



New Mechanisms for the Carbon Market? Sectoral Crediting, Sectoral Trading, and Crediting Nationally Appropriate Mitigation Actions

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Deutsche Zusammenfassung

Insbesondere die Industrieländer haben sich stark dafür eingesetzt, im internationalen Klimaregime neue Emissionshandelsmechanismen auf sektoraler Ebene einzuführen. Die Erwartung ist, dass solche Mechanismen in der Lage wären, erstens den Kohlenstoffmarkt in einer sehr viel höheren Größenordnung zu mobilisieren als bisher, zweitens Sektoren zu erreichen, in denen der Clean Development Mechanism (CDM) bisher kaum gegriffen hat, und drittens Entwicklungsländern Anreize zu geben, klimafreundliche Politiken und Maßnahmen einzuführen. Viertens wird erwartet, dass sektorale Mechanismen eine höhere ökologische Integrität haben würden als der derzeitige CDM. Dieses Papier analysiert die Anwendbarkeit von sektoralen Ansätzen in Entwicklungsländern und ihre Vor- und Nachteile.

Hauptsächlich sind zwei Ansätze in der Diskussion. Erstens *sectoral crediting*, in dessen Rahmen eine Baseline auf sektoraler Ebene etabliert würde und Zertifikate ex-post für erzielte Reduktionen ausgeschüttet würden. Und zweitens *sectoral trading*, in dessen Rahmen ein verbindliches sektorales Emissionsziel vereinbart würde und auf dieser Grundlage Zertifikate ex ante alloziert würden. Ein weiterer Begriff, der verwendet wird, ist *NAMA crediting*. Zumindest laut neuesten Definition im Verhandlungstext wäre *NAMA crediting* jedoch dasselbe wie *sectoral crediting* und *sectoral trading*.

Sektorale Ansätze würden per Definition Anreize für sektoralweite Transformationen setzen. Sie würden auch die Notwendigkeit beseitigen, die Zusätzlichkeit Projekt für Projekt zu prüfen.

Sektorale Ansätze würden auf Regierungsebene umgesetzt, zumindest im ersten Schritt. Diese Ansätze schieben damit einen Vermittler (die Regierung des jeweiligen Landes) zwischen den Kohlenstoffmarkt und die Akteure, die die tatsächlichen Investitionen tätigen müssten. Jedoch hat der Markt bisher große Schwierigkeiten gehabt, wichtige Sektoren wie Gebäude und Verkehr zu erreichen. Sektorale Ansätze könnten damit Anreize für Regierungen bieten, klimafreundliche Politikmaßnahmen wie Gebäudestandards in diesen Sektoren einzuführen. Emissionshandelsmechanismen haben jedoch den Nachteil, dass die Erlöse nur ex-post erzielt und nicht genau vorhergesagt werden können. Entwicklungsländer müssten daher sektorale Ansätze vorfinanzieren und wären dem Risiko ausgesetzt, die Kosten nicht wieder einzuspielen.

Eine andere Frage in Bezug auf die Stärke von Anreizen ist das Verhältnis von Angebot und Nachfrage. Angesichts des derzeit schwachen Ehrgeizes der Ziele der Industrieländer könnte möglicherweise jegliche Nachfrage nach Zertifikaten bereits aus dem projektbasierten CDM bedient werden.

Für die Energie- und Industriesektoren könnten sektorale Mechanismen im Prinzip direkt auf die Anlagenebene herunter gebrochen werden, entweder durch anlagenspezifische Baselines oder durch ein cap-and-trade Emissions-

handelssystem. In diesem Fall hätten die Unternehmen einen direkten Anreiz, ihre Emissionen zu reduzieren. Da sie im Gegensatz zum CDM automatisch qua Sektordefinition für die Teilnahme qualifiziert wären, wäre das regulatorische Risiko für Investoren deutlich niedriger als im CDM.

Sektorale Baselines müssten jedoch auf Grundlage von sektoralen Projektionen erstellt werden, die immer einen Unsicherheitsfaktor beinhalten. Es ist daher weiter zu prüfen, ob die Berechnung von Emissionsreduktionen auf sektoraler Ebene wirklich verlässlicher ist als die Prüfung Projekt für Projekt. Zudem würde die Quantifizierung von Emissionen und Reduktionen auf sektoraler Ebene erhebliche technische Kapazitäten erfordern.

Erste Studien über die Eignung bestimmter Länder und Sektoren haben gezeigt, dass die Datenverfügbarkeit in vielen Ländern ein großes Problem ist. Zudem umfassen in vielen Ländern die relevanten Sektoren nur einige wenige Anlagen, so dass kaum ein Vorteil zum projektbasierten CDM bestehen würde. Am anderen Ende des Spektrums verfügen China und Indien über sehr große Sektoren, diese sind jedoch sehr inhomogen, wodurch sich ein erheblicher Aufwand für die Datensammlung, Baseline-Festlegung und das Monitoring ergibt.

Auf der praktischen Ebene kann man daher schlussfolgern, dass für die meisten Länder die Einführung von sektoralen Mechanismen bestenfalls eine mittelfristige Perspektive sein dürfte. Auf der politischen Ebene haben sich wichtige Entwicklungsländer wie Brasilien, China und Indien bisher gegen die Einführung sektoraler Mechanismen gewandt.

Der Copenhagen Accord und der weitere Prozess unter der UNFCCC eröffnen jedoch die Möglichkeit, das Datenproblem anzugehen. Im Accord haben die Entwicklungsländer zugestimmt, in Zukunft zweijährige Inventarberichte vorzulegen. Auch einzelne Maßnahmen sollen laut Bali-Aktionsplan messbar, berichtbar und überprüfbar sein. Die Industrieländer haben im Copenhagen Accord erhebliche Finanzsummen zugesagt, um die Entwicklungsländer zu unterstützen. Ein Schwerpunkt in der Verwendung dieser Mittel sollte beim Kapazitätsaufbau für die Messung, Berichterstattung und Verifizierung von Emissionen liegen. Auch unabhängig von der Frage von Emissionshandelsmechanismen ist die Schaffung einer verlässlichen Datengrundlage ein Ziel mit hohem Eigenwert, denn sie ist eine unabdingbare Voraussetzung dafür, angemessene Politiken und Maßnahmen für die Reduktion von Emissionen entwickeln zu können.

