowed to take advantage of any risk-sharing scheme, such as buffer pools or insurance, but rather should be seen as a violation of contract and be sufficiently penalized, including the full rectification of the reversal. [BF, 362]

1157. On 15 (a), the current practice is the creation of a buffer pool account that is common for all the projects and is integrated by all the discounted credits due to risk management. The removals percentage to be discounted for each project could be a fixed value or could be dependent on a risk assessment. A normal value is around 20% of removals deposited within the buffer account, and these removals cannot be used to be sold in the market. Another tool is an insurance scheme, that allows the project owner to recover some reversals according to specific requirements and criteria. [STX, 363]

1158. On 15 (b), a risk assessment should be performed for all project types, including a minimum risk assessment for all project types, and some specific extra risks assessment for Nb projects. A related/fixed removals percentage should be discounted and deposited in a buffer pool. Intentional and unintentional reversal can be different categories to be assessed in the risk assessment, depending on determined thresholds, an insurance scheme could be applied, and an extra number of removals should be deposited within the buffer pool. This extra deposit could be recovered if an assessed risk took place, and if nothing happens during the project lifetime, these removals could be recovered at the end of the project lifetime. The risk assessment should be mandatory for all project types, and the insurance scheme could be mandatory depending on project type and threshold given and could be optional for all project types. [STX, 363]

1159. On the circumstances, the difference between intentional/unintentional reversals should apply. [NEUST, 364]

1160. In our specific area of expertise, no current practice for reversal risk tools has been established so far. On 15 (b), tool use should be identical whether intentional or unintentional reversals. [CARBI, 376]

1161. Buffer pools are necessary to ensure that across the industry, there are always sufficient verified credits that are not being used to cover reversal events for credits that are being used for a claim. This is the responsibility of the standard or governing body. Direct credit replacement and insurance are commercial options that are the responsibility of the entities engaging in a transaction on a deal-by-deal basis and should not be the responsibility of the standard or governing body. [NB, 344]

1162. Whilst buffer pools have remained the 'status quo' for safeguarding against non-permanence in the voluntary carbon market (VCM), there have been calls for their reform. Issuers have been criticised for adopting the partisan role of risk creator, risk rater and underwriter. In mature financial systems and compliance markets these roles are clearly disaggregated to avoid conflicts of interest. A lack of regulation has also led to arbitrary buffer pool contributions, with little or no scientific justification and/or reference to actuarial or historical data. Another key risk for the self-insurance approach in the VCM is undercapitalisation of buffer pools. In the event that the volume of reversal events exceeds the supply of certificates in the buffer pool, the issuer would encounter ‘carbon bankruptcy’ i.e. not enough certificates to cover the demand for Event of Carbon Default (EOCDs). This is particularly problematic for nature-based CDR where the risk of reversal is much higher. For example, a recent study into the buffer pool of California’s forest offset programs found that wildfires had already exhausted one fifth of its supply in less than a decade. The buffer pool was also extremely susceptible to carbon bankruptcy from risks such as disease, insects and drought. [CCPLE+RECS, 354]

1163. Today, insurance is not used as a tool to adequately address carbon reversal risk because any insurance maintained by a project developer today produces, in the event of a claim, a cash payout to the project developer. This cash payout may be used to restore damage to the underlying asset, or to mitigate other operational losses, but it does not actually address the damage, which is that an ER reversal results in the emission of a previously sequestered ton of CO_2 back into the atmosphere. [CPOOL, 355]

1164. For CCS, which is eligible under the EU ETS, reversal events require a storage operator to address all reversals in full via the cancellation of a corresponding amount of EUA. Additionally, there are provisions to transfer the liability towards national authorities, upon their acceptance. To permit activities in the first place an assessment of financial safeguards, insurances etc., present a firm and central requirement. Within the UNFCCC, the Durban decisions made an incentive for effective long-term storage by allowing buffer credits to be reimbursed to project proponents, upon proof of permanence or a transfer of liabilities to competent authorities. Within voluntary carbon markets, some standards rely on the governmental regulations for geological storage and do not impose further buffer requirements. Others have been requesting buffer deductions that are perceived as overregulation and an additional burden for project developers, as risks are thus hedged twice, once via the VCM operator and once via relevant and competent national authorities. Regardless of the approach, permanence hedging covers all, intentional and unintentional as well as during and beyond crediting period reversals. [CW, 358]

1165. Current risk reversal tools (buffer pools) reflect legacy rather than best practice. [CFL, 365], [1.5,366] outline the potential risk management approaches for carbon removals drawing on examples from insurance and credit markets:

(a) Risk retention: Self-insurance by project developers through withholding credits as a buffer; retention pools funded by fees on credit issuance managed by an industry remote regulatory body or recognized re-insurer type entities. Example: catastrophe reserves held by insurance companies to cover large losses;

(b) Risk transfer:

(i) Private solutions: insurance policies for specific perils like reversals; insurance wraps for entire projects or portfolios; securitization and credit risk transfer products (CDOs, CDS). Example: mortgage insurance transfers risk from banks to insurers;

(ii) Public-private solutions: public backstops and reinsurance for private market; risk pools with blended public-private capital; public loans or guarantees for higher risk projects. Examples: flood insurance, deposit insurance;

(c) Risk modelling and quantification: collect data and build models to enable risk-based pricing; apply lessons from insured loss models in property insurance; develop open-source models and data repositories. Examples: catastrophe models, credit scoring systems;

(d) Prevention and resilience: improved measurement and monitoring technologies; design buffers and portfolios for diversification; engineer reversal resistance into projects. Examples: building codes, credit risk modelling;

(e) Governance and oversight: st standards for buffer, insurance, disclosures; require stress testing and public reporting; audits and reviews of reversal response plans. Example: Financial regulations like Basel III;

(f) Incentive alignment: return unused buffers to incentivize performance; lower contributions for projects reducing reversal risks. Example: insurance premium discounts for risk mitigation. [CFL, 365], [1.5,366]

1166. Every removal has unique characteristics associated with the expected vs. unexpected rates of reversal. The important task is to address and declare both of these risks using robust methods, including the nature and the scale of the reversal. Quantified Risk has 3 dimensions: likelihood, duration, and impact. This allows for treatment of risks and instruments using “factors” relative to the expected environmental effect of the carbon. [CFL, 365], [1.5,366]

1167. Only like-for-like types of credits (same or higher inherent-permanence category) can be used to compensate for unintentional reversal under buffer pools as otherwise the risk structure of the buffer pool deteriorates over time. (See also [the response to] paragraph 14 [of *the Questions*]). [PCR, 348]

1168. Project participants should be given the freedom to choose a tool or combination thereof, subject to justification and any additional requirements set by the host party. We note the significant potential and applicability of insurance instruments both as a standalone option and in combination with other tools. In many contexts, insurance instruments used for removals appear to be devoid of many limitations of other instruments used to guarantee the delivery of carbon sequestration projects, such as buffer pools or temporary carbon credits. For example, unlike buffer pools, insurance instruments do not require freezing a significant amount of carbon credits generated by a project and thus incentivize project activities, nor do they lead to major disputes about the nature or longevity of temporary carbon credits, as may happen when structuring a project based on temporary carbon credits. Insurance instruments, differentiated by project location and other specific conditions, provide the most flexibility and risk orientation to address reversal risk and may be used to address other risks in removals beyond reversal. Additionally, with insurance instruments involved, the financial burden connected with the use of any guaranteeing instrument, be it a buffer pool or temporary carbon credits, may be distributed among the project participants more fairly. Lastly, neither buffer pools nor temporary carbon credits provide a solid solution for cases where a project ceases to exist entirely for any unforeseen reason, something which would not affect an insurance-based approach. [ICLRC, 349]

1169. Regarding reversals, the CO_2 storage legal framework mentioned above require operators to have an approved corrective measures plan which must be implemented in case of leakages. Furthermore, operators are required to surrender emission allowances (under the EU Emissions Trading Systems) equivalent to leaked emissions. It is important that the reversal risk rules established under the Article 6.4 mechanism do not result in extra obligations on storage operators already complying with national requirements, as this could significantly impact their revenue streams. [CCSA, 370], [ZEP, 371]

1170. On 15 (a), "the buffer pool should be managed by the UNFCCC. Each project may conduct a project risk assessment to determine the amount of ERs to be retained in the buffer pool. If a reversal event occurs in any NBS removal project, the buffer pool of UNFCCC should be used to compensate for the reversal. At the end of the crediting period, if the project demonstrates that it has low and/or no reversals, it may receive part of the ERs retained by the buffer pool. This approach may continuously increase the buffer pool of UNFCCC, even at the end of the crediting periods of the projects. [NBS, 373], [REGREEN, 374]

1171. On 15 (b), the requirements to communicate loss events may be addressed in each verification event. The use of the buffer pool may differ for intentional versus unintentional reversals and should be analyzed according to the severity of the reversal event. For example, an unintentional and low carbon reversal caused by an accidental fire may affect the carbon stocks, and this loss will be reflected in the measurement of the carbon stock during the verification event. Consequently, the buffer pool may not be used to compensate for these losses (in fact, this loss may not generate ERs between two verification events) [NBS, 373], [REGREEN, 374]

1172. As a carbon mineralization company, it is critical for us to illustrate the low-risk reversal rate of our novel injection technology. The use of direct negative emissions credit replacement or buffer pools is not something we anticipate having to utilize in the development of our company. As we continue to develop our robust verification methodologies, insurance for credits will be increasingly prevalent for all of our stakeholders, including third-party verification and crediting entities, credit customers/purchasers, and technology partners. At this time, due to the extremely low uncertainty nature of risk reversals associated with in-situ mineralization technology and beginning stages of our company, we do not have specific requirements around the buffer pools or refinancing of potentially lost credits. However, some companies, like Sylvera, are utilizing independent reversal risk assessments to monitor and score project performance over time. Should we need to explore these options, we believe we could easily incorporate some of these third-party entities into our crediting and verification system. [CLLA, 375]

1173. A thorough analysis should be conducted on these subjects, drawing on a range of literature and analysing the risks and complexities of these options. In addition, feasibilities of various options should be studied, to potentially deliver on longer-term monitoring, for example: i) by applying a top-off fee at issuance that goes to the host Party, and which serves to cover the costs of future monitoring and compensation (the fee could be set depending on the level of reversal risk); ii) and/or by establishing a long-term monitoring system through satellite imagery (and other methods as relevant depending on activity types), managed by the Secretariat, and funded through a share of proceeds levied on the issuance of credits that involve carbon storage, which could be tied to the expected durability /risk rating of an activity (see also [their responses to] paragraphs 10, 11 and 13 [of *the Questions*]). [CMW, 360]

1174. The risks associated to reversals should not be a necessary part of the A6.4 methods to determine the A6.4ERs achieved by a project activity based on removals: the methods are used only to determine the ERs associated with the net removals achieved at any point in time during the crediting period. The reversals may be expected to occur at any point in time at the future, and if they occur, the associated emissions, not only accruing to the CO_2 removals achieved by the project activity, but also the emissions from the CO_2 removals that have taken place before the start of the project activity, will be monitored and reported as an AFOLU related emissions occurring at the host country, which is not attributable to the project activity, but caused by another drivers of the AFOLU emissions causing agents (e.g. deforestation for intentional or non-intentional causes, like for example land-use changes legally decided and implemented, wild fires, droughts, storms, floods, etc.). These emissions will be reported by the host country at its national inventory and at the Biannual Transparency Report – BTR as part of the NDC implementation process under the Katowice Modalities and Procedures, and at the global stock takes and technical reviews for the national communications that are implemented regularly to all parties of the Paris Agreement. Observe that the causes of the reversals, being not under control of the project participant, are to be identified by the DNA and reported as emissions, and need to be reflected in the progressive ambitions of the NDC, giving rise to the actions by the party to either make extraordinary efforts to implement further activities under the national contributions to mitigation, or as emissions reductions activities to compensate the emissions at the AFOLU sector3. If the land area where the reversals occur has been included in the boundary of an A6.4 project activity for CO_2 removals under, e.g. the category for Afforestation and Reforestation, and A6.4ERs have been issued for this project, and the host country DNA has given authorization for such A6.4ERs to be first authorized as ITMOs for the international transfer and use by other NDC, or for other international mitigation purpose, these A6.4ERs ITMOs will be cancelled out, and any final user of these will have to replace the used A6.4ERs by others. The A6.4ERs removals are always subject to reversals, this is engraved in all of them, and must be acknowledged by all players in the market, from investors, authorizers, holders and dealers, and final users. The face stamp must have an indication on the conditions to be sought by the holder of these A6.4ERs when the cancellation is declared by the UNFCCC tracking system. If there is no insurance or guarantee by the issuing DNA, or by any other player in the market, the risk is at the final user, and he/her has used this ITMOs knowing there is a risk about this utilization. When it occurs, the user/holder will either acquire replacement ITMOs in the market, or requesting the host country DNA or any guarantee or insurance policy (if there is one indicated) to replace the lost A6.4ERs by another ones, according to the contractual agreement at the project implementation, and according to the conditions and formal statements of the host DNA at the issuance of the first transfer authorizations. Observe, however, that the A6.4ERs will be related to the removals and biomass and carbon pools regrowth at the project area after the project registration and achieved during the project crediting period. The previously existing carbon pools at the project area, which may have also been emitted as reversals together with the removal activities when this sinistration occurs, are not part of the A6.4ERs, and will be reported by the host country DNA and the project owner (private or public entities responsible for the land use at the project area) as their own and unique responsibility, and do not count as A6.4ER or ITMOs. For example, if an abandoned pasture is now showing carbon pools corresponding to 30% of its potential carbon pools as a mature forest. If this area is registered as an A6.4 project, and over next 20 years it reaches 100% of the carbon pools, this 70% increase will be A6.4ERs certificates under the ITMOs holder/final user. If this land in this point in time in the future is reverted as an urbanization area, and the 100% of carbon pools is lost, the ITMOs holder will have to negotiate his/her loss (which is 70% of the lost amount, and from different vintages since the project start). But the host country NDC and the project/landowner will report the 30% pre-existing biomass of the oldest vintage, plus the 70% emissions that are reported under the national inventory and BTR and will have to be considered as missing from the NDC targets in the ongoing NDC implementation period. Therefore, each host country and project participant will need to consider, at the time of project conception, what are the risks and measures to be put in place such as insurance, buffer carbon pools for protection of potential losses due to risks related to reversals events, etc. Those arrangements are not under the regulatory methods and do not have any implications on the liability from the side of A6.4 SB or from the UNFCCC bodies. The responsibility by SB regulatory role is only for the methods used to monitor, report, and verify the achieved removals, and any eventual reversals. The risks related to natural events and/or associated with drivers for land use changes (land tenure, opportunity costs, spatial planning) are to be used by the methodologies as parameters to determine the most appropriate frequency and methods to measure the changes in carbon pools during the crediting period. However, if reversal events are detected, they are monitored and reported, but do not have any consequence or responsibility by the side of the approval of the project activity by the A6.4SB, the validating or verifying DOEs, or any stakeholder related to the UNFCCC process. All consequences of the reversals, all risks, and all damage and loss coverage for the already issued A6.4ERs certificates, or for losses to future issuance of A6.4ERs, are at the side of the project proponents, and their arrangements with the local and national and international entities and institutions participating or interested in the project activity. It is to be again reemphasized: the methods for removals activities are designed to set up conditions for validation, registration, monitoring, and reporting achieved removals for project activities. Once the credits are issued, they are officially adopted and included at the national inventory of the host country, and the authorization for ITMOs first transfers are issued by the DNAs, by making the corresponding adjustments to the NDC and national inventory reporting system. During the crediting period, the project participants will monitor and report to the DNA and the UNFCCC (by accredited DOEs) the removals and reversals monitored. [CRCY, 350]

6.3. Reversal risk tools: Specific

1175. 16. What are options for robust buffer pool design, including conditions and procedures for its use, ER composition, replenishment, and administration.

