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Updated compilation of information on mitigation benefits of actions, initiatives and options to enhance mitigation ambition

Technical paper

Summary

This updated technical paper compiles information on the mitigation and sustainable development benefits of actions, initiatives and options to enhance mitigation ambition identified in the submissions by Parties and accredited observer organizations submitted to the secretariat under workstream 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action on pre-2020 ambition. This technical paper comprises three separate documents: the main text, contained in document FCCC/TP/2013/8, and two addenda, contained in documents FCCC/TP/2013/8/Add.1, and FCCC/TP/2013/8/Add.2. The main findings on the mitigation benefits of actions, initiatives and options to enhance mitigation ambition, found in the main text, are complemented by an overview table on thematic areas with high mitigation potential, benefits, barriers, examples of national policies and information on cooperative initiatives. The addenda substantiate the main findings with more detailed information.

Contents

I. Background

A. Mandate

1. This second version of the technical paper on mitigation benefits of actions, initiatives and options to enhance mitigation ambition was requested by the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) at the second part of its second session.[1] The first version of this technical paper was published on 28 May 2013 and is contained in document FCCC/TP/2013/4.

2. The technical paper compiles information, views and proposals on mitigation benefits of actions, initiatives and options to enhance ambition under the workplan on enhancing mitigation ambition, with a particular focus on 2013 and 2014. The information, views and proposals were submitted by Parties and observer organisations by two different deadlines, 1 March and 1 September 2013.[2] In the submissions, consideration was given to the following aspects:

(a) Mitigation and adaptation benefits, including resilience to the impacts of climate change;

(b) Barriers and ways to overcome them, and incentives for actions;

(c) Finance, technology and capacity-building to support implementation.[3]

B. Objective and approach

3. The objective of this second version of the technical paper is to compile information on mitigation benefits of actions, initiatives and options to enhance mitigation ambition in order to promote action under workstream 2 of the ADP.[4] This technical paper is based on the 59 submissions, including the 43 submissions by Parties or groups of Parties and the 16 submissions by observer organizations received by the secretariat by 15 October 2013.

4. In addition to the submissions, the technical paper also covers contributions by Parties and cooperative initiatives provided at in-session workshops and round tables held in 2013[5] in accordance with the conclusions of the ADP.[6] The technical paper draws upon publications referred to in the submissions, including the United Nations Environment Programme (UNEP) and the Intergovernmental Panel on Climate Change (IPCC) and

[1] FCCC/ADP/2012/3, paragraph 33, and FCCC/ADP/2013/2, paragraph 36(a).

[2] FCCC/ADP/2012/3, paragraph 31, and FCCC/ADP/2013/2, paragraph 33.

[3] Submissions under workstream 2 of the ADP made by Parties are available at <http://unfccc.int/bodies/awg/items/7398.php>, while those made by non-governmental organizations are available at <http://unfccc.int/parties_observers/ngo/submissions/items/3689.php>.

[4] FCCC/ADP/2013/2, paragraph 36(a).

[5] In-session workshops on the pre-2020 ambition: low-emission development opportunities and the pre-2020 ambition: opportunities for mitigation and adaptation related to land use held during the first part of the second session of ADP and the in-session workshop on the pre-2020 ambition: energy transformation, including scaling up renewable energy, enhancing energy efficiency and consideration of carbon capture and storage held during the second part of the second session of ADP. Information on these workshops is available at <http://unfccc.int/meetings/warsaw_nov_2013/workshop/7735.php>.

[6] FCCC/ADP/2012/3, paragraphs 30 and 32.

specialized international organizations, such as the International Energy Agency (IEA), the International Monetary Fund and International Labour Organization.

5. Compared with the first version, this second version of the technical paper includes more detail on thematic areas with high mitigation potential and information on mitigation benefits of national actions and cooperative initiatives identified in the submissions. Information is organised by thematic area with high mitigation potential, focusing on energy supply, energy efficiency, renewable energy, transport (including international aviation and maritime transport), fossil-fuel subsidy reform, short-lived climate pollutants (including fluorinated gases), land use and waste. However, since the selection of the thematic areas is based on the areas covered in the submissions, there is some overlap in terms of coverage of mitigation potential and sustainable development benefits, barriers and incentives for mitigation actions for each thematic area. Examples of national actions and cooperative initiatives are also provided for each thematic area. This paper presents information on finance, technology and capacity-building to support the achievement of emission reduction pledges and implementation of mitigation action by developing countries. This second version also contains updated information on the options and next steps for the ADP to enhance mitigation ambition.

