Response of The HBAR Foundation to the United Nations Framework Convention on Climate Change "Call for input 2022 - Activities involving removals under the Article 6.4 Mechanism of the Paris Agreement"[1] & "Call for input 2022 - Draft requirements for the development of mechanism methodologies"[2]

Introduction

The HBAR Foundation (THF), through its Sustainable Impact Fund (SIF), welcomes the opportunity to provide input on the draft recommendations of the Supervisory Body (SB) pertaining to removal activities under the Article 6.4 mechanism (published as Annex 5 and Annex 6 to the SB002 annotated agenda) as well as development and assessment of mechanism methodologies (published as Annex 7 and Annex 8 to the SB002 annotated agenda).

The SIF is a climate-tech grant fund launched at the end of 2021 to support adoption and growth of real-world digital climate solutions built on Hedera's carbon-negative proof-of-stake public distributed ledger network, which is differentiated by low energy, high throughput, and highest-grade security (ABFT). We are motivated by a commitment to accelerate climate action and simultaneously grow Hedera's ecosystem by catalyzing transformative open source climate-accounting and climate-finance solutions, ultimately bringing the balance sheet of the planet to the public ledger.

One of the centerpieces of our work is an innovative new open-source tool we call the Guardian. 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 ($mtCO_2e$)). One of the SIF's goals is to create the largest repository of open source digital methodologies in the world, which 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.

[1] Submitted via email to Supervisory Body at Supervisory-Body@unfccc.int, subject heading "*Call for input 2022 - activities involving removals under the Article 6.4 Mechanism of the Paris Agreement (THF SIF)*" on 11 October 2022 by 24:00 GMT.

[2] Submitted via email to Supervisory Body at Supervisory-Body@unfccc.int, subject heading "*Call for input 2022 - draft requirements for the development of mechanism methodologies (THF SIF)*" on 11 October 2022 by 24:00 GMT.

Removal Activities

In Annex 6, the SB's "Information note: Removal activities under the Article 6.4 mechanism" (*see* A6.4-SB002-AA-A06, ¶24(a)), a range of nature-based terrestrial activities (afforestation, reforestation and forest restoration, revegetation, improved forest management, etc.) have been listed as illustrative examples of qualifying anthropogenic carbon dioxide removal (CDR) for A6.4M purposes.

THF-SIF supports inclusion of these nature-based solutions (NbS) but is also mindful of criticisms increasingly leveled against biological carbon sequestration projects that their impermanence risks are significantly underestimated and long-term administrability challenges unworkable. While such concerns are not unfounded, we urge the SB to be sanguine about the prospect of satisfactorily addressing them. Arguing that NbS should not qualify as A6.4M removals or be permitted to generate credits for offsetting to compliance with emissions reduction targets (e.g., NDCs) is both unhelpful and premature.

First, technology-based solutions (TbS) that achieve removals through engineering/chemical methods (e.g., direct air capture (DAC)) are fast-emerging, but many applications remain prohibitively costly, and doubts continue to surround their capacity to deploy at scale, certainly fast enough to meet the urgency of the moment. SB may have little choice but to rely on NbS to ensure the Article 6.4 mechanism's success, in the medium term (~10-year time horizon) at least and likely far into the outyears.

Second, while climate change is undoubtedly diminishing the resilience of nature-based carbon stocks by intensifying the risk of reversals from extreme heat, forest fire, drought, flooding, and related human social disruptions, this is fundamentally a difference of degree, not kind—a policy problem considered solvable before, at the prior reversal risk rate, and one for which 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."[3]

More concretely, 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 over the achieved carbon stocks' holding period. 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,

[3] *See, e.g.,* National Academies of Sciences, Engineering, and Medicine (2022), *"Greenhouse Gas Emissions Information for Decision Making: A Framework Going Forward (English)."* Washington, DC: The National Academies Press. Available at https://nap.nationalacademies.org/catalog/26641/greenhouse-gas-emissions-information-for-decision-making-a-framework-going (last accessed Oct 11, 2022).

environmentally sustainable proof-of-stake DLT networks such as Hedera Hashgraph breaks those legacy assumptions and obsoletes traditional manual processes.

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.[4]

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.

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.

- With respect to A6.4-SB002-AA-A05, at §1.1 ("Monitoring"), ¶6, THF-SIF urges the SB to incorporate a requirement for mechanism methodologies to utilize best-available DLT-enabled dMRV. Specifically, we recommend amending the existing text (which reads "Mechanism methodologies shall require that all removal activities monitor the achieved carbon stocks through their quantification using field measurements, or field measurements in combination with remote-sensing data where applicable)" to read "Mechanism methodologies shall require that all removal activities monitor the achieved carbon stocks through their quantification using **best-available distributed ledger and dMRV technology, which may include transparent, aduitable** field measurements, ~~or~~ field measurements in combination with remote-sensing**, IoT, and satellite** data **with machine learning error detection** where applicable, **decentralized identifiers for actors that issue verifiable credentials and corresponding verifiable presentations linked to tokenized climate assets, which shall be interoperable across climate account systems."**
- With respect to A6.4-SB002-AA-A05, at §1.2 ("Reporting"), THF-SIF recommends that ¶10, ¶11, ¶13, ¶14, and ¶18 be revised in light of the capabilities DLT and dMRV, which in

[4] *See* World Bank Group (June 2022), *"Digital Monitoring, Reporting, and Verification Systems and Their Application in Future Carbon Markets (English)."* Washington, DC, USA: The World Bank Group. Available at https://openknowledge.worldbank.org/handle/10986/37622 (last accessed Oct 11, 2022).

concert enable all data fields and reporting outputs contemplated by these paragraphs to be transparent and discoverable by any member of the public at any time.