1176. The design of buffer pools for 6.4 could be based on existing buffer pool structures by Verra, Gold Standard, Plan Vivo, CAR, ACR and others that have been evolving over the last decade plus. [NB, 344]

1177. The existing buffer pool approach can be used to facilitate risk management and compensation of reversals in the short-term. However, innovation in risk management is needed through an effective risk framework of new actors including rating agencies, actuaries and insurers/reinsurers. The solution is to disaggregate roles and responsibilities roles by appointing independent, third-party actors to rate and underwrite against risk of reversal. In this scenario, the activity proponent could pay a fixed premium to the insurer for the transfer of risk and for a guarantee that if a reversal were to occur, the insurer would compensate (with equivalent cash or carbon) for the reversal. Transferring administration of buffer pools to independent, third-party insurers would remove issuers from liability concerns relating to the recourse for carbon default, claim settlement and dispute resolution. Their presence would increase user confidence for project developers exposed to risk of reversal and buyers concerned about the longevity of their CDR claims. Transition towards financial risk management best-practice would de-risk investments into voluntary and compliance carbon instruments and increase stakeholder confidence. There are various models for third-party insurers such as:

(a) Centralised: mandatory buffer pool contribution applied at each issue request; managed by the Issuer. Expected Effect used to determine the percentage of credits allocated to the buffer pool (e.g. 96% Expected Effect = 4% credits). Centralised buffer pool would be underwritten by a third-party insurer to cover the risk of carbon bankruptcy;

(b) Decentralised: buffer pools can only be managed by a third-party insurer, removing mandatory buffer contributions from the issuer. Risk management would be delegated to third party insurers subject to periodic audits to ensure appropriate quantity and quality of credits in case of an Event of Carbon Default (EOCD);

(c) Hybrid: Centralised Approach with opt-out function for the activity proponent to contract with an Insurance Body to manage risk of an EOCD. Combining self-insurance with conventional insurance would give actors autonomy to choose their preferred approach to effective risk management. As per the aforementioned approaches, all buffer pools should be periodically audited by the A6.4SB to monitor the integrity of replacement certificates. [CCPLE+RECS, 354]

1178. Buffer could be combined with insurance to provide complete coverage. Buffer contributions of 20% from projects are sufficient to cover the majority of reversals, which are more common but minor. This pool could serve as a first loss to claims any larger than a threshold of, for example 10 or 15%, where insurance covers the remaining loss up to the entire 100%. Such insurance is of the order of 5%-10% a year of the value of carbon at risk. Buffer contributions above the threshold ensure the buffer is replenished and remains liquid, even in the case of multiple total project failures. The insurance premium can be paid by some combination of the buffer operator from fees on sales or by an additional buffer contribution from developers. [KITA,347]

1179. Buffer pools can be made more robust by using a diverse set of removals in their composition, as well as diversifying their locations and ensuring that, particularly for land-based removals, they adhere to high standards of integration with their local ecosystems. Buffer pools should be continuously replenished to ensure that they are not quickly used up. Buffer pools must be calibrated to account for changes in reversal risks, both for the original removal and the buffer pool itself, due to climate change, rather than relying solely on historical data. In some cases, buffer pools alone may not provide sufficient insurance against reversal risks. [BF, 362]

1180. The buffer pool should be managed by the UNFCCC, and the requirements to request the use of the buffer pool should also be defined by the UNFCCC. Even if a catastrophic event occurs in a specific project, the buffer pool of the UNFCCC, which represents the collective buffer deposit from all projects, should compensate the buyer of the ERs. Placing all the insurance requirements' responsibility on the project developer may be infeasible for NBS removals. [PARIGI, 357]

1181. The buffer pool should be managed by the UNFCCC, and the requirements to request the use of the buffer pool should also be defined by the UNFCCC. Even if a catastrophic event occurs in a specific project, the buffer pool of the UNFCCC, which represents the collective buffer deposit from all projects, should compensate the buyer of the ERs. Placing all the insurance requirements' responsibility on the project developer may be infeasible for NBS removals. [NBS, 373], [REGREEN, 374]

1182. The initial level of contribution should be enough to cover all types of reversal risks over the next 100 years of storage. If direct credit replacement from buffer is desired, then the buffer should only contain real credits, that is credits based on irreversible storage or credits from emission reduction activities. Replenishment of credits in the buffer: Credits in the buffer should be cancelled whenever a reversal is reported and the activity becomes ineligible for further issuance until the lost removals are recovered. If the buffer goes bankrupt, the liable Party will need to manage by e.g. insurance or replenishment of the buffer at their own cost. Buffer pool should be administered by an independent entity who should instruct the registry administrator to move and cancel credits as needed. Risk monitoring should also be carried out by an independent entity, and not as self-monitoring by the project proponents, to avoid conflict of interest and possibilities of gaming. If any of these actors cease to function or exist before 100 years, then liability for ensuring compensation of reversals should lie with the host Party or the Party acquiring the credits. [SCC, 356]

1183. The buffer pool should be adjusted to risk by the project with lower thresholds, which could be adjusted every crediting period based on the results of non-permanence risk assessments, carried out during each monitoring period. It needs to be decided whether there would be a common buffer pool for all 6.4 projects or they would be kept separate. In terms of the size of the buffer pool, one can use VCM examples as a reference point. As of the end of November 2022, Verra's VCS has 65 million credits available in the buffer, just over 6% of the 1 billion credits issued. There have not been many instances where the buffer pool has been drawn on. In case the buffer pool is used up, there are several alternatives to cancelling credits from the buffer pool that could be considered, which are: corresponding reduction of future sales; cancellation of unsold credits; purchase of an "equivalent" number of carbon credits from a different project in the same registry. [SYLV, 367]

1184. A standardized risk assessment tool should be developed to be applied in the same manner for all the projects. In doing so, [STX, 363] suggests following elements are considered:

(a) Internal risks (financials, management, longevity...);

(b) External risks (stakeholders' engagement and some other stakeholders related risks, land ownership, country specific political risks, legal risks);

(c) Natural risks (if applicable/only for Nature based);

(d) Planned/intentional reversal risks.

1185. The project owners should calculate the amount to be deposited in the buffer pool by using the tool, so it is necessary to develop thresholds and values for all considered risks in the assessment. As a reference, Nature based project risk ratings range between 10-20%. The risk assessment should be updated periodically, depending on what makes sense for the project type, and it should be verified by a third party. [STX, 363]

1186. Buffer pools could, for example, be treated as annuities, with similar risk and processes applying to both. [CARBI, 376]

1187. Technical paper provided by SBSTA (FCCC/TP/2014/2) shows general factors to be considered when applying a permanence buffer of credits backed up by host party guarantee (para. 69-73) and details on accounts, liability, monitoring and verification in the event of a reversal (para. 78-82). It is also necessary to refer to “modalities and procedures for carbon dioxide capture and storage in geological formations as clean development mechanism project activities” (Decision 10/CMP.7), which applies non-permanent treatment options similar to the above options. Carbon dioxide capture and storage (CCS) CDM projects apply a combination of buffers and Party guarantees (Annex paras. 24-28, Decision 10/CMP.7). [NFS, 377]

1188. Buffer pools based on static risk frameworks and a one-time, upfront contribution are insufficient to manage ER reversal risk. According to [CPOOL, 355], buffer pools:

(a) Do not hold capital to manage unexpected outcomes;

(b) Do not reflect the continuing variety and innovation of project types, risks and geographies through granular and differentiated risk assessments and corresponding determinations of the appropriate buffer contributions on the individual project level; or

(c) Do not capture the dynamic nature of the underlying risks, which change over time driven by factors such as the changing climate regulatory requirements, and new technologies.

1189. Therefore, buffer pools will not have the required amount of ER s to compensate for scenarios in which serious unexpected risks materialize and cumulate or if the risk profile of a project changes over time. Recent experiences of buffer pools demonstrate acute failure. Buffer pools create a false sense of security, since they claim to make up for ER reversal events, but do not have rigorous measurement of the impact of the reversal event or quantification of the ensuing loss and cannot cater for unexpected outcomes. The accuracy and sufficiency of the buffer pools is not tested and the contribution levels are not differentiated enough to incentivize investment in risk mitigation of the underlying projects. [CPOOL, 355]

1190. Buffer pools are one of many risk management mechanisms. Other means of measuring and transferring risk among actors should be studied, including insurance, back-stops, performance guarantees and other approaches. Buffer pools are a “more of the same" approach to risk which may actually increase risk concentration whereas allowing the off-taker to bundle or aggregate assets with risk characteristics that meet a statistically expected environmental performance and portfolio effect due to managed correlation exposure may be a better means of managing risk. 10 tons with an insurance policy using 10 diversified tons on call with a 1% likelihood of failure diversifies project activities, drives innovation, and enables diversification of exposures. Buffer pools play an important role but have limitations. Other mechanisms like insurance should be explored to enable innovation in risk modeling, diversification, incentives, and financial resilience. Bundled buffered-insured portfolios could provide comprehensive coverage efficiently. [CFL, 365], [1.5, 366]

1191. There have been several unsuccessful buffer pool management models and no successful models proven to-date. By choosing a buffer pool mechanism, the choice is being made to allow an avoidable risk for which no one is accountable. [SH, 346]

1192. Allow insurance mechanisms to substitute for buffer contributions. [DG, 361]

1193. The durability of DAC removal can be a reversal risk tool. Companies seeking to purchase nature-based removals for business or marketing reasons, or to satisfy UN Sustainable Development Goals, can buy DAC-based buffer pools, removal options, or reversal insurance to hedge against reversal risk. Criteria could be developed based on which removals can be assessed for quality and fit-for-purpose products for buffer pools and reversal insurance. [DACC, 369]

1194. For permanent storage options, where the risk of leakage is less than one percent, buffer pools may become an over-regulation. If a buffer pool is deemed essential, a refundable buffer pool approach should be explored under which, credits allocated to the buffer pool, where no reversal occurs, can be reimbursed. This way, the system remains adaptable, provides a (monetary) incentive for safeguarding permanent storage approaches and promotes the efficient utilisation of carbon credits without impeding progress. Regarding the tools used to mitigate the risk of reversals, especially in relation to risk buffer pools, the SB should rely on rigorous scientific models. [NEUST, 364]

1195. For permanent removals that do not result in reversals, any systems of buffer pools or insurance has no value. During the Monitoring period, reversals should be monitored and addressed according to the applicable jurisdiction as well as counted as an emission by the storage company. At the end of the Monitoring period, there should be a transfer of responsibility to the host nation of the geological storage. If there is a reversal after the transfer of responsibility, the host nation should count the reversal as an emission and take measures according the applicable jurisdiction. Applying this approach within the EU, as an example, would rely on the ETS and CCS directives which prescribe that any CO_2 emitted from a storage site should be compensated by the purchase of an EU ETS EUA (Annex I activity). [SE, 345]

1196. Buffer pools imply double coverage of risks for geological sequestration in certain national contexts and should be restricted to places where national authorities do not cover the risks sufficiently. In case a buffer is used, it should reflect project specific risks and allow for minimal pooling across activity types/categories. Low risk CDR methods should not be penalized by overarching buffer requirements. Furthermore, buffers accounts for CDR activities should only be replenished with CDR credits, as CDR and emission reductions are not fungible. [CW, 358]

1197. A concept paper should be prepared, covering all these elements of buffer pool design, drawing on a range of literature and analysing the risks and complexities of different options. Furthermore, as the resilience of a buffer pool is directly linked to the robustness of the risk assessment/ measurement process, it should be conservative and continually updated. [CMW, 360]

1198. There are two different certificates related to the A6.4 project activities, and both emissions reductions A6.4ERs, or removals A6.4ERs will follow the same double layer certification: (i) the A6.4ERs issued after the monitoring has been completed by the verifying DOE and the certificates are issued by the A6.4SB underneath the UNFCCC modalities and procedures for the project activity; (ii) the ITMOs issuance as the authorization for first transfers of mitigation outcomes, by the side of the host country DNAs. The first layer of certification is related to the system in place for the registration and MRV as per the SB set rules, which are applicable during the crediting period (up to 3*15 years duration, in case of removals). The methods for monitoring the changed carbon stocks in the area, of course, can detect and assert the changes and enhanced carbon pools, which are deemed to occur under the prevailing conditions for the area during that crediting period. The risks associated with potential non-confirmation of the expected outcomes are used by A6.4 methodologies to determine the spatial and temporal frequency and measurements methods (field, remove sensing, etc.) to detect and report the outcomes. However, the regulatory risks, and the natural disasters risks, that may impose potential damages to the use of the mitigation outcomes by the final users (a foreign NDC, an international carbon offset mechanism like CORSIA, a corporative voluntary cancellation of emissions, etc.) are considered and disclosed by the host DNA when issuing the authorization that the national mitigation outcome is transferred for international use, giving rise of the ITMOs, under the annotation that the national inventory of the host country acknowledge these removals have been achieved by the host country. Once the A6.4ERs are authorized as first transferred ITMOs they cannot be part of the agreed national determined contribution (NDC) of the host country any more, because the international transfer has been authorized. This NDC corresponding adjustment is permanently registered, acknowledging the outcome has been achieved within the country, but the NDC has not accounted it as own mitigation contribution. If, at any point in time in the future, during the crediting period or beyond it, the regulatory conditions or any natural event is detected, such as the host country DNA reports these removed carbon stocks have been lost and the reversals emissions are reported, the A6.4ERs certificates and ITMOs are reported as having lost their currency backing. The final users are required to make the necessary changes in their inventory reporting, according to the system they have in place to make their emissions/removals reporting. If the final users are NDCs, the system is set by UNFCCC, e.g. the Sharm El Sheik Guidance relating to decision 2/CMA.3, annex, chapter VI (Tracking), and the Modalities and Procedures for the NDC implementation are in place to make the reversals accounting in the global stock take process. All actors and players (host country, project participants, investors, users, etc.) will have to review their contributions and their assets on mitigation outcomes and will have to replace or request the replenish of the losses, according to their market arrangements and contractual conditions. The financial implications of that losses, in terms of monetary costs, depends on the market value of the A6.4ERs and ITMOs at that time in the future, which, on their turn, depends on the offer and demand for climate mitigation outcomes, which, on its term, depends on how serious the political decision making, national and international judicial enforcements systems in place are able to achieve the emissions transition required by the Paris Agreement (please refer to Figure 1), which, finally, depends on how we as humans acting individually and locally, but also collectively and globally, are able to recognize our common but differentiated responsibilities, and address this challenging transition. [CRCY, 350]

1199. ***17. The need for additional procedures and guidance for the 6.4SB, PPs, insurers/ guarantors to implement options for direct ER replacement, including for insurance or guarantees***.