6. Information presented in this technical paper does not imply that there is consensus among Parties on issues and options covered in the submissions. Rather, it provides an overview of the information provided in the submissions, in accordance with its mandate.

C. Structure of the technical paper

7. The technical paper comprises a main text and two addenda. The main text contains a summary of the main findings, which are substantiated in the two addenda with more detailed information. Addendum 1 starts with an overview of the existing emission reduction pledges made by developed and developing country Parties under the Cancun Agreements and the projected emissions gap in 2020 (chapters II and III). It then provides a compilation of information on mitigation potential, benefits, barriers and incentives, and examples of national policies and cooperative initiatives grouped by key thematic areas with a high mitigation potential (chapter IV). Addendum 1 also contains information on the views on finance, technology and capacity-building to support implementation (chapter V). Addendum 2 provides an overview of the possible options to enhance mitigation ambition and next steps under workstream 2 of the ADP in advancing its work plan on enhancing mitigation ambition.

D. Possible action by the Ad Hoc Working Group on the Durban Platform for Enhanced Action

8. The ADP may wish to consider this compilation of information on mitigation benefits of actions, initiatives and options to enhance mitigation ambition, in particular the options related to enhancing mitigation ambition through pledges, national actions and financial, technological and capacity-building support. Having done so, it may wish to consider which specific next steps could be undertaken by the ADP in order to advance the work plan on enhancing mitigation ambition, with a particular focus on 2014 and beyond.

II. Main findings

Box 1
Key messages

- Emission reduction pledges have been made by more than 90 Parties whose emissions and removals represent around 80 per cent of the global total emissions, including emissions and removals from land use, land-use change and forestry. These pledges are significant but far from sufficient to close the emissions gap between the existing emission pathways and those consistent with the 2 °C upper limit on warming agreed by Parties at the United Nations Climate Change Conference held in Cancun, Mexico.
- While many Parties express a sense of urgency to close the gap as we approach 2020, this has yet to be translated into sufficient actions to attain to the 2 °C limit.
- However, there is ample technical mitigation potential to cover the emissions gap through policies, actions and initiatives in the thematic areas with high mitigation potential, but Parties face policy and political barriers that prevent them from fully realizing this potential.
- Significant experience exists in implementing policies, measures, actions and best practices that address policy barriers and also bring about substantial mitigation and sustainable development benefits, including under the clean development mechanism. Achieving emission reductions and harnessing sustainable development benefits through successful replication and scaling up of such policies is a major incentive and driving force behind further emission reductions.
- Cooperative initiatives that bring together different stakeholder groups, such as central and local governments, private sector, industry and civil society, across a number of thematic areas can contribute to enhancing Parties' efforts towards the implementation of the pledges and actions.
- Support is essential for developing countries as an incentive for stronger national action.
- The Convention, through its institutions, provides a framework and mechanisms for delivery of finance, technology development and transfer, and capacity-building. However, further discussions are necessary under workstream 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) on how to deploy support in such a way that it results in enhanced action.
- Under the ADP, Parties identified options to enhance ambition through pledges, national actions and related support as well as urgent measures that need to be taken in 2014 and 2015 at all levels. In addition, Parties suggest to continue with the technical and political work to foster cooperation and create a strong momentum for enhanced action.

9. Central to the Cancun Agreements adopted by Parties in 2010 is the decision to hold the increase in the global average temperature below 2 °C (the 2 °C goal), or below 1.5 °C, above pre-industrial levels.[7] In order to contribute to this goal, more than 90 Parties made conditional and unconditional pledges to reduce emissions by 2020 under the Cancun

[7] Decision 1/CP.16, paragraph 4.