Dennoch dürften sektorale Mechanismen auf absehbare Zeit bestenfalls in einer Handvoll von Entwicklungsländern Anwendung finden. Um alle Länder mit Unterstützungsmechanismen abzudecken, werden daher parallel weitere erhebliche Anstrengungen erforderlich sein, um den CDM weiter zu verbessern und umfassende transformative Politikmaßnahmen aus fondsbasierten Mechanismen zu fördern.

1 Introduction

Under the Kyoto Protocol's Clean Development Mechanism (CDM), industrialised countries (Annex I countries) can finance greenhouse gas (GHG) emission reduction projects in Southern countries (non-Annex I countries) and count the resulting Certified Emission Reductions (CERs) towards their Kyoto emission targets. In addition, in many industrialised countries companies can also purchase CERs and count them towards their national climate protection obligations. The purpose of this mechanism is to allow industrialised countries to tap into low-cost emission reduction potential in other countries and thus achieve their Kyoto targets more cost-efficiently. Moreover, the CDM is to assist the host countries in achieving sustainable development.

For almost ten years now, there has been a discussion to scale up the project-based Clean Development Mechanism (CDM) or complement it with new carbon market mechanisms. This discussion is driven by the perceived weaknesses of the CDM. Critics claim that CDM fails to screen out project proposals that are actually not additional. Furthermore, important sectors such as demand-side energy efficiency and transport as well as entire regions such as Africa are so far hardly represented in the CDM. Finally, due to its design as a project-based mechanism, some see the CDM as fundamentally incapable of achieving fundamental structural changes at the scale necessary to effectively combat climate change.

The discussion gained in intensity over the years and ultimately led to the decision of the Conference of the Parties serving as Meeting of the Parties to the Kyoto Protocol (CMP) in Montréal in 2005 to allow Programmes of Activities (PoAs) in the CDM. PoAs offer the opportunity to aggregate high numbers of small-scale decentralised activities into larger projects. At the same time, though, the conference also decided not to allow policies and standards under the CDM, which had been one of the focus areas of the discussion so far.

The topic was taken up again in the negotiations for a future climate agreement that was also started in Montréal. In particular developing countries are pushing for the creation of new carbon market mechanisms and three main proposals have been put on the table: sectoral crediting or sectoral no-lose targets, sectoral cap-and-trade trading, and crediting of nationally appropriate mitigation actions (NAMAs) taken by developing countries.

This paper aims to analyse in how far the proposed new mechanisms do actually hold promise for improving and going beyond the current CDM. The paper first looks at how the new mechanisms would be defined and would operate based on the current status of the negotiations. Second, the paper analyses possible advantages and disadvantages of the new mechanisms. Key questions in this respect are how robustly emission reductions could be quantified under the new mechanisms, what incentives the new mechanisms would provide for reducing emissions, and which sectors and countries would in practice be able and appropriate for employing new mechanisms. Third, the paper reviews the positions taken by key Parties as well as businesses and non-governmental organisations. Finally, the paper synthesises the findings from the previous chapters and discusses possible ways forward.

2 Overview and Definitions of Proposals

2.1 Basic Definitions

Several Parties have proposed new mechanisms in their submissions. This topic was at times discussed both in the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) and in the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA). In 2008 and 2009, both AWGs produced fairly long texts on possible new mechanisms. The following definitions are based on the LCA texts from June and November 2009 (UNFCCC 2009a, 2009b). It bears noting that in the texts coming out of Copenhagen there was hardly any detail on new mechanisms, mainly due to resistance from key non-Annex I countries to creating new mechanisms.

The negotiations have revolved mainly around three possible new mechanisms: sectoral crediting, sectoral trading and NAMA crediting.

Sectoral crediting would be based on an agreed emissions 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.

By contrast, sectoral trading would be a cap-and-trade approach. According to this proposal, again a target for sectoral emissions would be agreed that should be substantially below BAU projections. However, in this case the 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. The developing country would again need to implement actions to reduce its emissions. If it manages to reduce its emissions below its target, it would thereby achieve a surplus of trading units which it could sell. The country might also sell some trading units upfront to generate financing for the actions it wants to take. Instead of taking actions itself, the government could also devolve the sectoral target to the installations in the sector through a cap-and-trade emission trading system. If the country does not achieve the sectoral target, it would need to buy trading units to cover the shortfall.

As for NAMAs, from the negotiations so far it appears that NAMAs will be defined very broadly to include any type of action that reduce emissions, from specific investments to national policies such as financial incentive schemes or regulations. The proposal to credit NAMAs therefore initially seemed to be related to earlier discussions about allowing the crediting of policies under the CDM.

However, in the 2009 LCA texts the proposal for crediting NAMAs is hardly different from the proposals on sectoral crediting and trading. The LCA text distinguishes between participation on the basis of a crediting reference level and participation on the basis of a trading reference level. According to the LCA text, these two options would essentially function as the proposals for sectoral crediting and sectoral trading outlined

above: Parties that participate on the basis of a trading reference level Reducing emissions below the crediting reference level would yield credits, but there would no penalties for non-achievement. Parties participating on the basis of a trading reference level would receive trading units ex ante and would have to retire trading units equal to their actual emissions at the end of each trading period.

2.2 Procedures and Actors Involved

The submissions from Parties and LCA texts also go into some detail of how the proposed new mechanisms would work in practice. In addition, the discussion in the literature has gone into substantial detail.

The procedures for a sectoral crediting and sectoral trading would be essentially the same and basically involve the following steps:

1. The respective developing country would propose a sectoral crediting threshold or target. The proposal would need to be accompanied by a projection of BAU emissions in the sector.
2. This proposal would need to be assessed by an international body. This could either be the CDM Executive Board if given the necessary capacity or a new body. Given the high political significance, the ultimate decision may lie with the Conference of Parties (COP).
3. Once approved, the developing country would need to initiate actions to reduce emissions in the sector and to maintain a sectoral emissions inventory.
4. The inventory would need to be submitted for international assessment at regular intervals, e.g. annually. As the crediting would relate to total sectoral emissions, the individual mitigation actions would not need to be submitted for international assessment, in contrast to the CDM.
5. The last step is the main difference between sectoral crediting and trading. In the case of sectoral crediting, the developing country receives emission credits if sectoral emissions are below the crediting threshold. If emissions are above the threshold, there are no consequences. In the case of sectoral trading the developing country would need to make up for any emissions shortfall by buying additional trading units or else face consequences that would need to be defined.