1200. Insurance is a market mechanism that should be enabled but not provided by 6.4SB. It should be led/provided by the private sector with 6.4SB ensuring the enabling environment for private insurers to be able to operate. Direct ER replacement, additionally should be an option within a commercial agreement between transacting agents within 6.4, but not a service provided by 6.4SB due to the complexities of cross-project dynamics in replacing credits across a global market. [NB, 344]

1201. Temporary credits did not work under the CDM. Commercial insurances are used by the American Carbon Registry (ACR) in which a private insurance agency insures a project and makes other credits available in case of reversal. Buffer reserves are used in most voluntary markets. To function, buffer and insurance solutions both require: i) long-term contractual agreements, ii) monitoring period extending at least 20 years after the last credit issuance, and iii) clarity of liability in case of bankruptcy of the proponent, which should fall back to the host country government. [PCR, 348]

1202. To implement insurance instruments as a tool for activities involving removals under Article 6.4, several considerations need to be addressed by the SB, including: i) the risks covered by insurance policy; ii) duration of an insurance contract (policy) between an insurance provider and a project participant; iii) possible recipients of the insurance award; iv) possible uses of the insurance award; v) eligibility criteria for insurance providers. Parties could also consider establishing a special fund overseen by the SB (or an independent third party appointed under the UNFCCC). This fund would collect insurance awards paid for applicable projects under relevant circumstances, and allocate the resources received following the approved guidelines. [ICLRC, 349]

1203. To ensure that insurance serves as an efficient instrument for increasing the quality of activities involving removals, [ICLRC, 349] lists the following aspects to be considered:

(a) Insurance policies must be customized to address the unique risks associated with different activity types;

(b) Given the long-term nature of many removals projects, insurance coverage should extend over the project’s entire lifecycle, including the monitoring and verification phases, as well as the sequestration phase itself (for a certain amount of time), to ensure the mitigation of the risks mentioned above;

(c) Insurance providers, project participants, and scientific communities should collaborate to share data and knowledge regarding the risks, challenges, and successes activities involving removals, which could lead to more accurate risk assessment and premium pricing;

(d) Regulators and host countries can play a vital role by providing incentives and regulatory support (e.g. in the form of tax breaks, grants, or favourable policy frameworks) for insurance providers and project participants engaged in greenhouse gas sequestration initiatives. [ICLRC, 349]

1204. Currently, insurance is not used as a tool to adequately address carbon reversal risk because any insurance maintained by a project developer today produces, in the event of a claim, a cash payout to the project developer. This cash payout may be used to restore damage to the underlying asset, or to mitigate other operational losses, but it does not actually address the damage, which is that an ER reversal results in the emission of a previously sequestered ton of CO_2 back into the atmosphere. By contrast, the in-kind insurance compensates in ERs. While prevailing risk capital regimes under current insurance regulations make it extremely costly to allow for at scale in kind payouts in carbon removals, minor adjustments to these regulations are required to accommodate in kind payouts and to allow investment of insurance premiums and capital into ER s for the insurer ’s insurance reserves. [CPOOL, 355]

1205. The ultimate liability should be with the host Party or the credit acquiring Party. They may underwrite the buffer themselves or may engage services of a commercial insurance company to underwrite the buffer. This underwriting should also cover the liability for credits replacement from outside the market, which would be required in cases of intentional reversals and abandonment of monitoring. [SCC, 356]

1206. Review Offset Insurance Proposal. [PARIGI, 357]

1207. Either all credits must be equal, or they must be divided into groups within which everything is equal. There needs to be a minimum top-down design to determine the equivalency measures/groups or a sufficient authority that answers all questions of equivalency. Once that is done, pricing and liquidity are much easier to handle (but they are the second and third most important factors). Next required guidance is standardized contracts followed by establishment of clear lines of ownership, obligation and capital flows. All of these elements combined will make loss calculation and claims processes quicker, lower risk and lower cost. [KITA,347]

1208. All credits subject to an EOCD must be remediated by cancelling a volume equivalent to the magnitude of EOCD. Robust standards should be created to avoid non-fungibility of buffer credits and associated compensation. Currently, Issuers have loosely defined or have not set criteria to determine which credits should be cancelled from the buffer pool in the event of a reversal, meaning high durability credits could be replaced with lower durability credits. Clearly defined fungibility criteria must be set for how credits subject to a reversal event can be compensated for: 1) Expected Effect 2) Vintage 3) Methodology 4) Location. Fungibility is key for facilitating actions to be taken at scale. Fungibility occurs quantitatively by collapsing unique projects into 1 or 2 key determinant factors (e.g. durability period and Expected Effect). Clearly defined fungibility criteria would enable a more robust and transparent mechanism to address loss events and effective end-user claims. [CCPLE+RECS, 354]

1209. There must be a way to ensure that insurers are able to handle system level risks, such as mass forest dieback, which could potentially overwhelm an insurance market, e.g. government to be an insurer of last resort in some cases where the risk is still acceptable. Governments would need to ensure the existence of legal infrastructure necessary for credible long-term private law contracts. [BF, 362]

1210. Such requirements should be reflected in activity specific methodologies and should not be generalized as there are a variety of viable CDR options, all with their own needs and risk profiles. [CW, 358]

1211. Depending on the risk assessment results, an extra insurance procedure could be applied to guarantee the project carbon benefits in case reversal events occur. [STX, 363]

1212. Durability of projects should be reflected in the design of insurance. High-durability projects do not need to be audited at the same frequency or with the same mechanisms as lower-durability projects with potentially high anticipated reversals. Insurance practices should be relative to the certainty of the carbon’s long-term removal. [PT, 372]

1213. There is a need subject to innovative solutions required to solve these problems. Markets that need to scale to the multi-trillions of dollars will need solutions that can work at the multi-trillion dollar level. [CFL, 365], [1.5,366]

1214. The need and direct responsibility for direct ER replacement, including insurance or guarantees attributed to the project developer, may be unfair and place all the project risk on the project developer. The use of the buffer approach serves to minimize and share the risk of a specific project, as all projects will retain a portion of the ERs in a buffer pool to be used for replacement to the buyer in case of loss events. [NBS, 373], [REGREEN, 374]

1215. This is beyond the A6.4 methodology framework under supervision by the A6.4 SB. [CRCY, 350]

6.4. Treatment of uncancelled/unused buffer ERs

1216. 18. Are uncancelled ERs in the buffer pool returned to the activity proponent to incentivize performance and/or automatically cancelled, and is this done periodically throughout activity cycle or only after the end of the activity lifecycle or the host Party NDC timeframe?

6.4.1.1. Return to the proponent

1217. Uncancelled ERs should not be automatically cancelled. They should either be returned to the activity proponent or kept in a buffer pool to continue to ensure that project against reversal events beyond the project crediting lifetime. Based on the performance of the project and a risk assessment completed at the end of the crediting period, the amount of credits that need to be maintained in the buffer pool should be reassessed, with some portion of credits returned to the activity proponent depending on the reversal risk at that point in the project lifetime. [NB, 344]

1218. Returning the uncancelled ERs to the activity proponent would incentivize good performance. This could be done mid-lifecycle if good risk management is evident, at the end of the activity lifecycle (including any post monitoring requirements), or in line with the host Party NDC timeframe. However, if this timeframe is too long and markets trend towards a newer vintage preference, the incentive is diminished, in which case a cash payment could be provided instead, and the remaining ERs cancelled. [KITA,347] [CFL, 365] [1.5,366]

1219. Alternatively, Verra's approach could be considered in which a project becomes eligible to release buffer credits where non-permanence risk rating in the current verification report remains the same or decreases from the previous verification. Release from the buffer occurs when a verification report is presented to the Verra registry and VCU issuance requested. This may only occur where a verification report is issued at least 5 years after issuance date of the verification report previously submitted. This essentially equates to only releasing credits once every 5 years. [KITA,347]

1220. Uncancelled ERs should be returned to the activity proponent in cases where permanence is highly likely, based on a performance assessment. Such returns should follow a flexible rather than pre-determined timeline. [CW, 358]

1221. Return uncancelled 6.4ERs in the buffer pool to the project proponent. [DG, 361]. And periodically throughout the activity cycle to incentivize good behavior and better predictions. [CARBI, 376]

1222. If a buffer is deemed to be required for durable carbon removal activities with very low to nil risk of reversal, we support that then uncancelled ERs should be returned to the activity proponent. [PURO, 378]

6.4.1.2. Automatically Cancel

1223. They should be automatically cancelled. “Incentivising Performance” needs to be met with legal liability for default (again which can be supported with an insurance model). [PARIGI, 357]

1224. Unused ERs in the buffer pool should be automatically cancelled once monitoring has stopped. No uncancelled buffer ERs should be returned to the proponent. Cancelling unused buffer pool ERs ensures that reversals are better accounted for, given that buffer pools and related insurance systems are already unlikely to be able to guarantee permanence on a required timescale of several centuries. Regularly cancelling unused buffer pool ERs also reduces the risk that the buffer pool incorrectly appears over-capitalised. [CMW, 360]

6.4.1.3. Combination

1225. A portion of uncancelled ERs should be cancelled to account for the extended duration in which the offset emissions remain in the atmosphere which is not measured nor monitored after the crediting period. The remaining uncancelled ERs should be returned to the proponent at the end of such monitoring period. This assumes there will be uncancelled ERs, which has been empirically unproven in other buffer pool schemas. The alternative, that there is a negative account balance in the buffer pool, cannot be remediated and the liability is born by the common global citizen. Ongoing management of the buffer pool, including accounting for credits by proponent, by project, and by issuance over decadal timelines, will carry an ongoing cost which too must be funded upfront by the project proponents in order for the system to be sustainable. [SH, 346]

6.4.1.4. Partial

1226. The ERs deposited in the buffer pool could be recovered at the end of the project lifetime if no reversal event occurred. Nevertheless, a minimum percentage of ERs should remain within the buffer pool to offset reversals that may occur in the future. To incentivize performance, it could be considered to recover a determined percentage of the deposited ERs if no reversal event happened. The ERs recovered are to be discounted from the buffer pool and there should be a cap to maintain the minimum percentage of ER in the buffer pool. It should have a positive impact on the insurance scheme (if applied), since it is being demonstrated that the performance is complying with the requirements. [STX, 363]

1227. To work as a permanent solution for the risk of reversal, the buffer pool of a specific project should be partially returned at each verification event. In the final verification (end of crediting period), a portion of the buffer pool may be returned to the project proponent, while another part may be retained by the UNFCCC to be used as a guarantee for any reversals. Using this approach, the project proponent should not be required to have a back-up insurance (like bank insurances), as it is leaving ERs in the UNFCCC buffer pool. [NBS, 373], [REGREEN, 374]

6.4.1.5. Other inputs

1228. ERs are neither cancelled nor returned to the proponent under normal circumstances. If most projects do not suffer from reversal, the buffer pool grows over time (contributing to overall mitigation in global emissions). In case of reversals, corresponding volumes are cancelled. [PCR, 348]

1229. Uncancelled credits should stay in the buffer, thus strengthening the capacity of the buffer over time. [SCC, 356]

1230. Uncancelled ERs should be held as insurance for future unintentional reversals, as well as insurance against losses of non-certified carbon stores (e.g. through disease or forest fires in old growth forest or by extended drought). These remaining buffer pools may be necessary to handle the reversals that other buffer pools have not been able to redress by themselves. [BF, 362]

1231. It depends on the buffer pool model. For example, if a multi-project pool model is utilised, no returns should be done. Compensating activity proponents for avoiding reversals and not using the buffer pool could be done in a different way than by returning ERs. [SYLV, 367]

1232. This is not a matter for the methodological framework by SB. [CRCY, 350]

1233. 19. Whether the options for treatment and timing are mutually exclusive or could be applied in combination (e.g. returning some but not all ERs to proponent).

1234. Treatment and timing of returning ERs from a buffer can be applied in combination. For example, buffer contributions from a project could be lowered or even refunded to reward good risk management and lower than expected losses, once the buffer is above a certain level that maintains sufficient liquidity and capacity. [KITA,347]

1235. No need for combinations (see also [the response to] paragraph 18 [of *the Questions*].). [PCR, 348]

1236. Based on the performance of the project and a risk assessment completed at the end of the crediting period, the amount of credits that need to be maintained in the buffer pool should be reassessed, with some portion of credits returned to the activity proponent depending on the reversal risk at that point in the project lifetime. [NB, 344]

1237. [See [the response to] paragraph 18 [of *the Questions*]. [SH, 346]]

1238. All uncancelled credits should stay in the buffer. [SCC, 356]

1239. The only case some should be returned are where there is ongoing demonstrable low-risk of reversal, such as mineralization. All other types should be subject to automatic cancellation. [PARIGI, 357]

1240. No ERs from the buffer pool should be returned to the project proponent, even after the end of the crediting period or monitoring period (see also [the response to] paragraph 18 [of *the Questions*].). [CMW, 360]

1241. See [the response to] paragraph 18 [of *the Questions*]. [BF, 362]

1242. The project owners should decide according to their preferences what option to apply for the ER recovery (during project lifetime or at the end of the project cycle). [STX, 363]

1243. This problem should be approached from a higher level. The risks and risk management of either buffer or insurance should be matched as efficiently as possible following the principles from accounting that match insurance to assets. Broad principles such as matching risks duration, nature, and likelihood to instrument or approach should be pursued. [CFL, 365], [1.5,366]

1244. In case returns is applied, it should be limited to cases where there is no net loss of carbon stock at the next crediting/permanence (or monitoring period), once the non-reversal is guaranteed over the right timeframe. [SYLV, 367]

1245. To work as a permanent solution for the risk of reversal, the buffer pool of a specific project should be partially returned at each verification event. In the final verification (end of crediting period), a portion of the buffer pool may return to the project proponent, while another part may be retained by the UNFCCC to be used as a guarantee for any reversals. Using this approach, the project proponent should not be required to have a back-up insurance (like bank insurances), as it is leaving ERs in the UNFCCC buffer pool. [NBS, 373], [REGREEN, 374]

1246. Periodically only. I see no benefit in using end-of-cycle "true-ups". [CARBI, 376]

1247. This is not a matter for the methodological framework by SB. [CRCY, 350]

1248. 20. Possible basis for periodically returning ERs to proponents (e.g. metrics for activity performance, activity cycle milestones).

1249. It could be based on the risk assessment updates and the demonstration that no events occurred. It could also be based on activity cycle milestones, but these milestones should be determined by 6.4SB considering the differences among the different project types. [STX, 363]

1250. Risk associated to a specific project type with the activity risk assessment. [NB, 344]

1251. Permanence guarantees/ likelihood, as presented in the CCS modalities could be the basis. A similar logic should be installed for projects that are not relying on geological sequestration, but present an equally safe and permanent storage approach (E.g. ex situ mineralization). [CW, 358]

1252. There should be no basis for returning ERs to proponents, especially for them to be resold-at this point they are not additional and thus do not meet the standards of environmental integrity. [PARIGI, 357]

1253. The credits contributed into the buffer pool should not be returned to the contributors just as the insurance premium collected is not refunded by insurance companies. Coverage of risk is a service that is already delivered to the contributors. The rate of contribution in the future may be reduced for the entities with good track record of avoiding reversals, just as insurance premium does. [SCC, 356]

1254. ERs should not be returned to proponents. [SH, 346], [PCR, 348] (For [PCR, 348], see also [the response to] paragraph 18 [of *the Questions*].

