Crediting early action: options, opportunities and risks

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Executive Summary

Incentivising prompt mitigation action is a key objective pursued in the international climate negotiations to achieve the ultimate goal of avoiding dangerous climate change. Despite its potential benefits, climate change mitigation is currently not taking place at the scale and pace needed. Crediting emission reductions from early mitigation action, i.e. action before 1 January 2020 when international targets under a new global climate agreement are expected to start, could be one of the means to provide additional incentives for faster and deeper mitigation action.

The study identifies key issues and options for crediting early action and assesses implications of different options, contexts and assumptions for the incentives to take early action and for the environmental impacts, drawing upon lessons leared from international crediting mechanisms.

Our analysis showes that, while crediting early action could encourage deeper early emission reductions, it could also lead to higher cumulative emission paths and delayed action on climate change, depending on how and under which conditions crediting early action is implemented. In other words, crediting early action provides opportunities but also entails risks. The impacts of crediting early action on cumulative GHG emissions depend on the principles, rules and assumptions guiding the crediting, in particular which mitigation actions are eligible for crediting, how reference levels for crediting are established, how emission reductions are quantified, and whether the credits are used for or beyond compliance with international targets. If crediting early action is pursued, robust principles and rules for crediting are therefore essential to meet the objective of incentivising early mitigation action and avoiding higher cumulative emissions.

Regarding the scope for crediting early action, ensuring robust crediting seems most straightforward if the scope for crediting is outside of the scope of the future international target and more complex if the scope of crediting is narrower than the scope of the future international target. As for quantification of emission reductions, the most suitable approaches to quantifying emission reductions depend on whether crediting occurs at the level of economy-wide emissions, sector-wide emissions, policies, projects or programmes. In terms of timing, it is important to carefully balance the incentives for early action and avoid the crediting of actions that would have happened anyway. International oversight seems important to facilitate robust crediting. The same principles and rules should apply for the domestic use of credits from early mitigation action and for international transfers of early action credits.

Credits from early action could be used for compliance, i.e. to meet future targets, or beyond compliance, i.e. to increase ambition beyond established targets. In principle, using credits for compliance has no impact on cumulative GHG emissions when one credit corresponds to one additional tonne of reduction, whereas the use beyond compliance could further reduce GHG emissions. A

reduction in GHG emissions could also be achieved through compliance use, if one credit corresponds to more reductions than what is accounted towards compliance. Conversely, if a credit corresponds to fewer emission reductions than what is accounted towards compliance, GHG emissions could increase.

In summary, the environmental impact of crediting early action depends on how credits are quantified and used.

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Contents

1 Introduction

The accumulation of greenhouse gases (GHGs), such as carbon dioxide (CO_2), in the atmosphere leads to changes in the global climate. The global community has agreed on a long-term goal to avoid dangerous climate change by limiting the rise in global average temperature to no more than two degrees. The current binding and voluntary international targets of countries exceed by 8-10 gigatonnes of CO_2 equivalent (Gt CO_2e) the emission budget for 2020 consistent with meeting this goal, and significant further mitigation is required after 2020 (UNEP 2014). Extensive further mitigation action is thus urgently needed to stay on track to meet the two-degree target, and the window is closing fast.

Prompt mitigation action can generate considerable benefits - both in the short and long term. According to the IPCC (2014, p. 87), "[i]nertia in the economic and climate systems and the possibility of irreversible impacts from climate change increase the benefits of near-term mitigation efforts". Significant amounts of high-emitting, long-lifetime capital stock may be locked in during the next few years, leading to higher cumulative emissions and higher mitigation costs in the long term, in particular as large amounts of new capital investments are required in the next 5-15 years (IEA 2013, New Climate Economy 2014). There is also significant potential to reduce emissions of so-called short-lived climate forcers – gases with strong short-term global warming potential (GWP) – relatively quickly and cost-effectively. To achieve lasting climate benefits, efforts targeting short-lived climate forcers need to be complemented by parallel and persistent mitigation action on longer-lasting emissions (IEA 2013). There is a risk that we will miss out on valuable opportunities for early, low-cost and high-impact mitigation action (IEA 2013). Prompt mitigation action could avoid accumulation of GHGs in the atmosphere, reduce transaction costs of climate policies and reduce future mitigation costs through avoided lock-in of emission-intensive capital stock and enhanced innovation, learning and technology development, thus facilitating the adoption of deeper targets in the future (Michaelowa and Rolfe 2001; Pan and Van Regemorter 2004; New Climate Economy 2014).

Despite its potential benefits, climate change mitigation is currently not taking place at the scale and pace needed. On the contrary, emission-intensive capital stock is being locked in for decades to come, everywhere in the world. Governments face many barriers to implementing even win-win action, including costs and trade-offs between short-term and long-term political objectives, vested interests and market failures (New Climate Economy 2014). Some benefits may not be fully captured by conventional decision-making metrics, such as the GDP, and they may be difficult to quantify and subject to uncertainty. Furthermore, the global public good nature of climate change mitigation benefits disincentivises action by individual countries: the costs of action would incur today to the implementing country while the the benefits would accrue over time to all

countries. This raises the question of how the international climate regime can support prompt mitigation action in an effective and robust manner.

International recognition of early action could incentivise countries to reduce emissions faster and deeper before the start of future international targets in 2020, and build up political support for such action. Some countries may tend to set their international targets cautiously to ensure that they can comply with them under a range of plausible future scenarios, while daring to be more ambitious with any voluntary national targets. Furthermore, some countries may have cost-effective mitigation potential beyond what they see as their "fair share" of the global mitigation effort. This potential could be untapped through international cooperation and support, facilitated by an international framework for incentivising and recognising such cooperation.

Incentivising prompt mitigation action has been part of the global climate policy debate from the start. In 1995, a year after its entry into force, the United Nations Framework Convention on Climate Change (UNFCCC) launched a pilot phase of Activities Implemented Jointly (AIJ) for international cooperation on projects with "real, measurable and long-term" mitigation benefits. The Kyoto Protocol to the UNFCCC, adopted in 1997, establishes binding mitigation commitments for developed countries, and also contains provisions for early, i.e. pre-commitment-period, action (see section 2.4 for details).

Providing incentives for prompt mitigation is also a key topic in ongoing UN negotiations on a new global climate agreement. Commitments under the Kyoto Protocol, together with voluntary pledges taken by developed and developing countries under the Cancun Agreement ("Cancun Pledges"), fall short of what is needed by 2020 to stay on track to achieve the two-degree goal. Thus, creating incentives for substantial additional mitigation action already by 2020 is crucial. Closing the pre-2020 ambition gap is a key objective pursued under the so-called workstream 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP). Workstream 1 of the ADP is tasked with developing a new global climate agreement, applicable to all Parties, for adoption in 2015 and implementation from 2020. Countries are currently considering their intended nationally determined contributions (INDCs) to the new global climate agreement. In practice, countries may see a risk that mitigation action taken prior to target-setting results in a greater future burden compared to taking later action. This, in turn, could create perverse incentives to postpone action until international targets, and the international framework for recognising mitigation action to achieve these targets, are in place. However, there is currently no comprehensive international framework in place for recognising or incentivising early action.

This study identifies and analyses key issues relating to crediting early action as a means to provide incentives for early mitigation action. Crediting early action could be a way to provide incentives for countries to take mitigation action already before the entry into force of the new global climate agreement from 2020. However, it could also pose risks for environmental integrity (Kelly and

Bianco 2009), for example if actions were credited that would be implemented anyway or that are needed to achieve a future international target. The study aims to identify key issues and options for crediting early action and to understand the implications of different options and assumptions for the incentives to take early mitigation action and for the environmental impacts, in particular the impact on cumulative GHG emissions. The focus of the study is on understanding key concepts, issues and implications under different contexts and assumptions.

Key terms used in this report are summarised in Table 1 below. For the purpose of this study, we consider early action for the period until 1 January 2020 ("**pre-target period**"), when international targets under the new global climate agreement are expected to start ("**target period**", from 1 January 2020). We use "**target**" as a general term to refer to quantified commitments or pledges to reduce emissions or enhance removals of GHG emissions ("**emission reductions**") to a defined level within a defined timeframe. We differentiate between two distinct contexts in which early action can take place: (1) in countries that do not have international targets in the period up to 1 January 2020; and (2) in countries that have international commitments in the second commitment period under the Kyoto Protocol from 1 January 2013 to 31 December 2020.

We define "**crediting"** early action as the quantification and verification of emission reductions and/or removals in accordance with a recognised standard. Credited emission reductions from early action are referred to as "**early action credits"**. The core function of crediting is to ensure the quality of emission reductions by certifying that they are measured against a robust reference level and meet the criteria associated with a recognised standard.

We define the term "**recognition"** of early action broadly as international acknowledgement of the early action taken by a country. International recognition of emission reductions from early action may, but does not necessarily, imply the issuance and transfer of early action credits. We define "**international transfers**" and "early action credits" broadly to also include the use or transfer of entitlements associated with emission reductions, without necessarily involving the issuance and transfer of credits.

We distinguish two forms of recognition:

- **Use for compliance:** the use of emission reductions from eligible early action achieved in the pre-target period to meet international targets in the target period under the new global climate agreement, for example by accounting early action credits towards meeting a future international target; and
- **Use beyond compliance:** a mitigation contribution beyond international targets under the new global climate agreement ("use beyond compliance"), for example by cancellation of early action credits.

This study is organised as follows:

- **Section 2 presents an overview** of the key issues with regard to crediting early action;
- **Section 3 explores and assesses different approaches** for crediting early action; and
- **Section 4 provides conclusions and insights** for robust approaches for crediting early action in the context of the new global climate agreement.

Table 1. Key terminology of this report

Term	Definition used in this report
Early action	Mitigation action that takes place in the period up to 1 January 2020 ("pre-target period") and results in real greenhouse gas (GHG) emission reductions beyond levels the country would follow to meet its future international target.
Emission reduction	Emission reduction and/or removal of GHG emissions compared to a reference level, possibly adjusted for indirect effects, such as leakage effects or cross-sectoral effects, and quantified in metric tonnes of carbon dioxide equivalent
Recognition	International recognition of a country's contribution to climate change mitigation. Recognition can include use for compliance or use beyond compliance, and can involve, but is not limited to, crediting.
Crediting early action	Quantification and verification of emission reductions resulting from early action in accordance with a standard.
Early action credit	Unit or entitlement associated with an emission reduction equivalent to one tonne of carbon dioxide that results from crediting early action.
(International) transfer	Transfer of early action credits from one Party to another Party, typically through carbon markets. In this report, transfer is defined broadly to encompass the use or transfer of entitlements associated with emission reductions, without necessarily involving the issuance and transfer of credits.
Use for compliance	Use of early action credits for meeting an international target, e.g. through accounting of early action credits towards meeting the target
Use beyond compliance	Use of early action credits beyond meeting an international target, e.g. through cancellation of early action credits.
National target	Target relating to mitigation (reduction or limitation of GHG emissions) set voluntarily and unilaterally by a country to reduce or limit GHG emissions through domestic and/or international action.
Cancun Pledge	Voluntary pledge made by a country to reduce or limit GHG emissions by 2020 and communicated internationally in accordance with the Cancun Agreements under the UNFCCC.
International target	Target relating to mitigation (reduction or limitation of GHG emissions) under a new global climate agreement. The level, type, scope and legal nature of the target is not yet agreed and may differ across countries.
New global climate agreement	A new climate agreement in the form of "a protocol, another legal instrument or an agreed outcome with legal force" under the UNFCCC that is "applicable to all Parties" and is to be agreed by 2015 and to be implemented from 2020. The agreement is assumed to assign international targets to all parties for the target period.
Pre-target period	Period until 1 January 2020.
Target period	Period from 1 January 2020, when countries are expected to have international targets under a new global climate agreement.

2 Key concepts, steps and issues

2.1 Overview

2.1.1 Objective

The main objective of crediting early action is to enhance incentives for emission reductions or removals from early action.[1] An important consideration for meeting this objective is the impact of crediting early action on cumulative GHG emissions. Crediting early action is environmentally robust only if cumulative GHG emissions do not increase due to the crediting, i.e. if equal or higher emission reductions are achieved overall compared to the situation where early action is not credited.

The impacts of crediting early action on cumulative GHG emissions depend on the principles, rules and assumptions guiding the crediting, in particular which mitigation actions are eligible for crediting, how reference levels for crediting are established, how emission reductions are quantified, and whether the credits are used for or beyond compliance with international targets.

2.1.2 Key steps

Key steps in crediting early action include:

- assessing the eligibility of early action for crediting;
- establishing a robust reference level for crediting; and
- quantifying and verifying emission reductions of eligible actions, and possibly issuing credits for these emission reductions.

The practical complexity of these steps depends on the context, including the scope of the early action in relation to the scopes of any pre-target-period climate policies and international targets from 2020.