Agreements (see addendum 1 to this technical paper, chapter II). For developed countries, these pledges encompass quantified economy-wide emission reduction targets under the Convention for all developed countries and quantified emission limitation or reduction commitments under the second commitment period of the Kyoto Protocol by developed countries assuming commitments for this period.[8,9] For developing countries, these pledges are in the form of nationally appropriate mitigation actions.[10] There is recognition that the full implementation of these pledges can bring sizeable emission reductions and that rapid progress has been made recently by many Parties in taking action and implementing policies to achieve these pledges. In addition, many Parties that have not made pledges are also taking action, and Parties that have made pledges are taking action in areas that were not necessarily covered by their pledges.

10. Based on the pledges and not on the total effect of all global action on climate change, a significant gap is estimated to exist between the expected aggregate emission reduction effect of Parties' pledges in terms of global annual emissions by 2020 and aggregate emission pathways consistent with the likely chance of holding the increase in the global average temperature below 2 °C, or 1.5 °C, above pre-industrial levels (see addendum 1 to this technical paper, chapter III). In the *Emissions Gap Report 2013*, UNEP updated the estimation of the emissions gap and used the latest scenarios of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report. Based on this estimate, it was confirmed that further action is needed to reduce emissions by between 8 and 12 billion tonnes of carbon dioxide equivalent (Gt CO_2 eq) by 2020.[11] Since pledges were first analysed in 2009, the gap is getting larger rather than smaller and global total emissions are still increasing.

11. Limiting the warming caused by anthropogenic GHG emissions to less than 2°C will require limiting cumulative emissions from all anthropogenic sources to a quantity, which has been estimated for different degrees of certainty of staying under the warming limit for CO_2 emissions only, as well as factoring in other emissions.[12] More emissions today and in the past means fewer emissions in the future. Not closing the emissions gap by 2020 but still meeting the 2°C goal is theoretically possible since the temperature increase is determined by emissions over a period of time and not at a single point of time.[12] However, this would require much higher rates of global emission reductions in the medium-term, which is significantly more expensive in the medium and long term. Also, such a strategy carries with it higher risks, such as a greater risk of "lock-in" of carbon-intensive infrastructure, a limited choice of certain technologies in the medium-term, impact on economic development pathways and significantly increased risks of negative climate impacts. For these reasons closing the gap may not be feasible in practice for such scenarios and, as a result, the temperature goal would not be met.[12]

12. The window of opportunity to narrow the gap is closing. However, the gap can be reduced significantly if Parties take on more ambitious pledges by 2020, adopt strict rules for complying with emission reduction pledges, scale up mitigation policies and actions that deliver sustainable development benefits and address national priorities, such as economic growth, all while reducing emissions.

13. Parties recognized the urgent need to step up their mitigation effort as much as possible. They also recognized that there are many untapped options with vast proven potential to reduce emissions while also promoting economic and social development. This

[8] FCCC/SB/2011/INF.1/Rev.1.
[9] Decision 1/CMP.8, annex I.
[10] FCCC/SBI/2013/INF.12/Rev.1.
[11] UNEP, 2013.
[12] IPCC, 2013.

potential is rapidly diminishing as we approach 2020, since it takes time to establish the right policy settings, overcome barriers and ensure successful implementation.

14. Many developing Parties expressed the view that Parties should be guided by the objective and principles of the Convention and that developed countries should take the lead in implementing their existing commitments and raising their mitigation ambition by 2020. These developing Parties also expressed the view that Parties included in Annex I to the Convention (Annex I Parties) would increase their ambition to reduce emissions in line with the ranges referred to in the IPCC Fourth Assessment Report the gap could be almost closed by 2020.[13]

15. In their submissions, Parties and observer organizations highlighted sizeable mitigation potential available for the period ending in 2020 and referred to the estimates made by UNEP of the technical mitigation potential available by 2020 in the range of about 17 ± 3 Gt CO_2 eq, at a marginal cost of USD 50–100/t CO_2 eq reduced.[14] Parties emphasized mitigation and adaptation benefits of actions, including resilience to the impacts of climate change, as well as sustainable development benefits brought about through such actions, which motivate national support for stronger action by Parties.

> Governments have the power to create markets and policies that accelerate development and deployment of clean energy technologies, yet the potential of these technologies remains largely untapped.
>
> *Source*: IEA, 2013b.