1255. No ERs should be returned to project proponents from the buffer pool (see also [the response to] paragraph 18 [of *the Questions*].). [CMW, 360]

See [the response to] paragraph 18 [of *the Questions*]. [BF, 362]

1256. At each verification event, the individual activity's risk assessment should be used to estimate the percentage of ERs to be returned to the project proponent. [NBS, 373], [REGREEN, 374]

1257. Third-party audited annual returns only. [CARBI, 376]

1258. Credits should be returned to the project after the end of the monitoring period. It should not overlay the existing requirements such as EU ETS and EU CCS Directive as it could lead to a greater/double financial burden on CDR companies. [NEUST, 364]

1259. Two issues are being conflated here - the scientific principle for quantifying the risk and the third party review/governance board. This is the entire reason the insurance industry is regulated and separate from the assets they register. [CFL, 365], [1.5,366]

1260. This is not a matter for the methodological framework by SB. [CRCY, 350]

1261. 21. Procedures for the 6.4SB’s periodic review and ongoing management of buffer contributions (e.g. buffer composition, stress-testing the sufficiency of risk coverage).

1262. Buffer composition should be assessed at the level of the entire market to ensure sufficient coverage, i.e. enough available credits (minted but not transacted) to cover reversals. Especially in natural systems, given the likeliness of shifts in climate at the regional level, the buffer contribution should be reassessed regularly (every 2 years) on a project type level at methodology level, but would not make sense to reassess on a project level as the credits not committed to the buffer pool at the outset of the project will likely already be transacted. [NB, 344]

1263. Buffers should report their coverage levels publicly at least once a year. Along with procedures for buffer contributions, required time frames and any significant losses should all be documented. [KITA,347] [CFL, 365] [1.5,366]

1264. Risk-reporting standards and best practices from the asset management industry should be adopted. For example, limiting and reporting on buffer concentration risks within single projects or regions and systematic risks, such as natural catastrophe risks, climate change or political risks. Once the buffer constituents and risk exposure are reported, stress testing under different loss scenarios transparently demonstrates the robustness of the buffer. Regular public reporting on buffer coverage, risks, and stress testing results following asset management industry best practices will ensure transparency and integrity. Adopting risk quantification and modeling standards from insurance can further strengthen oversight. [CFL, 365] [1.5,366]

1265. Buffer contributions and stress-testing should occur seasonally to be in line with scientific practice and the precautionary principle of international law given the climatic extremes in future. [PARIGI, 357]

1266. The procedures for periodic review and ongoing management of buffer contributions are essential to guarantee an appropriate buffer pool to serve as insurance against reversals. [NBS, 373], [REGREEN, 374]

1267. It should regularly undergo stress-testing at least every 3 years to assess the pool’s resilience for a range of plausible reversal risk scenarios affecting the activities linked to the pool. Some events, such as occurrence of a high rate of reversals, may require more frequent review. The specific rate of reversals that would trigger a stress test and review could be determined based on analysis of existing practices in carbon crediting and other contexts (the European Central Bank, for instance, conducts annual stress tests). In addition to regular stress-testing, the composition of the buffer pool, including the share of credits by vintage, region and country, activity type, crediting methodology, and specific activity, should be published annually. [CMW, 360]

1268. A higher contribution rate may be required in the beginning (> 50 percent in certain cases) and subsequently adjusted downwards if, individually and collectively, the reduced rate is not likely to jeopardize the capacity of the buffer. [SCC, 356]

1269. Risk assessment updates should be performed by the proponent at every verification event to evaluate the impact of possible events that occurred and to evaluate if a certain risk is no longer present within the project and/or new risks must be considered. [STX, 363]

1270. A differentiation between short durability and high-quality permanent storage allocated credits would be desirable. [NEUST, 364]

1271. Procedures should include independent inspection by the SB if auditing reports indicate possible doubt. Stress-testing should be invoked based on a more than 10% departure from predicted sequestration rate in any single annual return period. [CARBI, 376]

1272. Today, we do not have any to provide. However, we are working on developing such thresholds as part of a separate body of work related to combining insurance and a buffer for a new carbon standard. We are happy to provide the results of our work in a later consultation. [KITA,347]

1273. This should be informed by subject-matter experts with experience. [SH, 346]

1274. This is not a matter for the methodological framework by SB. [CRCY, 350]

6.5. Cross-cutting and other inputs

1275. [CCSG, 340] proposes that following precautionary principles must be applied to CDR activities:

(a) To avoid moral hazard, emission reduction credits for off-setting must only be issued for residual unavoidable emissions following achievement of drastic emission reductions (90%) presented as part of a credible net zero/real zero decarbonisation strategy;

(b) CDR technologies must not be used to generate carbon removal credits at all currently, owing to the risk of promoting excessive, unregulated commercial activity in the oceans, testing unproven technologies;

(c) Carbon accounting for emission reductions and removals must be evidenced through transparent, independently verifiable standards and there is a need for guidance on their use;

(d) Strong, consistent regulatory effort is required at national and global levels to control the carbon market to ensure it drives measurable, high impact climate mitigation now and does not distract, undermine or channel finance away from effective nature-based solutions, emission reductions and habitat restoration that are proven to be effective but lack commercial appeal, into research ventures exploring unproven technologies;

(e) To ensure integrity, a non-profit driven mechanism must be developed for directing finance towards solutions that are ready to implement and quantified such as those identified and fully researched by Project Drawdown. For example, four land sink solutions in Drawdown's top 20 have the potential to reduce/sequester between

122 and 190GtCO2e by 2050. These also have multiple biodiversity co-benefits. In a statement on CDR: Nature-based and technological solutions, the European Parliament (2021) stated that nature-based solutions stand out as more cost effective and viable in the short run, while some technological alternatives have potential to become more relevant later this century;

(f) Due to lack of understanding and uncertainty of risks and verification of ocean CDR, projects must not commence without prior local consent;

(g) A coordinated ethical framework may be established to evaluate ocean climate actions prior to any deployment of geo-engineering in the ocean or on land;

(h) In terms of contribution to the global stocktake, the priorities should be to protect blue carbon ecosystems and their climate services, through natural enhancement (e.g. seagrass, kelp, saltmarsh) amplify ocean-based renewable energy and harmonise all ocean with climate goals. [CCSG, 340]

1276. The role of the forest sector and its contribution to the mitigation of, or adaptation to climate change are relatively well known and documented. However, reliance on this area of activity as a credible means of offsetting or eliminating all the climate impacts stemming from anthropic GHG emissions in the atmosphere is less well understood. Furthermore, certain groups criticize the advantages for the host communities to establish projects in this sector given the cumbersome process and significant constraints often associated with their implementation. Above all, they challenge the manner in which such projects tackle the permanence issue of sequestered carbon. The principles of environmental integrity, the intergenerational equity and the sustainable development must be the pillars of the 6.4 mechanism of the Paris Agreement and consequently, of any methodology accounting for atmospheric removal. Unlike the climate benefits stemming from a GHG emission reduction project, the climate benefits associated with the removal of atmospheric CO_2 and those related to carbon storage in the biomass of a forest ecosystem can only be temporary, which limits the compensatory potential associated with this type of project. Thus, number of issues must be addressed to accommodate it (see also Accounting for Removals). [QB, 341]

1277. New Zealand endorses the description of the roles of carbon dioxide removals (CDR) in mitigation strategies set out in the technical summary of Climate Change 2022: Mitigation of Climate Change, the Working Group III contribution to the IPCC’s 6th Assessment Report:

(a) As part of ambitious mitigation strategies at global or national levels, gross CDR can fulfil three different roles in complementing emissions abatement:

(i) lower net CO_2 or GHG emissions in the near term;

(ii) counterbalance ‘hard-to-abate’ residual emissions such as CO_2 from industrial activities and long-distance transport, or CH_4 and nitrous oxide from agriculture, in order to help reach net zero CO_2 or GHG emissions in the mid-term;

(iii) achieve net negative CO_2 or GHG emissions in the long term if deployed at levels exceeding annual residual emissions. Removals must complement rather than substitute for ambitious emission reductions. The role of removals in nations’ mitigation strategies will vary according to countries’ differing circumstances, including their emissions profiles, their economic characteristics, geography and ecology. [NZ, 342]

1278. Credits currently are not tagged with a particular geo-location but instead are associated with a particular project. For any credit that is land-based, such as a reforestation credit, it should come with a geo-location tag that is associated with the specific area (e.g. 1 hectare x 1 hectare) where that credit was produced. As projects often sell credits to multiple buyers that use that credit for a climate mitigation claim, ensuring each buyer/retirer understands they are taking on the reversal risk of that credit for that specific area where that individual credit is produced. To avoid the situation where multiple companies have bought credits from a project, but a project does not know which companies bear the responsibility if only 10% of the credits are experience a reversal that must be accounted for. In order for the effective monitoring and accounting of reversals, each credit must have either a unique geo-location or share a geo-location with a maximum number of other credits. Such a system will also be critical if additional ecosystem service value is stacked on top of the carbon credit value as it must be associated with a specific area of land. [NB, 344]

1279. The SB has not equated the climate impact of credits to the climate impacts of emissions they are purported to offset or as a standard setting body, standardized removals of varying durations. [SH, 346]

6.5.1. Definitions

1280. [NZ, 342] endorses the definition set out in the technical summary of Climate Change 2022: Mitigation of Climate Change, the Working Group III contribution to the IPCC's 6th Assessment Report: CDR refers to anthropogenic activities removing CO_2 from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological, geochemical or chemical CO_2 sinks, but excludes natural CO_2 uptake not directly caused by human activities. This definition should be retained unless there are clear reasons to amend it and the revisions materially improve clarity. This definition focuses on the results achieved and is neutral as to the methods or technologies employed. Risks and issues raised by different removals activities (including new technologies) will vary. Risks and issues should be assessed and managed with consistent rules, criteria and standards, rather than by excluding particular methods or technologies from the definition of removals for the Article 6.4 mechanism.

1281. [NZ, 342] proposes including in the definition of removals: activities to abate and ultimately reverse emissions from degraded natural carbon sinks such as drained organic soils in peatland, where rewetting and restoration can reduce and ultimately reverse net emissions. This would require expanding the scope of the definition beyond CO_2 removals, to include the net change in N_2O and CH_4 emissions from these soils. [NZ, 342]

6.5.2. Monitoring and Reporting

1282. [CCSG, 340] is not convinced that internally derived monitoring, reporting and verification protocols based on theoretical modelling, can provide the level of assurance needed to evaluate a GHG assertion. If measurements cannot be collected in the field / ocean, data integrity is put in question and the ability to confirm or verify permanence of removal. Internally derived protocols also raise concerns about independence which is a key principle of verification. Unless there is comprehensive, independent peer review and scientific consensus, it is difficult to accept a modelling approach. There should be a consistent framework to ensure the quality (accuracy, completeness, consistency and relevance) and availability (accessibility, timeliness, and format) of data used for carbon accounting removals. [CCSG, 340]

1283. Comprehensive and regular monitoring and accounting for removals and emissions (reversals) is important for accurate crediting. [NZ, 342] is concerned that simply defining the length of time that removals are considered permanent issuing credits, based on an ex-ante forecast of the volume of removals expected to be achieved over this time period, is unlikely to fully account for natural fluxes in natural systems or provide an incentive for ongoing management of carbon sinks. Instead, it should adopt an approach that comprehensively monitors and accounts for emissions (reversals) and removals. This is likely to be more accurate. New Zealand employs this approach within its NDC and domestic ETS. [NZ, 342]

6.5.3. Accounting for Removals

1284. Project validation must be done before projects are allowed to enter a GHG program (i.e. before they are sold as certified emission reduction credits). Validation must follow fit-for-purpose standards, include eligibility criteria such as integrity of baseline data, reasonableness of proposed quantification methodologies, monitoring protocols and a schedule of guard rails and co-benefits such as biodiversity protection, biodiversity enhancement and improved community resilience based on thorough pre-program engagement, baseline monitoring, research and consultation. [CCSG, 340]

1285. [CCSG, 340] recommends adherence to ISO-14064-3 or a newly developed standard becomes a mandatory requirement for verification of geo-engineering carbon removals. Full carbon reporting across the value chain (including scope 3) and/or conformity to science-based targets (SBTi) must be made a mandatory prerequisite to the purchase of carbon off sets. [CCSG, 340]

1286. On the quantification and issuance approach, the non-permanent nature of temporary removals rewarded by offset credits must be recognised and project proponents must use a quantification and issuance approach formulated according to the type of project. To ensure the environmental integrity of credits in a credible and transparent manner, the approach used should generate credits that can eliminate upon issuance and not after a period of 10, 20, or 100 years the climate impacts stemming from anthropic CO_2 emissions in the atmosphere. In the case of projects that involve temporary CO_2 removal, the stock change inventory gain type approach raises several operational, financial, and integrity issues. Failure to acknowledge the impact of the temporal dimension makes it impossible to define the actual climate benefit associated with temporary CO_2 removal as the removal of 1 tonne of CO_2 for 10 years does not produce the same climate benefit as the removal of the same quantity over 100 years. The temporary removal of one tonne of CO_2 over 100 years does not eliminate the total climatic impact of the emission of one tonne of CO_2. The tonne-year accounting approach for atmospheric CO_2 removal projects is much more coherent with the nature of this type of project. The special report on land use, land use change and forestry1 presented different approaches to measure, account for, monitor, and verify the gains stemming from the completion of a project related to the temporary removal of atmospheric CO_2. The report presents the tonne-year accounting approach and its advantages. In a context where reliance on temporary removals is contemplated to reduce a national GHG emissions budget, it is more than necessary to be able to demonstrate the actual compensatory potential of the credits used to conduct this significant accounting exercise. Recently, several criticisms have been levied in specialized publications regarding the intention of certain GHG offset programs to adopt the ton-year approach for forest sector projects. These criticisms raise an issue pertaining to the manner in which the additionality of the GHG gains rewarded by an offset credit is defined, rather than point to a methodological flaw stemming from the reliance on this approach. A comparative analysis of the gains rewarded by offset credits associated with either of the quantification and issuance approaches could provide a less negative picture of the tonne-year accounting approach. If the additionality criterion is properly managed, a tonne-year accounting approach can hardly overestimate the number of credits to be issued since the creation of a credit is based on an actual, permanent climate benefit and depends on the length of the period during which the carbon is kept out of the atmosphere. Consequently, in cases where the promoter introduces a project aimed at delaying the harvesting of a forest stand, the promoter would not receive a credit for each tonne of carbon present during this period but only a fraction of a credit, equivalent to the quantity of the climate benefit stemming from having delayed for one or more years the return to the atmosphere of the carbon sequestered. The impact of this, combined with the administrative and financial burden inherent in submitting an application for the issuance of credits to the authorities of a program (inventory, verification, etc.), could significantly delay a project's profitability aimed at postponing the harvesting of a forest stand by one or more years. The development of approaches based on the concept of tonne-year accounting thus seeks to address the issue related to the permanence criterion and the implications associated with its management to guarantee compliance with it, i.e. to physically maintain outside the atmosphere the CO_2 removed for a variable number of years. [QB, 341]