- With respect to A6.4-SB002-AA-A06, at §4.3.4 ("Double-counting"), ¶86:
    - THF-SIF recommends replacing the existing text (which reads "There could be two principal methods to avoid double-counting") with "There could be **three** principal methods to avoid double-counting," and adding "(c) **Automatic, transparent verification of carbon-removal project integrity and associated tokenized carbon-credit issuance, transaction, and retirement auditable to the $mtCO_2e$ using environmentally sustainable public distributed ledger networks coupled with dMRV**."
- With respect to A6.4-SB002-AA-A06, at §4.3.4 ("Double-counting"), ¶89, THF-SIF supports the SB's proposal to employ nested accounting, a powerful tool for managing climate governance issues. As noted, nested-accounting can be spatially referenced through geotagging and timestamping, bolstering source-emissions data accuracy and tamper resistance, and enabling credits to be traced to their removal activity point-of-origin, across jurisdictions, and up and down the value chain–auditability and transparency that will reduce double-counting.
- With respect to A6.4-SB002-AA-A06, at §4.5 ("Addressing reversal"), ¶98, THF-SIF recommends that emerging capabilities of DLT-enabled dMRV tooling be fully explored prior to limiting the period removal-activity participants should be accountable for monitoring their carbon stocks and compensating for any reversal. We certainly agree, "accountability for ever [sic] is not of practical value," but short of forever and other-things-equal, a longer duration may equate with higher environmental integrity. Where DLT-enabled dMRV is shown to equalize – or dramatically narrow the gap in – compliance burdens between short-, medium-, and moderately long-term monitoring periods, the SB ought to err on the side of caution and require the longest duration practicable under the circumstances.
- With respect to A6.4-SB002-AA-A06, at §4.5.1 ("Determining of permanence period"), ¶101, THF-SIF urges the SB to favor the 100-year permanence period selected by the Australian Carbon Farming Initiative, the California Cap-and-Trade Program, and the Verified Carbon Standard over the shorer 40-year term used by the American Carbon Registry. Paragraph 107 claims that "a shorter time horizon implies earlier climate action is more relevant to policy objective [sic]." It may be accurate to say that earlier action is more likely to achieve climate objectives; however, as a practical matter, decarbonization of the global economy is unlikely to be sufficiently far along in 40 years to permit monitoring to stop. Coupled with the power of DLT-enabled dMRV to reduce compliance costs, we urge the SB to recommend longer permanence periods.

Mechanism Methodologies

- With respect to A6.4-SB002-AA-A07, at §3.1.3 ("Option 3: Use the following elements in mechanism methodologies"), ¶18(f), THF-SIF applauds the SB for recommending consideration of "additional investments in adopting digital technologies, particularly for monitoring (e.g. Internet of Things technologies, blockchain technologies), thereby

increasing the reliability of the estimates and reducing uncertainties." However, we suggest two important revisions to this existing text:

  - First, "blockchain technologies" should be replaced with "**environmentally sustainable Distributed Ledger Technology (DLT) and public distributed ledger networks**," as blockchain is merely a subset of DLT. Indeed, many modern, environmentally sustainable DLT networks, including Hedera Hashgraph, use alternative designs, which benefit from faster transaction speeds, higher security, and lower energy consumption.
  - Second, we recommend that DLT be emphasized and dMRV be expressly mentioned, to wit: "adopting digital technologies, particularly **Distributed Ledger Technology (DLT) and public distributed ledger networks** coupled with **digital Monitoring, Verification, and Reporting (dMRV) for** monitoring (~~e.g.,~~ **remote-sensor and satellite data,** Internet of Things technologies, **machine learning, and verifiable credentials/decentralized identifiers, etc.**)"

- With respect to A6.4-SB002-AA-A07, at §3.3 ("Shall be real, transparent, conservative, credible and below business-as-usual (BAU)"), ¶21, THF-SIF notes that DLT solutions embed superior transparency over any competing process or procedure. According, the existing test (which reads "Mechanism methodologies shall require describing transparently the source of the data used, the assumptions made, the references used and the underlying steps of emission reduction estimates, where necessary including equations") could be stronger if revised as follows: "Mechanism methodologies shall **require best-available procedures, systems, and technology for maximizing transparency without compromising privacy, including use of public distributed ledger networks to record and display the** source of the data used, the assumptions made, the references used and the underlying steps of emission reduction estimates, where necessary including equations."
- With respect to A6.4-SB002-AA-A08, at §3.3 ("Shall be real, transparent, conservative, credible and below business-as-usual (BAU)"), ¶12, THF-SIF reiterates its comment with respect to A6.4-SB002-AA-A07, at §3.3, ¶21, above.

Contributors	
Jonathan Rackoff *Vice President, Global Policy* *The HBAR Foundation* *Wes Geisenberger* *Vice President, Sustainability & ESG* *The HBAR Foundation*	*Martin Wainstein* *Founder & Executive Director* *Open Earth Foundation* *Marco Schletz* *ClimateTech Innovation Fellow* *Open Earth Foundation*