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Transformative Potential of the New Market Mechanism

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Summary

There is general agreement that preventing dangerous climate change requires a fundamental transformation of the global economy. Regarding carbon markets, the EU, for example, has called for the new market-based mechanism (NMM) to be established under the UNFCCC to "facilitate transition towards low carbon economy and attract further international investment" (EU 2012). This paper discusses the transformative potential of the NMM and how it should be structured to maximize transformative impact.

Transformation research generally holds that transformations are not linear processes as result of intentional actions of powerful actors, but cases of interacting dynamics playing out on different timescales but congealing in one direction. They are co-evolutionary, that is, involving a multitude of changes in differing socio-technical (sub-)systems and take place at local, national and global levels.

A variety of climate finance institutions have expressed the ambition to focus their support on actions with transformational potential and have developed criteria to identify such actions. These criteria can be synthesised as follows:

- Impact beyond the project scope,
- building capacities,
- diversion of investment flows, and
- integration into wider political and social debates.

The negotiations on the NMM have so far not made much headway and its characteristics are hence not yet well-defined. The paper therefore does a case study of the EU ETS, the largest market-based system in existence, which shows that details in the arrangements of the scheme, such as allocation of allowances can significantly influence the incentive structure of the instrument.

Based on transition studies and the study of the EU ETS one can conclude that carbon pricing is necessary but is by itself not sufficient to redeem the various types of market failures that have led to the unsustainable global socio-economic system we are deemed to change. An NMM should therefore be tailored to complement national policies.

As for the NMM itself, based on the discussions held so far, four basic options for how the NMM could function can be conceived:

A) The host country government sets a sectoral target and implements non-trading policies and measures (PAMs) to reduce emissions.

B) The host country government sets a sectoral target and defines voluntary individual targets for the installations within the sector.

C) The government sets a sectoral target and defines binding installation-level emission targets, possibly forming the basis for a national ETS.

D) The host country government sets a sectoral target and installation-level targets, but instead of issuing credits to the host country government the international authority would issue credits directly to the covered installations if they beat their respective installation-level crediting thresholds.

Regarding the criteria for transformational potential explained above, option A) provides for some build-up of administrative capacity in the host countries and provides high potential for policy integration. However, most impacts

would depend on the specific set of PAMs that would be utilised. Options B-D would provide direct incentives to installation operators. They would also provide for strong build-up of administrative capacity. Due to the voluntary participation, options B) and D) would entail the problem of how to ensure that well-performing installations are rewarded even if the overall sectoral target is not met. Option C) would solve this problem by making installation-level targets mandatory and would thus provide the highest investment certainty.

One of the motivations behind the NMM discussion is the aim to facilitate the establishment of domestic emission trading systems in more and more countries. Establishment of a domestic ETS opens up further design questions, allocation rules being the most problematic of design features. It may well be the case that free allocation mechanisms are a 'necessary evil' to be able to establish an ETS. However, an ETS and carbon pricing can only unfold its potential if this 'evil' is overcome. The question is how fast this change in allocation practices can practically occur.

Especially when a sectoral ETS under an NMM would be directly linked to international carbon markets, it is in our view highly unlikely that developing countries will do without free allocation of permits to their industries quickly enough to spur transformative change. Introducing emission trading as an NMM in a developing country, exposing the newly regulated industry fully to carbon price levels that reflect the mitigation costs and more importantly capacities to pay of developed country competitors would dramatically change the terms of business in the NMM host country. It is therefore highly unlikely that any developing country would voluntarily participate in an NMM without being able to protect their industries and buffering the effect of carbon pricing via some amount of free allocations.

A way forward could be not to open emerging ETSs in NMM host countries directly to international carbon markets but instead begin with establishing a protected carbon market with full auctioning of permits but price management in the form of e.g. a price collar. This would allow to limit the impact on the competitiveness of the domestic industry and at the same time meet a key precondition for the effectiveness of carbon pricing: certainty about future prices. The level of ambition and both minimum and ceiling price could gradually be increased to the point where it reaches the level of international carbon markets and linking of markets can be achieved without strong effects on the terms of trade. That is, rather than converging carbon prices by linking systems with each other, a convergence of domestic carbon prices is probably needed to actually make linking politically possible.

1 Introduction

There is general agreement that preventing dangerous climate change requires a fundamental transformation of the global economy. For instance, the latest assessment report by the Intergovernmental Panel on Climate Change (IPCC) notes that "The stabilization of greenhouse gas concentrations at low levels requires a fundamental transformation of the energy supply system, including the long-term phase-out of unabated fossil fuel conversion technologies and their substitution by low-GHG alternatives". (IPCC 2014, p. 46)

The German Advisory Council on Global Change similarly holds that preventing irreversible damages will require unprecedented international cooperation, new welfare concepts, technological leaps, manifold institutional innovations and adaptable reform alliances. The WBGU posits that there have so far been only two transformations of comparable magnitude in human history: the neolithical revolution, during which human societies became sedentary and started agriculture, and the industrial revolution (WBGU 2011).

The call for transformation has been taken up in international climate policy. The Green Climate Fund (GCF) has been given the mandate to promote a "paradigm shift" and other international funding mechanisms such as the British-German NAMA Facility also demand that activities should contribute to "transformational change" (Green Climate Fund 2014a).

Also other funding agencies have taken up similar commitments. But public finance, disbursed through the GCF or bilaterally, will not suffice to provide the means for implementation at the levels required to meet the extraordinary challenge ahead. Private funding will have to accompany these public funds in order to spur the necessary investments in sustainable infrastructures worldwide. Market-based mitigation instruments have been proposed by many to leverage such private sector engagement (e.g. IETA 2014, Marcu 2014, Edenhofer et al. 2013).

A New Market-based Mechanism (NMM) was already defined under the UNFCCC in 2011 in Durban (UNFCCC 2012, §83), but further discussions on the issue have effectively stalled. Still, the NMM is to be guided by a set of criteria that were elaborated already one year earlier in Cancún (UNFCCC 2011, §80). These include inter alia that the NMM should stimulate mitigation across broad segments of the economy, safeguard environmental integrity, and ensure a net decrease of global greenhouse gas emissions. The EU has called for the NMM to "facilitate transition towards low carbon economy and attract further international investment" (EU 2012).

The indicated broad scope of the NMM together with the requirements for net decrease of emission and environmental integrity mandate that, like public funds for climate mitigation, the modalities and procedures of the NMM incorporate similar provisions with regard to transformational change. The fundamental questions of this policy paper therefore are:

- What is the transformative potential of the NMM?
- Can it contribute to a sustainability transformation at all?
- How should it be structured in order to maximize its transformative potential?

As basis for the discussion, the paper first synthesises how transformation has been defined in scientific literature and existing climate policy initiatives (sections 2.1 and 2.2). Based on this synthesis the paper establishes criteria for how to determine transformational impact (section 2.3). Second, the paper examines the transformative potential of market-based instruments on the basis of the EU ETS, so far the largest market-based mitigation instrument in existence (section 3). Third, the paper takes stock of the current discussion on the design of the NMM and applies some of the insights from the case study analysis to the case of the NMM (section 4). We conclude by translating these insights into policy recommendations for the further consideration of the NMM under the UNFCCC.

2 Definitions and Criteria of Transformation

2.1 Definitions in Transformation Literature

Studies of how transformative change, often also referred to as transitions, comes about have been a rapidly emerging field of research over the last decade. Transition studies conceptualise socio-technical systems according to the generic societal function they fulfil such as mobility, energy provision or food production. A socio-technical system is further defined as "a configuration of elements that include technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge" (Geels & Kemp, 2012, p. 49).

A transition is a long-term and co-evolutionary process of change where all of these elements mutually influence each other, ultimately amounting to major shifts in the overall system configuration. As this process includes not only physical changes in infrastructures or organisations but also a redefinition of norms and values, new perspectives on how certain problems are framed and eventually acted upon, a transition can be defined as a substantial shift in the deep and underlying structure of a system. In successful transitions, the dynamics in different societal subsystems and the interactions between these subsystems are co-evolutionary processes which reinforce each other (Geels & Kemp, 2012; Grin et al., 2010; Rotmans & Loorbach, 2010; Shove & Walker, 2007).

To grasp the dynamic processes by which these types of changes unfold, transition research has developed a multi-level perspective (MLP). The MLP conceptualizes transitions as a dynamic interplay of processes across three levels – landscape, regime, and niches – that interact and reinforce each other. These levels do not refer to specific spatial or organizational locations, but rather to a more theoretical idea of virtual levels characterized by different degrees of structuration. Thus, a regime is understood as the deep structure that lies behind the stability and path-dependency of socio-technical systems, explaining their basic logic of functioning. The **regime** level "is the rule-set or grammar embedded in a complex of engineering practices, production process technologies, product characteristics, skills and procedures, ways of handling relevant artefacts and persons, ways of-defining problems; all of them embedded in institutions and infrastructure." (Rip and Kemp, 1998, p. 338). Regime structures are shaped by an exogenous **landscape** that embodies the highest degree of structuration in so far as it cannot directly be influenced by individual groups of actors. The lowest degree of structuration can be found at the level of **niches** where new things are tried out that deviate from dominant regime logics (Geels, 2011; Geels and Kemp, 2012; Rotmans and Loorbach, 2010).

Given the multi-dimensional nature of transformational processes, it follows that structural change processes and paradigm shifts cannot be completely planned and strictly steered. However, it is possible to support transformations by increasing factors for successful transformations, and, as a result, to help directing the system towards an intended development pathway.