1287. GHG emission offset programs are defined according to the choice that is made between an ex-ante vs ex post quantification and issuance approach. At present, offset programs define the two approaches based on compliance with a single criterion, i.e. that the reduction or removal must be real when a credit is issued. This definition does not however consider the obligation to comply with all the offset program's criteria and requirements at the time of issuance of a credit. Yet to tie that issuance to commitments and conditions that will be met over time (after 100 years in the case of the permanence criterion) calls into question the capacity of a program to guarantee the environmental integrity and intergenerational equity of the temporary gains rewarded. To enhance the credibility, rigour, and transparency of all the initiatives and gains associated with a project to offset GHG emissions, we believe that the definition of an ex-ante and an ex post approach should be revised. The definition of both approaches should indeed be based on the answer to the following question: At the time of issuance, were all the offset program's criteria and requirements met? If the answer is positive, the ex post approach applies. If the response is negative, the ex-ante approach applies with or without the conditions pertaining to a particular criterion or requirement of the program. [QB, 341]

1288. On the challenge on additionality, the choice of activities and gains eligible for the issuance of offset credits, the adoption of a detailed definition of what constitutes additionality, and a rigorous application of this criterion should avoid several pitfalls related to the risk of rewarding gains that would have otherwise materialized in the absence of an offset project. To gain the trust of the stakeholders and to maximize the climate and financial benefits associated with a removal project, the Government of Québec has decided to solely make eligible for issuance of offset credits sustainable forest development activities with respect to which it was easy to demonstrate the additionality, i.e. afforestation and fill planting reforestation activity. [QB, 341]

1289. The definition of the permanence criterion, as adopted by WCI partners, implies the obligation to ensure a net atmospheric effect equivalent to that resulting from a reduction of an emission of one tonne of CO_2. According to the same definition, the net atmospheric effect would be obtained if the removal of one tonne of CO_2 was maintained outside the atmosphere for 100 years. The temporal notion introduced into this definition is intended to define a convention that allows for a non-permanent gain to become a permanent gain and not to define the means to achieve permanence. At present, the only common methodology adopted by all the GHG emission offset programs to ensure compliance with the permanence criterion is that of compelling a project promoter to physically maintain outside the atmosphere the carbon rewarded by offset credits for a period equal to the choice made by the program's authorities, according to their definition of the permanence criterion. However, linking the issuance of credits to future compliance with one or more criteria or requirements of the program, represents a significant risk to the obligation to guarantee the environmental integrity of the credits issued. Whereas the quantification and issuance approach introduced into the Québec forestry protocol ensures a net atmospheric effect, measured over a period of 100 years, equivalent to that resulting from the presence in the atmosphere of an emission of one tonne of CO_2 as soon as the credit is issued. [QB, 341]

1290. The Regulation respecting afforestation and reforestation projects eligible for the issuance of offset credits on privately-owned land (the Regulation) was recently adopted by the Government of Quebec. Québec's Forest protocol is the first such protocol that seeks to genuinely reward atmospheric CO_2 removals not only according to the quantity of CO_2 removed from the atmosphere but also the actual climatic effect or benefit of keeping a quantity of carbon out of the atmosphere for a given period. By avoiding rewarding an anticipated climate benefit, the Québec offset protocol can guarantee the environmental integrity of removal initiatives as soon as the offset credit is issued on the market and not after a variable period depending on the requirements of a GHG emission offset program. It is also the first protocol to confirm that when an offset is issued to a promoter the latter has already complied with all the program's criteria and requirements. The protocol allows for the issuance of forest offsets solely according to the climate benefit (radiative effect) associated with the annual carbon stocks removed from the atmosphere and the length of the period during which the stocks have been maintained outside the atmosphere. The approach issues a credit only if the climate benefit linked to it is sufficient to eliminate the impact measured over 100 years resulting from the presence in the atmosphere of one tonne of CO_2. By proceeding in this manner, the approach avoids rewarding anticipated climate benefits and carbon stocks that have not yet been measured within the boundaries of a project. Contrary to the outcomes or climate benefits associated with the completion of a GHG emission reduction project, the protocol recognizes an often-overlooked truth, i.e. the climate benefits associated with atmospheric CO_2 removal and those related to carbon storage in the biomass of a forest ecosystem can only be temporary. The Québec Regulation has been elaborated and enacted mainly to ensure the environmental integrity of the offset credits issued at the time of their issuance. The protocol does not issue credits when a project is initiated or when long-term commitments are made using the permanence criterion. It greatly enhances the conventional tonne-year accounting approach by focusing solely on the actual climate benefits achieved and not those that should be achieved. Thus, promoters do not have to give guarantees on the carbon stocks over several decades or even for more than 100 years. Under this approach, there is no need to provide for a special offset reserve should a project fail to fulfil its conditions concerning the permanence criterion by releasing into the atmosphere the carbon that it intended to sequester. What is more, there is no need to cancel or invalidate the credits, except, of course, in case of fraud. The Québec offset credit quantification and issuance approach also reduces the financial burden and operational constraints associated with project-related MRV obligations. It allows the promoter to decide when to submit a credit issuance request and affords considerable flexibility concerning the use of the territory covered and its resources, while guaranteeing the government's sovereignty over the territory. By proceeding in this way, questioning the length of the reporting period to be adopted became pointless, as the promoter need only claim climate benefits based on actual and measured carbon stocks, and is not bound by conditions over a certain period. Furthermore, the approach has the potential to apply to all activities pertaining to temporary atmospheric CO_2 removals regardless of the sector, e.g. agriculture, land use, and changes in land use. [QB, 341]

1291. The ex post tonne-year accounting were addressed with great clarity and thoroughness in information note A6.4-SB005-AA-A09 which contained a comprehensive and insightful exploration of ex post tonne-year accounting as a promising solution to address significant flaws in the current carbon markets. In particularly: table 8 provided complete responses to the arguments against the use of ex post tonne-year accounting were elaborated upon in a well-structured manner; table 9 offered a clear articulation of the advantages of employing ex post tonne-year accounting, along with specific conditions under which it should be used and its inherent limitations; table 10 demonstrated that ex post tonne-year crediting surpasses temporary crediting and tonne-based crediting, positioning it as the superior method for quantifying removals. Ex post tonne-year accounting should be the preferred approach moving forward; it is increasingly being adopted by scientific peers as the accounting method with the highest integrity in the carbon market, both presently and in the future. Table B-2 of the A6.4-SB005-AA-A09 information note document demonstrates that this accounting method has been adopted in various programs and methodologies in recent years. One of the reasons for some certification programs such as the Verified Carbon Standard (VCS) deciding against adopting ex post tonne-year accounting was because fewer credits are issued early in the crediting period. [FA,343] considers this a positive attribute that bolsters the integrity of the carbon market. By issuing units that have genuinely made a significant impact on the climate, the credibility of carbon credits is enhanced, ensuring that carbon removals are substantiated and verifiable. The second reason was because it allows short-term land-based activities without equivalent co-benefits. [FA, 343] acknowledges that this issue primarily pertains to specific natural land-based solutions like Improved Forest Management (IFM). However, this can be addressed by implementing a minimum activity period of 5, 10, 20 years, or more to ensure that only projects with long-term environmental benefits and significant co-benefits, such as preventing erosion, salinization, or protecting biodiversity, are eligible for tonne-year accounting, thus upholding its integrity. A more thorough and unbiased evaluation of the method, including input from the entire range of stakeholders, will lead to more informed and fair recommendations for activities involving removals. We acknowledge that tonne-tonne accounting is the prevailing approach in current carbon markets. However, to allow both tonne-tonne accounting and tonne-year accounting simultaneously would be a valuable interim step toward transitioning to a more universally applicable ex post tonne-year accounting method in the future. [FA, 343]

1292. The current accounting approach (Carbon1.0) cannot ensure the integrity of credits issued for impacts that have not yet been delivered. Credits with limited monitoring periods neither equate nor offset the climate impacts of emissions that endure into perpetuity. The standards do not standardize credits across removals of varying durations. Adoption of a tonne-year accounting framework should be reconsidered, with the following characteristics: an infinite time horizon, approximated as 1,000,000 years; a discount rate of 2-3.5% (Carbon 2.0). Such an approach used by The Climate Action Reserve and Quebec's compliance market. [SH, 346]

6.5.4. Addressing reversals

1293. Guidance should not be overly prescriptive with rules around long-term prohibition on land use change and/or intentional reversals (e.g. by deforestation of plantation forests). Landowners or project proponents who wish to reverse removals for which credits have been issued should be able to do so, provided they surrender credits equal to the volume of any resulting reversal (plus additional penalties in some cases). [NZ, 342] opposes the inclusion in international removals guidelines of a specified minimum permanence period for forestry during which forested land cannot be deforested (this unnecessarily constrains land-use). Instead, [NZ, 342] recommends that this issue is addressed, allowing reversal if these are appropriately and fully compensated for (equivalent credits and appropriate penalties). [NZ, 342]

1294. [SH, 346] argues that the rules, modalities, and procedures of Article 6.4, as proposed cannot ensure the integrity of credits issued for impacts that have not yet been delivered. Under the proposed system, there is no assurance that reversals will be identified and even if identified, it will be reported because the project proponent has conflicting interest not to report reversals. Furthermore, there is no assurance that the buffer pool mechanism will adequately address reversals, if they are identified and reported because there is no assurance that the buffer pool will be sized appropriately, and even if sized appropriately, will have appropriately designed mechanics, and even if sized appropriately with properly designed mechanics, will be managed appropriately over a period of several decades with changing leadership. There is an inherent liability in the buffer pool mechanism but no accountability for who will bear that liability. [SH, 346]

6.5.5. Avoidance of other negative environmental, social impacts

1295. The implementation of a temporary atmospheric CO_2 removal project in public or private territories poses, according to the quantification and issuance approach that is now widely adopted in the world, a significant challenge both to local, regional, subnational, and national governments, which are responsible for managing such territories for the well-being and benefit of their communities, and for private property owners. Accordingly, the obligation to physically maintain the carbon sequestered for a specified period of time to guarantee environmental integrity implicitly forces a promoter to control and limit access to, and the possible use of, the territory and its resources. For certain groups, this consequence of compliance with the permanence criterion according to the concept of conditionality and long-term commitment to ensure the environmental integrity of the market mechanism and the project's profitability represents a risk of infringement on the sovereignty of local, regional, or national governments. Along the same lines, to adopt a quantification and issuance approach that rewards an anticipated benefit forces project promoters to develop and implement more or less effective mechanisms to manage the inevitable risk of carbon re-entering the atmosphere which is caused by natural or anthropic disturbances inherent in the territories and the dynamics or natural processes of a forest ecosystem. In addition to being costly and highly restrictive, such mechanisms cannot alone guarantee the environmental integrity of a market mechanism over a period as long as 100 years after the issuance of a credit. And all the more so since most market mechanisms are not designed to last that long. Indeed, many are designed to help achieve carbon neutrality by mid-century or sooner. For the reasons mentioned above, we have decided to develop and adopt a new and unique non-conditional quantification and issuance approach for forest offset credits, based on rewarding an actual climate benefit that can offset, when a credit is used, 100 years of climate impact associated with a GHG emission, thereby avoiding the constraints and consequences related to these issues. [QB, 341]

1296. Poorly governed and regulated removals activities can disadvantage indigenous people and vulnerable communities. Potential harms include: the loss of use and control over land, project operators capturing removal activity revenues, but transferring liability for reversals to indigenous landowners without fair compensation, displacing alternative land uses such as food production, and imposing other risks and costs on vulnerable communities. At the same time, removals can offer significant benefits to indigenous peoples and vulnerable communities. Well-governed markets and other mechanisms to incentivise forestry and other land-based CDR activities can offer communities valuable and sustainable options for economic use of their land. But inflexible rules developed with the intent to protect indigenous people and vulnerable communities can have perverse outcomes. Excluding particular removals activities from the mechanism, or overly constraining communities’ choices about land use may restrict the rights, interests and opportunities of indigenous people to make informed choices over the use of their land. This can compound the harms that many indigenous communities have historically experienced in the loss of their most productive agricultural land. Māori, the indigenous people of Aotearoa New Zealand have extensive interests in forestry, agriculture and land, and make a large contribution to New Zealand’s afforestation removals, incentivised through our Emissions Trading Scheme. Under this system, credits are earned as new forests grow and, for production forests, are calculated by averaging across multiple harvest cycles. Liability to repay any credits earned for forestry removals if these are reversed is permanent, with no expiry date. But landowners can (subject to environmental and land use laws) choose to deforest their land if they meet their liability for reversals. This right to make choices over land use is especially important in the case of communally owned land, to ensure intergenerational equity and avoid communities losing control over or otherwise becoming alienated from their land. Setting a minimum time period for sequestration could impinge on these rights and local laws designed to protect them; for instance to help prevent alienation of Māori land Te Ture Whenua Māori Act places restrictions on long-term lease arrangements over 52 years. [NZ, 342]

1297. Nature-based solutions are radically different from tech-based interventions in that they are complex but possess a huge potential to provide additional benefits beyond CDR. In addition to reducing carbon emissions, interconnection between various environmental and social impacts, such as biodiversity loss, soil and plant health (and food security) and/or land conversion, must be recognized. To reflect this, soil related-methodologies must take into account both biodiversity and the chemical flows/stocks defined in planetary boundaries when defining impacts and trade-offs. A holistic view is essential to ensure that carbon-focused interventions do not do significant harm in other environmental domains. Consequently, a standardized, one-size-fits-all approach to crediting periods/ renewal and post-crediting monitoring may not adequately accommodate the diverse array of carbon removal activities. [AGREE, 368]

1298. What are the material impacts of project level interventions and whether an intervention is resilient to the already baked-in & expected forthcoming climate impacts must be assessed. Such double-materiality (i.e. inside-out and outside -in) approach is applied in emerging sustainability standard such as the ESRS standards, but avoided by others, such as the ISSB promoted by IFRS. Art6.4 could not only ensure a high integrity sustainability approach but could also be trailblazer for concrete methodology formulation and application that takes on board progressive approaches. [AGREE, 368]

1299. Agriculture is part of a complex and vast industry, and not only the dominant subset of nature, therefore any approaches that combine and build on government – business – nature considerations shall ensure that nature, as a 'silent stakeholder' (as accepted in the EU ESRS) is acknowledged as and when creating procedures for the approval of project interventions and the underlying methodologies. [AGREE, 368]

1300. Art6.4 could pioneer the development of concrete methodology formulation and application that takes on board progressive approaches such as the double materiality concept. The EU within the ESRS has included nature a "silent stakeholder" and has embedded this concept in its methodology to establish impact materiality, imposing significant additional obligations on a CSRD-reporting entity. This new positioning from EU makes it more likely that impacts on nature will be increasingly recognized and become part of both reporting obligations and mandatory agricultural production/land management requirements. Therefore, global value-chains will benefit from blueprints introduced by the Art6.4 mechanism. [AGREE, 368]

