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Sectoral Approaches to International Climate Policy

A Typology and Political Analysis

JONAS O. MECKLING
GU YOON CHUNG

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Jonas O. Meckling¹ and Gu Yoon Chung²

Energy Technology Innovation Policy
Belfer Center for Science and International Affairs
Harvard Kennedy School, Harvard University
79 John F. Kennedy Street
Cambridge, MA 02138
USA

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¹ Research Fellow, Energy Technology Innovation Policy research group, Belfer Center for Science and International Affairs, Harvard Kennedy School.

² Formerly Research Assistant, Energy Technology Innovation Policy research group, Belfer Center for Science and International Affairs, Harvard Kennedy School. Now Manager of Government Affairs at Enel North America.

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Comments are welcome and may be directed to Jonas Meckling at the Belfer Center for Science and International Affairs, Harvard Kennedy School, Harvard University, 79 JFK Street, Cambridge, MA 02138, jonas_meckling@ksg.harvard.edu.

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Energy Technology Innovation Policy (ETIP)

The overarching objective of the Energy Technology Innovation Policy (ETIP) research group is to determine and then seek to promote adoption of effective strategies for developing and deploying cleaner and more efficient energy technologies, primarily in three of the biggest energy-consuming nations in the world: the United States, China, and India. These three countries have enormous influence on local, regional, and global environmental conditions through their energy production and consumption.

ETIP researchers seek to identify and promote strategies that these countries can pursue, separately and collaboratively, for accelerating the development and deployment of advanced energy options that can reduce conventional air pollution, minimize future greenhouse-gas emissions, reduce dependence on oil, facilitate poverty alleviation, and promote economic development. ETIP's focus on three crucial countries rather than only one not only multiplies directly our leverage on the world scale and facilitates the pursuit of cooperative efforts, but also allows for the development of new insights from comparisons and contrasts among conditions and strategies in the three cases.

Abstract

Sectoral approaches have been gaining currency in the international climate debate as a possible remedy to the shortfalls of the Kyoto Protocol. Proponents argue that a sector-based architecture can more easily invite the participation of developing countries, address competitiveness issues, and enable immediate emission reductions. However, given the numerous proposals, much confusion remains as to what sectoral approaches actually are. This paper provides a simple, yet comprehensive, typology of the various proposals for sectoral approaches. Based on the dual criteria of regulatory content and actors, three such types are identified and described: government targets and timetables, industry targets and timetables, and transnational technology cooperation. For each of these types, existing proposals and ongoing initiatives are discussed. In a second step, the paper analyzes the political landscape in which sectoral approaches are being debated, identifying the interests of their key advocates as well as the concerns of their sceptics. The Japanese government and energy-intensive manufacturing industries represent the main proponents of sectoral approaches to address concerns of carbon leakage and economic competitiveness. Developing countries, instead, are wary of attempts to impose emission reduction targets on their economies through sectoral target setting. They, therefore, interpret sectoral approaches as sector-based forms of technology cooperation and technology transfer.

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1 Introduction

The global search for a post-2012 climate architecture has spurred a creative contest over the policy solution that best addresses global warming under existing economic and political realities. The key question is whether the design of the Kyoto Protocol should inform the future regime, or whether alternative or complementary designs are needed. Among the numerous proposals for new policy architectures, sector-based approaches have emerged as a frontrunner, steadily gaining political momentum over recent years.

The Bali Action Plan of December 2007 put the approach officially on the inter-governmental agenda. It made specific reference to “cooperative sectoral approaches and sector-specific actions” as a means to “enhance implementation of” articles in the UN Framework Convention on Climate Change (UNFCCC 2007: Art. 1 (b) (iv)). More recently, the July 2008 Declaration by the G8 leaders in Toyako, Japan, mentions sectoral approaches as “useful tools among others for achieving national emission reduction objectives” (G8 2008: Art. 24). It also adds that “sectoral approaches can be useful tools to improve energy efficiency and reduce GHG emissions through dissemination of existing and new technologies in a manner compatible with economic growth” (ibid.: Art. 25). It is now increasingly likely that some form of sectoral approach will make its way into the future climate regime.