Crediting NAMAs may at first seem rather complex if NAMAs are defined as any action that reduces emissions. Procedures for crediting NAMAs would then in principle need to take into account all the different types of actions NAMAs could be. However, as noted above in its latest iteration the definition of NAMA crediting in the LCA text only refers to crediting or trading at sectoral level.

In addition, much of the complexity disappears when taking a closer look at what NAMAs could be, for example what NAMAs were submitted under the Copenhagen Accord. They can be classified into five categories:

1. National emission neutrality targets;
2. National emission intensity targets;
3. National emission targets in terms of a deviation from business as usual;
4. Sectoral emission targets;
5. Specific actions at national and/or local level;

Evidently, the target-based approaches would be well compatible with crediting. How to measure, report and verify (MRV) national and sectoral emissions is generally well understood, though most developing countries would probably require significant capacity building to establish robust inventories.

If the definition of NAMA crediting was expanded to also allow crediting of specific actions, the situation would be more complex. Specific actions can in principle be of two types, they can be either specific investments or they can be policies. Specific investments can be credited through the CDM, so in principle no new mechanism seems necessary to allow crediting of this type of NAMAs. The possibility to MRV policies vary from case to case. In the case of a policy such as a renewable electricity feed-in tariff, one can straightforwardly count each kWh that benefits from the tariff and multiply the total with the respective grid's average emission factor. By contrast, while it is possible to determine whether a vehicle efficiency standard has been introduced and it is also possible to measure whether transport emissions are declining, it is difficult to determine to what extent the decline of emissions is attributable to the policy, or to other influencing factors, such as changing fuel prices.

It bears noticing that most of the proposed new mechanisms would operate at government level, at least in the first step. They would therefore constitute a fundamental break with the current CDM in that they would turn an instrument that was originally targeted at private investment into a tool for governments to finance climate-friendly policy measures. This may be seen as an advantage as it would constitute an incentive for governments to implement comprehensive climate-friendly policies. But it raises the question how the incentives would be passed through to those who would actually undertake the investments.

3 Potential Advantages and Disadvantages of the New Mechanisms

In the discussion about new mechanisms four main advantages are mentioned:

- Scaled up mechanisms are supposed to mobilise carbon finance on a much larger scale than so far to cover the costs of reducing emissions in developing countries and hence mobilise much greater volumes of credits.
- It is hoped that new mechanisms at an aggregate level will be better able to reach sectors the CDM has so far hardly tapped, especially transport and buildings.
- New mechanisms are supposed to give incentives to developing countries to implement climate-friendly policies.
- Finally, it is hoped that mechanisms at an aggregate level will be more environmentally robust than the project-by-project approach of the CDM.

The first three points essentially relate to the incentive structure new mechanisms would provide. The second point also relates to the approach to quantifying emission reductions, as MRV has been one important reason why implementing the CDM has so far been difficult in the transport and buildings sectors. The following will therefore discuss the incentive structures and MRV aspects of the proposed new mechanisms. A third factor that is important for points 1 and 2 is which sectors and countries would actually be able to make use of new mechanisms.

3.1 Incentives for Reducing Emissions

If implemented successfully, the proposed new mechanisms at sectoral level would by definition set incentives for sector-wide transformations in Southern countries. Years ago authors already argued that sectoral approaches might specifically give a major boost to decentralised small-scale renewable energy and energy efficiency activities or make it possible to implement fuel efficiency standards or comprehensive traffic management (Browne et al. 2005; Figueres 2005). This argument was recently taken up again for example by Schneider/Cames 2009.

The incentive structure would be different depending on whether a mechanism would work at government level or entity level. Operation at government level 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. These two cases of operation of government level or installation level will therefore be discussed in turn.

In principle, operation at government level need not be a barrier to achieving substantial emission reductions. Governments have a broad arsenal of policy tools at their disposal which they could use to reduce sectoral emissions below the baselines, such as taxes, financial incentives, standards or infrastructure investments. In particular, the power sector is in many countries still publicly owned or very tightly regulated, so governments could directly implement measures to reduce emissions in the power sector and use crediting revenues to finance these actions.

However, it may be questioned whether emission trading mechanisms would in fact constitute a strong incentive for governments to implement ambitious emission reduction policies and measures. The reliability of funding under crediting mechanisms is characterised by significant structural limitations related to the high levels of risk and uncertainty at various stages of the project development pipeline, relatively high transaction costs and complexity, and the timing of credit generation. Especially in developing countries the financing need is most acute before the start of implementation. Emission credits, however, are only generated when emission reductions have already been achieved. While there are some purchasing programmes for the CDM where it is possible to receive part of the carbon revenue upfront, the dominant market model has so far been “payment on delivery”. Moreover, upfront payment is a trade-off between receiving early financing and the amount of carbon financing received: since there is always a risk that a project will fail or not generate as many credits as expected, credits sold upfront fetch a lower price than issued credits. The range is currently 7.5-9 Euros for medium-risk forward sales, 9-10 Euros for low-risk forwards, 10-11.5 Euros for credits from registered projects, and 12-13 Euros for issued credits (GTZ 2010). In addition, the carbon revenue is subject to high risks. Ex ante, participants cannot be sure whether their project will be registered, whether it will actually achieve the expected amount of emission reductions and which price they will receive for the credits. Relying on carbon credit revenues to make an otherwise unprofitable project profitable is therefore a very uncertain proposition. Some critics claim that due to these reasons the CDM is in fact hardly ever a make-or-break factor when deciding to proceed with a project and that this has been confirmed by project developers themselves (Haya 2009).