1301. Methodologies must provide quantification of other impacts and ensuring that adverse / significant harm impacts are not occurring due to CDR activities. This will require that soil related-methodologies take into account both biodiversity and the chemical flows/stocks defined in planetary boundaries when defining impacts and trade-offs. Such holistic view is essential to ensure that carbon-focused interventions do not do significant harm in other environmental domains. It must be ensured that the methodologies designed to address the risk of reversals are specific to the nature of each type of CDR activities (nature-based or tech-based solutions). Nature-based solutions and particularly agriculture-related projects will require specific measures against reversals that may occur, for example, from farmers adopting conventional tillage practices. The release of carbon from the soil due to soil disturbances and the re-accumulation of the carbon in the field depend on many factors (e.g. application of organic amendments to the soil from cover crops, organic fertilizers or leaving residues on the field). [AGREE, 368]

7. References

Table 3. Parties that responded to the call for public input

Submission date	Party	Acronym	Reference number	Document URL
22/05/23	Russian Federation	RU	53	https://shorturl.at/houY5
09/05/23	United Kingdom	UK	54	https://shorturl.at/cquDS
02/05/23	Papua New Guinea on behalf of Coalition for Rainforest Nations	PN	55	https://shorturl.at/pACH3
17/04/23	Norway	NW	56	https://shorturl.at/hjVY0
07/04/23	Republic of Korea	ROK	57	https://shorturl.at/nMZ24

Submission date	Party	Acronym	Reference number	Document URL
23/03/23	Colombia on behalf of Chile, Colombia, Guatemala, Panama, Paraguay, and Peru	CO	58	https://shorturl.at/jwW03
15/03/23	European Union on behalf of European Union	EU	59	https://shorturl.at/gEY25
01/06/23	Brazil on behalf of Argentina, Brazil and Uruguay (ABU)	ABU	60	https://bit.ly/44w4CCh

Table 4. Stakeholders that responded to the call for public input

Submission date	Stakeholder	Acronym	Reference number	Document URL
04/10/22	Hayes Limnology Lab: Ocean alkalinity enhancement using electrolysis	HLB	1	https://bit.ly/40Cu7kx
06/10/22	Planetary Technologies: Ocean alkalinity methods	PT	2	https://bit.ly/3XadYQB
04/10/22	GCC: Inputs on Annex 5 to the SB002 annotated agenda	GCC	4	https://bit.ly/40Cu7kx
06/10/22	Winrock: ACR & ART input-6.4 removals public comment	ACR	8	https://bit.ly/3XadYQB
10/10/22	Wetlands International: Inputs on removal activities	WI	9	https://bit.ly/40HbE6A
11/10/22	Verdane: Response to UNFCCC Article 6.4 call	VA	10	https://bit.ly/3K9v0vp
11/10/22	TREEO: Review Article 6.4 mechanism	TREEO	11	https://bit.ly/3YC8lMe
11/10/22	TNC: Removals and REDD-plus	TNC	12	https://bit.ly/3x4BoMw
11/10/22	Timber Finance Initiative: Engineered timber as carbon storage	TFI	13	https://bit.ly/40xawCi
11/10/22	The HBAR Foundation: Response of THF to UNFCC Calls for Input on A6.4M	HBAR	14	https://bit.ly/3I9SmzB
11/10/22	Stockholm-Exergi: Contribution by Stockholm Exergi in response to UNFCCC's Call for input 2022	SE	15	https://bit.ly/3DNo7vp

Submission date	Stakeholder	Acronym	Reference number	Document URL
11/10/22	Running Tide: Article 6.4 input for ocean-based carbon removal	RT	17	https://bit.ly/3x7rvxO
11/10/22	Perspectives: Input on removal activities under A6.4 Mechanisms	PCR	18	https://bit.ly/3Ia9zsk
11/10/22	Orsted: Peatlands and BECCS	OD	19	https://bit.ly/40yUYy5
11/10/22	Instituto Acao Verde: Deforestation Double Counting	IAV	22	https://bit.ly/3DSjYXr
11/10/22	ICLRC: Response to call for input 2022-Activities involving removals	ICLRC	24	https://bit.ly/3I5SFeC
11/10/22	GCCSI: Submission to the A6.4 Supervisory Body Call for Inputs 2022 - SB002-A05	GCCSI	25	https://bit.ly/3x6y6IF
11/10/22	Evident C-capsule: Inputs on removal activities	ECP	27	https://bit.ly/3YEn49r
11/10/22	Drax: Response to the A6 consultation	DG	29	https://bit.ly/3x5deRV
11/10/22	DAC Coalition: Recommendations from Direct Air Capture Coalition	DACC	30	https://bit.ly/3Ih4aa6
11/10/22	Climeworks: Response to the documents regarding removals under Article 6.4	CW	31	https://bit.ly/3IjxZH0
11/10/22	Clean Air Task Force: CATF Article 6.4 Comments	CATF	32	https://bit.ly/3RKAs9E
11/10/22	Cercarbono: Additionality and double counting	CCO	33	https://bit.ly/40CC4Gp
11/10/22	Center for Clean Air Policy: CCAP Submision Annex 5 to the SB002	CCAP	34	https://bit.ly/3JVyAsH
11/10/22	Carbon Recycling: Contributions to the Information Note document	CRCY	36	https://bit.ly/3DRdqrO
11/10/22	Carbon Finance Labs: UNFCCC Article 6.4 Contribution	CFL	38	https://bit.ly/40JszFp
11/10/22	Carbon Engineering: Role of DACCS removal activities	CE	39	https://bit.ly/3IgnITE

Submission date	Stakeholder	Acronym	Reference number	Document URL
11/10/22	Carbon Business Council: Inputs on removal activities	CBC	40	https://bit.ly/3HI8yq5
11/10/22	CARBFIX: Subsurface mineralization of CO_2	CARBFIX	41	https://bit.ly/3YCZzNZ
11/10/22	BeZeroCarbon: Consultation response	BZC	43	https://bit.ly/3x5DD27
11/10/22	Bellona: Response to CDR call for input	BF	46	https://bit.ly/3In9Mjj
11/10/22	Arcusa S: Call for input 2022 - activities involving removals under the Article 6.4 Mechanism	SA	47	https://bit.ly/3Ih7QZs
11/10/22	ALLCOT: Inputs on Land-Based Removals	ALLCOT	48	https://bit.ly/3Xl8hPz
11/10/22	Center for International Environmental Law: CIEL Submission on Article 6.4 Removals (late submission)	CIEL	50	https://bit.ly/3XjZ4XQ
11/10/22	IETA: Removals input for 6.4SB (late submission)	IETA	51	https://bit.ly/3xbZcxS
13/10/22	MDB Working Group comments on the annotated agenda of the third meeting of the Supervisory Body	MDB WG	53	https://bit.ly/3ljtzjA
14/10/22	Office of the United Nations High Commissioner for Human Rights (OHCHR) on behalf of The Office of the UN High Commissioner for Human Rights	OHCHR	60	https://bit.ly/40GSsG8
27/10/22	Action Group on Erosion Technology and Concentration (ETC group) on behalf of Action Group on Erosion Technology and Concentration (ETC Group)	ETC	61	https://bit.ly/3NorLBk
15/03/23	Oeko-Institut e.V. Institute for Applied Ecology on behalf of Stockholm Environment Institute, University of Edinburgh and Oeko-Institut	OI	62	https://shorturl.at/axJPT

Submission date	Stakeholder	Acronym	Reference number	Document URL
10/04/23	Bellona Foundation (BF) on behalf of Bellona Foundation	BF	63	https://shorturl.at/bezFJ
21/03/23	Center for International Environmental Law (CIEL)	CIEL	64	https://shorturl.at/ciuB7
17/03/23	Heinrich Böll Foundation (HBF)	HBL	65	https://shorturl.at/girL5
16/03/23	Global Carbon Capture and Storage Institute on behalf of The Global CCS Institute	GCCSI	66	https://shorturl.at/xCVZ5
16/03/23	LIFE Education Sustainability Equality (LESE) on behalf of Women and Gender	LESE	67	https://shorturl.at/hFU09
15/03/23	Carbon Capture and Storage Association (CCSA)	CCSA	68	https://shorturl.at/fozV2
15/03/23	ActionAid International on behalf of CLARA submission, submitted by ActionAid International	CLARA	69	https://shorturl.at/aezSW
15/03/23	International Emissions Trading Association (IETA)	IETA	70	https://shorturl.at/RWY57
15/03/23	WWF	WWF	71	https://shorturl.at/wFL15
15/03/23	Institute for Agriculture and Trade Policy (IATP)	IATP	72	https://shorturl.at/colX5
15/03/23	Friends of the Earth International on behalf of Friends of the Earth International	FOE INT	73	https://shorturl.at/sFRUZ
15/03/23	Institute for Governance and Sustainable Development (IGSD)	IGSD	74	https://shorturl.at/agy27
15/03/23	The University of Texas at Austin	UT	77	https://rb.gy/fwzn4
15/03/23	Indigenous Education Network of Turtle Island (IENTI/IEN) on behalf of Indigenous Environmental Network (IEN)	IEN	78	https://rb.gy/rliin
15/03/23	Carbon Market Watch (CMW) on behalf of Carbon Market Watch (CMW)	CMW	78 (a)	https://rb.gy/18qiq
14/03/23	Plymouth Marine Laboratory (PML)	PML	79	https://rb.gy/03i3m

Submission date	Stakeholder	Acronym	Reference number	Document URL
14/03/23	Environmental Defense Fund (EDF) on behalf of Environmental Defense Fund, Conservation International, The Nature Conservancy, Wetlands International, Rare, Ocean Conservancy, Ocean & Climate Platform, National Wildlife Federation	EDF	80	https://rb.gy/p2aah
14/03/23	Stockholm Exergi	SE	81	https://rb.gy/2kwcr
14/03/23	Drax Group	DG	82	https://bit.ly/3MU9hHd
20/04/23	Friends of the Earth Germany/ BUND	FOE + BUND	83	https://bit.ly/3NdOa43
31/03/23	Friends of the Earth England, Wales and Northern Ireland	FOE UK	84	https://bit.ly/43HiyJJ
27/03/23	Carbon Finance Lab	CFL	85	https://bit.ly/45QmfyE
22/03/23	AirCapture and Denominator	AD	86	https://bit.ly/43Ei3js
17/03/23	IEAGHG	IEAGHG	88	https://bit.ly/43los3x
17/03/23	Jack Roberts	JR	89	https://bit.ly/3NaOjp6
17/03/23	Jason Demeny	JD	90	https://bit.ly/3OVS1Er
22/05/23	Thoralf Gutierrez (Sirona Tech)	TG	91	https://shorturl.at/mqvLU
22/05/23	Richard Edwards (Clo Carbon Cymru)	CLO	92	https://shorturl.at/cgrJU
22/05/23	Paul Halloran (University of Exeter)	UOEX	93	https://shorturl.at/gv036
22/05/23	CarbonRun	CR	94	https://shorturl.at/moLUZ
22/05/23	Inplanet GmbH	IP	95	https://shorturl.at/kwKPT
22/05/23	Inplanet GmbH	IP	95	https://shorturl.at/cST15
22/05/23	Prof. Ning Zeng (University of Maryland)	UMD	96	https://shorturl.at/xKW89
22/05/23	Tim Isaksson	TI	97	https://shorturl.at/aoMQS
22/05/23	Planetary Technologies	PT	98	https://shorturl.at/cdfTY
22/05/23	Paolo Piffaretti (Carbonx)	CX	99	https://shorturl.at/fyFM3
22/05/23	David Andersson (ECOERA AB)	ECOERA	100	https://shorturl.at/dHRV5
22/05/23	Adam (Zopeful Climate)	ZC	101	https://shorturl.at/xyzDO
22/05/23	Hanna Ojanen (Carbonculture)	CCULT	102	https://shorturl.at/svZ05

Submission date	Stakeholder	Acronym	Reference number	Document URL
23/05/23	Tony S. Hamer (GHG PATS)	PATS	103	https://shorturl.at/efBKL
22/5/2023	Carbon-Based Consulting LLC	CB	104	https://shorturl.at/ehzN3
23/05/23	Carbon Removal India Alliance (CRIA)	CRIA	105	https://shorturl.at/guLX1
23/05/23	BlueSkies Minerals Inc.	BS	106	https://shorturl.at/ntxFS
23/5/2023	Carbon Business Council	CBC	107	https://shorturl.at/cyER8
24/05/23	Kaja Voss (Inherit Carbon Solutions AS)	ICS	108	https://shorturl.at/FRW15
24/05/23	Lead authors of the State of Carbon Dioxide Removal Report	SCDRR	109	https://shorturl.at/jnL47
24/05/23	Cella	CLLA	110	https://shorturl.at/aDEH1
24/05/23	Stockholm Exergi	SE	111	https://shorturl.at/fwIV5
24/05/23	Plymouth Marine Laboratory	PML	112	https://shorturl.at/aezDH
24/05/23	Injy Johnstone	IJ	113	https://shorturl.at/iIV46
24/05/23	OpenAir	OAIR	114	https://shorturl.at/tvyU6
24/05/23	OXO Earth	OXO	115	https://shorturl.at/dgACL
24/05/23	Keep Our Sea Chemical Free	KOSCF	116	https://shorturl.at/aqrS5
26/05/23	Marginal Carbon AB	MC	117	https://shorturl.at/KW458
27/05/23	Charm Industrial	CHI	118	https://shorturl.at/hjGR7
24/05/23	Carbon Finance Labs	CFL	119	https://shorturl.at/iBFN0
24/05/23	Dr. Robert Chris	DRCS	120	https://shorturl.at/egqFK
24/05/23	Stockholm Environment Institute; University of Edinburgh; Oeko-Institut	SEI+	121	https://shorturl.at/gILT7
25/05/23	Linden Trust for Conservation	LTC	122	https://shorturl.at/aqwU6
27/05/23	1PointFive	1.5	123	https://shorturl.at/eOQV0
28/05/23	Seafields	SF	124	https://shorturl.at/eOQV0
25/05/23	Microsoft Inc.	MS	125	https://shorturl.at/guxA4
24/05/23	Climeworks AG	CW	126	https://shorturl.at/tuS04
24/05/23	Equatic	EQ	127	https://shorturl.at/bsGOV
24/05/23	IEAGHG	IEAGHG	128	https://shorturl.at/nBKSY
27/05/23	Business Council for Sustainable Energy	BCSE	129	https://shorturl.at/bINWY