2.1.3 Analogy to crediting mechanisms

Many issues relevant to crediting early action have analogies with other crediting mechanisms, especially the Kyoto Protocol's Clean Development Mechanism (CDM). The CDM is a flexible mechanism under the Kyoto Protocol for quantifying and certifying emission reductions in accordance with internationally agreed modalities and procedures. CDM concerns projects and programmes in developing countries that do not have international commitments under the Kyoto Protocol. It has been developed through extensive global multi-stakeholder collaboration during a course of more than ten years and is the most widely

[1] In the following, „emission reductions" refer to both emission reductions and removals.

applied international crediting mechanism to date. The Kyoto Protocol's Joint Implementation (JI) is a similar mechanism which partially uses CDM standards and credits emission reductions generated in industrial countries that have commitments under the Kyoto Protocol. Credits issued under these mechanisms are internationally transferrable and eligible for use for compliance under the Kyoto Protocol. We will therefore draw upon lessons learned from international crediting mechanisms, especially the CDM, in discussing the design elements for crediting early action in section 3 below.

2.1.4 Key concepts of crediting emission reductions

Figure 1 illustrates key concepts of crediting emission reductions. Crediting mechanisms often, but not always, define a business-as-usual (BAU) emission path (broken yellow line), representing the most likely course of future development. The BAU emissions path is not a clear-cut concept: first, it is a scenario that builds on assumptions about the future, such as economic activitiy, international fuel prices or climatic conditions. And second, it may or may not include existing or new policies which may, may not, or may partially be motivated by mitigating climate change.

Crediting mechanims use a reference level (green line) – or "baseline emissions" under the CDM – as the basis for quantifying emissions reductions. The reference level could, but does necessarily have to, be different from the BAU emissions path. Crediting mechanisms may set the reference level lower than the BAU emissions for various reasons (Schneider et al 2014): as a means to address uncertainty and determine emission reductions in a conservative manner, to avoid perverse incentives for the credited entities to artificially inflate the reference level[2], or to issue fewer credits than emission reductions occur with the view to achieving a global net decrease in emissions due to the use of the mechanism (Vrolijk 2013; Lazarus et al 2013). As discussed further below, a future international emissions target could, depending on the context, be another reason for setting the reference level below the BAU emissions path. Another important and much-debated question is the extent to which existing policies that decrease GHG emissions (e.g. renewable energy feed-in tariffs) or increase GHG emissions (e.g. fossil fuel subsidies) should be included or excluded in establishing the reference level (Spalding-Fecher 2013). Including policies which decrease GHG emissions could generate perverse incentives for policy makers to postpone the introduction of such policies, since this could lower the credit volume. On the other hand, excluding such policies could credit emissions reductions from actions that would happen anyway and could thus undermine environmental integrity.

Emission reductions are credited by comparing the actual emissions (red line) with the reference level, possibly adjusting for indirect effects, such as leakage

[2] For example, version 6.0.0 of the CDM methodology AM0001 for HFC-23 destruction uses an emission benchmark of 1.0% which is far below the common emission rates in the industry, in order to avoid perverse incentives for plant operators to operate plants at higher emission rates for the purpose of generating more credits.

emissions or cross-effects between sectors, policies and mechanisms. Emission reductions associated with moving from BAU to the reference level (yellow area) are not eligible for crediting while emission reductions achieved beyond the reference level are eligible for crediting (light blue area).

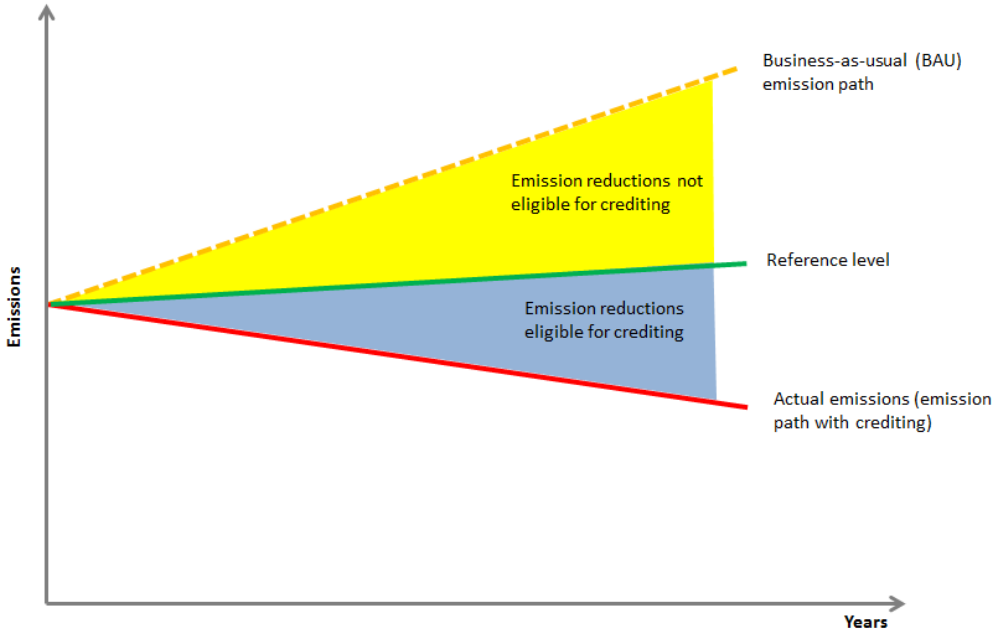

Figure 1. Key concepts of crediting emission reductions

2.1.5 Illustration of key concepts for crediting early action

Figure 2 illustrates, based on a hypothetical example, how crediting early action could work. This example uses a set of assumptions that will be further discussed and relaxed in Chapter 3.

We assume a country with an international target from 2020 onwards (target period) but no international target up until the year 2020 (pre-target period). The country may, but does not necessarily, have a national target in the pre-target period, covering part or all of its emissions. For the target period, we assume the country to have an economy-wide, multi-year international target which requires a deviation (reduction) from business-as-usual (BAU). The dark blue box in the figure represents the emission budget corresponding to the future international target.

The BAU emission path (yellow broken line) represents the country's emissions in the absence of its international target, noting that BAU emissions may or may not include current and future climate policies.

In this example, we assume that, to achieve the future international target, the country would need to start deviating from its BAU emissions at some point already before the start of the target period, even without the possibility to credit early action (green line, emission path without crediting early action). This leads to some underachievement in the initial years and equivalent overachievement in

the last years of the target period. The emission path without crediting early action (green line) is used as reference level for crediting, with emission reductions below the reference level being credited.

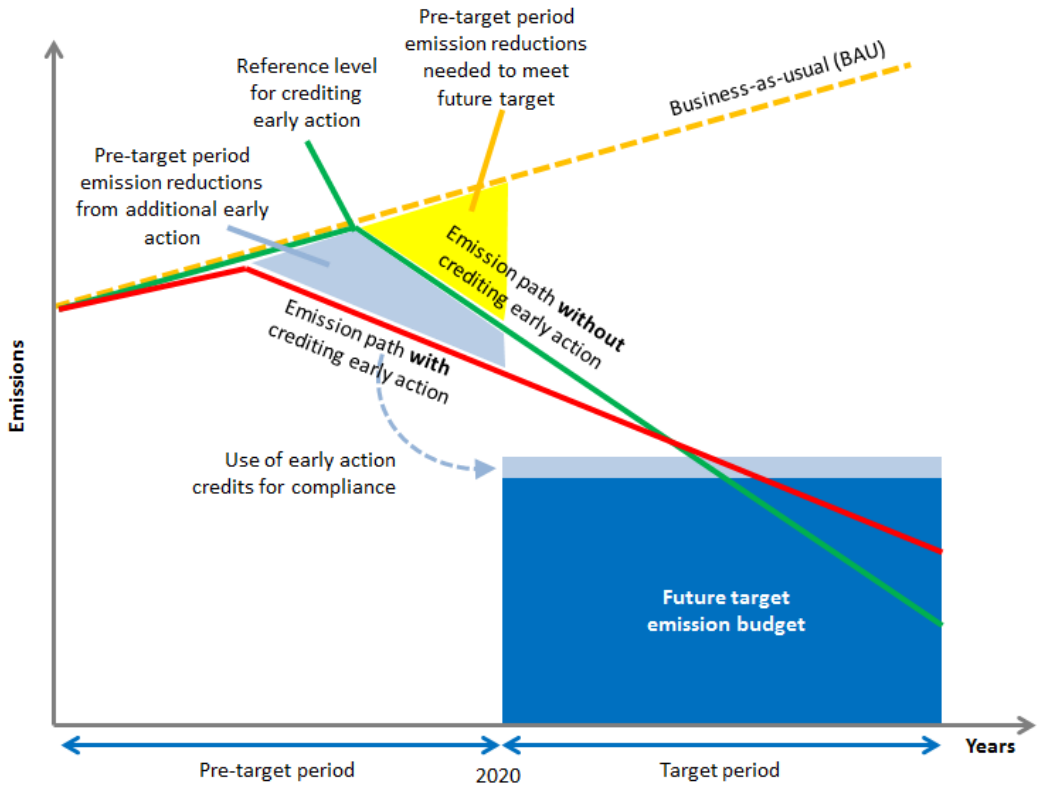

Figure 2. Crediting emissions reductions from early action

We further assume that the country has significant cost-effective mitigation potential in pre-target years. The most cost-effective mitigation pathway over the total (pre-target and target) period would consist of taking early action and reducing emissions more strongly in earlier years, with less mitigation in later years (red line in the figure). The possibility to credit early action could enhance the incentives for the country to follow this cost-effective mitigation path and to overcome barriers to such early action. We assume that, due to the incentives from crediting early action, the country uses its cost-effective mitigation potential and follows the cost-effective emissions path (red line). The emission reductions in pre-target years exceeding the reference level are credited (light blue area between the green and red line).

Finally, in this figure, we assume that the country wants to use early action credits for compliance, that is, towards meeting its future international target during the target period (light blue area above the emissions budget). In this case, early action results in more emission reductions in the pre-target years (light blue area between the red and green line) and correspondingly less emission reductions in

the target years (light blue area above the emission budget). Hence, cumulative emissions over the total period are the same for both emission paths (the green and the red line) and the environmental integrity of the international target is not undermined.

2.2 Key issues for crediting early action

In illustrating the concept of crediting early action with the example above, we made several assumptions which may not be applicable in all cases and contexts. In the following, we highlight key questions and assumptions for crediting early action which are then explored in greater detail in Chapter 3.

2.2.1 At which level could early action be credited?

In Figure 2, we assumed that early action is credited against an economy-wide reference level (green line). Emission reductions from early action could also be credited at other levels, such as for a sector, a policy, or a project or programme. Moreover, emission reductions from early action may or may not fall within the same scope (sectors, GHGs) compared with that of the future international target, and the scope of the early action may be broader or narrower compared with that of the future international target. In section 3.1, we discuss four potential levels for crediting early action: economy-wide, sector-wide, policy-level, and project/programme-level.

In analogy to crediting mechanisms, this issue refers to the level of the crediting mechanism: does it credit economy-wide action, sectoral action, policies, programmes or projects, and does it cover the emissions of one or more greenhouse gases, does it fall within the same scope as the future international target?

2.2.2 Which early actions should be eligible for crediting?

Which mitigation actions should be eligible for crediting is a key question when pursuing crediting early action. Early action should not be eligible for crediting if it would have happened anyway, either as part of the BAU emissions path or in order to achieve a future international target. The latter consideration is relevant for early action that occurs under the same scope (GHGs, sectors) as the future international target. Crediting early action that would happen in any case would imply higher cumulative emissions over the total (pre-target and target) period, compared to the case without early action crediting, if these credits are used for compliance with future international targets.

The eligibility of pre-target-period mitigation actions for crediting relates to whether, and to what extent, a country would, in order to achieve its future international target, need to start reducing its emissions prior to the target years (green line). In Figure 2, we assumed a linear emission reduction path, starting already before the target period. However, this may not always be the case and may depend on the context. Different contexts would imply different pre-target-period emission paths, which could range from the BAU emission path (yellow

broken line in Figure 2) to the emission path with early action (red line in Figure 2).

When assessing which mitigation actions shall be eligible for crediting early action, a careful balance needs to be struck between incentivising early action and avoiding crediting emission reductions that would happen anyway. Depending on the level of crediting, different approaches may be necessary to ensure that only actions that would not happen anyway are credited, including through establishing robust eligibility criteria, e.g. by developing positive lists of activities or levels that are deemed eligible or negative lists of activities or levels that are deemed ineligible, or through establishing robust reference levels which reflect actions that would happen anyway.

In analogy to crediting mechanisms, this issue refers to the question of which mitigation actions are deemed eligible and additional to what would otherwise occur. We explore this theme in further detail, including in the context of the four possible levels of early action, in section 3.1.

2.2.3 How can mitigation outcomes be quantified?

Crediting early action requires quantifying the emission reductions associated with eligible early actions. A broad range of approaches could be used for this purpose, depending on whether crediting covers the entire economy or a certain sector, whether it takes place at the level of policies, programmes or projects, whether the emission reductions from early action fall within the same scope as the future international target, how the resulting emission reductions can be best measured or modelled, and whether adjustments are needed to account for leakage or cross-effects.