New crediting mechanisms would retain the limitations of the current CDM in terms of receiving the revenue only ex-post and not being able to predict accurately how much revenue will be received. Developing coun-

try governments would need to prefinance sectoral schemes and run the risk of not being able to recoup their costs. The sectoral trading proposal has been put forward as a solution to the upfront financing problem: If governments received trading units *ex ante*, they would be able to sell part of them and use the resulting revenue to finance their policies. However, governments may only wish to do so if they can be very sure that the planned policies will in fact be able to deliver the expected reductions, as otherwise they would need to in the end buy back the trading units they sold initially.

Due to these factors, Ward et al. (2008: 71) question whether sectoral mechanisms would in fact provide a strong incentive for developing countries to implement climate-friendly policies: “As governments are not investing in policies and measures to speculate in carbon markets, the volatility of carbon credits may be a serious problem for governments.” This limitation could probably only be overcome if Annex I countries were willing to move away from the currently dominant market model of payment on delivery and instead provide significant amounts of upfront financing. One option would be to establish sectoral schemes in direct partnerships between the respective non-Annex I country and one or more Annex I countries. Alternatively, funding could be provided through the new climate fund that is probably going to be established under the UNFCCC as a result of the current negotiations.

If a sectoral mechanism is broken down to the installation level, installation owners have a direct incentive to reduce emissions as long as their abatement costs are lower than the price of carbon. A further advantage is that they usually have a much clearer picture than governments how and to what extent they can reduce their emissions. They would still need to hedge against the volatility of the carbon price, though.

While not explicitly envisaged in the negotiation text, not only sectoral trading but also sectoral crediting mechanisms could be broken down to the installation level (Marcu 2009). 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. If an installation reduces its emissions below the baseline, it becomes eligible for receiving credits. Under this approach, external risks would be largely minimised for the installation owners. The regulatory risk would be much lower than under the CDM as there would be no question about eligibility. Due to the low regulatory risks installation-level crediting might even be able to actually drive financing decisions.

Crediting individual installations on the basis of a sectoral baseline raises the question, however, how to handle a situation where individual installations reduce their emissions below their baselines but the sector as a whole does not because other installations have emissions above their baselines. 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. One option would be for the government to buy trading units to make for any shortfall that may exist. Other options, which would probably be politically more acceptable to developing countries, would be to hold back a share of the credits issued to form a reserve or to make the installation-level baselines 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 for their excess emissions (Baron/Buchner/Ellis 2009; Helme et al. 2010; Marcu 2009).

Sectoral trading in the form of cap-and-trade at installation level would further simplify issues. As units are issued *ex ante*, they could be traded under standardised contracts. This would probably result in exchange-based trading, which would further facilitate operation of the mechanism. Entities could manage their allow-

ances as assets and sell them whenever they liked, rather than having to wait for the ex-post assessment of their performance. However, for most developing countries the adoption of binding sectoral caps is probably still far away (Marcu 2009).

A final question related to the strength of the incentive is the price credits would fetch, which is the result of the balance between supply and demand. Given the uncertainty about the future climate regime any estimates are rather speculative. They crucially hinge on whether the USA will adopt a binding target, how stringent this target will be and how stringent other countries' targets will be. Various estimates synthesised by the UNFCCC Secretariat have put the potential demand for credits in 2020 at 0.5-1,7 Gt CO₂-eq. (UNFCCC 2008a). By comparison, even the project-based CDM on its own is already projected to deliver about 600 Mt CO₂-eq. in 2020 (Butzengeiger-Geyer et al. 2010).

3.2 Environmental Integrity

The proposed new mechanisms imply to establish the baselines or targets at an aggregate level instead of for specific activities. They would thus have the advantage of removing the necessity to determine the additionality of individual investment decisions. However, sectoral approaches also pose new challenges for baseline-setting.

The quantification of emission reductions at aggregate levels would have to rely on modelling and projections, which always possess a degree of uncertainty. Baseline projections need to be based on assumptions about the future impact of current policies, the development and penetration of technologies and the development of economic activity. Uncertainties are likely to be especially great for countries that are growing rapidly and where the GHG-intensity of production can vary significantly over the period of the baseline projection, either through technology choice or technology developments. Also, many developing country economies rely heavily on manufacturing and commodities, which are more sensitive to economic fluctuations than service sectors. Growth rates are therefore more variable and difficult to predict in developing than in industrialised countries (Helme et al. 2010). Ellis/Moarif 2009 highlight an example from China, where the IEA in 2000 projected that electricity generation would be 1.5 trillion kWh in 2005, whereas actual generation in 2005 ended up at 2.5 trillion kWh. If China had adopted a sectoral crediting baseline or even a sectoral target on the basis of the original projection, it would probably have failed to achieve its target by a wide margin.

Schneider/Cames (2009) discuss in detail the practical challenges associated with establishing reliable baselines. As it is not possible to verify assumptions on key emission drivers such as future economic growth and fuel prices, it may not be possible to assess proposed baselines purely on technical grounds and in an objective manner. One key political risk is that countries have an incentive to inflate their baselines in order to weaken the level of effort they have to make.

These problems can be avoided to a certain extent by using intensity targets, for example in terms of emissions per unit of GDP, per unit of electricity produced etc. Changes in these key drivers of emissions would then be factored into the baseline. Intensity targets would probably also be more palatable to developing countries as there would be no danger that the targets might become a "cap on growth". The disadvantage is that absolute targets provide certainty on the environmental outcome whereas intensity targets do not.

Overall, it is not yet clear whether baselines at aggregate levels would be more reliable than project-by-project additionality testing. The experience from the EU ETS, the first large-scale real-case sectoral approach, also gives cause for caution. In its first trading phase from 2005 to 2007 the EU ETS was substantially oversupplied, in part due to faulty baseline data. It is therefore imperative to assess the reliability of quantifying developing country reductions at aggregate levels before scaling up uncapped trading. Ideally, robust inventories should be put in place first and emissions be internationally MRVed for several years before establishing sectoral trading schemes on that basis.

At the moment, probably only a few, if any, Southern countries dispose of the necessary technical capacity to establish reliable sectoral emission inventories. The introduction of the EU emissions trading system has highlighted the significant challenges connected to obtaining reliable data. Sectoral approaches would therefore require significant capacity building.