Submission date	Stakeholder	Acronym	Reference number	Document URL
28/05/23	Business Council for Sustainable Energy	BCSE	129	https://shorturl.at/vwP49
25/05/23	Running Tide	RT	130	https://shorturl.at/bitEP
25/05/23	Negative Emissions Platform and other co-signatories	NEP	131	https://shorturl.at/lrRY8
25/05/23	Phil Kithil	PK	132	https://shorturl.at/HNRWZ
25/05/23	CCU Alliance	CCU	133	https://shorturl.at/bzFN2
25/05/23	Timber Finance	TFI	134	https://shorturl.at/iwKPW
25/05/23	Air Capture	AC	135	https://shorturl.at/lwIJP
25/05/23	Mati Carbon Removals	MCR	136	https://shorturl.at/wFGU6
25/05/23	Center for Negative Carbon Emissions	CNCE	137	https://shorturl.at/enoGI
20/05/23	CarbonPlan	CP	138	https://shorturl.at/efoKU
25/05/23	Captura	CAPT	139	https://shorturl.at/cuHMU
14/05/23	UNDO	UNDO	140	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Captura.pdf
25/05/23	Neustark AG	N-AG	141	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_UNDO.pdf
25/05/23	44.01	44.01	142	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_NeustarkAG.pdf
25/05/23	IETA	IETA	143	https://unfccc.int/sites/default/files/resource/SB005_call_for-input_4401.pdf
25/05/23	Carbon Direct.Inc	CD	144	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_International%20Emissions%20Trading%20Association%20%28IETA%29.pdf
25/05/23	The Doers Club	TDC	145	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Carbon%20Direct%20Inc.pdf
25/05/23	Drax Group	DG	146	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Doers%20Club.pdf
25/05/23	Carbfix	CARBFIX	147	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Drax%20Group.pdf

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25/05/23	Puro.earth	PURO	148	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Carbfix.pdf
25/05/23	CO2RE Hub	CO2RE	149	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Puro%20Earth.pdf
25/05/23	Swiss Lenten Fund	SLF	150	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_CO2RE%20Hub%20.pdf
25/05/23	Coalition for Negative Emissions	CNE	151	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_SwissLenten_Fund.pdf
25/05/23	Climate Analytics GmbH	CA	152	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Coalition%20for%20Negative%20Emissions.pdf
25/05/23	Climate Action Platform Africa	CAPA	153	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Climate%20Analytics%20gGmbH.pdf
25/05/23	The Bioenergy Association of Finland	BEAF	154	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Climate%20Action%20Platform%20Africa.pdf
25/05/23	Zero Emissions Platform	ZEP	155	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Bioenergy%20Association%20of%20Finland.pdf
25/05/23	Leefmilieu	LU	156	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Zero%20Emissions%20Platform.pdf
25/05/23	Carbon Gap	CG	157	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Leefmilieu.pdf
25/05/23	Orsted	ORST	158	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_CarbonGap.pdf
25/05/23	The Bellona Foundation	BF	159	https://unfccc.int/sites/default/files/resource/SB005-call_for_input_%C3%98rsted.pdf

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25/05/23	Fern	FERN	160	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_The%20Bellona%20Foundation.pdf
25/05/23	Carbon Capture and Storage Association	CCSA	161	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Fern.pdf
25/05/23	Dogwood Alliance	DA	162	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Carbon%20Capture%20and%20Storage%20Association.pdf
25/05/23	CCS+ Initiative	CCSI	163	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_DogWood%20Alliance%20.pdf
25/05/23	Stripe Climate & Shopify	SCS	164	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_CCS%2B%20Initiative.pdf
25/05/23	Carboniferous	CF	165	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Stripe%20Climate%20%26%20Shopify.pdf
25/05/23	National Wildlife Federation	NWF	166	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Carboniferous.pdf
25/05/23	KLIMPO	KLIMPO	167	https://unfccc.int/sites/default/files/resource/SB005_call_for-input_National%20Wildlife%20Federation.pdf
24/05/23	Direct Air Capture Coalition	DACC	168	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_KLIMPO.pdf
25/05/23	Octavia Carbon	OC	169	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Direct%20Air%20Capture%20Coalition.pdf
25/05/23	Aspiration	ASPI	170	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Octavia%20Carbon.pdf
25/05/23	Global CCS Institute	GCCSI	171	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Aspiration.pdf

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25/05/23	Carbon Capture Inc.	CCI	172	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Global %20CCS%20Institute.pdf
24/05/23	Biofuelwatch	BW	173	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_CarbonCapture%20Inc.pdf
25/05/23	Carbon Capture Coalition	CCC	174	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Biofuelwatch.pdf
25/05/23	Environmental Defense Fund	EDF	175	https://unfccc.int/sites/default/files/resource/SB005_call_for-input_Carbon%20Capture%20Coalition.pdf
25/05/23	Paebbl	PBL	176	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Environmental%20Defense%20Fund.pdf
24/05/23	EFI Foundation	EFIF	177	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Paebbl.pdf
25/05/23	Recarb	RB	178	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_EFI%20Foundation.pdf
25/05/23	World Resources Institute	WRI	179	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_EFI%20Foundation.pdf
25/05/23	Clean Air Task Force (CATF)	CATF	180	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_World%20Resources%20Institute.pdf
25/05/23	Edison Electric Institute (EEI)	EEI	181	https://unfccc.int/sites/default/files/resource/SB005_call_for_inputCleanAirTaskForceCATF.pdf
24/05/23	Ocean Visions	OV	182	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Edison%20Electric%20Institute%20%28EEI%29.pdf
25/05/23	John M. Fitzgerald	JMF	183	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Ocean%20Visions.pdf

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25/05/23	Prof. William R Moomaw (Tufts University)	WRM	184	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_JohnMFitzgerald.pdf
26/05/23	PD Forum	PDF	185	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Prof%20William%20R%20Moomaw%20Tufts%20University.pdf
26/05/23	CIBOLA Partners	CIBO	186	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_PD%20Forum.pdf
25/05/23	Heirloom	HM	187	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_CIBOLA%20PARTNERS%20v2.pdf
25/05/23	Perspectives Climate Research GmbH	PERSP	188	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Heirloom.pdf
25/05/23	Carbon Engineering	CE	189	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Perspectives%20Climate%20Research.pdf
25/05/23	Boston Consulting Group	BCG	190	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Carbon%20Engineering.pdf
26/05/23	Mary S. Boot, Partnership for Policy Integrity and Chad Hansen, John Muir Project	PPI	191	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Boston%20Consulting%20Group.pdf
25/05/23	Nasdaq Stockholm	NSQ	192	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_MaryBooth_ChadHansen.pdf
25/05/23	Michael Hayes	MHS	200	https://unfccc.int/sites/default/files/resource/SB005_call_for_input_Nasdaq%20Inc..pdf
09/06/23	Blueskiesminerals.inc	BSM	201	https://unfccc.int/sites/default/files/resource/MichaelHayes.pdf
12/06/23	Seal Research Trust	SRT	202	https://unfccc.int/sites/default/files/resource/BlueSkiesMinerals.pdf
14/06/23	CarbonRun	CR	203	https://unfccc.int/sites/default/files/resource/SealResearchTrust.pdf

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15/06/23	Roberto Rochadelli (fupef)	RBI	204	https://unfccc.int/sites/default/files/resource/CarbonRun.pdf
15/06/23	Sky Harvest Carbon (Will Clayton)	SH	205	https://unfccc.int/sites/default/files/resource/RobertoRochadelli.pdf
15/06/23	NovoCarbo	NC	206	https://unfccc.int/sites/default/files/resource/Sky_Harvest_Carbon.pdf
15/06/23	Capture6	CAP6	207	https://unfccc.int/sites/default/files/resource/Novocarbo.pdf
15/06/23	Finnwatch	FNW	208	https://unfccc.int/sites/default/files/resource/Capture6.pdf
16/06/23	ECOERA	ECOERA	209	https://unfccc.int/sites/default/files/resource/Finnwatch.pdf
16/06/23	OpenAir	OAIR	210	https://unfccc.int/sites/default/files/resource/ECOERA.pdf
16/06/23	Carbon Business Council	CBC	211	https://unfccc.int/sites/default/files/resource/OpenAir.pdf
16/06/23	Rick Berg (Nori.inc)	NORI	212	https://unfccc.int/sites/default/files/resource/CarbonBusinessCouncil.pdf
16/06/23	Thomas Hoffmann (Decarbo Engineering GmbH)	THN	213	https://unfccc.int/sites/default/files/resource/NoriInc.pdf
16/06/23	Timber Finance	TFI	214	https://unfccc.int/sites/default/files/resource/DecarboEngineering.pdf
16/06/23	CarbonPool	CPOOL	215	https://unfccc.int/sites/default/files/resource/TimberFinance.pdf
16/06/23	OceanForesters	OF	216	https://unfccc.int/sites/default/files/resource/CarbonPool.pdf!
17/06/23	Takachar	TAK	217	https://unfccc.int/sites/default/files/resource/OceanForesters.pdf
17/06/23	Carbo Culture	CCE	218	https://unfccc.int/sites/default/files/resource/Takachar.pdf
18/06/23	Rewind.earth	REW	219	https://unfccc.int/sites/default/files/resource/CarboCulture.pdf
18/06/23	Clean Air Tech Limited	CATL	220	https://unfccc.int/sites/default/files/resource/Rewindearth.pdf

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18/06/23	Elitelco	ELI	221	https://unfccc.int/sites/default/files/resource/CleanAirTech.pdf
18/06/23	Otherlab	OLAB	222	https://unfccc.int/sites/default/files/resource/Elitelco.pdf
18/06/23	Carbon Click, S.A. de C.V	CCL	223	https://unfccc.int/sites/default/files/resource/Otherlab.pdf
18/06/23	Arca	ARC	224	https://unfccc.int/sites/default/files/resource/CarbonClick.pdf
19/06/23	AirMiners	AMN	225	https://unfccc.int/sites/default/files/resource/Arca.pdf
19/06/23	Seaweed Generation	SWG	226	https://unfccc.int/sites/default/files/resource/AirMiners.pdf
19/06/23	Max Planck Institute for Biogeochemistry	MPI	227	https://unfccc.int/sites/default/files/resource/SeaweedGeneration.pdf
19/06/23	Carbon Mineralization Flagship Center	CNF	228	https://unfccc.int/sites/default/files/resource/MaxPlanckInstitute.pdf
19/06/23	Green East Master Ltd	GEM	229	https://unfccc.int/sites/default/files/resource/CarbonMineralizationCenter.pdf
19/06/23	The Charles Darwin Rescue Plan	CDR	230	https://unfccc.int/sites/default/files/resource/GreenEastMaster%2C.pdf
19/06/23	International Biochar Initiative	IBI	231	https://unfccc.int/sites/default/files/resource/CharlesDarwinRescuePlan.pdf
19/06/23	CarbonHemp Blo.Inc	CHB	232	https://unfccc.int/sites/default/files/resource/InternationalBiocharInitiative.pdf
19/06/23	CCS+ Initiative	CCSI	233	https://unfccc.int/sites/default/files/resource/CarbonHempBlockchain.pdf
19/06/23	Microsoft	MS	234	https://unfccc.int/sites/default/files/resource/CCS%2BInitiative.pdf
19/06/23	ecoLocked GmbH	ELG	235	https://unfccc.int/sites/default/files/resource/Microsoft.pdf
19/06/23	University of Hamburg	UOH	236	https://unfccc.int/sites/default/files/resource/EcoLocked.pdf
19/06/23	German Biochar Association	GBA	237	https://unfccc.int/sites/default/files/resource/UniversityHamburg.pdf

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19/06/23	Omega Terraform	OT	238	https://unfccc.int/sites/default/files/resource/GermanBiocharAssociation.pdf
19/06/23	Carbon Lockdown Project	CLP	239	https://unfccc.int/sites/default/files/resource/OmegaTerraform.pdf
19/06/23	Carbofex Oy	CFO	240	https://unfccc.int/sites/default/files/resource/CarbonLockdownProject.pdf
19/06/23	Everest Carbon Inc	ECI	241	https://shorturl.at/ghkV5
19/06/23	Dead Battery Depot.ltd	DBD	242	https://shorturl.at/eBES3
19/06/23	CROPS Carbon International LTD	CROPS	243	https://shorturl.at/erGT2
19/06/23	Stockholm Exergi	SE	244	https://shorturl.at/qGMRV
19/06/23	Carbonfuture	CFUT	245	https://shorturl.at/aeCMY
19/06/23	C-Capsule	CCPLE	246	https://shorturl.at/uMOQT
19/06/23	Captura	CAPT	247	https://shorturl.at/luJK3
19/06/23	44.01	44.01	248	https://shorturl.at/cKS28
19/06/23	XPRIZE	XPZ	249	https://shorturl.at/qBQW3
19/06/23	Skyrenu Technologies	STECH	250	https://shorturl.at/dpPS1
19/06/23	Carbuna AG	CAG	251	https://shorturl.at/dALNU
19/06/23	The Bellona Foundation	BF	252	
19/06/23	Noya PBC	NPBC	253	https://shorturl.at/dmrCF
19/06/23	Equatic	EQ	254	https://shorturl.at/dvHV8
19/06/23	IATA and Airbus	IATA	255	https://shorturl.at/xV078
19/06/23	Rivotto	RTTO	256	https://shorturl.at/avwNP
19/06/23	U.S. Biochar Coalition	USBC	257	https://shorturl.at/avxV7
19/06/23	FEWCOOP SA	FEWCOOP	258	https://shorturl.at/adlGL
19/06/23	Cella Mineral Storage, Inc	CLLA	259	https://shorturl.at/eqHK4
19/06/23	Rethinking Removals Doers Club	RRDC	260	https://shorturl.at/hnBUV
19/06/23	Eyob Tenkir Shikur	ETS	261	https://shorturl.at/uIVY9
19/06/23	Kita	KITA	262	https://shorturl.at/iCOY2
19/06/23	The Zero Emissions Platform	ZEP	263	https://shorturl.at/pqxK7
19/06/23	Black Bull Biochar (BBB)	BBB	264	https://unfccc.int/sites/default/files/resource/Kita.pdf

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19/06/23	DEMOcritUS	DEMO	265	https://unfccc.int/sites/default/files/resource/ZeroEmissionsPlatform.pdf
19/06/23	RedCarbon	RC	266	https://unfccc.int/sites/default/files/resource/BlackBullBiochar.pdf
19/06/23	IEAGHG	IEAGHG	267	https://unfccc.int/sites/default/files/resource/RedCarbon.pdf
19/06/23	Octavia Carbon	OC	268	https://unfccc.int/sites/default/files/resource/IEAGHG.pdf
19/06/23	Carbon Gap	CG	269	https://unfccc.int/sites/default/files/resource/OctaviaCarbon.pdf
19/06/23	John M. Fitzgerald	JMF	270	https://unfccc.int/sites/default/files/resource/CarbonGap.pdf
19/06/23	Drax Group Plc	DG	271	https://unfccc.int/sites/default/files/resource/JohnM_Fitzgerald.pdf
19/06/23	ARCTECH USA	AU	272	https://unfccc.int/sites/default/files/resource/DraxCorporateLimited.pdf
19/06/23	Mati Carbon Removals	MCR	273	https://unfccc.int/sites/default/files/resource/ARCTECH.pdf
19/06/23	Direct Air Capture Coalition	DACC	274	https://unfccc.int/sites/default/files/resource/MatiCarbonRemovals.pdf
19/06/23	Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science	GRI/LSE	275	https://unfccc.int/sites/default/files/resource/DirectAirCaptureCoalition.pdf
19/06/23	Sitos Group, Inc	SGI	276	https://unfccc.int/sites/default/files/resource/GranthamResearchInstituteonClimateChangeandtheEnvironment.pdf
19/06/23	Crown Monkey	CM	277	https://unfccc.int/sites/default/files/resource/SitosGroup.pdf
19/06/23	Jim Ransom	JR	278	https://unfccc.int/sites/default/files/resource/CrownMonkey.pdf
19/06/23	Terrra	TERRA	279	https://unfccc.int/sites/default/files/resource/Jim_Ransom_TeamIOB.pdf