16. In addition, Parties' submissions suggest that there are thematic areas with high mitigation potential, such as energy supply, energy efficiency, renewable energy, transport (including international aviation and shipping), fossil-fuel subsidy reform, short-lived climate pollutants (including fluorinated gases), land use and waste (see addendum 1 to this technical paper, chapter IV). These areas offer many opportunities for mitigation action that could be employed and scaled up prior to 2020. The table below summarizes information for each thematic area in terms of mitigation potential and benefits, sustainable development benefits, barriers that prevent the utilization of this potential, examples of national actions and information on cooperative initiatives that help to address these barriers and set a foundation for ambitious action at the national and international level.

17. Policies and activities in these areas with high mitigation potential, as presented in this paper, have significant sustainable development benefits, such as promotion of low-emissions development opportunities and economic growth, reduced air pollutant emissions, improved health conditions and reduced health care costs, and new jobs creation. Such benefits are likely to build up additional motivation for political and substantive engagement of various stakeholders. In this sense, such benefits provide incentive for further action and in many cases are a major incentive and a main driving force behind

> Over 100 countries, including almost all the major economies, have set themselves renewable energy targets, while over 120 countries have put in place policies promoting renewable energy.
>
> *Source*: REN21, 2013.

[13] The IPCC Fourth Assessment Report provided a range of the differences between emissions in 1990 and emission allowances in 2020 for various greenhouse gas concentration levels for both Annex I Parties and Parties not included in Annex I to the Convention (non-Annex I Parties) as a group. For Annex I Parties the range is –25 per cent to –40 per cent by 2020, while for non-Annex I Parties there should be substantial deviation by 2020 from the baseline level of emissions (IPCC, 2007).

[14] UNEP, 2012.

many mitigation policies and efforts.

18. Parties acknowledged that setting the right incentives and providing financial, technological and capacity-building support for developing countries could help to address the policy and political barriers to mitigation actions and could lead to stronger action at all levels – subnational, national and international. Parties also acknowledged that major impediments to taking action can exist in the form of economic, institutional, information and capacity barriers.

19. To overcome these barriers, an array of existing national policies, including best practices and success stories, was highlighted in the submissions and during the ADP workshops and round tables held in 2013. Parties discussed the usefulness of information exchange on such best practices and success stories, as policies and measures of some countries could significantly benefit and impact other countries' emission levels, if the latter were to adopt similar approaches, for example as concerns energy efficiency standards for industrial motors. During such discussions, Parties identified a number of best practices and success stories that include policies supporting promotion of clean and renewable energy; setting energy or emission performance standards for buildings, appliances, and vehicles; economic and fiscal policies; and carbon and air pollution-pricing policies, such as carbon taxes, air pollution charges and market-based mechanisms, particularly the clean development mechanism (CDM). Parties acknowledged that the use of CDM can be an effective in increasing mitigation ambition, as it provides a ready-made architecture for facilitating mitigation actions. Some Parties made specific proposals to that end, such as promoting voluntary cancellation of units from CDM and funding of existing CDM projects.

Box 2

Examples of existing national policies, measures and actions plans as highlighted by Parties in the submissions and during the workshops and round tables of the Ad Hoc Working Group on the Durban Platform for Enhanced Action held in 2013

Brazil	Action plans for mitigation and adaptation in agriculture, and for prevention and control of deforestation and fires in the Cerrado and the Amazon
China	A workplan for controlling greenhouse gas emissions and the Comprehensive workplan for energy conservation and emissions reduction during the 12th five-year plan period
European Union	EU fluorinated gases regulation, EU directive on ecodesign of energy-related products, EU climate and energy package
Indonesia	National action plan for reducing greenhouse gas emissions and National strategy on REDD-plus[a]
Japan	Top-Runner programme on energy efficiency
Kenya	National climate change action plan for 2013–2017
The Philippines	Climate change act and National climate change action plan for 2011–2028
Tanzania	National forestry policy and Forest Act
United Arab Emirates	Green growth strategy
United Kingdom	The UK Low Carbon Transition Plan: national strategy for climate and energy
United States	The President's Climate Action Plan, Economy standards for corporate average fleet and performance standards for new power plants

[a] Reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries.