Further complexities would arise if the scope of crediting NAMAs did include policy-based NAMAs. In order to prevent situations where developing countries hesitate to introduce climate-friendly policies in order not to render CDM projects non-additional, the CDM Executive Board has decided that the baseline of projects may be based on a hypothetical scenario without the policy (UNFCCC 2004). In line with this decision, the baseline of a policy-based NAMA might be defined as the situation without the policy. However, what would additionality mean in this case? How to determine that a policy would not have been introduced anyway, given that policies are usually introduced for a variety of reasons and that GHG emission reduction policies usually entail a number of benefits, such as reduction of pollutant emissions, technology promotion, decreased dependence on fossil fuel imports etc.?

Furthermore, as raised above it may in many cases be impossible to establish a direct link between a policy and the climate benefit achieved since policies typically intervene in complex environments where many factors come into play. Further complexities would arise if governments implemented several overlapping policy-based NAMAs, for example NAMAs tackling electricity supply and demand.

If policies are supposed to be incentivised through the carbon market, it may therefore in many cases be more straightforward to use a sectoral-wide approach rather than try to pinpoint the reductions achieved specifically by a certain individual policy. This points back to the latest definition of NAMA crediting in the LCA which also essentially envisages NAMA crediting as sectoral crediting or sectoral trading.

3.3 The Viability of Sectoral Mechanisms for Specific Countries and Sectors

Due to its nature as a market-based mechanism, the current CDM portfolio is heavily concentrated where investment conditions are best, i.e. in countries with huge emission reduction potential and a beneficial investment environment with a stable political and legal system. The four leading countries India, Brazil, China and Mexico account for no less than three quarters of all projects currently in the pipeline while many other countries have so far been completely bypassed (UNEP Risø 2010).

The current imbalance gives rise to the question which countries would actually be able to make use of the proposed new mechanisms. On the one hand, poorer countries might find it easier and cheaper to implement

policies and measures than to try to attract individual investment projects. On the other hand, given the amounts of technical capacity and data required, it can be expected that only the most advanced developing countries would be able to make sectoral mechanisms work. While this would not necessarily be problematic from a climate protection point of view since these are also the countries which account for the bulk of emissions, it could nevertheless raise political difficulties. Every Conference of the Parties since implementation of the CDM began has seen substantial discontent by the more disadvantaged countries about the unequal geographical distribution of CDM projects and demand for action to address this issue.

In addition, sectoral mechanisms may not be appropriate for every sector. Establishing a robust baseline at the sectoral level would necessitate having detailed and reliable emission inventories and projections for the host countries or at least for the sectors covered. The reliability of the emissions monitoring would also need to be ensured.

Helme et al. (2010) examine the electricity, iron and steel, and cement sectors in Brazil, China and Mexico. They find significant limitations in data availability and, in some cases, host country administrative capacities, a wide range of efficiency performance across firms in the same sector in some countries – from world class installations to highly outdated ones – substantial administrative and policy barriers to implementation of even low-cost mitigation opportunities in some cases as well as weaknesses in needed financial infrastructure to finance investments. Serious data gaps and uncertainties about projections became apparent in particular in China, the world's largest emitter. Helme et al. (2010) therefore propose that a mechanism based on technology objectives may for the intermediate future be rather more suitable for China than an emissions-based approach. As examples of possible technology objectives they mention reducing the share of clinker in cement production, replacing inefficient vertical shaft cement kilns, increasing the share of iron and steel facilities using coke dry quenching technology, or decommissioning inefficient old plants. Helme et al. (2010) suggest that technology objectives would fit well into China's overall economic planning process and their achievement could be readily MRVed without requiring collection of comprehensive emissions data in the sector. Such an approach would therefore be suitable as unilateral NAMA or a NAMA that is supported from public funding. Determining emission credits for beating a technology objective would be more complex as it would require intensity factors for the technologies and an assessment of the volume of production that uses the technology. It would also require definition of a baseline, raising all the difficulties in establishing an adequate sectoral baseline discussed above, which the technology goal as such would not necessarily require if no credits are to be issued.

In a similar exercise, Butzengeiger-Geyer et al. (2010) examine 6 economic sectors in 9 non-Annex I countries. Importantly, they find that most sectors in most countries are actually too small to warrant a sectoral approach. In most cases there are only a handful of installations, so a sectoral approach would have no advantage compared to the project-based CDM. Generally, only China and India have industrial sectors that are large enough to warrant sectoral approaches. However, here the problem is that the sectors usually consist of very efficient large installations on the one hand and large numbers of very inefficient small installations on the other hand. Effectively addressing emissions would mean to include these small installations in a sectoral approach. However, this would cause high costs for monitoring and verification of emissions. For this very reason the EU ETS only includes installations above a certain threshold. This again points to a technology-based approach as maybe being a more appropriate interim step.

4 Positions of Parties, Businesses and Non-Governmental Organisations

Parties and stakeholders have voiced a variety of positions on the introduction of new mechanisms. Without claiming to be comprehensive, the following section gives a brief account of some of the more well-defined and detailed positions that have been put forward. The chapter is mainly based on the author's observation of Parties' interventions during the negotiation sessions as well as Parties' submissions to the UNFCCC (UNFCCC 2008b, 2009c, 2009d, 2009e, 2009f) and position papers elaborated by stakeholders.

Industrialised countries are generally in favour of sectoral approaches and crediting NAMAs. They hold that market-based approaches will be able to deliver most of the financial support needed by developing countries.

The EU in particular has been a main proponent and formulated the long-term vision of establishing a global carbon market covering all countries and sectors as the most efficient means to achieve emission reductions. The EU sees sectoral crediting and sectoral trading as an intermediate step that would allow to scale up mitigation activities from the project to the sectoral level and would facilitate a transition to sectoral and ultimately national cap-and-trade mechanisms. In fact, the suggested definitions and modalities for sectoral crediting and sectoral trading in the negotiation texts discussed above largely go back to the EU. According to the EU, sectoral baselines and targets should be set at ambitious levels, substantially below business as usual (BAU), in order to generate a net environmental benefit for the atmosphere. The EU also highlights the possibility to receive upfront financing in the case of sectoral trading.