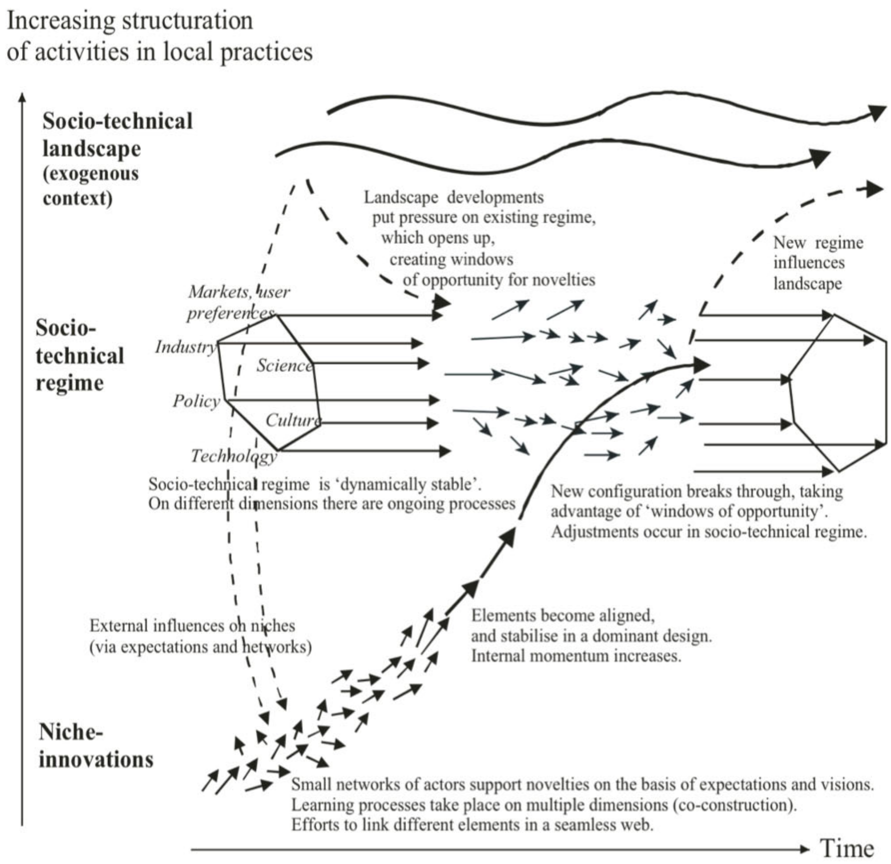


Figure 1: Multi-level perspective on transitions. *Source: Geels (2011).*

Typically, every transformative process which a system undergoes can be depicted as a (stylised) S-curve with four phases "the pre-development phase where the status quo system dominates, but non-visible changes in the background take place; the take-off phase, where the process of structural changes is gaining momentum; the acceleration phase, where structural changes become visible and the stabilization phase, where a new regime is established" (Wesely et al., 2013, p. 44).

In summary, transformations are not linear process as result of intentional actions of powerful actors, but suites of interacting dynamics playing out on different timescales but congealing in one direction. General characteristics of transformation are (WBGU, 2011):

- Large-scale change processes are co-evolutionary, that is, involving a multitude of changes in differing socio-technical (sub-)systems and take place at local, national and global levels.
- They include both the development of (niche) innovations as well as their selection by users and societal anchoring through markets, regulations, infrastructures and new societal norms.
- They are influenced by large numbers of actors from politics, science, business, civil society and individuals.
- They are ultimately radical processes regarding their impacts and reach, but may take decades to complete.

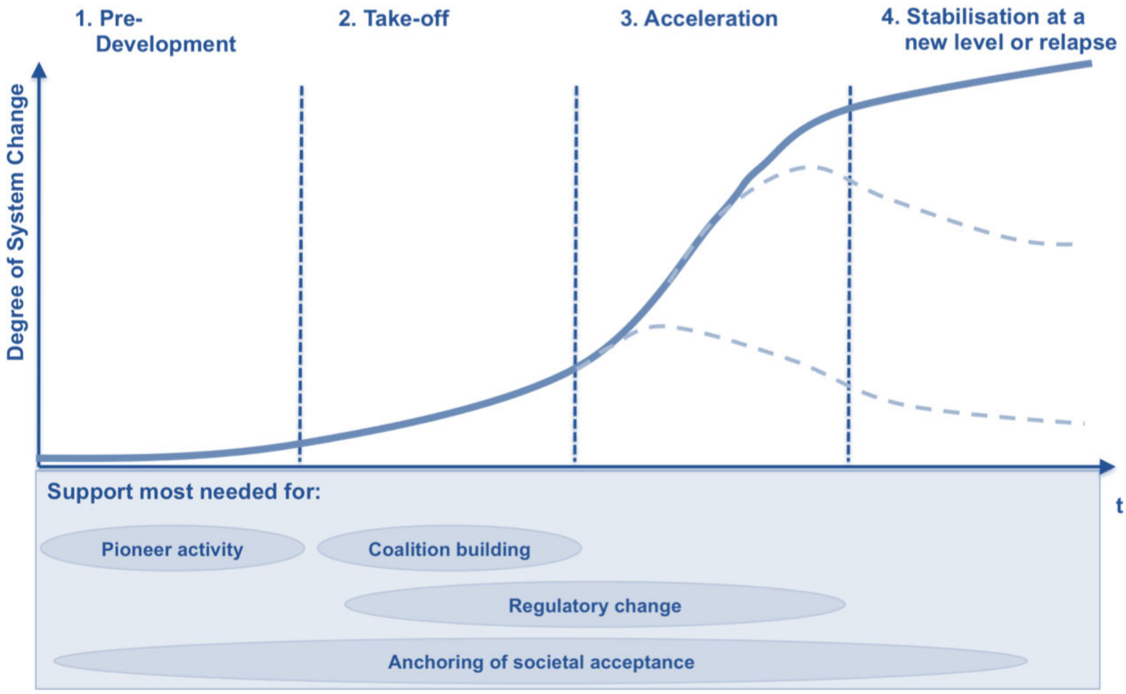


Figure 2: Phase model curve and intervention types. *Source: Mersmann and Wehnert (2014).*

2.2 Definitions in Climate Policy

A variety of climate finance institutions have expressed the ambition to focus their support on actions with transformational potential. This section summarises the definitions these institutions have employed.

2.2.1 Green Climate Fund

The Green Climate Fund has been given the mandate to promote a "paradigm shift" and has subsequently elaborated the following criteria to determine the paradigm shift potential of proposed projects (Green Climate Fund, 2014a):

- Potential for scaling up and replication and its overall contribution to global low-carbon development;
- Knowledge and learning potential;
- Contribution to the creation of an enabling environment
- Contribution to the regulatory framework and policies
- Overall contribution to climate resilient development pathways

Further assessment criteria are mitigation and adaptation impact potential, sustainable development potential, vulnerability and financing needs of the recipients, country ownership, efficiency and effectiveness (Green Climate Fund, 2014a).

Building on these general criteria, the GCF's results management framework elaborates a logic model consisting of the following levels (Green Climate Fund, 2014b):

1) Paradigm shift objective
2) Impacts at fund level
3) Project/Programme outcomes
4) Project/Programme outputs
5) Activity
6) Inputs.

As for level 1), the GCF has defined the paradigm shift objective for mitigation as a shift to low-emission sustainable development pathways.

As for level 2) of the logic model, the GCF has defined the fund-level impacts for mitigation as:

1) Reduced emissions through increased low-emission energy access and power generation;
2) Reduced emissions through increased access to low-emission transport;
3) Reduced emissions from buildings, cities and industries;
4) Reduced emissions from land use, deforestation, forest degradation, and through sustainable forest management, and conservation and enhancement of forest carbon stocks.

As for level 3), the GCF has defined the following project/programme level outcomes for mitigation:

1) Strengthened institutional and regulatory systems for low-emission planning and development;
2) Increased number of small, medium and large low-emission power suppliers;
3) Lower energy intensity of buildings, cities, industries, and appliances;
4) Increased use of low-carbon transport;
5) Improved management of land or forest areas contributing to emissions reductions.

The GCF has also adopted three core indicators for mitigation in its results management framework:

1) Tonnes of carbon dioxide equivalent (tCO2eq) reduced as a result of Fund-funded projects/programmes;
2) Cost per tCO2eq decreased for all Fund-funded mitigation projects / programmes;
3) Volume of finance leveraged by Fund funding, disaggregated by public and private sources.

2.2.2 NAMA Facility

The British-German NAMA Facility has defined the following list of questions to assess the transformational potential of proposed projects (NAMA Facility, 2014):

- "Is the outlined NAMA support project part of a broader programme or policy framework that contributes to achieving an ambitious sectoral or national emission reduction target or implementing a low-emission development strategy?
- Would the achievement of the emission reduction target or implementation of the low-emission development strategies contribute to bringing the target country onto a low-carbon development path? Does the outlined NAMA support project fit into a broader context of mitigation activities in the sector?
- Does the outlined NAMA support project help to change the prevailing structures of the sector that contribute to high emission levels? Please refer to the starting situation of the country and the sector. Does the NAMA support project help to overcome the systematic barriers to the reduction of the emissions, and if so, how?
- What transformational impacts does the outlined NAMA support project have beyond the scope of the project?
- Does the outlined NAMA support project develop capacities to reduce further GHG emissions beyond the scope of the project?
- Does the outlined NAMA support project serve to strengthen the institutional capacities of the national system, as described for

example in the aid effectiveness criteria of the OECD/DAC?