Establishing robust reference levels against which emission reductions from early action are compared – the green line in the figures – is a critical step for ensuring environmental integrity. In general, early action is quantified by comparing observed or modelled emissions after the implementation of eligible early action with the reference level, which reasonably represents the emissions in the absence of crediting early action. The reference level can take many forms: it may be based on modelling or measurements, it may be absolute (an emission path) or intensity-based (emissions per unit), and it may be fixed *ex ante* or dynamic (adjusted *ex post*). Depending on the context, the reference level may need to reflect some pre-target-period deviation from BAU emissions to achieve a future target, consider national targets and policies, and address the inherent uncertainties associated with modelling of emission projections and quantifying emission reductions. By definition, early action that takes place at a different scope (sectors, GHGs) than the future international target, is not implemented for the purpose of achieving the future international target, whereas early action occurring within the same scope as the future international might be deemed to be needed partially or in full for achieving the target and may thus need to be incorporated in the reference level.

In analogy to crediting mechanisms, this issue is related to the setting of the baseline and quantifying emission reductions. We explore this question in the context of the four possible levels of early action in section 3.1.

2.2.4 Over which time period should early action be credited?

In the context of the new global climate agreement, another important question is the start date for crediting early action. We discuss this and other timing issues in section 3.4.

In analogy to crediting mechanisms, this issue is related to the project start date and crediting period start date.

2.2.5 How should emissions above the reference levels be reflected in crediting?

In Figure 2, we assumed that the country reduces its emissions below the green line in all years of the pre-target period. We discuss in section 3.5 how emissions exceeding the reference level should be dealt with.

In analogy to crediting mechanisms, this issue refers to the situation where monitored emissions are above the baseline emissions.

2.2.6 How could early action credits be internationally transferred and used?

In Figure 2, we assumed that emission reductions from early action are used within the host country. However, a country could also engage in early action through international cooperation by selling early action credits to other countries or investing in early action in another country. We explore in section 3.6 the aspects of transferring early action credits internationally and using them outside the host country.

In analogy to crediting mechanisms, this issue refers to the transfers and use of credits.

2.2.7 Which governance arrangements could best ensure robust crediting?

Governance arrangements and international supervision on any crediting for early mitigation action are a further element which we briefly discuss in section 3.7.

2.2.8 How could early action be incentivised once countries have international targets?

In Figure 2, we assumed that the country does not have an international target in the period up to 2020. Once countries enter a system of consecutive international targets, reducing emissions beyond what is required to achieve the current international target could be regarded as a form of early (or deeper) mitigation action, making progress towards achieving the future international target in advance, already during the current target period. Recognition of such over-

achievement could provide additional incentives for such earlier (or deeper) mitigation action. In a system of consecutive targets, such recognition can be achieved by allowing "banking" of excess emission reductions from the current target period to future target periods and allowing banked emission reductions to be used for compliance with future international targets. The Kyoto Protocol allows banking between consecutive commitments periods, subject to some restrictions. However, there are currently no provisions regarding whether and how overachievement in the second commitment period of the Kyoto Protocol could be recognised in the target period under the new global climate agreement.

Banking of early emission reductions between consecutive target periods could provide either incentives or disincentives for early (or deeper) action and could increase cumulative emissions or not affect them, depending on the ambition of the current international target and how the reference level for such banking is set. If the current international target is set below BAU emissions, the possibility of banking emission reductions beyond the current international target has no impact on cumulative emissions, while providing incentives for over-achievement. In this case, any over-achievement beyond the current international target could be recognised and banked into the subsequent target period.

In contrast, if the current international target is set above the BAU emissions, unrestricted banking of emission reductions beyond the current international target enables the country to delay mitigation action, compared to a situation where such banking is not allowed, potentially resulting in higher cumulative ermissions.

To avoid this latter situation, one option might be to recognise early action only beyond the emissions path that the country would need to follow in order to achieve the future international target without any banking from the current target period (green line see Figure 3). In other words, the reference level for recognising early action would in this situation be set in the same way as in Figure 2, as if the country would not have the current international target. To avoid adverse impacts on cumulative GHG emissions, as a general approach, the reference level for recognising early action for countries with current international targets could be set as the either the BAU emissions path or the level of the current international target, whichever is lower. In practice, however, it might be politically challenging to agree whether the current international target of a country is set above or below its BAU emissions. As pointed out in section 2.1.4 above, the BAU emission path is not a clear-cut concept and depends on many assumptions and the inclusion or exclusion of existing and future policies.

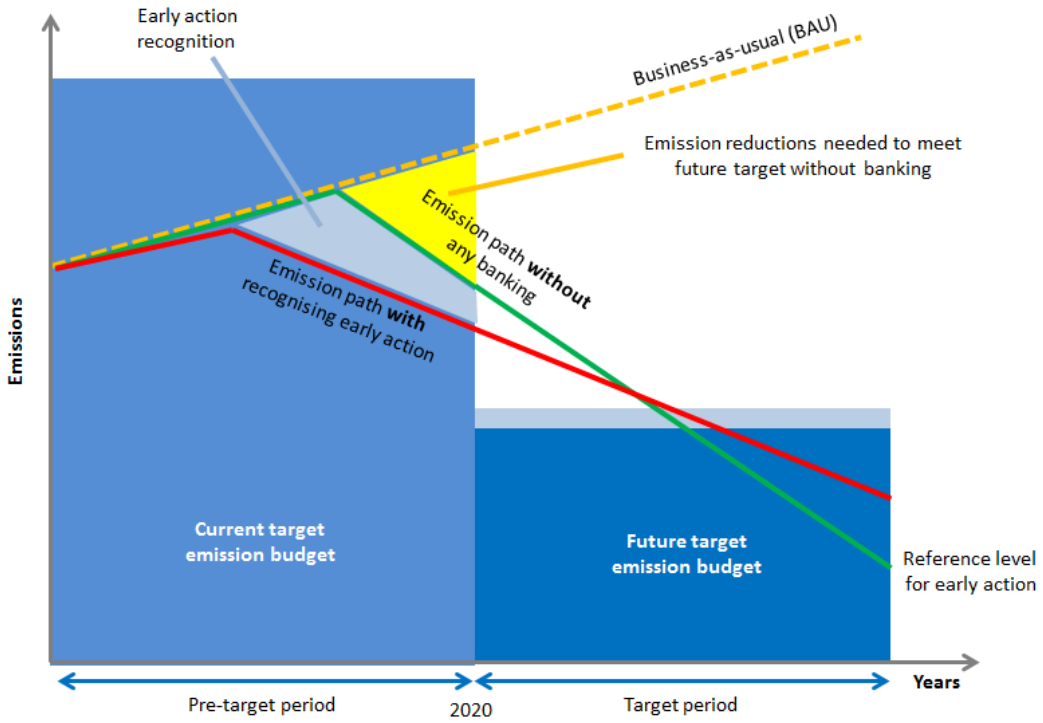

Figure 3. Recognition of early action for countries with current international targets above BAU emissions

2.2.9 What are the implications of using credits for or beyond compliance?

In Figure 2, we assumed that early action credits are used for compliance to meet the future international target. However, countries may alternatively wish to use early action credits beyond compliance, for example for enhancing ambition through voluntary cancellation. Using credits for or beyond compliance has different implications on cumulative GHG emissions: assuming that one credit represents one tonne of additional emission reductions, the use of credits for compliance has no impact on cumulative emissions, whereas the use beyond compliance leads to emission reductions beyond international targets. Emissions can be reduced beyond international targets also in the case of compliance use when one credit is used to account for fewer emissions than the actual emission reductions associated with that credit. Conversly, if emission reductions from early action are overestimated, the use of early action credits for compliance undermines the ambition of international targets by leading to higher cumulative emissions. The use of early action credits beyond compliance does not involve such a risk.

Thus, whether cumulative emissions stay the same, decrease or increase, compared to a situation where early action is not credited, depends on (1) whether

one credit represents one tonne of additional emission reductions, or more or fewer reductions; and (2) whether credits are used for or beyond compliance. The risk of higher cumulative emissions due to compliance use of early action credits is the main threat to the environmental integrity of crediting early action and thus warrants close scrutiny.

In analogy to crediting mechanisms, this issue relates to the use of credits for compliance under the Kyoto Protocol or beyond compliance, for example through the voluntary cancellation of credits to enhance ambition.

2.3 Mitigation targets under UNFCCC

Crediting early action implies that countries have an international mitigation target in future years. Under the current international climate regime, countries have different types of international targets.

Developing country Parties to the Kyoto Protocol have binding, absolute, economy-wide, multi-year commitments covering a basket of GHGs. The first commitment period covered the period from 2008 to 2012, and included countries that accounted for around a quarter of global GHG emissions in 2010. Thirty-seven countries, representing less than 15% of global GHG emissions, have targets under the second commitment period of the Kyoto Protocol covering the period 2013 to 2020 (Morel and Shishlov 2014).

Under the Cancun Agreements, over ninety Parties, including developed and developing countries representing 86% of global carbon dioxide emissions, have made voluntary pledges to contribute to mitigation by 2020. Of these, fifty-eight Parties have made economy-wide pledges for 2020, covering about 75% of the global carbon dioxide emissions in 2010 (UNEP 2014). Unlike the commitments under the Kyoto Protocol, these Cancun Pledges are voluntary rather than binding in nature, and they are diverse rather than identical in scope and form.

As for international climate policy from 2020, a new global agreement is to be adopted by December 2015 and countries are currently in the process of preparing Intended Nationally Determined Contributions" (INDCs) which specify their (intended) mitigation contributions for a target period starting from 2020. These contributions, together with supplementary upfront information, are to be submitted ahead of the adoption of the new agreement. In the context of this study, these contributions represent the ”future international targets”, and the ”target period” refers to the initial target period under this new agreement, expected to start from 2020 (not yet agreed).

In general, targets concerning climate change mitigation can differ with regard to several aspects, including:

- **Time frame:** Continuous multi-year targets are applied under the two commitment periods of the Kyoto Protocol, whereas single-year pledges were made under the Cancun Agreements;

- **Scope:** Commitments under the Kyoto Protocol and many Cancun Pledges are economy-wide, whereas some Cancun Pledges were made with regard to sectors, policies or projects;
- **Greenhouse gases:** Commitments under the Kyoto Protocol targets and many Cancun Pledges cover a basket of six or seven greenhouse gases, whereas some Cancun Pledges refer only to CO_2 or do not specify the gases;
- **Absolute versus intensity targets:** Commitments under the Kyoto Protocol are expressed as absolute amounts of emission budgets whereas some Cancun Pledges were expressed as intensity targets (e.g. per gross domestic product).
- **Reference year:** All commitments under the Kyoto Protocol are expressed relative to a historical reference year, whereas developing countries' Cancun Pledges were defined as a deviation from BAU and many pledges are indeed expressed relative to future BAU emissions in a future reference year (mostly 2020).
- **Quantification:** Under the Cancun Agreements, some mitigation pledges for sectors, policies or projects are quantified, whereas others are not;
- **Accounting framework:** Under the Kyoto Protocol, accounting rules are specified, whereas accounting rules, including key metrics such as Global Warming Potential (GWP), do not (yet) exist for Cancun Pledges and international targets under the new global climate agreement.
- **Legal nature:** commitments under the Kyoto Protocol are legally binding, whereas Cancun Pledges are not. The legal nature of targets under the new global climate agreement is not yet determined.

The diversity of current mitigation pledges, and discontinuities between the current Kyoto commitments and Cancun Pledges and the new post-2020 regime, raise a number of questions with regard to crediting early action in the context of a new global climate agreement: (How) should the Cancun Pledges and international targets, as well as voluntary national targets outside the scope of UNFCCC, be reflected in crediting early action? (How) should crediting early action be considered in the context of quantified and non-quantified pledges or contributions at sectoral-, policy-, or project-level? Could Kyoto units that are not used for compliance (i.e. units representing over-achievement of Kyoto commitments) classify as early action credits in the context of the new global climate agreement?

In a submission to the UNFCCC, Brazil has suggested that "international recognition of early action would greatly contribute to closing the ambition gap before 2020, while facilitating the fulfillment of Parties commitments after 2020". Specifically, Brazil proposes the recognition of quantifiable, additional emission reductions achieved before 2020 by allowing use of such reductions for compliance under the new global climate agreement (Government of Brazil 2013). Brazil proposed several early mitigation actions to be eligible for such use, including:

- Additional quantified emission reductions from Nationally Appropriate Mitigation Actions (NAMAs) communicated to the UNFCCC by developing country Parties from policies taken as of 2009; and

Voluntary cancellation of Kyoto units, namely Assigned Amount Units (AAUs), Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs), should also be accounted for under the new global climate agreement, for the purpose of (1) increasing ambition of commitments under the Kyoto Protocol's second commitment period; and (2) achieving international targets through early action under the new global climate agreement.

2.4 Relevant provisions under the Kyoto Protocol

The Kyoto Protocol does not allow industrialised countries to credit domestic mitigation action taken prior to the start of the first commitment period; domestic emission reductions achieved up to 2007 cannot be banked or otherwise recognised towards compliance with commitments which started in 2008. Banking of eligible greenhouse gas units from one commitment period to the next is allowed, subject to certain restrictions.

The Protocol required Parties to make "demonstrable progress" by 2005, to ensure that Parties get on track towards achieving their international commitments under the Kyoto Protocol. In the international negotiations, some countries, including Sweden, argued for a head start on the first commitment period, with the view to providing additional incentives for early mitigation action, which, however, was not agreed in the final accounting rules.