Norway has also set out the goal of establishing a global price on carbon, based on the conviction that this would be the most efficient way to of implementing technologies at large scale. Norway therefore proposes that developing countries should establish emission trading schemes or carbon taxes, which could be done in combination with proposals for crediting on the basis of sectoral targets or NAMAs. As means of funding such mechanisms, Norway supports to set aside a share of industrialised countries' assigned amount units (AAUs) and distribute these as up-front financing to developing countries that introduce carbon taxes or emissions trading systems. The amount of AAUs transferred to a country would be scaled up based on system coverage, high price and early implementation, and scaled down based on GDP/capita.

New Zealand has been a proponent of NAMA crediting, but, as reflected in the LCA text, the proposal submitted by New Zealand is essentially the same as the sectoral crediting and sectoral trading proposal made by the EU. New Zealand suggests that a trading threshold could be established as a form of NAMA or in conjunction with a NAMA. Trading units could then be issued either ex post based on emission reductions achieved, or they could be issued ex ante, which you lead to consequences (which are not defined) in case the target is not met.

The USA has also been generally favourable of sectoral approaches and may even legislate their use in its domestic legislation to set up an US emissions trading system. The Waxman-Markey bill that was passed by the House of Representatives in 2009 envisages the use of offsets from reductions across an entire sector. Specific modalities for implementing this provision would still need to be determined. If the USA passes into law climate legislation this years (the prospects of which are admittedly uncertain) it would hence be the first industrialised country to have legislation on the use of sectoral offsets from developing countries.

Japan has taken the position that the CDM could fulfil the role of incentivising NAMAs while maintaining environmental integrity. Japan has posited that sectoral baselines may have a very high margin of error, which would undermine environmental integrity. How to set baselines and targets should therefore be addressed first. Japan suggests that to minimise the uncertainty of projections, intensity targets should be used as a matter of principle. Japan has also spoken out against targets being of a no-lose character and maintains that major developing countries should be obliged to achieve intensity targets.

Among **developing countries**, several are in favour of sectoral approaches and/or crediting NAMAs. South Korea has explicitly suggested to establish a NAMA crediting mechanism, commenting that crediting NAMAs could enhance the current project-based CDM towards program- and policy-based crediting mechanism. South Korea suggests that sectoral targets or cap-and-trade schemes, which are not eligible for crediting under the current CDM, could be the NAMAs that would be eligible for crediting. Sectoral baselines should be established based on the carbon intensity of the respective sector in the respective country.

In its discussion of NAMAs, South Africa has stated that NAMAs may be financed through the carbon market and may include no-lose sectoral crediting baselines where appropriate. Argentina has spoken out in favour of sectoral crediting on a no lose basis, highlighting that the potential for growth of the CDM is limited due to the high efforts required for developing and implementing individual projects.

Positions of other countries seem to be strongly influenced by earlier discussions about transnational sectoral approaches. According to this approach, global performance benchmarks would be defined for specific industries, in particular trade-intensive industries, and these benchmarks would then be applicable to both industrialised and developing countries. The main motivation behind this proposal that was pushed by some industry sectors was to eliminate competitive distortions that might arise by differences in national climate policies. However, developing countries have roundly rejected this approach. In their submissions and interventions, they have repeatedly stressed that sectoral approaches should not be imposed on Parties and should not lead to global standards, parameters or trans-national or national sectoral emission reduction targets.

Some countries apparently transpose this opposition to transnational sectoral approaches to sectoral approaches in general. China has stated that emissions trading and the project-based mechanisms operate generally well under the current rules and thus the relevant overall structures shall be maintained. China suggests that operational improvements could be made but does not see a need for establishing new mechanisms. China has also taken the position that emission reductions from NAMAs shall as a matter of principle not be used to offset Annex I targets. Brazil, El Salvador, India, Panama, and Paraguay have equally taken positions to build on the CDM rather than establish new mechanisms.

The Alliance of Small Island States (AOSIS) has taken the position that sectoral crediting and sectoral no-lose targets would not constitute an improvement to the CDM. AOSIS posits that current CDM problems relating to additionality, verification, monitoring and validation would be compounded, as the magnitude of covered activities for which credit is sought would expand. AOSIS also highlights that the establishment of an appropriate sectoral baseline would be an inherently political exercise. AOSIS is therefore of the view that sectoral mechanisms would not create real, measurable and verifiable reductions and would thus undermine the environmental integrity of the Kyoto Protocol. AOSIS concedes that sectoral emissions trading relative to a base year's emissions which takes place outside an offsetting context might be one way forward for major-emitting developing countries.

Finally, the more leftist Latin American governments like Bolivia and Venezuela have expressed strong reservations against any scaling up of market mechanisms.

As for **non-governmental organisations**, the Climate Action Network (CAN) has submitted a detailed position paper during the UNFCCC negotiations. CAN first of all stresses that credits must not replace ambitious emission reductions within developing countries. They also posit that additionality testing under the CDM has been highly ineffective in filtering out business-as-usual projects, that therefore a much more effective means of screening projects is necessary and that the CDM must move beyond the current zero-sum game, where emission reductions under the CDM only serve to allow Annex I countries to increase their emissions. On this basis, CAN expresses cautious support for exploring sectoral approaches if the crediting baselines or no-lose targets are set ambitiously well below BAU levels. Sectoral approaches with ambitious targets would deliver a net benefit to the atmosphere and remove the necessity for project-by-project additionality testing. At the same time they caution that sectoral baselines are difficult to establish and might lead to large amounts of “hot air”. In addition, to enable developing countries to achieve such ambitious baselines, financial and technological support would need to be delivered to enable non-credited NAMAs within the respective sector. CAN posits that by themselves sectoral targets and the possibility to generate credits would probably not be a strong enough incentive for developing countries to implement ambitious policies and measures. CAN also highlights that most developing countries would require substantial capacity building to be able to use sectoral mechanisms (CAN 2009).

As for **business stakeholders**, the International Emissions Trading Association (IETA) has for example issued a paper that is highly sceptical of government-level mechanisms. IETA highlights three key risks:

- **Implementation Risk:** The risk that the developing country fails to adequately implement or enforce emission reduction policies and measures due insufficient capacity, negligence, or institutional inertia;
- **Default Risk:** The risk that, after issuance, the developing country fails to honour emission reduction purchase agreements into which it has entered; and
- **Performance Risk:** The risk that the policies and measures used, despite being fully implemented and well enforced, fail to deliver the expected reductions.