- Does the outlined NAMA support project envisage the participation and/or development of the private sector? What is the specific contribution of the private sector to the transformational potential?
- Does the outlined NAMA project adopt an innovative approach to reducing emissions, which can have impacts beyond the specific NAMA support project (e.g. technology transfer)?
- Is the outlined NAMA support project replicable in terms of its applicability in other regions, countries and internationally?"

2.2.3 CDKN

The Climate and Development Knowledge Network (CDKN) in its policy brief "How can the Green Climate Fund initiate a paradigm shift?" (Harmeling et al., 2013) proposes the following criteria:

- "Funding decisions could be based on the level of ambition shown in actions towards a paradigm shift and the project or programme's comprehensiveness. An important element is the relevance of a proposed action to the climate-related problems in that country
- A country's capacity to implement projects and its needs should both be considered when deciding what constitutes an ambitious proposal; the latter is especially relevant for the most vulnerable countries. This could be combined with a certain floor allocation for the most vulnerable countries, which would ensure a minimum level of funding for them. For example, adaptation finance /and to some extent for mitigation finance) would fund activities meeting certain key requirements, with the ambition element being less relevant to avoid setting benchmarks that might delay action.
- Proposals aiming towards a paradigm shift should include near-term benefits as well as long-term benefits. Another way of ensuring immediate impact could be allocating a certain share of the available funds on a competitive basis, such as the extent of CO_2 reductions achieved (but taking into account inter alia the GCF's safeguard provisions).
- Embedding the funded activity into national strategies and programmes, and incentivising the dynamism of sub-national and local actors is important for ensuring sustainability after the duration of the GCF-funded project. It also allows lessons learned to be disseminated. Strong stakeholder engagement processes in the identification and implementation of the proposals are crucial. "

2.2.4 DFID

The UK Department for International Development funds mitigation and adaptation projects and programs in developing countries through its International Climate Fund (ICF). A total of nearly 4 billion GBP is to be provided to projects between April 2011 and March 2016 (DFID, 2014a). The ICF is seeking, just like the other examples presented, to maximize its impact by bringing about transformational change, e.g. through facilitating institutional and policy change.

DFID has developed key performance indicators (KPI) that help to assess (not measure) the transformative impact of its supported activities. The following account is based on these KPI (DFID, 2014b):

1. "Scale: National, sectoral, regional or economy-wide programmes including institutional reform and policy reform are more likely to be transformational because of their reach. This could include large programmes such as energy sector reform, or

large scale deployment of a technology so it can reach a critical deployment mass and so drives down its deployment costs or a small TA programme that works to support a country to reduce national fossil fuel subsidies or remove a key barrier to transformational change. Projects that are particularly innovative may not be required to meet the scale criteria.

2. Replicable: programmes which others can and do copy, leading to larger-scale or far faster roll-out are more likely to be transformative. This includes programmes which help cut the cost for followers – be it through investments in capacity and skills, by removing barriers through e.g. key policy change or helping drive technology down the learning curve.
3. Innovative: programmes which are new and innovative have the potential to be transformational by demonstrating and piloting new ways of achieving objectives that could lead to wider and sustained change. These programmes are often high risk but with corresponding high potential returns.
4. Leverage: programmes that leverage others to help increase the impact beyond the programme should, all things being equal, be more likely to be transformational by unlocking scale and replication potential. Leverage could be of domestic flows from recipient country, private sector or other aid flows – but it is important that leveraging is additional and does not crowd out existing sources. It is also important to consider the investment/country context (risk-reward) for assessing the effectiveness of leveraging, as the highest level is not necessarily the best. It could also come about by encouraging mainstreaming at scale (e.g. a small shift in WB energy lending could have huge impacts).

In order for a programme to be considered as transformational the following conditions are likely to prevail. These conditions are part and parcel of an effective development programme:

- Sustainable: Programmes that are sustainable are more likely to have an impact after they have ended. However, not all piloting and innovation programmes will be sustainable, as there is an element of experimentation in the ICF – so innovative technology, for example, will only be sustainable if successful.
- Political will and local ownership: Working with national stakeholders, including the powerful, who want to deliver change consistent with their own political economy will be more effective.
- Increased capacity and capability to act: strengthening local capacity supports continued, action on climate change and lays the conditions for transformational change.
- Evidence of effectiveness is credible and shared widely. Others are unlikely to follow unless they are confident of the case for change. This argues for substantial and quality M&E of key programmes, presenting failure alongside success. "

2.3 Synthesis

The criteria used to assess the transformative potential of climate change mitigation instruments do reflect the concepts of the scientific transition research literature. The guidelines applied by the various institutions presented above reflect ideas such as the co-evolutionary nature of socio-technical transformation processes and the need to actively shape the conditions for evolutionary economics, for variation and selection of technologies and practices, towards "breeding" more sustainable alternatives. Sometimes this reflection is more explicit, sometimes less so.

The assessment criteria applied by the various funding institutions can be categorized into four main points: impact beyond the project scope, improving capacities, diversion of investment flows and integration into wider political and social debates. However, the assessment approaches differ in the emphasis they apply to these categories respectively. For a summary of the proposed criteria see **Table 1**.

The four categories as presented below will also guide our analysis of the transformative impact of various design options for a New Market Mechanism as discussed in chapter 4.

2.3.1 Impact beyond the Project Scope

Of course, a necessary condition for a mitigation instrument to be considered "transformative" is that it fulfils its prime objective, i.e. it reduces carbon emissions. However, this condition is not considered sufficient. For a truly transformative impact all funding institutions analysed in this paper consider more multidimensional impacts imperative. The NAMA Facility for example highlights a need to change prevailing structures, e.g. through tackling systematic barriers. Others highlight the need to promote the transfer of technologies between developed and developing countries and increased deployment of low-carbon technologies thus realising a decrease of technology costs through learning and economies of scale (NAMA Facility, GCF, DFID).

Interestingly, while a number of funders highlight the need for "innovative policies", the need for policies for innovation is not taken up. In our view another desirable impact beyond the project scope would be that it spurs (private sector) investment in research and development resulting in innovation of technologies and practices that can have positive spill-over effects into other parts of the (global) economy.

Last but not least, more immediate co-benefits for wider sustainable development objectives are considered as an essential complement to the long-term transformative impact of a given instrument (GCF, NAMA Facility, CDKN).

The focus on a variety of impact dimensions beyond pure GHG mitigation reflects the co-evolutionary nature of socio-technical transformations. Technological change alone will

Criteria	Indicators	NAMA Facility	GCF	CDKN	DFID
Impact beyond project scope	change of prevailing structures	✓			
	promotion of technology transfer	✓			
	technological learning	✓	✓		✓
	economies of scale		✓		✓
	sustainability co-benefits	✓	✓	✓	
Building capacities	administrative capacities	✓	✓	✓	✓
	private sector sensitization	✓			✓
	identification for sustainable business case		✓		✓
Diversion of investment flows	shift of investment patterns towards sustainable types of production and consumption	✓	✓		✓
Political integration	integration with other policies into a coherent policy mix	✓	✓	✓	

Table 1: Overview of Criteria for transformative potential of climate finance instruments. *Source: Wuppertal Institute.*

not result in the type of deep restructuration of large parts of our societies and economies necessary on the way towards sustainable and climate compatible system.

2.3.2 Building Capacities

The built-up of capacities is highlighted by all institutions assessed above. This reflects a need to realign or in some cases create administrative institutions that are able to guide and govern a transition towards a more sustainable socio-technical system. Programs or instruments with high "knowledge and learning potential" (GCF) are therefore to be prioritized.

But the need for improved capacities is not limited to administrative capacities. To foster a sustainability transformation corresponding capacities are needed also in the private sector to sensitize business for climate change mitigation and adaptation as well as wider sustainable development objectives. These capacities will be needed to optimize current business practices and to identify sustainable business models for the future.

Also the idea to support innovative programs and policies that are replicable elsewhere (GCF, NAMA Facility, DFID) reflects a notion of capacity building. Testing such innovative approaches will increase the global portfolio of policies making it potentially easier to combine and select appropriate policy mixes for any given national circumstances.

The focus on such innovative approaches and the idea of investing in a portfolio of different approaches (DFID, GCF) resonates well with the concepts of transition management of which deliberate experimentation with a wide set of promising approaches is a core element.

2.3.3 Diversion of Investment Flows

A successful transformation towards sustainability will require enormous investments in low-carbon technologies at all scales and across all sectors of our economies. A common criterion across all assessed approaches is therefore the question whether a particular instrument does alter investment patterns towards more sustainable types of production and consumption. The necessary shift of investment flows cannot be achieved through the realignment of public funds alone, it will also require the inclusion of the private sector (NAMA Facility).

A key objective of all assessed approaches is also the idea that lock-in of unsustainable technologies and/or infrastructures is to be avoided. Especially in the power sector, energy intensive industries, buildings and transport investments are typically extremely long-lived. Investments in technologies and infrastructures that appear to provide efficiency gains in the short term may prevent more fundamental change in the long run.

To avoid this, it is necessary to create an enabling environment for investments in low carbon technologies. In many cases this will mean to changing the terms of "natural selection" in an evolutionary economics sense in favour of sustainable solutions. To assess the transformative potential of a mitigation instrument with regard to this criterion would mean to discuss whether or not the respective instrument can add to this enabling environment.

2.3.4 Integration into Wider Political and Social Debates

As noted above, one individual instrument cannot bring a transformation about on its own. It can only contribute as one element in a concert of efforts. If transformations are characterised by the co-evolutionary nature of change within the various societal sub-systems, it becomes apparent that policy instruments developed top-down on their own cannot induce the required intensity of change. Most funding institutions therefore require the supported instruments to be embedded in a larger policy package or strategy (NAMA Facility, GCF, CDKN). Again the idea of a portfolio of instruments comes to the fore.