Note that the use of the year 1990 as the main reference year for Kyoto Protocol's commitments, against which emissions are to be reduced during the commitment period, implicitly allows countries to benefit from reductions in emission *levels* that occurred in the period 1991 to 2007. Note that this does not imply crediting of the *cumulative* emission reductions occurring during pre-commitment-period years.

Under Joint Implementation (JI), projects may be implemented before the start of the first commitment period but Emission Reduction Units (ERUs) are only granted for reductions occurring during the first commitment period. Some countries – Bulgaria, Czech Republic, Poland, Romania and Ukraine – established schemes which granted AAUs to project developers for reductions prior to 1 January 2008, with the view to incentivising early mitigation action and enhancing the attractiveness of JI (Shishlov et al. 2012). This way of incentivising early mitigation action has no impact on cumulative GHG emissions, since the units to account for early action are taken from the AAU budget of the first commitment period. However, this approach is mainly attractive to countries with an AAU surplus in the first commitment period or where projects have significant co-benefits.

Under the CDM, Parties agreed to a prompt start and allowed crediting of emission reductions that were generated from 1 January 2000 onwards. The

prompt start of the CDM provided incentives for an early development of CDM projects; 863 registered CDM projects have a crediting period starting before 1 January 2008 (UNEP DTU 2014).

3 Options for crediting early action

In this chapter, we identify and evaluate different options for principles and rules governing the crediting for early action. This chapter provides a more technical analysis of issues and options, with the view to synthesise the findings from our analysis in Chapter 4.

We first introduce different levels and scopes for crediting early action (section 3.1), which are important for a discussion of which actions should be eligible for crediting (section 3.2) and the identification and assessment of options for eligibility criteria and quantifying emission reductions for different levels and scopes of crediting (section 3.3). We then further explore timing issues (section 3.4), the situation of monitored emissions exceeding reference levels (section 3.5), international transfers of early action credits (section 3.6), and international governance arrangements (section 3.7).

In evaluating options, we consider mainly three aspects:

- **Incentives:** the ability to provide incentives for early action;
- **Environmental integrity:** the impacts on cumulative GHG emissions;
- **Practicability:** the practical feasibility of the approach.

3.1 Crediting early action at different levels and scopes

Crediting early action can occur at various levels. We explore four different levels for crediting early action:

- **Economy-wide emissions:** Emission reductions from early action are credited by establishing an economy-wide reference level, measuring economy-wide emissions and crediting observed reductions in emissions compared to the reference level.
- **Sector-wide emissions:** Emission reductions from early action are credited in one or several selected sectors by establishing sector-wide reference levels, measuring sector-wide emissions and crediting observed reductions in emissions compared to the sector-wide reference level, possibly adjusted for cross-sectoral emission effects.
- **Mitigation policies:** Emission reductions from early action are credited for specific mitigation policies. This requires defining which policies should be eligible for crediting and quantifying the mitigation outcome from the policies. Emission reductions could be either quantified by establishing a policy-specific reference level and monitoring actual emissions or by directly modelling or monitoring the emission reductions attributed to the policy in question.

- **Mitigation projects and programmes:** Emission reductions from early action are credited for specific mitigation projects or programmes. This requires defining which projects or programme should be eligible for crediting and quantifying the mitigation outcome from the projects. Emission reductions could be either quantified by establishing a project/programme-specific reference level and monitoring actual emissions or by directly modelling or monitoring the emission reductions attributed to the project or programme in question.

The level at which early action is credited has implications on whether establishing eligibility for crediting is a relevant issue and on how emission reductions can be quantified (Table 2). Which actions should be eligible for crediting is one of the key questions in pursuing crediting for early action. When crediting at policy-, project- or programme-level, this question can be addressed through criteria that determine which actions are eligible for crediting in which context (eligibility criteria). When crediting at economy- and sector-wide level, the eligibility of actions is reflected in the determination of the reference level, i.e. which actions are included or excluded when determining the reference level.

With regard to quantification of emission reductions, comparing the reference level with monitored emissions can be a suitable approach for all four levels of crediting. For crediting at policy-, project- or programme-level, direct monitoring or modelling of emission reductions can be more accurate or easier, depending on the type of policy, project or programme. Finally, indirect emission effects, such as cross-sectoral or cross-policy effects or other leakage effects, can be relevant for crediting at sectoral, policy-, project-, and programme-level. At economy-wide level, indirect emission effects are mostly relevant in the context of international trade which is not considered in GHG inventories under UNFCCC. For all four levels, emission reductions of one or more greenhouse gases could be eligible for crediting.

Table 2. Implications of different levels of crediting early action

<table>
<tr><th></th><th>Economy-wide</th><th>Sector-wide</th><th>Policies</th><th>Projects or Programmes</th></tr>
<tr><td>Eligibility criteria</td><td colspan="2">Not relevant</td><td colspan="2">Relevant</td></tr>
<tr><td>Quantification of emission reductions</td><td colspan="2">Comparing a reference level with actual emissions</td><td colspan="2">1) Comparing a reference level with actual emissions; or
2) Direct modelling or monitoring of emission reductions</td></tr>
<tr><td>Indirect emission effects</td><td>Rarely relevant</td><td colspan="3">Relevant</td></tr>
</table>

Another important dimension is how the scope for crediting early action relates to the scope of the future international target. The scope could vary with regard to

the geographical area, the type of installations, emission sources or sectors of the economy, and the GHGs considered. The following configurations are possible:

- **The scope of crediting early action is outside the scope of the future international target**, e.g. early action is credited at programme-level for CH_4 reductions, whereas the country has an economy-wide future international target for CO_2 emissions;
- **The scope of crediting early action and the scope of the future international target are the same**, e.g. early action is credited at economy-wide level and the country has an economy-wide future international target, both including the same GHGs;
- **The scope of crediting early action is narrower than the scope of the future international target**, e.g. early action is credited at policy level, whereas the country has an economy-wide future international target;
- **The scope of crediting early action is broader than the scope of the future international target**, e.g. early action is credited at sector level for both CO_2 and CH_4 emissions, whereas the country has an future international target for the same sector but only addressing CO_2 emissions;
- **The scope of crediting early action is narrower with regard to one aspect but broader with regard to another aspect compared to the scope of the future international target**, e.g. early action is credited at policy level addressing both CO_2 and CH_4 emissions, whereas the country has an economy-wide future international target for CO_2 emissions only.

The relation of the scope of crediting early action and the scope of the future international target can have implications on both the eligibility of actions and the quantification of emission reductions (Fuessler et al 2014). For example, if the scope of early action is outside the scope of the future international target, the early action does not, by definition, contribute to achieving the future international target, and consequently the future international target does not impact eligibility criteria or reference levels. We therefore differentiate in the further analysis between the potential configurations with regard to the scopes of crediting early action and the future international target.

In the absence of information on the scope of the future international targets (in the form of Intended Nationally Determined Contributions, INDCs) under the new global climate agreement, the existing Cancun Pledges can serve as helpful proxies for anticipating the scope of countries' future international targets. It seems plausible to assume that the scope of a country's future international target would not be narrower than their Cancun Pledge (if they have one). The Cancun Pledge may also, at least in the case of economy-wide pledges, be used as a proxy of the maximum emission level that the country aims to achieve by the start of the target period in order to be on track to achieve its future international target.

3.2 Which actions should be eligible for crediting?

Which mitigation actions should be eligible for crediting is a cross-cutting theme applicable to all four levels of crediting early action: at economy-wide and sector-wide level, this question relates to which actions should be included or excluded in setting the reference level. At policy-, project- or programme-level, this question relates to whether a specific policy, project or programme should be deemed eligible for crediting.

As pointed out in section 2.2.2, the eligibility of actions for crediting relates to whether, and to what extent, a country would, in order to achieve its future international target, need to start reducing its emissions prior to the target years (green line in Figure 2). If the scope for crediting early action is different from that of the future international target, in principle, all actions could be eligible, as long as their additionality could be demonstrated and the emission reductions can be attributed to the actions taken and be quantified with reasonable certainty. If the scope of crediting early action and the future international target overlap, the question arises whether some actions would be undertaken in order to achieve the future international target.

In principle, one could argue that a country has no direct incentives to reduce emissions early, if pre-target year reductions cannot be internationally recognised and used for complying with its future international target. Delaying emission reductions could save costs for complying with the future international target. However, countries could also have incentives to implement mitigation policies early on, for several reasons (Kennedy 2002; Michaelowa and Rolfe 2001), for example:

- Investing in less GHG intensive technologies during the course of normal capital stock turnover can be more cost-effective than implementing retrofit measures later on or decommissioning plants before the end of their technical lifetime;
- Early technological innovation and adoption can reduce the compliance costs later on and lead to positive spill-over effects;
- Some GHG abatement opportunities could have negative costs, such as energy efficiency measures;
- Some GHG abatement opportunities could have co-benefits, such as reduced air pollution, and thus reduce social costs;
- Allowing learning can reduce transaction costs in the future compliance period, such as learning by entities from a pilot ETS phase. In some cases, the savings of transaction costs due to learning could exceed the additional mitigation costs from early action (Pan and Van Regemorter 2004);
- Reducing emission abruptly, for example by shutting down plants, could lead to capacity constraints and may cause economic disruptions.

However, there are also barriers that may prevent or undermine the implementation of even attractive courses of action, and these barriers may be context-specific (e.g. country-, sector-, or project-specific) (IEA 2013, New Climate Economy 2014).

Three important issues arise from this. First, some policies which reduce GHG emissions are driven by policy objectives other than addressing climate change, such as economic growth, diversification of the economy, safety and human health. This holds, for example, for air pollution regulations, safety regulations or some energy efficiency standards (Schneider et al 2014). Some of these policies may be implemented anyway by the country, with or without a future emissions target, and with or without the possibility of crediting early action.

Second, adopting some mitigation policies prior to the target years could, depending on the context, be economically efficient or necessary in order to meet the future international target. Some countries may set their targets in a way that does not require mitigation in the pre-target years while others may set their future international targets in ways that require pre-target period mitigation compared to BAU. Target-setting is influenced by various factors such as political priorities and national mitigation potential which, in turn, is influenced by the country's economy, geography and also temporal dimensions such as age of capital stock and timing of new investments. Many countries who put forward pledges under the Cancun Agreements are already testing and implementing national policies, such as carbon pricing mechanisms, with the aim to deviate from their BAU emissions by 2020. They are doing so without certainty of how these mitigation actions are recognised internationally and whether they would be considered eligible for crediting in pre-target years. Similarly, many Annex I Parties to the Kyoto Protocol started reducing emissions well before the first commitment period, without the possibility of crediting early action, and have continued to reduce their emissions beyond their international commitmentes without certainty of whether and how such over-achievement will be recognised by the international community. However, some countries may also choose to implement mitigation actions in a manner that emissions are only reduced upon the start of the target period. For example, regulations could become only effective on the start date of the future target period or the planning and commissioning of large zero-emitting power plants could be timed in a way to reduce emissions as of the start date of the target period.

And third, these considerations also confirm that the concept of BAU emissions is not clear-cut but subject to assumptions and normative choices. For example, mitigation policies driven by policy objectives other than climate could or could not be included in BAU emissions. In this regard, projections of BAU emissions are could vary considerably, depending on the assumptions and choices made.

These three issues pose challenges for the objective of ensuring robust crediting for early action. Crediting emission reductions from *all* actions taken before the target years would set the broadest incentive to take early action, effectively extending the incentives for mitigation from the target period to the pre-target

period and reducing perverse incentives to postpone action until the target period. It would recognise the efforts of, and reward those countries which may have adopted national mitigation targets and started early to reduce emissions, independent of the progress in the international climate regime. But it could also have adverse consequences: it could imply that some mitigation actions are credited which would be implemented anyway, either to achieve other policy objectives or to get emissions on track towards meeting the future international target. This could generate "non-additional" emission entitlements which enable countries to mitigate less during the target period. The impact on cumulative GHG emissions could turn out to be negative, i.e. resulting in higher cumulative emissions, compared to a situation where early action is not credited.