Proponents argue that sectoral approaches may more easily invite participation of developing countries in a future climate treaty; that sectoral approaches address competitiveness concerns for industries in developed countries that face competition with counterparts in developing countries that have not committed to binding emissions obligations; and that sectoral approaches result in immediate emission reductions. In short, sector-based agreements are often discussed as a potential avenue to rectify the limitations of the Kyoto Protocol.

Yet, despite the attention paid to sectoral approaches, there remains considerable confusion about the question of what actually constitutes a sectoral approach. Beyond the idea that policies should be designed at the level of industry sectors, the numerous proposals from governments, academics, think tanks and business associations share little. The number of interpretations matches the number of vested interests. This has resulted in a state of Babylonian confusion, in which the term “sectoral approach” has often become a buzzword rather than a clear-cut proposal for designing international climate policy (cf. Bradley, Baumert et al. 2007).

This paper addresses the confusion around sectoral approaches by providing a systematic typology of sectoral approaches on the one hand, and of the main advocates and their agendas on the other. We thus aim to provide a map to navigate the jungle of sector-based policy proposals. Clarity about options is the first step towards well-founded choice. The paper proceeds in three steps. First, sectoral approaches will be placed in the landscape of policy options for a post-2012 climate architecture, considering both top-down and bottom-up approaches. Thereafter, three types of the sectoral approaches will be discussed by considering the regulatory content and the regulatory actors. In a third step, the focus shifts from policy to politics as the key proposals in current climate negotiations will be outlined. Further, the key political struggles over sectoral approaches will be identified. The last section summarizes the typology and political agendas behind proposals for sectoral approaches.

2 Sectoral Approaches and a Post-2012 Climate Regime

The Kyoto Protocol provided a top-down architecture for international climate policy, setting economy-wide emission reduction targets and timetables. The regime has its strengths and weaknesses (Aldy and Stavins 2008). On the positive side, it has introduced market mechanisms that hold the potential to substantially reduce the cost of mitigation. These market mechanisms may allow emissions abatement to occur where marginal cost is lowest. Further, Kyoto has implemented the principle of “common but differentiated responsibilities” by demanding leadership from industrialized countries. On the negative side, the Kyoto Protocol suffers from nonparticipation of key industrialized countries and emerging economies as the most obvious limitation. Most importantly, the world’s two single-biggest emitters, the US and China, are not part of the agreement. Moreover, it creates insufficient incentives for the large-scale deployment of low-carbon technologies, critics argue (Prins and Rayner 2007). This is partly due to the fact that Kyoto sets short-term emission reduction targets instead of long-term targets that would have a stronger impact on investment in energy infrastructure. As a result of selective participation and lack of incentives, the Kyoto Protocol has so far achieved only minimal emission reductions.

As the first commitment period of the Kyoto Protocol draws to an end in 2012, the international policy community is discussing and negotiating a future climate framework in a number of policy processes and fora, including the UNFCCC process, the Kyoto Protocol process, the L20