The integration of a supported mitigation instrument is not only desirable to embrace the co-evolutionary nature of transformative change, it typically also helps to increase the ownership of implementing countries. The required transformational change does not come about in an instant but over decades. To govern change processes over this time scale, any instrument will need to rely on a strong basis of support to be able to send (investment) signals credibly and tenaciously. In that sense mitigation instruments may proof to have a stronger transformative impact if they feature self-sustaining properties. Creating a complementing yet interdependent policy puzzle might thus increase the persistency of individual policies.

To be effective in driving transformative change towards sustainability, Kivimaa and Kern (2014) argue for a balanced policy mix that entails both 'motors of innovation' – policies that aim to support innovation and creating niches to develop and mature sustainable solutions – and 'motors of creative destruction' – policies that challenge unsustainable practice and destabilise the incumbent socio-technical regime.

3 Transformative Potential of Market-Based Instruments – The Case of the EU ETS

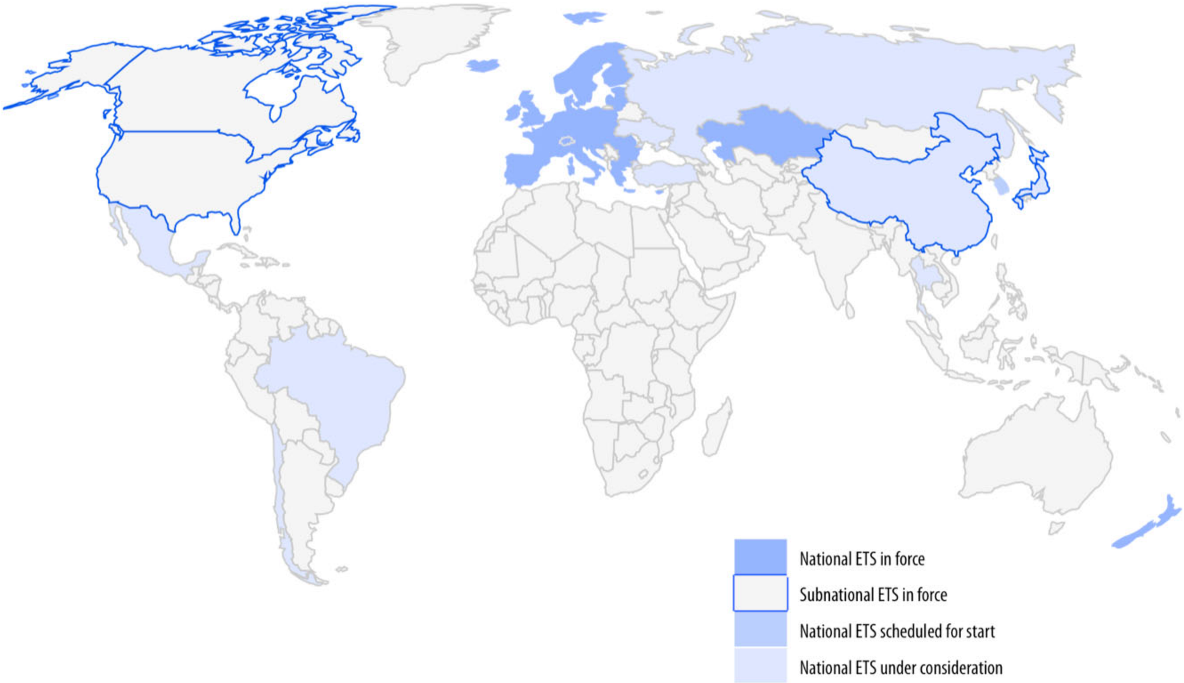
WBGU (2011) argues that for the type of transformative change necessary to avoid (permanently) trespassing planetary boundaries it is inevitable to internalise the external effects of carbon pollution into economic decision making. They argue for carbon pricing as a central building block of the regulatory framework to avoid dangerous climate change. Furthermore, they have recommended that it should be the goal of German and European diplomatic efforts to establish global emissions trading at the company level. A New Market Mechanism could be an important stepping stone towards this end as it would offer an avenue for developing countries without a formal cap on their national ghg emissions to enter the European carbon market and connect sectors of their economy with the EU ETS before eventually establishing their own national trading schemes. However, WBGU (2011) also states that carbon pricing alone is not sufficient to redeem the various types of market failures that have led to the unsustainable global socio-economic system we are deemed to change.

In this chapter we will test these claims by analysing the transformative potential of market-based mitigation instruments, namely the EU ETS, taking into account the criteria synthesised in section 2.3 above.

We have chosen the case of the EU ETS because assessing the transformative potential of hypothetical policy instruments is highly speculative. The design options for the NMM are still so vague and low in detail that a substantive discussion is impossible. At the same time, there is a distinguishable trend towards the development of new (sectoral) emissions trading schemes in many regions of the world (see **Figure** 3 below).

Most of these initiatives are modelled, at least to some extent, on the European Emissions Trading Scheme (EU ETS). The EU ETS was established in 2003 with the adoption of the EU emissions trading directive and started operation in 2005. It is by far the largest and most comprehensive market-based mitigation policy in the world. Meanwhile, the EU ETS has entered its third trading period and a host of experiences have been made and documented. The EU ETS is therefore a critical case to reflect on when discussing the transformative potential of market mechanisms.

As stated above, to assess the transformative potential of a policy instrument, one has to look beyond the instrument itself and instead look into wider effects into socio-technical and socio-economic subsystems. The chapter is organized in accordance with the criteria spelled out above. The assessment is carried out by reviewing and briefly summarizing the most recent literature.



National		Subnational	
in force			
EU Emissions Trading System (EU ETS)		Canada - Québec Cap-and-Trade System	China - Shenzhen pilot system
Kazakhstan Emissions Trading Scheme (KAZ ETS)		China - Beijing pilot system	China - Tianjin pilot system
New Zealand Emissions Trading Scheme (NZ ETS)		China - Chongqing pilot system	Japan - Tokyo Cap-and-Trade Program
Swiss ETS		China - Guangdong pilot system	USA - California Cap-and-Trade Program
		China - Hubei pilot system	USA - Regional Greenhouse Gas Initiative (RGGI)
		China - Shanghai pilot system	
ETS implementation scheduled			
Korea Emissions Trading Scheme			
ETS under consideration			
Brazil	Russia	Brazil - Rio de Janeiro	Canada - Manitoba (WCI)
Chile	Thailand	Brazil - Sao Paulo	Canada - Ontario (WCI)
China	Turkey	Canada - British Columbia (WCI)	China - Hangzhou
Japan	Ukraine		
Mexico			

Figure 3: Overview of existing ETSs and ETSs under consideration. *Source: Wuppertal Institute based on ICAP (2014).*

3.1 Impact beyond Project Scope

The scope of the EU ETS is vast. It covers nearly half of all ghg emissions in the European Union (European Commission, 2014). On the other hand, the stated goal is narrowly focused on emissions. As noted in section 2.3.1, there is a shared view in research and among climate finance institutions that for a truly transformative impact more multidimensional impacts are imperative. Transformations are by definition co-evolutionary (Grin et al., 2010), i.e. change is occurring in various sub-systems of the socio-technical regime simultaneously and interdependently. In this section we will therefore discuss if and how the EU ETS has affected socio-economical practices beyond reducing emissions e.g. through spurring innovation and/or creating environmental or social co-benefits.

First and foremost, the EU ETS has succeeded in achieving its prime objective, to reduce CO2 emissions in the regulated sectors. Even including the generous allocation of permits, the EU ETS drove emissions 2.5 to 5 per cent below business-as-usual emissions in the first trading period (Venmans, 2012). A positive contribution is generally acknowledged for the second trading period as well. However, due to the heavy impact of the financial and economic crisis it is difficult to clearly and unequivocally attribute the drop in emissions to the ETS. Furthermore, an important part of emission reductions have been achieved outside the regulated sectors through the use of CDM and JI. Despite widespread concerns, carbon leakage, i.e. a migration of carbon intensive industries to evade the regulation, leading to increased emissions outside the regulated area, has hardly occurred (Venmans, 2012).

Altogether, it can be credibly assumed that the ETS has substantially contributed to reducing ghg emissions and thus does comply with the necessary condition to contribute to transformative change. But what has been the ETSs impact beyond this central objective?

The central idea of carbon pricing is to internalise external costs of ghg emissions. If companies face direct costs for every ton of CO2 they emit, they will take these emissions into account in everyday decision making. Jong et al. (2014) have found evidence that this is not only the case for managers who are confronted with the cost of carbon emissions immediately, but also for investors on stock markets. By correlating allowance prices with companies' share prices they demonstrate that the EU ETS does 'bite', i.e. that investors are sensitive to carbon prices and the relative carbon intensity of a firm is viewed as a significant factor in determining a company's value. This is in fact a fundamental change in investor behaviour that can be considered a change of prevailing structures.

The impact on innovation of low-carbon technologies and diffusion of such technologies has however remained below expectations. Kemp and Pontoglio (2011) have reviewed the relevant literature on technological innovation through environmental policy instruments. While scholars relying on theoretical models of incentives typically suggest that the ETS should invoke increased R&D on low-carbon technologies and hence increased innovation, the empirical literature by means of econometric studies, empirical case studies or surveys of firms finds little evidence that this is actually the case under the given designs. The record of current carbon pricing instruments is particularly poor when it comes to the effect on radical innovations that imply a break with current competencies and technologies. Furthermore, they find that the adoption of innovative technologies can be influenced both positively as well as negatively depending on the specific arrangement of the policy instrument (see also chapter 3.3).