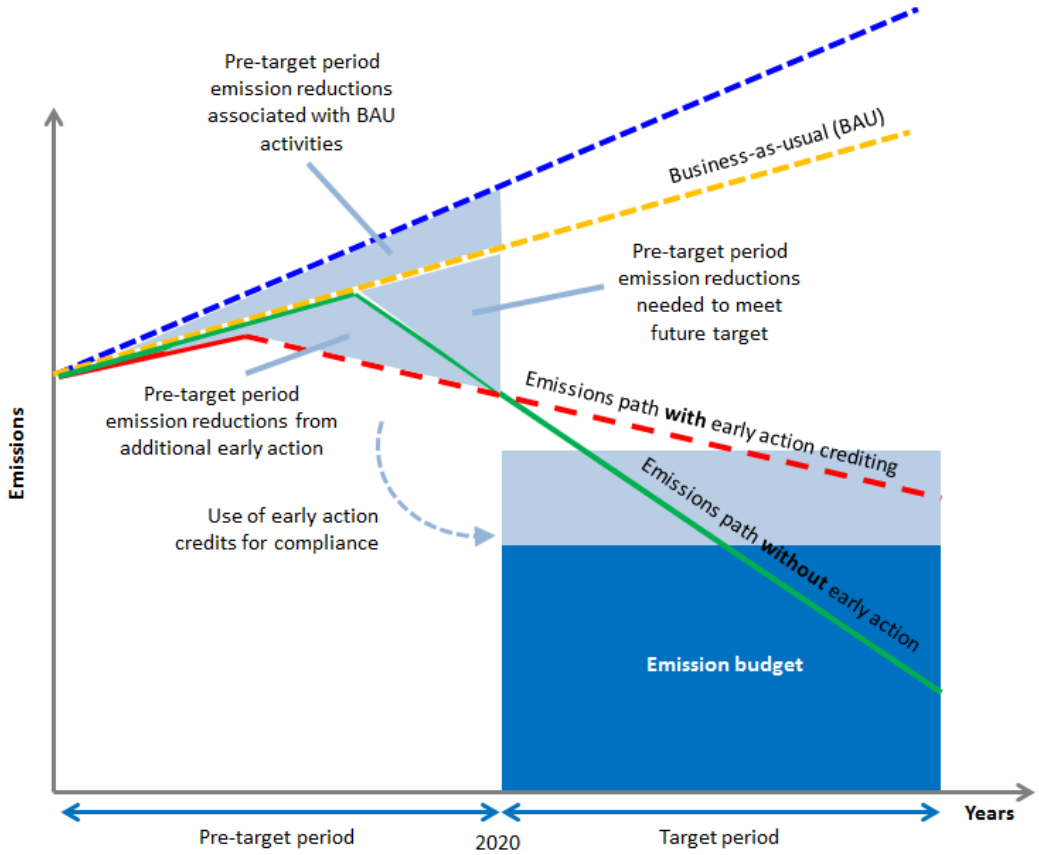

Figure 4. Possible implications of crediting all mitigation actions in pre-target years

This case is illustrated in Figure 4. In the figure, we define BAU emissions as the emissions that would occur in the absence of the future international target. We assume that some mitigation policies which are driven by policy objectives other than climate change would be implemented anyhow and are thus reflected in the BAU emissions scenario. Accordingly, the emissions path without any mitigation policies would be higher (blue broken line). If *all* mitigation policies (here we mean all policies that lead to lower emissions, including policies which have co-benefits) were credited, the emission reductions between the blue line and the red

line (light blue area) could be used for compliance in the target period, allowing the country to follow a higher emissions path over the entire period considered (red broken line), thus leading to higher cumulative emissions, compared to the situation where early action would not be credited (green line). In the following section, we discuss different options to address this issue for all four potential levels of crediting, together with other aspects of quantifying emission reductions.

3.3 Options for establishing eligibility and quantifying emission reductions

3.3.1 Economy-wide emissions

When crediting emission reductions from early action at economy-wide level, credits are issued for the difference between an economy-wide reference level and observed economy-wide emissions.

Establishing an appropriate economy-wide reference level for pre-target years raises several issues. First, as pointed out in section 3.2 above, the emissions path a country would follow in pre-target years to achieve its future international target without the possibility to credit early action depends on which mitigation policies the country would implemented anyhow to pursue other policy objectives and the extent of mitigation (if any) required to achieve the future international target. Countries could be encouraged to provide information on the parameters and underlying assumptions of target-setting, including planned policies and anticipated emission pathway(s) for achieving the future international target, covering also pre-target years, in order to understand to extent the implementation of policies in pre-target years is foreseen or necessary to achieve the future international target. This could facilitate the establishment of transparent and robust reference levels.

Second, an important challenge is addressing the inherent uncertainty associated with emission projections. Economy-wide emissions are not only impacted by mitigation action but also by exogenous factors, such as economic growth, climatic conditions, international fuel prices, or technological developments. An emissions projection is, by nature, a hypothetical emission pathway based on a set of assumptions rather than an attempt to accurately predict the future. An unexpected recession could reduce GHG emissions far below anticipated levels, as experienced in Europe following the financial crisis. In countries with a large share of hydro power, precipitation can strongly influence emissions. In the United States, the availability of shell gas has led to considerable emission reductions. A technology break-through, such as strong cost reductions of photovoltaic, can significantly alter the future emissions profile of a country or sector. Establishing an emissions reference level is thus associated with considerable uncertainty.

This challenge becomes particularly apparent if the emission reductions resulting from early action are small compared to the uncertainty of future emissions as a result of exogenous factors, as illustrated in Figure 5 and Figure 6. In this case,

the impact of exogenous factors on future emissions could exceed the impact of additional early action being initiated due to the possibility to credit such action. Establishing baselines under uncertainty has been discussed under the CDM and large uncertainties in relation to the mitigation outcome are also referred to as "signal-to-noise-problem" (Schneider et al 2014), where, in our case, the signal is the additional mitigation outcome due the possibility of crediting early action and the noise is the uncertainty associated with the reference level. If the emission reductions turn out to be larger in both the reference case (broken green line in Figure 5) and the early action case (broken red line Figure 5) due to exogenous factors, then crediting against a pre-determined reference level (green line Figure 5) would lead to over-crediting of early action. If the emission reductions are smaller in both the reference case (broken green line in Figure 6) and the early action case (broken red line in Figure 6), the country would receive less credits than actual emission reductions achieved from early action.[3]

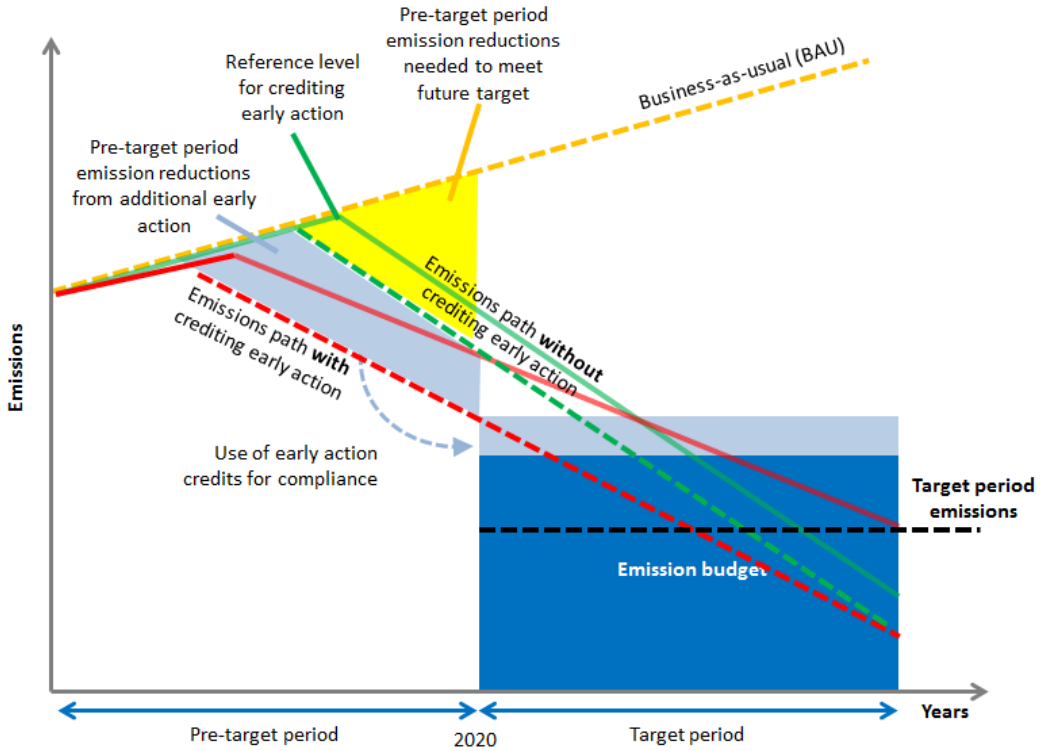

Figure 5. Impact of uncertainty when the reference level is overestimated

[3] Note that in the figure in this case the country would also not meet its international target domestically and would thus need to purchase units from other countries.

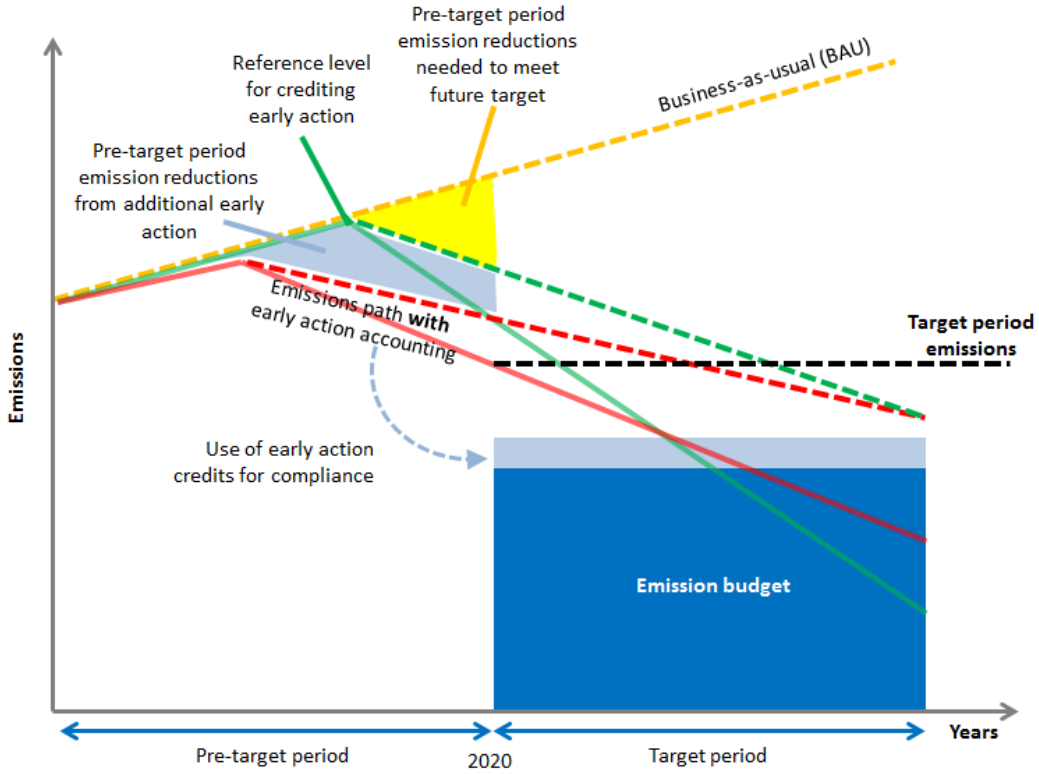

Figure 6. Impact of uncertainty when the reference level was underestimated

One way of mitigating uncertainty in setting the reference level could be the use of intensity (or indexed) reference levels where the approach to calculate the reference level is established *ex ante* but the actual value of the reference level in terms of tonnes of emissions is determined *ex post* through monitoring (Schneider et al 2014). This approach is common in project-based crediting mechanisms. A simple example is expressing the reference level as emissions per gross domestic product (GDP). A more sophisticated approach could be using several indexes which reflect the main drivers for emissions (Schneider and Cames 2009). For example, the reference level could be established for each year as a function of the observed GDP growth, international fuel prices, and climate conditions. While these approaches clearly add complexity, they could partially address the "signal-to-noise-problem" described above.

Conservative assumptions could be another way of mitigating the uncertainty of reference levels, similar to approaches used in crediting mechanisms (Schneider et al 2014). Conservative assumptions tend to under-estimate rather than over-estimate reference levels. They provide a higher confidence that no "over-crediting" occurs but also reduce the incentives for early action which could lead to missed mitigation opportunities and reduce cost-efficiency. Hence, in choosing the degree of conservativeness, a reasonable balance needs to be struck, taking into account the scale of the uncertainties and the incentives for early action.

Third, further considerations are needed if countries intend to participate in international transfers of units. Purchasing or selling units from or to other countries could impact the pre-target year reduction path. Figure 7 illustrates this situation where a country is a net buyer of units in the target period. If a country plans to rely on international unit purchases to meet its international target, the use of international units during the target period could allow the country to follow a higher emissions path in pre-target years (black line) compared to the situation where no units were used (green line), assuming that achievement of the international target requires mitigation already in the pre-target years. This could be reflected in setting reference levels if countries have approved plans for purchasing international units and using them in the context of their international targets. A more complex case is where the exchange of units is driven by markets, for example, if emissions trading schemes between two countries are linked, and hence the extent to which units are used becomes only apparent *ex post*. Reflecting international purchase of units in the reference level could also be more difficult when countries purchase international units as a buffer to meet an international target with a higher confidence, rather than as a substitute for domestic mitigation action. In this case, the units may be voluntarily cancelled or banked into future target periods if the international target is met with domestic policies.