20. Many efforts to enhance mitigation ambition are supported by cooperative initiatives implemented at all levels and across various thematic areas.[15] The range of the initiatives referred to in the submissions is very broad in terms of coverage of purpose (e.g. leading to political dialogue and/or focused on implementation), participation (e.g. involving the public and private sectors, cities and/or local governments), geographical coverage (e.g. regional and/or international), and thematic coverage (e.g. energy efficiency or waste).[16] These initiatives have the potential to support actions leading to emission reductions directly (e.g. by specifying emission reduction commitments for cities) or indirectly (e.g. by creating enabling environment for increased action).

21. Cooperative initiatives could help Parties to enhance actions and deliver greater emission reductions. However, it is difficult to attribute emission reductions to individual cooperative initiatives owing to the fact that the results are accounted for in national greenhouse gas inventories. In this sense, there is little value in accounting for cooperative initiatives separately from national actions. Since they are voluntary in nature, as highlighted by some Parties, cooperative initiatives facilitate action by all countries, including developing countries, and do not constitute new or additional commitments for developing countries.

22. According to the view expressed by many developing country Parties, successful implementation of national actions by developing countries is linked to access to financial, technological and capacity-building support (see addendum 1 to the technical paper, chapter V). For many Parties, enhanced delivery of financial support is linked to transparency of financial flows and the identification of sources and ways to attract financing to developing countries. The capitalization of the Green Climate Fund, enhancement of the Adaptation Fund and operationalization of the registry of nationally appropriate mitigation actions were noted as arrangements that can facilitate the provision of enhanced financial, technological and capacity-building support for developing countries.

23. The preparation of a road map by developed countries to mobilize financial support and finding ways to increase such support was considered essential by developing countries in enhancing mitigation and adaptation actions. Technology needs assessments, technology road maps and action plans are also seen as instrumental in facilitating technology development and transfer to developing countries. The full operationalization of the Technology Mechanism is viewed by many Parties as critical to enabling enhanced actions by developing countries. The importance of capacity-building support is also recognized.

24. With regard to the options and next steps to enhance mitigation ambition, some Parties identified a comprehensive process that is relevant to increasing the ambition of pledges and of action and related support. This process includes steps of more general and cross-cutting nature, such as the clarification of pledges, recognition of efforts, transparency of mitigation efforts and assessment (see addendum 2 to this technical paper, chapter II). A number of Parties made more specific proposals under ADP workstream 2 that could be grouped into two broad sets of options described below (see addendum 2 to this technical paper, chapters III and IV).

25. One set of options focuses on proposals for enhancing the ambition of pledges. These proposals suggest that the ADP would call on Parties to address the conditions associated with their pledges, to broaden the scope of pledges, and to adhere to strict

[15] The secretariat is setting up a portal which contains a database of selected cooperative initiatives accompanied by a description and specifications of type, coverage, participation and other aspects. The portal will be available at <http://unfccc.int/7785>.

[16] Weischer and Morgen, 2012 and Blok et al, 2012.

accounting rules. Parties that have not made emission reduction pledges would be invited to do so, and all Parties could be invited to make new, more ambitious pledges. Finally, under this set of options, some Parties propose that Parties to the Kyoto Protocol ratify the amendment to the Kyoto Protocol urgently and implement the provision contained in decision 1/CMP.8, paragraph 7, to revisit their quantified emission limitation and reduction commitments for the second commitment period at the latest by 2014.

26. The second set of options focuses on proposals in relation to the ambition of mitigation actions and of financial, technological and capacity-building support. It encompasses options relating to the identification of best practice national actions, recognition of cooperative initiatives and their role in catalysing action towards increasing ambition, and assessment of the ways to provide enhanced financial, technological and capacity-building support to developing countries. Also, it was suggested that in addition to work under the ADP, the UNFCCC can play a role in strengthening national mitigation processes aimed at assessing emission sources, identifying mitigation opportunities, facilitating investment and implementing relevant actions.