The contribution of the EU ETS to drive down the cost of low-carbon technologies is also estimated to be relatively low. One of the inherent features of a market based instrument is that its steering effect is completely based on cost structures and its neutrality towards certain technologies. Companies are completely free in choosing the means of mitigating the emission (or offsetting them). Firms will therefore naturally focus on those options first that are already proven and available at low cost. More targeted policy instruments such as technology specific feed-in tariffs are likely to have contributed much more strongly to the cost digression of photovoltaic and wind power experienced in recent years (Kemp & Pontoglio, 2011).

3.2 Building Capacities

As discussed in section 2.3.2, in order to achieve a fundamental and ultimately transformative change towards a more sustainable socio-economic system, capacities are necessary both in administrative institutions and the private sector. Public administration needs to guide and govern the required change and the private sector needs to develop and maintain sustainable business models.

The EU ETS certainly has contributed to the development of such capacities both in administering the scheme as well as in the private sector. The increased sensitivity for carbon emissions through pricing as discussed above is already an indicator of built-up of such capacities. However, many regulated companies have seen carbon trading primarily as a tool for compliance with the regulation instead of seeing (speculative) emissions trading as a business on its own (Pinkse & Kolk, 2007). At the same time, the EU ETS has spurred the emergence of an eco-system of specialized traders, information brokers, banks, consultants, etc. providing services to regulated industries from the outside. Voß and Simons (2014) go as far as describing this eco-system as an *"instrument constituency"* as *"powerful collective actors who strategically market their solutions, for example, by engaging with problem discourses, recruiting important supporters, or seeking to outcompete other instruments for a dominant position in the 'toolbox of policymaking'"* (Voß & Simons, 2014, p. 6).

LaBelle (2011) finds that the institutional set-up of the EU ETS is relatively strong as compared to other fields of environmental policy making (e.g. energy efficiency policy in the EU). He highlights that the EU ETS as an institution with strong sectoral mandate represents "a dynamic method of mitigating sectoral risk" (p. 401) through bringing together various "specialized stakeholders to work together to create effective solutions which mitigate risks of rolling-out new technologies" (p. 400). His initial verdict therefore is that the EU ETS and the institutional set-up around it is well-designed to spur the deployment of low-carbon technologies.

3.3 Diversion of Investment Flows

Ultimately, a future sustainable global economy will need a fundamental restructuration of physical infrastructures. As discussed in section 2.3.3, a transformative policy must therefore contribute to a diversion of public and private investments into more sustainable assets and avoid lock-in of unsustainable infrastructures (Unruh, 2000).

While the ETS's positive impact on capacities in the administrative and private sectors are pretty much undisputed, the question is less clear for the ETS's impact on investments in the regulated sector. From the available literature it becomes apparent that in order to create the right investment incentive it is imperative to look into the details of the ETS. The arrangement of allocation plans (grandfathering, benchmarking or auctioning) and details such as the closure rules for installations to be shut down at the end of their lifetime and the provisions of the new entrants reserve are central for the incentive structure in the ETS.

There exists ample literature discussing the implications of allocation mechanisms on the incentive structure. Theoretic economic models for a long time predicted that efficiency of emissions trading would be independent from the chosen allocation mode (Montgomery, 1972). However, more recent (empirical) research has shown that this is not the case. Iterative grandfathering, i.e. the free allocation of allowances on the basis of historic emissions in every trading period, has been proven to be particularly unhelpful. It can be shown that this mode of allocation is particularly favourable for inefficient and highly polluting installations. If allocations are based on historic output or performance, companies have an incentive to artificially extent the lifetime of an old installation in order not to forgo the allocation of free permits that can be sold in subsequent trading periods (e.g. Neuhoff et al., 2006; Ellermann, 2008).

The flaws in the EU ETS allocation scheme became apparent during the first and second trading period. Especially power producers drew in significant windfall profits as they were able to pass on opportunity costs of freely allocated allowances to end consumers. In response to this the EU has revised their allocation mechanism. In the third trading period allocation plans were centralised and the share of allowances to be auctioned substantially increased as free allocation to the power sector was completely abolished (Venmans, 2012).

Despite these changes in the ETS design, there is little empirical evidence for the EU ETS triggering substantial investments into low-carbon technologies. This is largely attributed to high price volatility in the market and overall low carbon prices. Both are a consequence of a high degree of uncertainty over the stringency of EU climate policy in general and the ETS in particular (Venmans, 2012; Kirat & Ahmada, 2011; Fontini & Pavan, 2014; Boneti et al., 2013; Jaraite & Di Maria, 2012; Hoffmann, 2007; Löfgren et al., 2013).

Instead, many companies have applied a "wait-and-see" strategy at least in the early phase of the ETS (Kemp & Pontoglio, 2011). Others have focused on short term improvements in their production processes through for example fuel switch (Grubb, 2012; Kemp & Pontoglio, 2011; Pinkse & Kolk, 2007).

To conclude, the EU ETS has contributed less than expected to investment in low-carbon technologies. In part, this was due to allocation mechanisms that set the wrong incentives. However, the ETS has undergone reforms to adjust the incentive structure. A second reason for the sub-optimal performance is over-allocation of permits which in combination with the unexpected effects of the European financial and economic crisis led to a substantial oversupply of allowances and hence low carbon prices, too low to incentivize long-term investments in low-carbon technologies. Mending both price levels and allocation mechanisms, the ETS's impact on investments could probably be greatly improved. However, Lehman & Gawel (2013) argue that despite the static efficiency of the ETS, optimal design of the ETS (in terms of diversion of investment flows) is impossible given that the ETS is politically negotiated under uncertainty and under the premises of serving various potentially divergent political goals, such as security of supply, industry policy or other non-climate environmental benefits.

An assessment of the instrument's transformative potential must therefore take into account not only an economic but also a political perspective if it is meant to reveal the full picture.

3.4 Integration into Wider Political and Social Debates

As stated above, transitions are by definition co-evolutionary. A single policy instrument, even if it is designed to serve plural purposes, can hardly enable and support change on all required levels. Policy mixes – "set[s] of different and complementary policy instruments to address a [complex] problem" (Borras and Edquist, 2013, p. 1514) are particularly important to bring forward sustainability transitions (Kivimaa and Kern, 2014). In this section we will therefore discuss to what extent the EU ETS is an element of such a policy mix and how it interacts with other instruments in the mix.

The EU ETS is part and parcel of the wider integrated energy and climate package of the EU. As such it is embedded in a wider policy package: the EU's 20-20-20 in 2020 policy – reduction of ghg emissions of 20 per cent as compared to 1990 levels, increase the share of renewable energy to 20 per cent and reduce the primary energy consumption by 20 per cent below business as usual through energy efficiency measures. The ETS is the centre piece of this package and specifically targeted to address the emission reduction component of the 20-20-20 goal, while there are various policies to support the deployment of renewable energy and increase energy efficiency both at the EU and at the member state level.

The integrated EU energy and climate policy has largely been successful. The EU is on track to meeting its emission reduction goal. The integration of different policies into one coherent package has been hailed in this context. Connie Hedegaard, EU Climate Commissioner and responsible for the EU ETS stated in October 2013 that *"[d]uring the economic crisis we had more than one target and that has helped us a lot. Imagine if we had only had a CO_2 target and the ETS during this crisis. Would Europe have continued to have such a strong focus on energy efficiency and renewables? I don't believe it."* (quoted in Euractive, 2013).

There has been criticism that the price crash of the EU ETS has been partly due to the parallel implementation of policies to promote energy efficiency and renewables. However, the efficiency and renewable energy parts of the EU climate and energy package were taken into account when the ETS cap was set (Capros et al., 2008). The actual scale-up of renewables has so far been in line with the projections made during the preparation of the climate and energy package. The efficiency and renewables pillars of the climate and energy package can therefore not be blamed for the problems of the EU ETS (Hermann and Matthes, 2012).

Despite this track record, the future of the ETS as part of a wider policy package remains disputed. The debate over the upcoming 2030 EU target was dominated to some extent by the question whether the EU should stick to the three complementary goals or whether it should only commit to one single ghg reduction target. While the European Parliament favoured for three binding targets, parts of the European Commission in line with some member states and industry groups favoured a single target that would eventually be accompanied by non-binding renewables and efficiency targets (Euractive, 2014).

This debate is in line with the understanding of several mainstream economists who argue that the ETS should be sufficient to achieve the climate policy objectives and any other policy will negatively affect the ETS's efficiency in doing so. (e. g. Sinn, 2011). Others have argued that an integration into a policy package is in fact beneficial and necessary if the emission cap of the ETS is not negotiated independent from the regulated entities and their performance but instead "capture" of the political process takes place. A policy mix may also be necessary to accommodate for multivalent policy goals, in the case emission reduction is not the sole failure to be corrected but other goals such as nuclear phase out or renewable energy goals as a means of industrial policy are also relevant (Gawel et al., 2014; WBGU, 2011; Löfgren et al., 2013).

The EU ETS was established with a view to provide a long-term signal to the private sector. However, the recent crisis of oversupply and the difficult discussions with regard to an increased level of ambition demonstrate how vulnerable the ETS as a system is to the changing political economy in the EU generally. Given that individual member states are effectively able to detain the political process of adjusting the system in a moment of crisis, the self sustaining properties of the instrument as such have to be considered low to inexistent. The fate of the only other large-scale cap-and-trade system that pre-dates the EU ETS, the SO_2 allowance trading system established in the United States in the 1990's, gives a striking example of what can happen to purely political markets, if political support on which it is built vanishes: After a number of court rulings and subsequent regulations, the SO_2 allowance trading system effectively collapsed in 2010 (Schmalensee and Stavins, 2012).