group³, the G8+5 Climate Change Dialogue⁴, the Major Economies Meeting on Energy Security and Climate Change⁵ and the Asia-Pacific Partnership for Clean Development and Climate (APP). A large number of design options for future climate policy have been on display (Baumert, Blanchard et al. 2002; Aldy, Barrett et al. 2003; Aldy and Stavins 2007; Egenhofer 2008; Kuik, Aerts et al. 2008).⁶ The key debate revolves around the question whether the top-down approach of internationally agreed targets-and-timetables should be continued, albeit in a revised form, or whether alternative bottom-up approaches are necessary. On the one hand, a number of policy proposals advocate the target-and-timetables approach, but suggest refinements to overcome the problems of the Kyoto architecture (Frankel 2007; Michaelowa 2007). On the other hand, a growing number of scholars promote less centralized approaches under the umbrella term of bottom-up approaches (Victor, House et al. 2005; Barrett 2007; Pizer 2007). This wide-ranging group of proposals questions the political feasibility and viability of internationally agreed economy-wide emission reduction targets and timetables. The general idea is that less centralized (regional/national vs. international) and less comprehensive (sectoral vs. economy-wide) climate policies represent a more manageable step. Over time such approaches are thought to lead to an integrated and coherent international framework. A large number of policy proposals for bottom-up approaches have been made (Barrett 2007; McKibbin and Wilcoxon 2007; Pizer 2007; Victor 2007), of which sectoral approaches have had the most political upwind.

As opposed to the top-down target-and-timetable approach for entire economies, sector-based approaches begin with an assessment of technologies and processes for each selected industry sector and determine policy measures based on that assessment. Proponents argue that the key advantages lie in particular in incentives for broader participation and in addressing issues of carbon leakage and international competitiveness (Egenhofer and Fujiwara 2008; Schmidt, Helme et al. 2008). Under some form of incentive structure, developing countries could potentially be willing to make binding GHG reduction commitments in specific energy-intensive sectors, even if they would not take on economy-wide emission reduction targets. This would allevi-

³ The L20 group was proposed by then Prime Minister of Canada, Paul Martin, as a group of leading nations to tackle pressing transnational policy challenges.

⁴ The G8+5 Climate Change Dialogue was launched by the UK government in 2005 when it hosted the G8 Summit in Gleneagles. Next to the G8 members, it includes five key developing countries (Brazil, China, India, Mexico, South Africa).

⁵ The “major economies” or “big emitters” group was convened by the US in 2007. It includes the 16 biggest GHG emitters.

⁶ The Harvard Project on International Climate Agreements has been a particularly productive source of policy proposals. Much of the debate on alternative design choices builds on the project’s work. See www.belfercenter.org/climate.

ate the concern of industrialized countries that their energy-intensive industries would suffer competitive disadvantages if their competitors operate outside a carbon constraint.⁷ In sum, sectoral approaches are seen as possible solutions to the imperfections witnessed in today's comprehensive effort to curb GHG emissions, namely by increasing participation of countries; alleviating concerns about international competitiveness; and addressing the problem of carbon leakage.

That said, however, the existing literature cautions viewing sectoral approaches as a panacea (Baron, Reinaud et al. 2007; Bradley, Baumert et al. 2007). The potential advantages are compromised by a number of disadvantages of the sectoral approach. Economic convention holds that sectoral approaches are second-best alternatives to economy-wide mechanisms with regard to cost-effectiveness. Economists point out that a comprehensive (i.e., upstream) approach that encompasses sources and sinks of GHGs from all sectors allows the flexibility to reduce emissions in the least-costly sectors while also preventing carbon leakage from regulated to unregulated sectors. By contrast, targeting emissions reductions in a given sector or industry deprives sectoral approaches of such cost-saving options and instead creates room for leakage. Furthermore, the narrower coverage of sector-based approaches may undermine environmental effectiveness. If there is any consensus on sectoral approaches, it is that they will need to complement broader existing or proposed frameworks rather than replace them.

3 A Typology of Sectoral Approaches

The confusion around sector-based approaches calls for a parsimonious typology. A number of categorizations have been introduced to the debate (cf. Baron, Reinaud et al. 2007; Bodansky 2007; CCAP 2008; Egenhofer and Fujiwara 2008). However, none of these authors develops a systematic typology that is simple, yet comprehensive enough to organise the field. Mostly, categorizations serve to contrast the author's policy proposal with alternative proposals. In the following, we propose a threefold typology that will serve to classify existing policy proposals and ongoing initiatives. The typology considers two criteria across which sector-based approaches vary: regulatory content and regulatory actors.