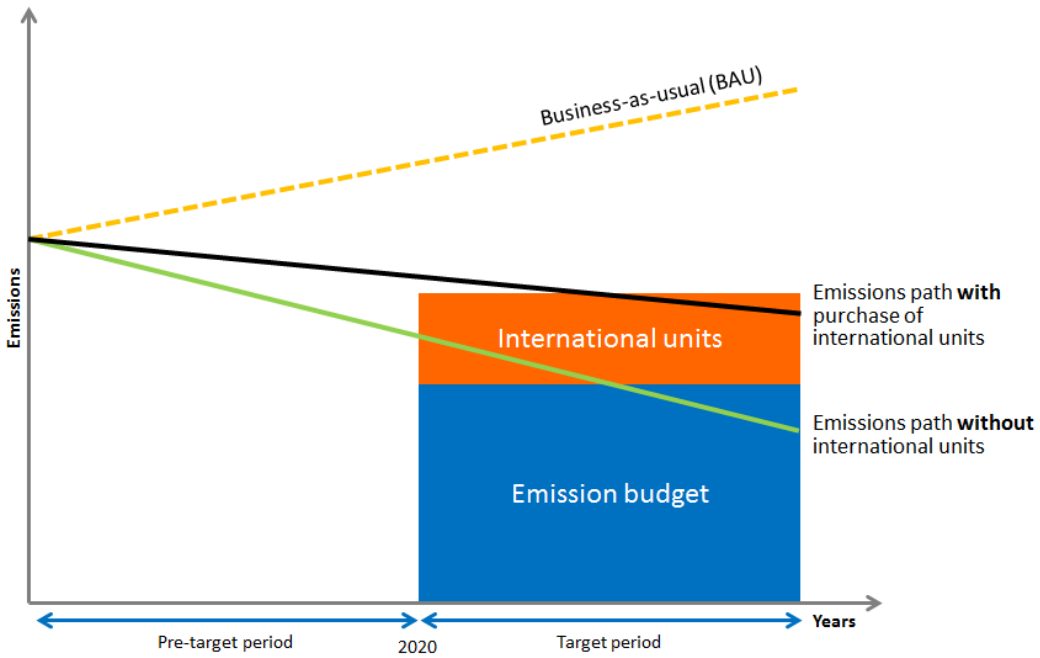

Figure 7. Impacts of using international units on the pre-target year reduction path

We explore three approaches that could be used to establish reference levels:

- **Economic modelling** could be used to determine the economically most efficient reduction path to meet a future international target without the possibility of crediting early action and using the credits for compliance.

- **Emission projections** by the country based on implemented and planned policies, similar to projections used in national communications submitted to the UNFCCC, could be used to derive a plausible emissions path.
- **Linear interpolation** between current emissions and the future international target could be another approach to derive an emissions path. A similar approach was used in deriving the 2013-2020 emissions budget for the second commitment period of the Kyoto Protocol based on the mitigation pledges made for 2020.

All three approaches have some merits and shortcomings. Economic modelling could be used to identify the most cost-efficient emissions path to achieve a future international target as reference level. This approach could be particularly useful where countries mainly use market-based instruments as mitigation policies, such carbon taxes or an early implementation of an emissions trading scheme. Economic modelling could also enhance comparability of reference levels between countries if the same models and assumptions are applied consistently across countries. However, economic modelling is subject to considerable uncertainties due to model characteristics and assumptions. The results from economic modelling heavily depend on assumptions on economic growth, future international fuel prices, the rate of technological innovation, among others. The economic models and assumptions could be difficult to validate when reviewing a proposed reference level, creating risks that countries use model assumptions that tend to overestimate the reference level. Another drawback is that this approach implicitly assumes that countries would take a cost-efficient reduction path. In practice, barriers often prevent using abatement opportunities with negative costs or political priorities can lead to market distortions (e.g. subsidies of fossil fuels). Economic modelling also requires significant capacity and knowledge; developing new models could be resource intensive.

Emission projections could take the specific circumstances and policies of a country into consideration if based on appropriate models. Emission projections could include different scenarios, including a BAU scenario, a scenario to achieve a future international target (i.e. the Cancun Pledge or an international target under the new global climate agreement), as well as scenarios under which early action is implemented. Where international targets are supported by emission scenarios, these could also be drawn upon when establishing the reference level. The scenario used to achieve the future international target could be used as reference level. Emission projections could appropriately reflect the impacts of existing and new policies. As with economic modelling, assumptions on economic growth, fuel prices and other parameters play an important role. A sensitivity analysis, varying key assumptions, could inform on the plausible range of the different scenarios and a reasonably conservative scenario could be selected as reference level, balancing environmental integrity and incentives for the country. Complex bottom-up models and country-specific assumptions could be difficult to validate, creating risks that countries use model assumptions that tend to overestimate the reference level. International review or third party assessment,

requirements for supporting information, and development and application of international guidelines for emission projections could mitigate this risk.

Linear interpolation between current emissions and a future international target is a simple and bold approach which avoids establishing a reference level based on subjective assumptions or complex models that are difficult to validate. It circumvents the problem that countries have incentives to propose inflated reference levels. The main shortcoming of this approach is that a linear reduction path may not reasonably reflect the most likely emissions path; it could lead to "over-crediting" for some countries and "under-crediting" for others. Policies take time to be formulated and implemented, and investments made as a result of these policies can have considerable lead times. Policies can lead to unlinear mitigation outcomes over time, with higher mitigation impacts observed in later years. In practice, the deviation from BAU emissions could thus be stronger in later years of the pre-target period than in early years, as indicated through the green line in Figure 2.

In conclusion, all three approaches have merits and shortcomings. Among the options, emissions projections may be best suited since they allow reflecting the specific cicumstances of the country. They could be informed by the future international target, historical emission trends and mitigation policies adopted and under consideration. To be robust, emission projections should err on the conservative side, that is, aim to ensure that any over-crediting is more than offset by under-crediting on the aggregate. Some "over-crediting" and "under-crediting" may be inevitable due to inherent uncertainty of predicting future scenarios.

Finally, to ensure robust crediting for early action, economy-wide emissions need to be monitored through GHG inventories and the overall emission reductions may need to be verified. Accurate GHG inventories are thus another important prerequisite for robust crediting of economy-wide or sector-wide early action. Countries wishing to credit for early mitigation would require to have in place a national system to monitor emissions and annually report GHG inventories to the UNFCCC, prepared in accordance with applicable IPCC Guidelines. Developed countries may support the establishment of such systems in developing countries. The GHG inventories may be reviewed, using existing review processes under UNFCCC, and emission reductions from early action may only be credited after successful resolution any issues identified during the expert review process.

3.3.2 Sector-wide emissions

When crediting sector-wide early action, emission reductions are determined as the difference between a sector-wide reference level and observed emissions in the sector, and possibly adjustments for cross-sectoral emission effects. With regard to the scope of the future international target, there are three contexts to consider: (1) crediting a sector that will, during the future target period, be part of an economy-wide international target, i.e. the scope of the crediting is more narrow than the scope of the future international target, (2) crediting a sector which is also subject to a future international sectoral target, i.e. the scope of

crediting and the future international target are the same, and (3) crediting a sector which is outside the scope of the future international target.

In principle, the issues identified for economy-wide emissions also apply to sector-wide crediting: Establishing an appropriate reference level is a key challenge, including the question whether and to what extent a country would deviate from BAU emissions in pre-target years in the sector. Addressing uncertainty of sectoral emissions and the implications of using international units are also important issues to address.

The use of a sector as scope for crediting brings up a number of further challenges. Sectors can be defined in several ways, including based on economic activities, such as the International Standard Industrial Classification of All Economic Activities (ISIC), based on categories used for reporting of GHG emissions under IPCC Guidelines and in Common Reporting Format (CRF) tables (e.g. "road transportation"), or based on where the mitigation measures implemented (e.g. households). However, mitigation action often impacts emissions from different sources which can be located upstream or downstream of the sector concerned. Cross-sectoral emission effects can be significant in some cases. For example, a policy promoting electric vehicles could reduce emissions in the CRF sector "Road transportation" but increase emissions in the CRF sector "Public heat and electricity production". In addition, the decrease in fuel consumption from "road transportation" and increase in fuel consumption from "Public heat and electricity production" would both impact emissions from fuel production which are reflected in various other CRF sectors, including "Coal mining and handling", "Oil", "Natural Gas", "Venting" and "Flaring". Considering emissions in one sector only can thus over- or under-estimate emission reductions from early action. To avoid this, cross-sectoral emission effects could be quantified, which, however, is not always straight-forward and could make crediting sector-wide mitigation action more complex in some cases. Some work on addressing cross-sectoral emission effects has already been carried out under CDM in the context of Programmes of Activities.

Sector-wide reference levels could, in principle, be established using the same approaches as discussed for economy-wide emissions – economic modelling, emissions projections, and linear interpolation – with similar merits and shortcomings. Performance benchmarks could be another alternative if a sector is defined in a way that it provides a homogenous product or service, such as clinker production or lighting (Prag and Briner 2012, Schneider et al 2014). Performance benchmarks could, for example, be established by assessing the performance of peers or identifying a reference technology.

How sectoral reference levels could be established also depends on the scope of the future international targets:

1. **Economy-wide targets:** In the case where a country has a future economy-wide target but intends to credit early action only in one or several sectors, it is not obvious how the different sectors contribute towards achieving the future economy-wide target. In practice, the country would need to break

down its economy-wide target into sectoral targets. The sectoral contribution to the economy-wide target could then be used as basis for setting a sectoral reference level. However, with this approach, countries could have incentives to inflate contributions of sectors not proposed for crediting and underestimate the contributions of sectors proposed for crediting, as this would result in higher reference levels. Over-crediting could then occur if sectors not proposed for crediting underperform and sectors proposed for crediting outperform compared to the initial estimate. Relevant information from the host country, such as technical and economic analysis, could facilitate assessing claims for mitigation contributions by sectors and sectoral reference levels. However, ultimately it is a policy choice which sectors contribute to achieving the future economy-wide target which could make it difficult to challenge such claims. Similar considerations hold for the use of international units (see Figure 7). If a country intends to use international units to meet a future economy-wide target, it could be difficult to assess the implications for the emissions path in a particular sector in pre-target years. Among the options discussed in section 3.3.1, linear interpolation would require breaking down the economy-wide target into sectoral contributions.

2. **Sector-level targets:** In the case where the country has a future sector-level target concerning the same sector, the future target could be used to inform the reference level, including assumptions on the extent to which (if any) pre-target period mitigation would be needed to achieve the future sector-level target in the absence of crediting early action. This case may be less relevant in practice, assuming that all countries that currently have economy-wide Cancun Pledges and/or Kyoto Protocol commitments (representing 75% of global CO_2 emissions in 2010) will have economy-wide targets also under the new global climate agreement.

3. **No target:** In the case where the sector is outside the scope of the future international target, the reference level could be set using general principles of conservativeness, taking into account relevant existing and planned policies in the sector.

Finally, as with economy-wide emissions, accurate information on sector-wide GHG emissions is another prerequisite for robust crediting for early action. In practice, this could for some sectors be more difficult than establishing economy-wide emissions, depending on the definition of the sector, the type of policies implemented to achieve early action, and the data available in the country. For example, if information on energy consumption is only available at aggregated levels, models and assumptions have to be used to break consumption down to economic sectors, or additional data need to be collected. Data availability could thus limit the possibility to credit early action for some sectors. As with economy-wide emissions, we countries wishing to credit early action may need to have in place a system to monitor emissions and annually report GHG inventories to the UNFCCC, followed by an international review process.

3.3.3 Mitigation action from policies

When crediting mitigation action from policies, two important questions arise: which policies should be eligible for crediting early action, and how can the mitigation outcome from policies can be quantified and attributed to a specific policy, in particular in the case of several overlapping policies?

As with crediting at sector-wide level, we consider three different contexts: (1) a policy which has a more narrow scope than the future international target, e.g. a policy addressing renewable energy and a future economy-wide target, (2) a policy which has the same scope as the future international target, e.g. both the policy and the future international target addressing renewable energy, and (3) a policy which addresses emissions that are outside the scope of the future international target, e.g. a policy addressing CH_4 emissions with a future international target for CO_2 emissions.

Which mitigation policies should be eligible for crediting?

In considering which mitigation policies should be eligible for crediting, three aspects are particularly important: First, as pointed out in #section 3.2, some mitigation policies can be driven by policy objectives other than climate change, and may be implemented anyway. In practice, developing methodologies for assessing whether a specific mitigation policy is introduced (or implemented earlier) due to an incentive – in this case the incentive from crediting the mitigation outcome – or whether it would also be implemented otherwise is inherently challenging, given the intrinsically political nature of policies. The decision-making process on policies is quite different than in the private sector. Whether or not a policy is adopted and implemented depends on many factors, including the power of different stakeholders in the country, public awareness on the issue, the capacity of implementing agencies, corruption, and other factors. This issue is relevant for all three contexts highlighted above.

Second, as pointed out in section 3.2, depending on the context, some countries may implement some mitigation policies before the target year period in order to achieve the future international target. This issue is relevant when the policy targets emissions which fall within the scope of the future international target. Whether a specific mitigation policy is deemed to contribute towards achieving the future international target or whether it is deemed to constitute (early) action beyond that, could be difficult to assess in practice. Information provided by the host country could facilitate this assessment. However, all applicable mitigation policies would need to be considered together to assess to what extent they contribute to reducing emissions from the BAU level (broken yellow line in Figure 2) to the emissions path the country would take without crediting early action (green line in Figure 2), or reducing emissions beyond that (i.e. below the green line and towards the red line in Figure 2). Crediting emission reductions from all new (or expansions of existing) climate policies that are implemented in the pre-target period is unlikely to be a robust and conservative approach (see Figure 4).