Also, while scholars have argued for the existence of an instrument constituency that is interested in the development and continuity of the instrument as such (Voß & Simons, 2014), this constituency rests itself on a much smaller social basis than other instruments. The German feed-in tariffs for example are backed by farmers who install wind power or solar PV on their land, by a wide range of middle-class investors who organize themselves in renewable cooperatives, by local craftsmen who earn a living in the installation of wind generators and PV arrays and by a local renewable energy industry. The support basis for feed-in tariffs in Germany is arguably much broader and divers than that of the EU ETS (Hockenos, 2012).

3.5 The Devil is in the Detail

Despite numerous deficits, there has been some transformative impact of the EU ETS and the deficits show that it has substantial potential to further drive transformative change contributing to a wider set of policies that together form an effective policy mix. To summarize, the EU ETS:

- has contributed to reducing emissions in the regulated sectors;
- has effectively contributed to developing administrative and private sector capacities;
- has made managers and investors take into account carbon emission in everyday decision making.

However, it also

- has failed to provide an effective incentive to invest in low-carbon technologies and some cases may have even alimented the use of dated technologies causing lock-in;
- hardly contributed to drive down costs of low-carbon technologies;
- did little to foster private sector research and development in low-carbon technologies and thus did hardly spur innovation of especially more radical and potential disruptive technologies.

However, it is also clear that the transformative potential of the instrument has not fully been realized yet. Our analysis has shown that many of the EU ETS's sub-optimal performances can be attributed to flaws in the detailed arrangements of the scheme:

- Free allocation of permits create perverse incentives and can lead to lock-in of outdated, inefficient technologies.
- Closure rules and rules for new entrants can similarly lead to lock-in.

- High price volatility and overall low price levels fail to provide a long-term incentive for R&D for low-carbon technologies.
- A high degree of uncertainty induced by the changing political economy prohibited the ETS from providing a long-term signal for investments in low-carbon technologies.

Most of these flaws, however can be redeemed through adjustment in the detailed arrangements of the ETS. For example, the lack of a long-term incentive for investment in low-carbon technologies and the high degree of uncertainty can (partially) be accounted for by price management, e. g. through minimum prices or price collars (Grubb, 2012). In fact, most of the more recently established ETSs, the Californian ETS, the various Chinese pilot ETSs as well as the prospective Korean scheme, feature some form of price management mechanisms (ICAP, 2014). Even in the EU the idea of a minimum price has been taken up by member states. The UK has introduced a flexible carbon tax to emulate a minimum price for the regulated entities under the EU ETS (Sandbag, 2012).

Distortions through free allocations and new entrant and closure rules have already been tackled to some extent by the increased use of auctioning in the third trading period, but may prove a bit more difficult to avoid altogether. Free allocation has been a tool to secure the support of wide ranges of industry in order to establish the ETS in the first place. And they remain important to accommodate concerns over carbon leakage for industries that are subject to international competition.

Even if these flaws on the implementational level can be dealt with, the ETS will need to be integrated in a wider policy mix. It can be an effective instrument that puts economic pressure on current unsustainable economic practices. As such the ETS can be interpreted as a 'motor of creative destruction' of unsustainable economic practices (Kivimaa and Kern, 2014), but it fails to be a 'motor of innovation'. As a technology neutral policy it does not provide a protected space for emerging more sustainable technologies. The EU ETS's track record for spurring innovation is poor. More targeted policies are necessary to complement the ETS and make up for these deficiencies.

All these things considered, our assessment of the transformative potential of the EU ETS res-

Criteria	Indicators	Effects of the EU ETS
Impact beyond project scope	change of prevailing structures	medium
	promotion of technology transfer	weak
	technological learning	weak
	economies of scale	weak
	promoting innovation	weak
	sustainability co-benefits	unclear
Building capacities	administrative capacities	strong
	private sector sensitization	strong
	identification for sustainable business case	medium
Diversion of investment flows	shift of investment patterns towards sustainable types of production and consumption	weak (due to free allocation)
Political integration	integration with other policies into a coherent policy mix	strong (but strongly contested)

Table 2: Assessment of the transformative potential of the EU ETS. *Source: Wuppertal Institute.*

onates well with WBGU's verdict that pricing carbon – and the EU ETS plays a key role here – is a necessary condition for the radical transformation towards sustainability required, but it is not sufficient to induce behavioural change alone given that other forms of market failure exist which can only be tackled by a concert of specific policies.

4 NMM and Transformation

4.1 What Design for the New Market-Based Mechanism?

In December 2011 in Durban, the 17th Conference of the Parties (COP) to the UNFCCC decided to 'define' a NMM but did not stipulate operational details (UNFCCC, 2012). COP decisions have so far only defined some very broad outlines for the NMM. The NMM is supposed to promote mitigation across 'broad segments' of developing country economies, may operate on a sectoral and/or project-specific basis, and is to achieve a net decrease and/or avoidance of GHG emissions (UNFCCC, 2013).

As the challenges of sectoral approaches are largely different from those of project-based approaches, this paper limits itself to the sectoral perspective. There are two basic approaches to establishing an emission market mechanism, the baseline-and-credit approach, used by the CDM and other offset mechanisms, and the cap-and-trade approach, used by the EU emissions trading system (EU ETS) and others. In the context of developing a sector-based NMM these have usually been referred to as sectoral crediting and sectoral trading (Sterk et al., 2014; see also UNFCCC, 2014).

4.1.1 Sectoral Crediting

Sectoral crediting would be based on an agreed emission threshold or "no-lose target" at sectoral level. That is, countries would agree on a level of emissions for a sector. This threshold could be either in terms of absolute emissions or intensity-based, for example in terms of emissions per unit of GDP, emissions per unit of electricity generated, etc. The developing country could then undertake actions to reduce its emissions to the agreed level, either unilaterally or with some international support. If emissions are reduced below the target, the developing country would receive credits. If the target is not achieved, there would be no penalties. As illustrated in **Figure 4**, the maximum environmental benefit of a crediting system would be the difference between the BAU scenario and the crediting baseline – or lower, if the country misses its target.

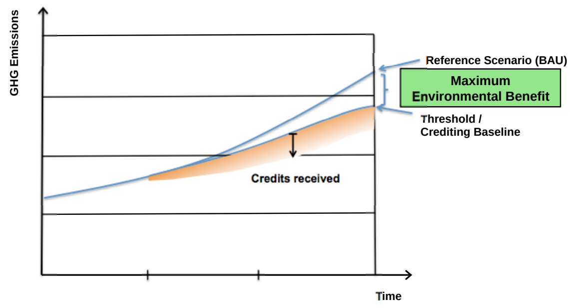


Figure 4: Environmental Benefit of Sectoral Crediting.
Source: Wuppertal Institute

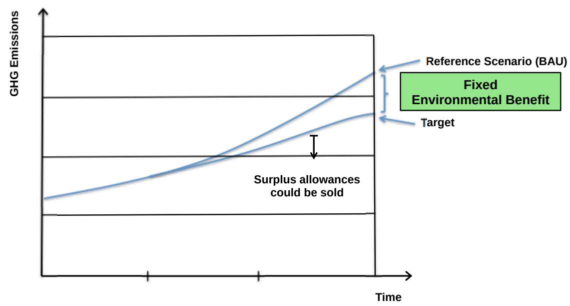


Figure 5: Environmental Benefit of Sectoral Trading.
Source: Wuppertal Institute

4.1.2 Sectoral Trading

By contrast, sectoral trading would follow the cap-and-trade approach. The sectoral target would be a mandatory cap and the developing country would receive tradable units ex ante, essentially equivalent to the assigned amount units (AAUs) industrialised countries receive under the Kyoto Protocol. If the country manages to reduce its emissions below its target, it would thereby achieve a surplus of trading units which it could sell. If the country does not achieve the sectoral target, it would need to buy trading units to cover the shortfall. As illustrated in **Figure 5**, a trading system would therefore have a fixed environmental benefit.

4.2 How Would the NMM Stimulate Mitigation Actions?

One key feature of the existing CDM is that credits are issued based on the individual performance of one project / one installation – irrespectively of the performance of all other installations in this sector. By contrast, the proposals for a sectoral NMM explicitly aim for a group performance approach: Emissions would be assessed for a whole sector or group of emitters and trading units would be issued based on the performance of the whole group / sector.

Such new sectoral mechanisms may have to operate at the government level, at least in the first instance, as private entities could hardly take responsibility for entire sectors. This would introduce an intermediary (the developing country governments) between the carbon market and those who actually undertake the investments. It would therefore be necessary for the developing country governments to implement appropriate policies to pass the incentive on to investors or those affected by the policies.

As an alternative to governments implementing policies, sectoral mechanisms may also be devolved at the installation level. While not explicitly envisaged in the negotiation texts, not only sectoral trading but also sectoral crediting mechanisms could be broken down to the installation level. The process would be similar to an allocation in a cap-and-trade system, but instead of allowances each installation would be given a crediting baseline. However, the responsibility for meeting the targets would stay with the host country governments. This is a significant difference to the current project-based mechanisms, where the liability for project failures lies solely at the hands of private project developers. New market mechanisms would give host governments a much more active role in safeguarding greenhouse gas reduction achievements (Butzengeiger et al. 2012)

On this basis, the following basic options can be conceived:

A) The government sets a sectoral target and implements non-trading policies and measures to reduce emissions. These may be either mandatory "sticks" or voluntary "carrots". This approach would thus be essentially akin to Art. 17 trading under the Kyoto Protocol or the mechanism under the EU's effort sharing decision for those sectors not covered by the EU ETS.