27. To advance ADP workstream 2, it was proposed by Parties that as ADP continues its technical work in 2014 and 2015 in the form of technical workshops, it should also establish relevant links to work at the political level, comprehensively covering, mitigation, adaptation and support (see addendum 2 to this technical paper, chapter V). Parties made a number of specific process-related proposals for such technical work in areas with mitigation potential, to be done in 2014, such as further discussing mitigation opportunities in the areas of land use and biofuels. One group of Parties, supported by others, proposed a detailed technical and interactive process under workstream 2 with the objective of identifying specific policies and technologies with the potential to rapidly and cost-effectively reduce emissions in the near term and policies that can enable more widespread implementation of such technologies.

28. Several Parties proposed a range of issues that require a decision by the Conference of Parties at its nineteenth session. This range of issues include a call to Parties to raise the ambition of their emission reduction pledges and their financial support accompanied by an acknowledgement of the leadership role of developed country Parties, a recognition of efforts by Parties and cooperative initiatives, an invitation to the Montreal Protocol to consider a phase-down in the production and consumption of hydrofluorocarbons, a recognition of early action taken before 2020 under the 2015 agreement, ,and a call for a work programme under the Subsidiary Body for Scientific and Technological Advice until 2015. Actions taken under such a decision could form an input to the preparation for the September 2014 Leaders' Summit convened by the United Nations Secretary-General. Overall, Parties expect that work at the technical and political level can foster cooperation and create a strong momentum for action at the national and international level.

Overview of thematic areas, their mitigation potential, benefits as well as barriers related to national action and cooperative initiatives

Thematic area[a]	*Mitigation potential and benefits by 2020 in Gt CO_2 eq*[b]	*Sustainable development benefits*	*Barriers*	*Examples of national actions*	*Indicative number of cooperative initiatives*[c]
Energy supply *Fuel switching limiting inefficient coal use* *Renewable energy sources* *Carbon capture and storage* *Methane from fossil-fuel production*	2.2–3.9 0.5–1 1.5–2.5 (electricity and heat only) 0.2–0.4 0.6	• Energy security • Economic diversity and resilience • Reduced air pollution and health costs	• Higher costs of low-carbon options compared to conventional fossil-fuel options • High increase in the demand for electricity driven by economic growth and the lack of affordable alternatives to fossil fuels to meet such demand • Market organization and price distortions	• Emissions trading (pricing carbon) • Carbon taxes (pricing carbon) • Emission standards (avoiding carbon lock-in) • Technology-specific support for research, development and demonstration (enabling future reductions, bringing costs down)	23
Energy efficiency *Building heating and cooling* *Appliances and lighting* *Industry* *Transport*	Up to 2.9 0.5 0.5 0.4 0.2	• Macroeconomic benefits • Often cost-effective • Social improvements • Reduced air and water pollution and health costs • Positive impact on public budgets and fossil-fuel import bills	• High upfront capital costs and perceived capital risk • Lack of affordable technologies suitable to local conditions • Market organization, price distortions and split incentives • Information barriers	• Minimum performance standards (overcoming investment risks) • Energy-saving obligations, possibly with certificate trading (overcoming investment risks) • Energy audits and negotiated agreements (awareness-raising)	24
Renewable energy *Electricity and heat production* *Biofuels*	1.5–2.5 –	• Social improvements • Macroeconomic benefits • Reduced air and water pollution and health costs • Positive impact on public budgets and fossil-fuel import bills	• High upfront capital costs and perceived capital risk • Lack of affordable technologies that are suitable to local conditions • Market organization and price distortions	• Renewable energy targets (providing long-term stability) • Feed-in tariffs (lower costs) • Obligations to supply a share of electricity, heat and fuels from renewable sources (overcoming investment risks) • Tradable certificates (pricing carbon) • Net metering (overcoming storage) • Direct subsidies or tax credits (bringing costs down)	24
Transport *Land-based transport*	1.7–2.5	• Improved health and safety • Job creation	• High upfront capital costs and perceived capital risk • Market organization and price distortions	• Avoid (transport-related land-use policies, avoiding carbon lock-in) • Shift (bus rapid transit, avoiding carbon lock-in) • Improve (vehicle performance	24