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19/06/23	The European Biochar Industry Consortium	EBIC	280	https://unfccc.int/sites/default/files/resource/Terrra.pdf
19/06/23	Inventive Resources, Inc	IRI	281	https://unfccc.int/sites/default/files/resource/EuropeanBiocharIndustryConsortium.pdf
19/06/23	STX	STX	282	https://unfccc.int/sites/default/files/resource/InventiveResources.pdf
19/06/23	HBAR Foundation	HBAR	283	https://unfccc.int/sites/default/files/resource/STX.pdf
20/06/23	Inversion Point Technologies Ltd	IPT	284	https://unfccc.int/sites/default/files/resource/HBAR_Foundation.pdf
20/06/23	Oeko-Institut, Greenhouse Gas Management Institute, Stockholm Environment Institute, University of Edinburgh Business School, Infras, Carbon Limits, and Calyx Global	OI	285	https://unfccc.int/sites/default/files/resource/InversionPointTechnologies.pdf
20/06/23	remove	ROVE	286	https://unfccc.int/sites/default/files/resource/Oeko-Institut_GGMI_SEI.pdf
20/06/23	Carbon Capture and Storage Association	CCSA	287	https://unfccc.int/sites/default/files/resource/remove.pdf
20/06/23	Running Tide	RT	288	https://unfccc.int/sites/default/files/resource/CarbonCapture_StorageAssociation.pdf
20/06/23	ActionAid International	AAI	289	https://unfccc.int/sites/default/files/resource/RunningTide.pdf
20/06/23	Carbon Recycling	CRCY	290	https://unfccc.int/sites/default/files/resource/ClimateLandAmbitionandRightsAlliance.pdf
20/06/23	Planboo	PBOO	291	https://unfccc.int/sites/default/files/resource/Carbon_Recycling.pdf
20/06/23	Spark Climate Solutions	SCL	292	https://unfccc.int/sites/default/files/resource/Planboo.pdf
20/06/23	From the Ground Up	FGU	293	https://unfccc.int/sites/default/files/resource/SparkClimateSolutions.pdf
20/06/23	TecnoFiltro SCS	TFSCS	294	https://unfccc.int/sites/default/files/resource/FromTheGroundUp.pdf

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20/06/23	Planetary Technologies	PT	295	https://unfccc.int/sites/default/files/resource/TecnoFiltro%20SCS.pdf
20/06/23	Levitree, Inc	LVI	296	https://unfccc.int/sites/default/files/resource/Planetary_Technologies_Kelland.pdf
20/06/23	Partanna	PNNA	297	https://unfccc.int/sites/default/files/resource/Levitree.pdf
20/06/23	Earth's Blue Aura	EBA	298	https://unfccc.int/sites/default/files/resource/Partanna.pdf
20/06/23	Greg H. Rau	GHR	299	https://unfccc.int/sites/default/files/resource/EBA.pdf
20/06/23	Daniel Schwaag	DS	300	https://unfccc.int/sites/default/files/resource/Planetary_Technologies_Rau.pdf
20/06/23	JPMorgan Chase & Co	JPM	301	https://unfccc.int/sites/default/files/resource/Made_of_Air.pdf
20/06/23	Climeworks	CWORKS	302	https://unfccc.int/sites/default/files/resource/JPMorgan_Chase.pdf
20/06/23	International Coordinating Council of Aerospace Industries Associations	ICCAIA	303	https://shorturl.at/fxRV7
20/06/23	Ted Christie-Miller (BeZERO)	BEZERO	304	https://shorturl.at/cAQ37
21/06/23	Sylvera	SYLV	305	https://shorturl.at/ilG12
21/06/23	Pachama	PACHA	306	https://unfccc.int/sites/default/files/resource/Sylvera.pdf
22/06/23	Conservation International	CI	307	https://unfccc.int/sites/default/files/resource/Pachama.pdf
22/06/23	Carbon Market Watch	CMW	308	https://unfccc.int/sites/default/files/resource/ConservationInternational.pdf
23/06/23	Austrian Biomass Corbonisation Society	ABCS	309	https://shorturl.at/quG36
24/06/23	PYREG GmbH	PYREG	310	https://shorturl.at/xPWY2
25/06/23	IETA	IETA	311	https://shorturl.at/uILV6
26/06/23	Climate Analytics	CA	312	https://shorturl.at/kuwCY
23/06/23	South pole	SP	313	https://shorturl.at/klLTU
27/06/23	Global CCS Institute	GCCSI	314	https://shorturl.at/yEF69
29/06/23	Carbon Capture Machine	CCM	315	https://shorturl.at/dZ479
19/06/23	Climate Land Ambition and Rights Alliance	CLARA	316	https://shorturl.at/cfrT1

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30/06/23	Center for International Environmental Law	CIEL	317	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_Center%20for%20International%20Envt%20Law.pdf
30/06/23	Carbon Engineering	CENG	318	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_Carbon%20Engineering.pdf
30/06/23	Vertree	VRT	319	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_Vertree.pdf
02/07/23	Carbon Twist	CTWIST	320	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_CarbonTwist.pdf
02/07/23	Project Developer Forum	PDF	321	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_PD%20Forum.pdf
03/07/23	Puro.earth	PURO	322	https://unfccc.int/sites/default/files/resource/sb006_pubic_conslutations_removals_Puro.earth_.pdf
03/07/23	ReGen	REGEN	323	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_ReGen.pdf
03/07/23	UBQ Materials	UBQ	324	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_UBQ%20Materials.pdf
03/07/23	Locus Solutions	LOCUS	325	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_Locus%20Solutions.pdf
03/07/23	GROVE VENTURES, Hetz Ventures, Firstime, VINTAGE, Jibe Ventures, GOOD COMPANY, fresh.fund, Epsilon, PLANETech (joint submission)	GROVE	326	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_Grove%20Ventures_et_al_0.pdf
04/07/23	Inversion Point Technologies (also submitted on 20 June, see below)	IPT	327	https://unfccc.int/sites/default/files/resource/sb006_pubic_conslutations_removals_Inversion%20Point%20Technologies%20Ltd.1.pdf

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04/07/23	Albo Climate	ALBO	328	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_Albo_Climate.pdf
05/07/23	Bomvento	BOMV	329	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_Bomvento.pdf
05/07/23	Aspiration	ASPI	330	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_Aspiration.pdf
05/07/23	Environmental Defense Fund (EDF)	EDF	331	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_Environmental%20Defense%20Fund.pdf
06/07/23	Deep Ocean Stewardship Initiative (DOSI)	DOSI	332	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_Deep%20Ocean%20Stewardship%20Initiative.pdf
06/07/23	SYNCRAFT Engineering GmbH	SYNCR	333	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_SYNCRAFT%20Engineering%20GmbH.pdf
06/07/23	IGNITE THE SPARK	IGSP	334	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_Ignite%20The%20Spark.pdf
06/07/23	Civil society organizations (open letter from 127 signatories)	OPCSO	335	https://unfccc.int/sites/default/files/resource/SB006_call_for_input_open%20letter%20from%20127%20civil%20society%20organisations.pdf
10/07/23	Atmosfair gGmbH	ATMO	336	https://unfccc.int/sites/default/files/resource/SB006_public_consultations_on_removals_atmosfair%20gGmbH.pdf
08/07/23	Indigenous Environmental Network (IEN)	IEN	337	https://unfccc.int/sites/default/files/resource/SB006_call_for_input_IEN.pdf
05/07/23	RedCarbon	RC	338	https://unfccc.int/sites/default/files/resource/SB006_call_for_input_RedCarbon.pdf

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03/07/23	Carbon Business Council	CBC	339	https://unfccc.int/sites/default/files/resource/SB006_call_for_input_Carbon%20Business%20Council.pdf
17/07/23	Cornwall Carbon Scrutiny Group	CCSG	340	https://unfccc.int/sites/default/files/resource/CornwallCarbonScrutinyGroup.pdf
18/07/23	Government of Quebec	QB	341	https://unfccc.int/sites/default/files/resource/Government%20of%20Quebec%20submission%20Part%201%20%28English%29.pdf
20/07/23	New Zealand	NZ	342	https://unfccc.int/sites/default/files/resource/NewZealand.pdf
21/07/23	Forair	FA	343	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%20Forair.pdf
24/07/23	NatureBridge	NB	344	https://webcms.unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%20NatureBridge.pdf
27/07/23	Stockholm Exergi	SE	345	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%20Stockholm%20Exergi.pdf
27/07/23	SkyHarvest	SH	346	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%20Sky%20Harvest.pdf
28/07/23	Kita	KITA	347	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Kita%20new.pdf
28/07/23	Perspective Climate Research	PCR	348	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%20Perspectives%20Climate%20Research.pdf
31/07/23	International and Comparative Law Research Centre	ICLRC	349	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%20International%20and%20Comparative%20Law%20Research%20Center.pdf

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31/07/23	Carbon Recycling	CRCY	350	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%20Carbon%20Recycling.pdf
31/07/23	44moles	44M	351	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%2044moles.pdf
31/07/23	Isometric	ISOMETRIC	352	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%20Isometric.pdf
31/07/23	Carbfix	CARBFIX	353	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Carbfix.pdf
31/07/23	C-Capture and International REC Standard	CCPLE + RECS	354	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removals%20C-Capsule%20and%20International%20REC%20Standard.pdf
31/07/23	CarbonPool	CPOOL	355	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_CarbonPool.docx.pdf
31/07/23	SaveClimate Campaign	SCC	356	https://unfccc.int/sites/default/files/resource/SB006_public_consultation_removal%20SaveClimate%20Campaign.pdf
31/07/23	Osservatorio Parigi	PARIGI	357	https://unfccc.int/sites/default/files/resource/SB006_PublicCconsultation_removals_OsservatorioParigi.pdf
31/07/23	Climeworks	CW	358	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Climeworks.docx.pdf
01/08/23	Negative Emission Platform	NEP	359	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Negative%20Emission%20Platform.pdf

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01/08/23	Carbon Market Watch	CMW	360	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Carbon%20Market%20Watch.pdf
01/08/23	Drax Group	DG	361	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Drax%20Group.pdf
01/08/23	Bellona Foundation	BF	362	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Bellona%20Foundation.pdf
01/08/23	STX Group	STX	363	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_STX%20Group.pdf
01/08/23	Neustark	NEUST	364	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_neustark.pdf
01/08/23	Carbon Finance Labs	CFL	365	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Carbon%20Finance%20Labs.pdf
01/08/23	1PointFive	1.5	366	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_1PointFive.pdf
01/08/23	Sylvera	SYLV	367	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Sylvera.pdf
01/08/23	Agreena	AGREE	368	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Agreena.pdf
01/08/23	Direct Air Capture Coalition	DACC	369	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Direct%20Air%20Capture%20Coalition.pdf

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01/08/23	Carbon Capture and Storage Association	CCSA	370	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Carbon%20Capture%20and%20Storage%20Association.pdf
01/08/23	Zero Emissions Platform	ZEP	371	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Zero%20Emissions%20Platform.pdf
01/08/23	Planetary Technologies	PT	372	https://unfccc.int/sites/default/files/resource/SB006_PublicConsultation_removals_PlanetaryTechnologies.pdf
01/08/23	NBS Brazil Alliance Team	NBS	373	https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Funfccc.int%2Fsites%2Fdefault%2Ffiles%2Fresource%2FSB006_Public%2520consultation%2520on%2520removals_NBS%2520Brazil%2520Alliance%2520Team.pdf.xlsx&wdOrigin=BROWSELINK
02/08/23	re-green	REGREEN	374	https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Funfccc.int%2Fsites%2Fdefault%2Ffiles%2Fresource%2FSB006_Public%2520consultation%2520on%2520removals_re.green_.pdf.xlsx&wdOrigin=BROWSELINK
02/08/23	Cella Mineral Storage	CLLA	375	https://unfccc.int/sites/default/files/resource/sb006_Public%20consultation%20on%20removals_Cella%20Mineral%20Storage.pdf
04/08/23	Carbon International	CARBI	376	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_National%20Institute%20of%20Forest%20Science.pdf
08/08/23	National Forest Science	NFS	377	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_National%20Institute%20of%20Forest%20Science.pdf

Submission date	Stakeholder	Acronym	Reference number	Document URL
08/08/23	Puro.earth	PURO	378	https://unfccc.int/sites/default/files/resource/SB006_Public%20consultation%20on%20removals_Puro.earth_.pdf

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Document information

Version	Date	Description
02.1	30 August 2023	Formatting changes to correct headings.
02.0	28 August 2023	Published as a late annex to the annotated agenda of SB 007. This version takes into account the guidance provided by the Supervisory Body at SB 006 (SB 006 meeting report, para. 23) Note: This document is published without editorial review.
01.0	5 July 2023	Published as a late annex to the annotated agenda of SB 006.

Decision Class: Operational, Regulatory
Document Type: Information note
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Keywords: A6.4 mechanism, data collection and analysis, emission removal activities, methodologies, regulatory framework

Related documents:

28 August 2023	A6.4-SB007-AA-A14 - *Information note*: Draft elements for the recommendations on activities involving removals (version 02.0)
4 July 2023	A6.4-SB006-AA-A14- Information note: Draft elements for the recommendation on activities involving removals (version 01.0)
3 June 2023	A6.4-SB005-A02 – Information note: Guidance and questions for further work on removals (version 02.0)
17 May 2023	A6.4-SB005-AA-A09 – Information note: Removal activities under the Article 6.4 mechanism (version 04.0)
17 May 2023	A6.4-SB005-AA-A10 – Information note: Summary of the views submitted by Parties and observers on activities involving removals (version 01.0)
10 March 2023	A6.4-SB004-A02 - Information note: Guidance and questions for further work on removals (v.01.0)
28 February 2023	A6.4-SB004-AA-A04 - *Information note*: Removal activities under the Article 6.4 mechanism (version 3.0)
07 November 2022	A6.4-SB003-A03 - *Recommendation:* Activities involving removals under the Article 6.4 mechanism (version 1.0)

25 October 2022	A6.4-SB003-AA-A03 - *Draft recommendation*: Removal activities under the Article 6.4 mechanism (version 2.0) A6.4-SB003-AA-A04 - *Information note*: Removal activities under the Article 6.4 mechanism (version 2.0)
15 September 2022	A6.4-SB002-AA-A05 - *Draft recommendation*: Requirements for the development and assessment of mechanism methodologies pertaining to activities involving removals (version 1.0) A6.4-SB002-AA-A06 - *Information note*: Removal activities under the Article 6.4 mechanism (version 1.0)
08 July 2022	A6.4-SB001-AA-A05 - *Concept note*: Removal activities under the Article 6.4 Mechanism (version 1.0)