B) The government sets a sectoral target and defines voluntary individual targets for the installations within the sector. If an installation beats its target, it receives credits from the government. If not, there are no penalties.

C) The government sets a voluntary sectoral baseline and defines binding installation-level emission targets, possibly forming the basis for a national ETS.

The International Emissions Trading Association (IETA, 2010) is sceptical of such a government-based approach. It argues that there is a strong risk that either governments may fail to introduce appropriate policies, or that policies may

International handling of credits / emission units	Government receives credits / allowances			D) Installation receives credits
National implementation	A) Government Policies	B) Installation-level crediting	C) Binding installation targets	

Table 3: Options for implementation at government or installation level. *Source: Wuppertal Institute.*

fail to be as effective as initially projected, or that governments may renege on their obligation to pass international credits on to the investors. They therefore propose that instead of going through governments sectoral crediting might be established with a direct relation between the installations and the international authority. In this version, the target would be set by the host country government, but instead of issuing credits to the host country government the international authority would issue credits directly to the covered installations if they beat their respective installation-level crediting thresholds. The host country government would nonetheless be responsible for ensuring that the overall sectoral target is met (Option D).

These different options are summarized in the **Table 3** above.

4.3 Transformational Potential of NMM Options

A sector-based NMM would by definition go beyond the project scope in terms of coverage. However, whether broad coverage would translate into radical transformational impact would strongly depend on the implementation details of the mechanism. As the example of the EU ETS has shown, even an instrument covering nearly half of a country's emissions need not necessarily have a deep impact.

The design of the NMM is still completely open and even the design options that have been proposed to date remain at a very high level of abstraction. Any assessment of the potential impact of the NMM can therefore be only a first approximation based on general principles. The following attempts to provide such an approximation for the four implementation schemes A-D.

4.3.1 Government-Led Scheme

In option A, the host country government retains all credits/allowances that are issued and uses them to co-finance policy implementation. This option therefore directly provides for policy integration. Governments generally have a broad range of policy options at their disposal, such as energy/CO_2 taxation, mandatory efficiency standards, renewable feed-in tariffs or other forms of financial support. As no trading units are issued to individual installations, emissions could be accounted at the aggregate sectoral level based on statistical data such as fuel statistics, which reduces transaction costs (Sterk et al. 2014).

The reduction of transaction costs entailed by accounting for emissions at an aggregate level may facilitate the participation of countries that have not been able to participate in the CDM, which has partly been caused by the substantial installation-level MRV required under the mechanism. Some analysts also consider that implementing PAMs might be easier for poorer countries than trying to attract individual investment projects (Sugiyama, Yamaguchi & Yamagata, 2005).

However, actual changes of prevailing structures, promotion of technology transfer and learning, economies of scale, sustainability benefits, incentives for private sector participation and diversion of investment flows would depend on what PAMs are implemented. Some policies such as banning outdated technology can achieve very considerable emission reductions at very low transaction costs (Schneider and Cames, 2009). This government-led approach could also facilitate the blending of carbon finance from the NMM with other sources of domestic or international climate finance (Prag and Briner, 2012).

4.3.2 Voluntary Installation-Level Participation

In options B and D, the government would pass the sectoral target on to the individual installations within the sector. Each installation would be assigned its own emission target. If an installation achieves its target, it receives credits. If not, there are no penalties.

Hence, installations would be directly exposed to the carbon price signal, which would promote private sector sensitisation and the identification of sustainable business models. The regulatory risk for investors would be much lower than under the CDM as there would be no question about eligibility, which would be determined top-down, and thus sectoral crediting might even be able to actually drive financing decisions (Marcu, 2009). The regulatory risk would be especially low in option D), where investors would receive credits from the international authority. There would thus be no policy risk that the host country government might renege on its obligation to issue credits to good performers.

Due to the need to MRV installation-level emissions, transaction costs would be higher than for option A), but by the same token there would be a correspondingly stronger build-up of administrative capacity.

However, since target achievement would not be mandatory for installations, there may be situations where some individual installations successfully reduce emissions but others do not and thus the sector as a whole does not. Therefore, the sector as such would not be eligible for credits but individual installations would be. If installations that reduce emissions run the risk of not being rewarded because of the failures of others, the system would hardly provide an incentive to reduce emissions. The crediting of individual installations would therefore need to be decoupled from the performance of the sector as a whole.

The literature discusses various options (e.g. Baron, et al. 2009; Helme et al., 2010; Marcu, 2009; Harrison et al., 2011). One option would be for the host country government to take on the risk and guarantee to provide credits to installations that reduce their own emissions regardless of the overall sector performance. However, this does not reduce the risk, it merely shifts it from the installations to the host country government, which may not have much appetite for assuming such risks, so political feasibility of this option may be low. Another option, which might be politically more acceptable to developing countries, would be to hold back a share of the credits issued to form a reserve. The government could also try to reduce the risk of sectoral non-performance by implementing additional policies to reduce sectoral emissions (that is, combining options A) and B) or D)). But if both government and installation operators work to reduce emissions, the question is who of them deserves which share of the credits for the overall sectoral reduction.

Combining sector-wide target setting with voluntary installation-level participation therefore poses a major challenge for how to ensure that the sectoral target is actually met and that well-performing installations are actually rewarded.

Even if one of the above options is chosen to ensure that sufficient credits will be available for well-performing installations, only installations with mitigation options at cost below the international carbon price would be incentivised to participate. Due to the voluntary nature of the system, installations with higher mitigation cost would not have to reduce their emissions. The impact on prevailing structures, technology promotion, economies of scale, and diversion of investment flows would hence probably be limited to a sub-set of the sector, unless the international carbon price was higher than the cost of most mitigation options within the sector.

Integration with other policies would need to be developed by the host country governments on a case by case basis.

4.3.3 Mandatory Installation-Level Participation

In option D) the installation-level targets would be made mandatory with penalties attached. These could either be financial penalties, which could be used by the government to purchase trading units if needed, or obliging the companies themselves to purchase trading units if they have excess emissions. The government could also introduce a fully-fledged emissions trading system. Option D) would thus have all the advantages of options B) and D) but not have the problem that the overall sectoral performance might not yield enough credits to reward the individual good performers. This option would therefore ensure that each installation has an incentive to reduce emissions and would thus most strongly contribute to private sector sensitisation (Sterk et al. 2014). However, as the example of the EU ETS has shown the actual impact of such a system would nonetheless strongly depend on the implementation details.

4.3.4 Synthesis

Table 4 provides an overview of how the four NMM options may be measured against the transformation criteria outlined in chapter 2.3. Even though the details of the NMM have not been defined yet, a general level of assessment is still possible. Option A) provides for some build-up of administrative capacity in the host countries and provides high potential for policy integration. However, most impacts would depend on the specific set of PAMs that would be utilised. Options B-D would provide direct incentives to installation operators and would thus promote business sensitisation the most. They would also provide for strong build-up of administrative capacity. Due to the voluntary participation, options B) and D) would entail the problem of how to ensure that well-performing installations are rewarded even if the overall sectoral target is not met. Option C) would solve this problem by making installation-level targets mandatory and would thus provide the highest investment certainty.

However, the strength of the incentive would nonetheless strongly depend on further implementation details. The assessment of the EU ETS has shown that a robust signal is needed: the carbon price incentive only unfolds its full effectiveness if investors can be sure that the price has only one direction to go: upwards. This raises the question how certainty about future carbon prices can be generated envisaged in a setting as envisaged for the NMM, where the carbon price would not be set domestically as in the EU ETS but by the global balance of supply and demand. This very problem of insufficient global demand to pay for further emission reductions in developing countries has brought the CDM to a near standstill. The CDM situation led the High-Level Panel of the CDM Policy Dialogue to recommend that there should be some form of international reserve bank (CDM Policy Dialogue, 2012).

It bears noting that the above are prototypical options, in reality one can expect a combination of option A) with one of the options B) to D), as there will always be some policies already in place and further ones are likely to be introduced in parallel or later for climate- or non-climate reasons, such as air quality. If designed effectively, such a hybrid of emission pricing and other PAMs arguably also provides the best prospect for maximising both environmental effectiveness and economic efficiency.

Systems based only on emission prices can be expected to perform well on a short-term basis (static efficiency) but entail a risk that the focus of action is laid on short-term rather than long-term considerations (thus neglecting dynamic efficiency). For example, new technologies may be neglected which in their infancy have high costs but may ultimately become the most cost-effective option (Weber and Hey, 2012). This is exemplified by the CDM, which has thousands of hydro and wind energy but only few solar energy projects (UNEP Risø, 2014). At the same time, targeted support instruments such as feed-in tariffs have induced strong deployment and technological learning that has reduced equipment costs of solar photovoltaics by about 80% within the last five years (Liebreich, 2013). Effectively reducing emissions therefore requires a portfolio of policies tailored to fit the specific circumstances (Gupta et al., 2007).