IETA also cautions that the risks of government-operated mechanisms may be too high for buyers to be willing to provide upfront financing. IETA concedes that this option may nevertheless be the most attractive for governments that prefer centralised control of their economy and have sufficient capital available domestically.

IETA’s view of installation-level mechanisms is generally positive as these would provide a direct incentive to companies to reduce emissions and allow to substantially scale up emission reduction efforts compared to the project-based CDM. They also point out, however, that these mechanisms would require detailed installation-level emissions accounting, which few developing countries would be capable of without significant capacity building (IETA 2010).

5 Conclusions

In particular industrialised countries have strongly advocated for introducing new emission trading mechanisms at sectoral level. The expectation is that scaled-up mechanisms will be able to mobilise carbon finance on a much larger scale than so far, will be better able to reach sectors the CDM has so far hardly tapped, will give incentives to developing countries to implement climate-friendly policies, and will be more environmentally robust than the project-by-project approach of the current CDM.

Two main approaches have been discussed: sectoral crediting, where a baseline would be established at sectoral level and credits would be awarded ex-post for emission reductions achieved; and sectoral trading, where a binding sectoral target would be agreed and trading units would be allocated ex ante on this basis. A further term that is being used is NAMA crediting, but at least according to the latest definition in the LCA NAMA crediting would be the same as sectoral crediting and sectoral trading. A country might implement individual NAMAs, but crediting and trading would take place on the basis of a sectoral emissions threshold.

Sectoral approaches would by definition be better suited to achieving sector-wide transformations and might in particular give a boost to small-scale decentralised renewable energy, energy efficiency and transport projects. They would also remove the necessity of testing additionality on a project-by-project basis.

Since sectoral approaches would operate at the government level, at least in the first instance, these approaches would introduce an intermediary (the developing country governments) between the carbon market and those who actually undertake the investments. However, as the carbon market has so far had difficulties in reaching some sectors such as the building or transport sector anyway, sectoral approaches could potentially provide the necessary stimulus for developing country governments to introduce policies and measures such as building codes to redirect investments in these sectors. However, sectoral mechanisms would still retain the limitations of the current CDM in terms of receiving the revenue only ex-post and not being able to predict accurately how much revenue will be received. Developing countries would therefore need to prefinance sectoral schemes and run the risk of not being able to recoup their costs through emissions trading. These limitations could probably only be ameliorated if industrialised countries were willing to finance a significant part of the costs upfront.

Another question related to the strength of incentives is the balance of supply and demand. Based on the currently rather low level of ambition of industrialised countries' targets any demand for credits might easily be met by the project-based CDM.

For the energy and industry sectors, sectoral schemes could potentially immediately be devolved to the entity level through installation-level baselines or a domestic cap-and-trade emission trading system. Such installation-level schemes would give a direct incentive to companies to reduce emissions. Since eligibility would not be an issue, regulatory uncertainty for investors would be much lower than under the current CDM.

However, the quantification of emissions and reductions for sectoral approaches would have to rely on modelling and projections, which always possess a degree of uncertainty. Projections at an aggregate level may therefore be more reliable than project-by-project additionality testing, but they might be even more unreliable. The history of overallocation in the EU ETS gives cause for caution in this regard. It is therefore im-

perative to further assess the reliability of quantifying developing country reductions at the sectoral level before scaling up uncapped trading.

In any case, establishing a robust baseline at the sectoral level would necessitate having detailed and reliable emission inventories and projections for the host countries or at least for the respective sectors. The reliability of the emissions monitoring would also need to be ensured.

First studies that have examined the applicability of sectoral mechanisms to specific countries and sectors have indeed found that data availability and reliability is a serious constraint in many countries. They have also found that in many countries the relevant sectors comprise only a few installations so that there would not be a high advantage compared to the project-based CDM. To be of use, top-down emission trading approaches in these countries would therefore need to be multi-sectoral like the EU ETS. However, this would increase the complexity of MRV as different methodologies would be needed for each sector.

At the other end of the spectrum, China and India have large sectors but these are very diverse, being composed of very modern large installations on the one hand and very small and inefficient ones on the other hand. Including these small installations in sectoral mechanisms would substantially increase the effort necessary for data gathering and continuous monitoring.

One may therefore conclude that sectoral mechanisms are interesting, but for most countries actual implementation will probably not be feasible before the middle of this decade even in purely practical terms. One also needs to be conscious of the fact that even most industrialised countries do not yet have sectoral emission trading systems. So far, only the EU, New Zealand, Norway, and Switzerland have operating systems. In most other industrialised countries there are ongoing discussions, but the introduction of emission trading systems is far from certain. Even in the EU, where implementation of an ETS was fast-tracked as much as possible, the process from the publication of the Commission's Green Paper on emissions trading to the start of the system took five years.

In political terms, key non-Annex I countries like Brazil, China, and India have so far opposed the introduction of sectoral mechanisms.

On the positive side, the Copenhagen Accord and the ongoing process under the UNFCCC may provide the opportunity to address the data problems. Under the Accord, non-Annex I countries have committed to submit national communications including emission inventory reports every two years. Parties will probably agree on requirements for non-Annex I inventories that are substantially more stringent than the current ones. Further work will be done on how to MRV individual NAMAs.

To enable and support developing countries' actions, Annex I countries have pledged to provide 30 billion USD in fast-start financing until 2012 and to jointly mobilise up to 100 billion USD per year by 2020. Building the necessary capacity to reliably measure, report and verify emissions should be made one of the priority uses of this funding over the next years. Gathering detailed and reliable data is a highly valuable end in itself, and not just a means to the end of establishing emission trading mechanisms. Having a clear picture of the current situation is an indispensable prerequisite for being able to develop and implement appropriate emission reduction policies and measures. At a side event at the recent session of the Subsidiary Bodies in Bonn, a representative from Chile highlighted how her country had approached developing its national communication not as a inconvenient imposition from the international level but instead used it as a key tool in the development of its climate strategy.