Thematic area[a]	*Mitigation potential and benefits by 2020 in Gt CO_2 eq*[b]	*Sustainable development benefits*	*Barriers*	*Examples of national actions*	*Indicative number of cooperative initiatives*[c]
				standards, overcoming investment risks)	
Aviation and shipping	0.3–0.5	• Development and diffusion of new technologies • Air quality improvement • Job creation	• Increasing traffic volumes • Trade-offs between reducing carbon emissions and increasing nitrogen oxide emissions • Indirect emissions (from land-use change and biofuel production) • Market organization and price distortions	• Air traffic management (allowing efficient routes) • Shipping energy management plans (awareness-raising) • Aircraft and ship emissions standards (overcoming investment risks) • Emissions trading schemes (pricing carbon)	5
Fossil fuel subsidy reform	1.5–4.5	• Economic growth • Enhancing development and diffusion of new technologies • Environmental and health benefits • Social welfare benefits	• Lack of information • Lack of administrative capacity • Concerns regarding adverse economic impacts • Concerns regarding adverse impacts on the poor • Opposition from specific interest groups	• Reform plan • Communications strategy (getting public buy-in) • Phased energy price increases (softening adverse economic impacts) • Improved efficiency of state-owned enterprises (act by example) • Targeted measures to avoid adverse impacts on the poor	1
Reducing short-lived climate pollutants, including fluorinated gases[d] *General*	1.1	• Improved health and air quality • Improved quality of agricultural production and ecosystems	• Residential: high fuel and technology costs, low awareness of health impacts • Agriculture and forestry: weak enforcement, low stakeholder awareness, high costs of modified feed • Industrial processes: limited access to finance and community awareness • Fossil-fuel industry: high investment costs and technical constraints • Transport: unavailability of ultra-low sulphur fuels	• Regulation (overcoming investments risks) • Economic incentives (pricing emissions)	3
Fluorinated gases	0.5	• Energy savings • Adaptation	• Need for technical developments • Flammability and toxicity risks • Regulations and standards that inhibit the use of alternatives	• Vehicle refrigerant regulation (overcoming investment risks) • National and regional fluorinated gas regulations	1

Thematic area[a]	*Mitigation potential and benefits by 2020 in Gt CO_2 eq*[b]	*Sustainable development benefits*	*Barriers*	*Examples of national actions*	*Indicative number of cooperative initiatives*[c]
			• Insufficient supply of components • Investment costs • Lack of relevant skills	(overcoming investment risks)	
Land use *Forestry* *Agriculture*	1.3–4.2 1.1–4.3	• Environmental protection • Biodiversity • Job creation • Adaptation	• Lack of finance • Poor enabling environment • Lack of access to effective low-cost technology • Vulnerability of forest resources • Poor data • Drivers of deforestation	• Protected areas expansion • Command and control measures • Economic instruments	23
Waste	0.8	• Public health improvements • Environmental protection • Closing the nutrient cycle and avoiding methane emissions	• Lack of finance • Lack of capability to assess benefits • Lack of technology transfer	• Composting • Waste regulation (e.g. landfilling)	11

[a] Thematic areas partly overlap. A description of the areas can be found in Addendum 1.

[b] Mitigation potential estimates for energy efficiency and renewable energy are from IEA, 2012. Mitigation potential estimates for fossil-fuel subsidy reform are from IMF, 2013. Mitigation potential estimates for reducing emissions from fluorinated greenhouse gases and reducing short-lived climate pollutants are from UNEP, 2011c. Mitigation potential estimates for transport, land use and waste are from UNEP, 2012. Some estimates are probably underestimated compared to others, owing to the use of different sources and methodologies. Potential values are not strictly comparable and are not additive, as they partly overlap.

[c] The number of cooperative initiatives is indicative because not all initiatives may be included and for some the coverage is unclear or ambiguous, while some other initiatives are cross-cutting in terms of their thematic coverage.

[d] Some short-lived climate pollutants are outside of the definition of the emissions gap. Assuming full implementation of measures by 2020, the impact of the emission reductions achieved in that year on the global temperature over a 100-year time horizon would be about 1.1 Gt CO_2 eq.

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