A third issue arising from crediting individual mitigation policies is that the overall net effect on mitigation is the result of both policies decreasing GHG emissions and policies increasing GHG emissions. If all policies reducing GHG emissions would be credited as early action, while policies increasing GHG emissions are not accounted for, the net mitigation outcome could be over-estimated compared to the BAU emissions path. This issue is relevant for all three contexts highlighted above.

We explore the following approaches to establish the eligibility of migitation policies for crediting:

1. **Cut-off date:** All policies adopted or implemented after a cut-off date could be regarded as eligible crediting. This approach was suggested by Brazil, with a cut-off date of 2009 (Government of Brazil 2013).

2. **Crediting only policies motivated by climate mitigation:** A bold approach could be crediting only those policies which are mainly or only implemented for the purpose of mitigating climate change and do not generate significant co-benefits. For example, a regulation requiring the destruction of HFC-23 emissions from HCFC-22 production or N_2O emissions from adipic or nitric acid production would be clearly motivated by addressing climate change, since the abatement of these gases involves costs but does not generate economic, social or environmental co-benefits. A country would thus not have incentives to introduce such policies other than mitigating climate change.

3. **Consideration of the aggregated impact of policies:** Another approach could be considering the impact, including in the pre-target period, of all mitigation policies in the host country in context with the view to identifying two "packages" of policies: one "ear-marked" package that together brings the country on a path towards meeting its future international target and a second package which would reduce emission reductions further and which may be implemented at a later stage (or not at all) in the absence of additional incentives. Policies in the first package could include policies that are a priority for the country while policies in the second package represent further early action potential identified by the host country beyond its pre-target-period plans. Policies identified in the second package could then be eligible for crediting early action. Countries could provide *ex-ante* information on opportunities to introduce or scale up mitigation earlier, subject to early action crediting, in addition to what is needed for achieving future international targets in the absence of early action crediting. For example, for countries that have made policy-level pledges under the Cancun Agreements, policies going beyond these pledges could be considered eligible for crediting.

In our assessment, the first approach does not seem sufficient on its own to safeguard environmental integrity. The implications of the first approach depend on when the cut-off date is set, and whether it applies to the date of adoption only or also to broader considerations such as extent of implementation and changes in policies. While this approach limits the policies qualifying as eligible, it does not address the issue that crediting for all policies after that date could lead to higher

cumulative emissions due to crediting emission reductions that would be required anyway to achieve the future international target (see Figure 4) in the context where the policy addresses emissions that fall within the scope of the future international target. Also, this approach would not, on its own, address the question of "additionality" as all policies after the cut-off date, including those motivated by other policy objectives than mitigating climate, would be eligible for crediting.

With regard to the second approach, context is important. One could argue that policies only implemented for the purpose of mitigating climate are more likely to be implemented due to the opportunity of crediting, compared to policies that generate significant co-benefits. For example, regulations addressing N_2O emissions from adipic production do not provide co-benefits and could be regarded as being motivated by addressing climate change. Hence, this approach may be feasible, if the scope of the policy does not overlap with the scope of the future international target and if emission reductions from the policy can be reasonably quantified. A disadvantage is that this approach would exclude a broad range of mitigation potential from crediting, including the promotion of renewable energy, energy efficiency or sustainable transportation. Excluding this potential could set perverse incentives to prioritise policies without co-benefits over policies with co-benefits, which could actually delay the long-term transformation of economies and lock in GHG intensive technologies.

The third approach could be further explored for the context where a policy addresses emissions that fall within the scope of the future international target. One challenge is that it is robust only if the first package of policies, identified as needed to achieve the future international target, is actually implemented and delivers the envisaged emission reductions. If these policies would (partially) not be implemented later on, then the second package of policies may contribute towards achieving the international target, rather than constituting early action. A robust crediting would thus require monitoring the implementation and mitigation outcome from both packages of policies. In such case, it may be simpler to establish an economy-wide reference level, based on the first package of policies, and to credit early action against an economy-wide reference level.

How could the mitigation outcome of policies be quantified?

To quantify the mitigation outcome from policies, a number of methodological approaches have been developed in the context national climate policies, nationally appropriate mitigation actions (NAMAs), life-cycle assessments (LCAs) and project-based crediting mechanisms, such as the CDM. Common approaches include, for example, bottom-up models developed for specific sectors (e.g. in the transport sector), economic models (e.g. to determine the effects of carbon pricing), surveys (e.g. to assess changes in the modal split), or monitoring of control groups (e.g. to determine uptake of efficient appliances without subsidies). Which approaches are most suitable depends on the specific features of the policy and sector.

Generally, quantifying the mitigation outcome from policies is possible and frequently applied in policy-making but quite demanding and associated with considerable uncertainties. Quantifying emission reductions can be straight-forward for some activities, such as policies targeting specific installations which otherwise do not have incentives to implement mitigation measures. In other sectors, quantification can pose challenges, for example:

- For many enabling policies it can be difficult to establishing a clear causal relationship between the policy and the mitigation outcome. For example, subsidies and economic incentives support the implementation of GHG reducing measures but may not always be decisive. Determining how many activities would also be implemented without the incentives can be methodologically challenging. For example, reduced interest rates for the energy efficient retrofit of buildings could increase the rate of such retrofits, but not all buildings may be retrofitted due to the incentive scheme.

- In some sectors, such as the transport sector, often several policies address the same target groups. Interaction between such policies can be difficult to estimate and quantify. For example, in the transport sector, the effect of changes in vehicle taxes, fuel taxes, speed limitations, subsidies to public transport, etc might be difficult to clearly distinguish.

As with economy-wide and sector-wide reductions, an international review process may be needed to ensure that robust methods are used to quantify the mitigation outcome and that their application is appropriate. Towards this end, processes for review and approval of methods used to quantify emission reductions may be established or existing multilaterally agreed methods could be used, such as CDM baseline and monitoring methodologies. Verification of emission outcomes could either follow international review processes or could be undertaken by accredited entities, such as Designated Operational Entities (DOEs) under the CDM or Accredited Independent Entities (AIEs) under JI.

3.3.4 Mitigation action from projects or programmes

When crediting mitigation action from projects or programmes, the same questions arise as for policies: which projects or programmes should be eligible for crediting, and how can the mitigation outcome be quantified?

In the case of projects or programmes we consider two different contexts: (1) a project or programme which has a more narrow scope than the future international target, e.g. a hydro power plant in the and a future sectoral target of the power sector, and (2) a project or programme which reduces emissions that are outside the scope of the future international target, e.g. a project or programme addressing CH_4 emissions with a future international target for CO_2 emissions.

Which mitigation projects should be eligible for crediting?

Under crediting mechanisms, the eligibility of projects is commonly established through additionality tests and/or eligible criteria, referred to as "applicability conditions" under the CDM. Such tests and criteria could also be used when

crediting projects for early action. If the incentives from crediting early action are passed on to the operators of the projects, e.g. through an crediting programme, such tests could, in principle, be used to assess whether a project is likely to be implemented anyway or only due to the incentives from crediting early action, noting the uncertainties and inherent difficulties with assessing additionality (Classen et al 2012; Erickson and Lazarus 2013). In conclusion, whether a project would be implemented due to incentives or not, seems more feasible to assess than for policies. This approach would be feasible and sufficient in the context where a project or programme which reduces emissions that are outside the scope of the future international target.

However, in the case of project or programmes that reduce emissions which fall within the sccope of the future international target, additionality tests and eligibility criteria do not address the question whether the project contributes to achieving the future international target: A truly additional project could either help the country getting on path towards meeting its future international target, moving from the yellow broken to the green line in Figure 2, or constitute additional early action, moving from the green to the red line in Figure 2. For a specific mitigation project, proposed for crediting, this would be difficult to assess.

How could the mitigation outcome of projects be quantified?

To quantify the mitigation outcome from projects, numerous baseline and monitoring methodologies have been developed, mainly under the CDM but also under other crediting mechanisms. These could be used to quantify the mitigation outcome from projects. Existing processes, such as validation and verification by DOEs could be drawn upon to ensure that they are applied correctly.

3.4 Timing issues

Several timing issues arise when crediting for early action. A first question is from when early action should be credited. For example, Brazil proposed that non-Annex I Parties can credit mitigation action as of 2009 towards commitments under a new global climate agreement (Government of Brazil 2013). Under the Kyoto Protocol, it was agreed in 1997 that early action from CDM projects can be credited as of 1 January 2008.

This question touches upon the dilemma pointed out earlier between the aim of providing incentives and ensuring environmentally robust crediting. Retroactively crediting mitigation action would reward countries that started action early. Another argument for choosing an early point in time is that formulating and implementing policies requires time, as does the planning and implementing investments in low GHG technologies. For example, planning and building new cement, steel or power plants can take several years. The impact of earlier policies is thus often much greater within a given pre-target period than for policies implemented later. In this context, it is important to define when an early mitigation is considered to be initiated – e.g. when the legislation is adopted or

when it becomes effective – and how subsequent changes (e.g. a change to legislation) are dealt with.

However, a decision to retroactively credit early action cannot incentivise further mitigation action in the past but only for the future; by definition, it concerns action that has happened even in the absence of certainty whether early action will be credited. Retroactively crediting early action could therefore pose significant risks for environmental integrity, in particular if it would involve large amounts of non-additional credits which would enable postponing further mitigation action.

A second timing question is related to the process for reporting and review of information supporting claims for crediting early action. As a first step, countries would need to decide on and notify the UNFCCC about their intention to credit early action. The decision by a country to seek crediting early action could either be part of its international target under a new global climate agreement, or countries could notify the UNFCCC thereafter, possibly within a specified timeframe. As a second step, or together with the first step, countries would need to submit documentation supporting the claims for early action to the UNFCC, if the process for establishing reference levels and quantifying emission reductions is country-specific and country-driven. If proposals for reference levels are internationally reviewed, this process may require additional time. In such case, early action could be credited either after the completion of the review process or after the initial notification by the Party. The latter may be more appropriate since the Party could initiate further mitigation action even if the review process has not yet been finalised.

Finally, a third question is the duration and continuity of crediting early action. Crediting early action for a continuous period up to the start of the initial future international target period under the new global climate agreement (expected to be 1 January 2020) seems a more robust approach than crediting single years.

3.5 Emissions exceeding reference levels

To quantify emission reductions from early action, monitored emissions can be compared with a reference level. Monitored emissions usually vary over time, e.g. due to changes in economic activity or environmental conditions; they could fall below the reference level in some years, and exceed the reference level in other years. This raises the question as to how emissions exceeding the reference level should be dealt with.

We consider two options:

- **Annual balance:** The monitored emissions are compared to the reference level in each year of the pre-target period for which early action is credited. If the monitored emissions fall below the reference level, credits are issued for the difference between the reference level and the monitored emissions; if the monitored emissions exceed the reference level, no credits are issued.

- **Balance over the entire pre-target period:** The cumulative monitored emissions over the entire pre-target period are compared to the cumulative emissions corresponding to the reference level. Credits are issued for the difference in cumulative emissions. No credits are issued if the cumulative monitored emissions exceed the cumulative reference level.

Environmentally, the balance over the entire pre-target period is more robust than the annual balance, as illustrated with the following example: Imagine a situation where the monitored emissions vary from year to year but cumulatively correspond to the reference level. If credits are issued on an annual basis, reductions in years of over-performance would be credited while emissions exceeding the reference level in years of under-performance would not be compensated for. Overall, credits would be issued although the country cumulatively does not reduce its emissions below the reference level. By contrast, no credits would be issued in this case under the approach that considers the balance over the entire pre-target period.

When balancing emission reductions over the entire pre-target period, different approaches could be taken towards the issuance of credits:

- First, credits could be issued only *ex post*, after the pre-target period, when data on monitored emissions is available for all years. This approach is applied under the Kyoto Protocol for Removal Units (RMUs) when countries choose to account them over the entire commitment period.

- Second, credits could be issued on an annual basis, and any underperformance could be compensated through the cancellation of credits or other units. This approach is a second option for accounting of RMUs under the Kyoto Protocol.

- Third, credits could be issued on an annual basis, and any under-performance in a particular year be deducted from the calculated emissions reductions in the subsequent year. The over-issuance in the previous year would then be compensated by issuing less credits in the subsequent year. This appraoch is applied under the CDM.

The first two approaches would fully compensate for any underperformance and ensure that credits are only issued for the net reduction below the reference level over the entire pre-target period. The third approach could potentially lead to some over-crediting if a country would over-perform in initial years and under-perform in later years of the pre-target period. The second and third approaches may provide larger incentives for early action than the first approach, since credits are issued at an earlier point in time.

To ensure robust crediting for early action, balancing emission reductions over the entire pre-target period for which early action is credited seems more approriate, if there is a risk that monitored emissions could exceed the reference level. In other cases, credits could be issued on an annual basis or even shorter intervals (as long as data to quantify emission reductions is available for shorter intervals).

Allowing annual issuance of credits would provide larger incentives for early action. Compensating for any temporary under-performance through cancellation of credits or other units seems an appropriate approach to ensure that no over-crediting occurs.