Criteria	Indicators	Government policies	Installation level crediting	Binding installation targets	International crediting of installations
Impact beyond project scope	change of prevailing structures	PAM-dependent	Medium	High	Medium
	promotion of technology transfer	PAM-dependent	Medium	High	Medium
	technological learning	PAM-dependent	Medium	High	Medium
	economies of scale	PAM-dependent	Medium	High	Medium
	sustainability co-benefits	PAM-dependent	Medium	High	Medium
Building capacities	administrative capacities	Medium	High	High	High
	private sector sensitization	PAM-dependent	High	High	High
	identification for sustainable business case	PAM-dependent	Medium	High	Medium
Diversion of investment flows	shift of investment patterns towards sustainable types of production and consumption	PAM-dependent	Medium	High	Medium
Political integration	integration with other policies into a coherent policy mix	High potential	Case by case issue	Case by case issue	Case by case issue

Table 4: Transformative potential of NMM implementation options. *Source: Wuppertal Institute.*

5 Conclusion: Potential and Limits for a Transformative NMM

This paper has sought to synthesise the findings from transformation research and to elaborate how these findings may be applied to the design of the NMM.

Transformation research generally holds that transformations are not linear processes as result of intentional actions of powerful actors, but cases of interacting dynamics playing out on different timescales but congealing in one direction. General characteristics of transformation are:

- They are co-evolutionary, that is, involving a multitude of changes in differing socio-technical (sub-)systems and take place at local, national and global levels.
- They include both the development of (niche) innovations as well as their selection by users and societal anchoring through markets, regulations, infrastructures and new societal norms.
- They are influenced by large numbers of actors from politics, science, business, civil society and individuals.
- They are ultimately radical processes regarding their impacts and reach, but may take decades to complete.

A variety of climate finance institutions have expressed the ambition to focus their support on actions with transformational potential and have developed criteria to identify such actions. These criteria can be synthesised as follows:

- Impact beyond the Project Scope: For a truly transformative impact all funding institutions analysed in this paper consider more multidimensional impacts imperative, including changes of prevailing structures, promotion of technological learning, transfer and innovation, economies of scale and sustainability benefits.
- Building Capacities: In order to achieve a fundamental and ultimately transformative change towards a more sustainable socio-economic system, capacities are necessary both in administrative institutions and the private sector. Public administration needs to guide and govern the required change and the private sector needs to develop and maintain sustainable business models.
- Diversion of Investment Flows: Ultimately, a future sustainable socio-economic system will need a fundamental restructuration of physical infrastructures. A policy with transformative potential must therefore contribute to a diversion of public and private investments into more sustainable assets and avoid lock-in of unsustainable infrastructures.
- Integration into Wider Political and Social Debates: As transformations are by definition co-evolutionary, a single policy instrument, even if it is designed to serve plural purposes, can hardly enable and support change on all required levels. Poli-

cy mixes are necessary to bring forward sustainability transitions.

The negotiations on the NMM have so far not made much headway and its characteristics are hence not yet well-defined. Even the design options that have been proposed to date remain at a very high level of abstraction, too abstract to allow for a detailed analysis. The case study of the EU ETS has shown that details in the arrangements of the scheme – take the allocation of permits as an example – can significantly influence the incentive structure of the instrument. Small changes in the design can make huge differences whether an instrument supports transformative change towards a sustainable socio-technical system or to the contrary contribute to locking in incumbent unsustainable technologies and practices even further.

Some general conclusions can nonetheless be drawn. The WBGU and others argue that carbon pricing is necessary but is by itself not sufficient to redeem the various types of market failures that have led to the unsustainable global socio-economic system we are deemed to change. More specifically, Kivimaa and Kern (2014) argue that a policy mix can only effectively support a sustainability transition if it covers both aspects of creation and destruction. There is a need for policies that create technological niches, that promote sustainable technologies, that nurture innovation etc. But there is also a need for policies that challenge the incumbent regime by controlling emissions, by changing institutional arrangements that have historically favoured unsustainable practices or by changing the terms of business to destabilise the incumbent socio-technical regime. A major conclusion therefore is that an NMM need to be integrated into a policy mix and that the mechanism should be tailored to complement national policies.

As for the NMM itself, based on the discussions held so far, four basic options for how the NMM could function can be conceived:

A) The host country government sets a sectoral target and implements non-trading policies and measures to reduce emissions.

B) The government sets a sectoral target and defines voluntary individual targets for the installations within the sector.

C) The government sets a sectoral target and defines binding installation-level emission targets, possibly forming the basis for a national ETS.

D) The host country government sets a sectoral target and installation-level targets, but instead of issuing credits to the host country government the international authority would issue credits directly to the covered installations if they beat their respective installation-level crediting thresholds.

Option A) provides for some build-up of administrative capacity in the host countries and provides high potential for policy integration. However, most impacts would depend on the specific set of PAMs that would be utilised. Options B-D would provide direct incentives to installation operators and would thus promote business sensitisation the most. They would also provide for strong build-up of administrative capacity. Due to the voluntary participation, options B) and D) would entail the problem of how to ensure that well-performing installations are rewarded even if the overall sectoral target is not met. Option C) would solve this problem by making installation-level targets mandatory and would thus provide the highest investment certainty.

However, the strength of the incentive would nonetheless strongly depend on further implementation details. The experience with the EU ETS has shown that some design features are particularly critical for setting transformative incentives. In particular, it has shown that a carbon price incentive only unfolds its full effectiveness if investors can be sure that the price has only one direction to go: upwards.

This raises the question how certainty about future carbon prices can be generated in a setting as envisaged for the NMM. Not setting the carbon price domestically but by a function of global supply and demand poses a particular problem in this regard. Recent history demonstrated this rather drastically: Insufficient global demand to pay for further emission reductions in developing countries has brought the CDM to a near standstill. The CDM situation led the High-Level Panel of the CDM Policy Dialogue to recommend that there should be some form of international reserve bank, but analysts do not see many options for stabilizing the market apart from more ambitious mitigation commitments. (CDM Policy Dialogue, 2012; Hermwille, 2013).

One of the motivations behind the NMM discussion is the aim to facilitate the establishment of domestic emission trading systems in more and more countries. Establishment of a domestic ETS opens up further design questions, allocation rules being the most problematic of design features. At the same time the promise to provide free allocations was key to gain industry support to agree on the EU ETS in the first place, as it is said to limit potential adverse effects on competitiveness of regulated versus non-regulated companies (Hepburn et al., 2006; Egenhofer, 2007). Others have argued that increased free allocation may shift political economies in a way that would allow to agree more stringent regulation overall (Hanoteau, 2005, cited in Gawel et al., 2014). In fact, it may well be the case that free allocation mechanisms are a 'necessary evil' to be able to establish an ETS.

However, an ETS and carbon pricing can only unfold its potential if this 'evil' is overcome. The question is how fast this change in allocation practices can practically occur. The EU ETS changed its allocation mechanisms already after its second trading period and as a result the share of free allocation was strongly reduced. However, there still exist generous exemptions from the general auction of permits for heavy industries.

Given that NMM was defined to take into account "different circumstances of developed and developing countries" (UNFCCC 2012, §83) and to ensure "voluntary participation of Parties, supported by the promotion of fair and equitable access for all Parties" (UNFCCC, 2011, §80a) one has to ask critically how fast this change can be expected to occur in a developing country participating in an NMM. Especially, when a sectoral ETS under an NMM would be directly linked to international carbon markets, it is in our view highly unlikely that developing countries will do without free allocation of permits to their industries quickly enough to spur transformative change.

In fact, the push to extend carbon markets to developing countries is driven to some extent by the idea that industrial production in developing countries, due to its environmental inefficiency, hosts a large mitigation potential available at relatively low-cost. For regulated entities in developed countries this would provide a means to meet their obligations more cost-effectively (see also UNFCCC, 2012, § 83). For developed country industries this would be very beneficial, but it would most likely not create a "level playing field" for industrially competing industries. Given national and international differences in capacity to pay, a uniform carbon price is socially regressive. Treating dissimilar cases alike is as inequitable as treating similar cases differently (Sterk and Hermwille 2013).

Introducing emission trading as an NMM in a developing country, exposing the newly regulated industry fully to carbon price levels that reflect the mitigation costs and more importantly capacities to pay of developed country competitors would dramatically change the terms of business in the NMM host country. Imagine, a country like India or China would introduce a sectoral ETS with full auctioning of permits and linking to the EU ETS without limitations. A company in the NMM host country would face competing bids from European competitors who not only have a higher capacity to pay but also would need less allowances per unit of output because of their allegedly higher carbon efficiency. With carbon prices at levels that are required to incentivise investment in low-carbon technologies, this structural disadvantage could threaten the mere existence of industries in the NMM host country. It is therefore highly unlikely that any developing country would voluntarily participate in a NMM without being able to protect their industries and buffering the effect of carbon pricing via some amount of free allocations.

The political realities suggest that the practical potential for transformative change of market-based mitigation instruments, a sectoral ETS under a NMM scheme, has limited prospects for success, especially if the idea is to integrate international carbon markets in a global carbon market, as long as strong differences in the level of development, consequently of capacities to pay and carbon efficiencies of existing industrial infrastructures exist.

A way forward could be not to open emerging ETSs in NMM host countries directly to international carbon markets but instead begin with establishing a protected carbon market with full auctioning of permits but price management in the form of e.g. a price collar (Grubb, 2012). This would allow to limit the impact on the competitiveness of the domestic industry and at the same time meet a key precondition for the effectiveness of carbon pricing: certainty about future prices.

The level of ambition and both minimum and ceiling price could gradually be increased to the point where it reaches the level of international carbon markets and linking of markets can be achieved without strong effects on the terms of trade. That is, rather than converging carbon prices by linking systems with each other, a convergence of domestic carbon prices is probably needed to actually make linking politically possible (Tuerk et al., 2009).

We therefore recommend not to rush the integration existing carbon markets with those that might be emerging under the NMM. Pushing for direct linking of ETSs could create an incentive for governments in developing countries to rely on free allocation of permits in order to protect domestic industries and thus create and maintain an incentive for lock-in of unsustainable technologies.

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