The further development and implementation of the provisions in the Accord and the LCA should therefore serve to substantially improve the data situation in non-Annex I countries. In addition, while for most non-Annex I countries sectoral mechanisms are probably a rather distant prospect, Mexico and South Korea are actively considering the introduction of domestic multi-sector emission trading systems. Over the next decade, these examples may gradually spread to other more economically advanced non-Annex I countries. Ultimately, it may be possible to fully link such developing country systems to the EU ETS and systems in other industrialised countries.

Nevertheless, for the foreseeable future this will at best apply for a handful of non-Annex I countries. To cover all non-Annex I countries with support mechanisms, substantial efforts will therefore also need to be invested into improving the CDM and supporting comprehensive transformational NAMAs through fund-based financing instruments.

Quellen

- Baron, Richard, Barbara Buchner and Jane Ellis (2009): *Sectoral Approaches and the Carbon Market*. Paris: Organisation for Economic Cooperation and Development/International Energy Agency.
- Browne, Jodi, Eduardo Sanhueza, Erin Silsbe, Steve Winkelman and Chris Zegras (2005): *Getting on track: Finding a path for transportation in the CDM. Final Report, March 2005*. Winnipeg, Manitoba: International Institute for Sustainable Development.
- Butzengeiger-Geyer, Sonja, Paula Castro, Björn Dransfeld, Axel Michaelowa, Yuri Okubo, Anders Skogen and Kristian Tangen (2010): *New Market Mechanisms in a Post 2012 Climate Regime – Challenges and Opportunities, Report to the German Federal Environment Agency (forthcoming)*.
- CAN (2009): *Views on possible improvements to emissions trading and the project-based mechanisms, Submission of the Climate Action Network International, March 2009*. Climate Action Network.
- Ellis, Jane and Sara Moarif (2009): *GHG Mitigation Actions: MRV Issues and Options*. Paris: Organisation for Economic Cooperation and Development/International Energy Agency.
- Figueres, Christiana (2005): Sectoral CDM: Opening the CDM to the yet unrealized goal of sustainable development. *International Journal of Sustainable Development Law & Policy*, Vol. 2, Nr. 1, p. 5-27.
- GTZ (2010): *CDM Highlights Newsletter, Issue No. 84, June 2010*. Eschborn: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH.
- Haya, Barbara (2009): *Measuring Emissions Against an Alternative Future: Fundamental Flaws in the Structure of the Kyoto Protocol's Clean Development Mechanism, Energy and Resources Group Working Paper ERG09_001*. Berkeley, CA: University of California at Berkeley.
- Helme, Ned, William Whitesell, Mark Houdashelt, Juan Osornia, Haibing Ma, Ashley Lowe and Thomas Polzin (2010): *Global Sectoral Study: Final report*. Washington, DC: Center for Clean Air Policy.
- IETA (2010): *Thinking Through the Design Possibilities for a Sectoral Crediting Mechanism, Three Options to Encourage Discussion, Version 1, Published 5 March 2010*. International Emissions Trading Association.
- Marcu, Andrei (2009): Sectoral Approaches in Greenhouse Gas Market: A Viable Proposition? In K. Holm Olsen, J. Fenhann, & M. Hinojosa (Eds.), *NAMAs and the Carbon Market. Nationally Appropriate Mitigation Actions of Developing Countries* (pp. 97-111). Roskilde: UNEP Risø Center.
- Schneider, Lambert and Martin Cames (2009): *A Framework for a Sectoral Crediting Mechanism in a Post-2012 Climate Regime. Report for the Global Wind Energy Council*. Berlin: Öko-Institut.
- UNEP Risø (2010): *UNEP Risø CDM/JI Pipeline Analysis and Database, June 1st 2010*, <http://www.cdmpipeline.org>.
- UNFCCC (2008a): *Investment and financial flows to address climate change: an update, Technical paper, FCCC/TP/2008/7, 26 November 2008*. Bonn: UNFCCC.
- UNFCCC (2008b): *Further input in relation to possible improvements to emissions trading and the project-based mechanisms under the Kyoto Protocol, Submissions by Parties, FCCC/KP/AWG/2008/MISC.7, 13 November 2008*. Bonn: United Nations Framework Convention on Climate Change.
- UNFCCC (2009a): *Ad Hoc Working Group on Long-term Cooperative Action under the Convention, Revised negotiating text, Note by the Secretariat, FCCC/AWGLCA/2009/INF.1, 22 June 2009*. Bonn: United Nations Framework Convention on Climate Change.
- UNFCCC (2009b): *Ad Hoc Working Group on Long-term Cooperative Action under the Convention, Non-Paper 42, Various approaches to enhance the cost-effectiveness of, and to promote, mitigation actions, Non-paper by the facilitator, 06/11/09 @ 17:15*. Bonn: United Nations Framework Convention on Climate Change.
- UNFCCC (2009c): *Ideas and proposals on the elements contained in paragraph 1 of the Bali Action Plan*,

- Submissions from Parties, Part I, FCCC/AWGLCA/2009/MISC.4 (Part I), 19 May 2009. Bonn: UNFCCC.*
- UNFCCC (2009d): *Ideas and proposals on the elements contained in paragraph 1 of the Bali Action Plan, Submissions from Parties, Part II, FCCC/AWGLCA/2009/MISC.4 (Part II), 19 May 2009. Bonn: UNFCCC.*
- UNFCCC (2009e): *Ideas and proposals on the elements contained in paragraph 1 of the Bali Action Plan, Submissions from Parties, Addendum, FCCC/AWGLCA/2009/MISC.4/Add.1, 22 May 2009. Bonn: UNFCCC.*
- UNFCCC (2009f): *Further input on how the possible improvements to emissions trading and the project-based mechanisms, as contained in annexes I and II to document FCCC/KP/AWG/2008/5 and annexes I and II to document FCCC/KP/AWG/2008/INF.3, would function, submissions from Parties, FCCC/KP/AWG/2009/MISC.3, 10 March 2009. Bonn: United Nations Framework Convention on Climate Change.*
- Ward, Murray, Charlotte Streck, Harald Winkler, Martina Jung, Hagemann, Niklas Höhne and O'Sullivan (2008): *The Role of Sector No-Lose Targets in Scaling Up Finance for Climate Change Mitigation Activities in Developing Countries, Prepared for the International Climate Division, Dept for Environment, Food and Rural Affairs (DEFRA), United Kingdom.*

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