3.6 International transfers of early action credits

Enabling international transfer of early action credits could create additional demand, and thus incentives, for early action, since early action credits could be used not only by the host country but also by other countries. In principle, international transfer of early action credits and their use by a non-host country for or beyond compliance does not impact the issues identified and solutions proposed in this report. Therefore, the same rules and principles may apply when early action credits are transferred internationally. In the absence of any international framework for recognition of early action credits to address the issues identified in this study, buyer countries of international units may need consider the issues identified and solutions proposed in this report, to ensure that the purchase of international units leads to additional emission reductions (see also Lazarus et al 2014).

3.7 International governance arrangements

Our discussion on reference levels for early action showed that, while crediting early action can provide additional incentives for earlier and deeper mitigation action up to 2020, it can also pose risks for environmental integrity. If Parties decide to allow crediting early action, common rules and international oversight are thus important to ensure environmental integrity.

To promote consistency, transparency and environmental integrity, key principles and rules governing crediting early action could be agreed and coordinated at the international level, and international oversight be executed on the implementation of these principles and rules. The principles and rules may at least cover the possible level(s) of early action (e.g. economy-wide, sector-wide, policy-level and/or programme- and project-level), any eligibility criteria and principles governing the setting of reference levels, timing issues, as well as procedures and institutions for international oversight.

The further governance arrangements may depend, inter alia, on the principles governing the setting of reference levels. Simple approaches, such as the linear interpolation, could be addressed under existing processes, such as the submission and review of GHG inventories. If the establishment of reference levels is country-specific and country-driven, a process for international review of proposals submitted by countries could be required. The governance arrangements could be based on similar international processes under UNFCCC, such as the review, assessment and compliance mechanisms existing under the UNFCCC and the Kyoto Protocol.

4 Conclusions

Incentivising prompt mitigation action is a key objective pursued in the international climate negotiations to achieve the ultimate goal of avoiding dangerous climate change. Crediting emission reductions from early mitigation action – that is, action taken before the start of a target period under the new global climate agreement from 2020 – could be one of the means to provide additional incentives for prompt mitigation action. Whether and how early mitigation action should be credited is a challenging question. Our analysis showed that, while crediting early action could encourage more early emission reductions, it could also lead to higher cumulative emission paths and delayed action on climate change, depending on how and under which conditions crediting early action is implemented. In other words, crediting early action provides opportunities but also entails risks. If crediting early action is pursued, robust principles and rules for crediting are therefore essential to meet the objective of incentivising early mitigation action and avoiding higher cumulative emissions.

4.1 Which approaches for crediting seem best suited?

In Chapter 2 we identified key issues with crediting early action and discussed options to address them in Chapter 3. Key findings from the analysis include the the following:

- **Level and scope for crediting early action:**

  We assessed four potential levels for crediting: economy-wide emissions, sector-wide emissions, mitigation policies, and mitigation projects or programmes. We also identified that the scope for crediting early action is important, i.e. whether crediting early action addresses the same greenhouse gases, sectors, projects or emission sources as the future international target.

  We find that crediting early action is simpler if the scope for crediting is outside that of the future international target, e.g. if methane (CH_4) emissions are credited whereas the future international target only covers carbon dioxide (CO_2) emissions. In this case, the future international target has no impact on the pre-target emission levels. In other cases, meeting a future international target may, but does not necessarily, require reductions in emissions already in the pre-target period. Several issues arise if the scope for crediting is more narrow than that of the future international target, e.g. if specific sectors, policies, projects or programmes were credited in a host country with an economy-wide future international target. In this case, a specific sector, policy or project could be either used to get on path towards meeting the future economy-wide target (i.e. it corresponds to the "pre-target period mitigation to achieve the target" in Figure 2) or to achieve mitigation action beyond that (i.e. it corresponds to the "pre-target period mitigation due to additional early

action " in Figure 2). Moreover, the international transfer of units to meet the future international target could have implications on the pre-target year emissions path, and attributing the implications to specific sectors, policies, projects or programmes could be challenging. For these reasons, ensuring robust crediting seems most straightforward if the scope for crediting is outside of scope of the future international target and more complex if the scope of crediting is narrower than the scope of the future international target (see Figure 8).

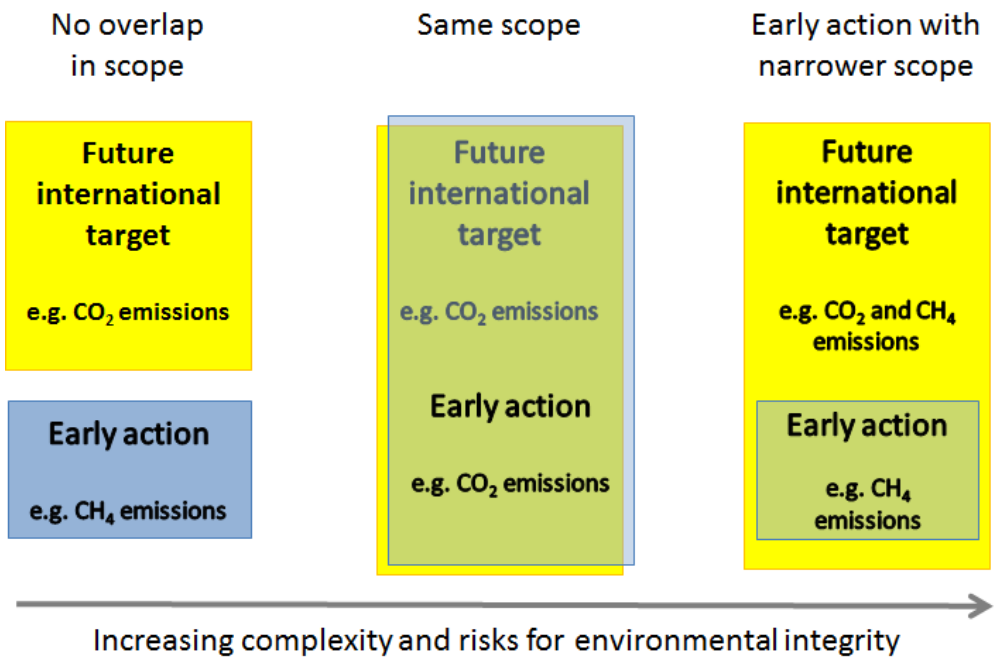

Figure 8. Complexity and risks for environmental integrity for different scopes of early action and the future international target

We further identify that establishing whether early action is taken due to the incentives from crediting seems more feasible for projects or programmes than for policies. The implementation of mitigation policies is a policy choice which can be motivated by policy objectives other than addressing climate change; assessing whether a specific mitigation policy is implemented due to incentives from crediting early mitigation action could be difficult for policies that generate co-benefits. Another finding is that quantifying emission reductions from policies and sectors could be challenging, due to cross-sectoral effects or interactions between policies.

Most countries have made economy-wide Cancun Pledges; these countries may also have economy-wide international targets under a new global climate agreement. Our findings suggest that, while setting reference levels for economy-wide emissions is also associated with challenges, in particular the

inherent uncertainty of any emission projections, these challenges may be easier to address than the issues identified with crediting early mitigation action at a more narrow scope than the future international target, such as sectors, policies or projects.

- **Quantification of emission reductions:**

  We find that the most suitable approaches to quantifying emission reductions depend on the level of crediting. To determine reference levels, emission projections informed by historical emission trends, the Cancun Plegdes, and international targets under a new global climate agreement seem the best suited approach. Transparent documentation of assumptions, approaches to address uncertainty, such as conservative assumptions in establishing reference levels or using intensity-based or indexed reference levels, as well as consideration of impacts of using international units are important to ensure robust reference levels. If crediting of sectors or policies is pursued, cross-sectoral effects and interlinkages between policies are issues that should be considered. Establishing greenhouse gas inventories is another important pre-requisite of crediting early action at economy-wide or sector-wide levels.

- **Timing issues:**

  The timing for crediting early action requires carefully balancing the incentives for early action and avoiding the crediting of actions that would have happened anyway. Retroactively crediting early action would reward countries that started action early but cannot, by definition, incentivise further action in the past. Processing proposals for early action may require time and it could be reasonable to start crediting before the process has been finalised. To ensure robust crediting, it seems important to credit early action for a continuous period up to 2020 and not for single years.

- **International transfers of early action credits:**

  Enabling international transfers of early action credits could provide additional incentives for such action. The same principles and rules should apply as for the domestic use of credits from early mitigation action.

- **International governance arrangements:**

  International oversight seems important to facilitate robust crediting. Internationally agreed principles and rules may at least cover the possible level(s) of early action, any eligibility criteria and principles governing the setting of reference levels, timing issues, as well as procedures and institutions for international oversight.

4.2 Using credits for or beyond compliance?

Early action credits could be used in two ways: for compliance, i.e. towards meeting the future international target, or beyond compliance, i.e. as a mitigation contribution beyond international targets. In principle, using credits for

compliance has no impact on cumulative GHG emissions if one credit corresponds to one additional tonne of reduction, whereas the use beyond compliance could further reduce GHG emissions.[4]

In this regard, using early action credits beyond compliance, e.g. by transferring them to a cancellation account, could be used to increase of ambition and close the pre-2020 ambition gap. An international instrument for recognition of such early action may provide incentives for countries to do so. For example, early action taken by countries could be registered under a mechanism or registry for recognition of early action. A formal recognition of early action beyond compliance would provide transparency on early mitigation actions by countries, including the quantification of associated emission reductions, and acknowledge the early action countries have taken. And importantly, several methodological challenges identified in this study are less relevant if the credits were used beyond compliance; wrongly establishing reference levels or over-estimating emission reductions would not have any consequences on cumulative emissions but only overestimate the efforts by countries. In this regard, a process for recognition of early action beyond compliance could facilitate closing the pre-2020 mitigation gap and could be an alternative route for incentivising early action. On the other hand, the possibility to use credits to meet the future international target may create stronger incentives to take early mitigation action, as this would attach more value to early action credits.

4.3 Which other factors are important?

Several other factors and assumptions can have an impact on the effectiveness of crediting early action. Ultimately, the implications of crediting early action on incentives and cumulative emissions will depend on how these underlying factors will play out and whether important assumptions will prove true. Understanding these factors and assumptions may be important in judging the opportunities and risks of crediting early action.

First, a common, internationally agreed framework for measurement, reporting and verification (MRV) and accounting is an important pre-requisite for robust crediting for early action. Crediting early action requires internationally agreed principles for the MRV and accounting of international targets, e.g. with regard to the quantification of GHG emissions and which gases and Global Warming Potentials (GWPs) are considered, as well as a framework for accounting international transfer of units, including early action credits, e.g. to avoid double counting of emission reductions. Crediting early action is also only robust if countries have continuous multi-year targets, rather than single-year targets (Lazarus et al. 2014).

[4] A reduction in GHG emissions could also be achieved through compliance use, if one credit corresponds to more reductions than what is accounted towards compliance. Conversely, if a credit corresponds to less fewer emission reductions than what is accounted towards compliance, GHG emissions could increase.

Second, an important underlying assumption for the effectiveness of crediting early action is how the incentives from crediting early action will play out in practice. The opportunity to credit early action could provide incentives for countries not to wait until the target period starts but to reduce emissions early on. It could solve the dilemma that countries may wait with reducing emissions in order to have less ambitious future international targets. Ideally, countries could be willing to adopt deeper international targets in the future if they have more flexibility on how and when to reduce GHG emissions in order to follow a more cost-effective emission path. If countries would, as a result of the possibility to credit early action, take deeper international targets in the future, using early action credits for compliance could potentially lead to cumulatively lower GHG emissions in the long term. On the other hand, there could be a risk that countries embrace crediting early action as an opportunity to credit actions they are implementing anyway, with the view to secure a larger emissions budget in the future. Once the possibility of crediting early action is established, even countries that were not promoting this option might use the opportunity, if they would otherwise see themselves in a disadvantage compared to countries which make use of excessive crediting. In the worst case, without robust rules and procedures, this could lead to a race to the bottom and delay climate action.

A third consideration is the extent to which international oversight will be able to effectively safeguard the environmental integrity of crediting early action. As highlighted in this study, crediting early action raises complex methodological questions which can be challenging to address. Information provided by host countries can facilitate robust crediting, although information asymmetry between host countries and those providing international oversight may be a challenge.

4.4 Further research

Finally, we identify several areas where further research could not only facilitate robust crediting early action but also be useful for other elements of the current and future climate regime:

- Any emissions projections are inherently associated with considerable uncertainties. A great variety of methodological approaches have been developed by countries and researchers to model emissions under various scenarios and assumptions. We see value in drawing upon this expertise and developing best practice guidelines for emission projections. Such guidelines could facilitate the development of methodologically sound and transparent emission projections and could enhance comparability of targets and reference levels among countries.
- While a broad range of methodologies for quantifying mitigation outcomes from projects have been developed over the past 15 years, a similar set of tools is not yet available for quantifying mitigation outcomes from policies. International tools, methodologies or guidelines for quantifying mitigation outcomes from policies could add value to several national and international policy processes, including national planning of mitigation policies and

monitoring their outcome, such as for NAMAs, preparing national emission projections and assessment of future target levels, international review of mitigation outcomes, or crediting early mitigation action.

- It could be useful to explore the order of magnitude of the volumes of potential over-crediting of early action under selected assumptions, including from delayed action in the target period, and of untapped potential for emission reductions from early action, including from avoided lock-in.

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