Regarding regulatory content, existing literature largely identifies two sets of commitments: targets and timetables for emission reductions and cooperation on technology research, development, and deployment, including regulatory measures such as technology standards. Sectoral

⁷ It is not clear whether the risk of carbon leakage is real. In fact, some studies debunk the conventional wisdom that industrial facilities in developing countries are less efficient and more carbon intensive than their counterparts in developed nations (Schmidt et al. 2006). Yet, rhetorically the argument plays a significant role in the political debate.

targets and timetables focus on the end goal of GHG mitigation of a given sector. The target could be either an absolute target for emission reductions (i.e., tCO₂ for a given sector) or an intensity target (e.g., tCO₂ per output unit). Generally speaking, the sectoral targets-and-timetables approach is similar to the Kyoto framework, though it operates at a less aggregated level than economy-wide targets. Sectoral targets and timetables could also be implemented through emissions trading. Technology cooperation represents a second option for the regulatory content of sector-based approaches. This includes cooperation on research, development and deployment/transfer of low-carbon technologies, for which governments and/or firms can be the cooperation partners. Sectoral technology cooperation can be expanded to include regulatory elements such as the harmonization of technology standards.

Sector-based approaches can also vary with regard to regulatory actors. Models range from inter-governmental agreements (Schmidt, Helme et al. 2006; Bodansky 2007; Bradley, Baumert et al. 2007) to global industry self-regulation (Baron, Reinaud et al. 2007; Egenhofer and Fujiwara 2008). The question whether governments or industry bodies should set the rules is relevant with regard to the environmental effectiveness, economic efficiency, and the democratic accountability of sector-based approaches. The answer to this question is not obvious. For the purpose of our typology, we consider both government-led and industry-led sector-based approaches.

If regulatory content (targets vs. technology cooperation) and regulatory actors (governments vs. industry) are the key criteria for differentiating sector-based approaches, four distinct ideal types can be identified in a two-by-two matrix. Out of these, three types actually exist in the debate on the future of climate policy: sectoral government targets and timetables; sectoral industry targets and timetables; and transnational technology cooperation. The latter type usually includes both governments and business, which is why we do not differentiate between government technology cooperation and business technology cooperation.

- **Government targets and timetables:** These sector-based approaches set sectoral emission reduction targets for countries through an inter-governmental process. Approaches in this category are usually addressed at developing countries, the idea being that developing countries adopt targets for key sectors, while developed countries adopt economy-wide targets.
- **Industry targets and timetables:** This group of sector-based approaches are global voluntary emission reduction commitments by industry. Firms in a global industry sector

commit to a target and timetable for emission reductions through an industry association or initiative.

- **Transnational technology cooperation:** Sector-based technology cooperation includes a variety of activities around research, development and deployment of low-carbon technologies in a given sector. Such arrangements usually involve both governments and firms.

Type	Government Targets and Timetables	Industry Targets and Timetables	Transnational Technology Cooperation
Content	Sectoral targets for developing countries (and sector-based calculation of targets)	Voluntary targets for global energy-intensive industries	Public-private cooperation on information sharing, RD&D and technology transfer
Proposals /Initiatives	<ul style="list-style-type: none"> • CCAP • Japan 	<ul style="list-style-type: none"> • IAI (aluminium) • CSI (cement) • WSA (steel) 	<ul style="list-style-type: none"> • APP • IPHE (hydrogen)
Literature	Schmidt, Helme et al. 2006; Baron, Reinaud et al. 2007; Bradley, Baumert et al. 2007; Sawa 2008; Schmidt, Helme et al. 2008	Baron, Reinaud et al. 2007; CSI 2008; Egenhofer and Fujiwara 2008	Philibert 2004 ; Baron, Reinaud et al. 2007 ; Bradley, Baumert et al. 2007 ; De Coninck, Fischer et al. 2007

The following sections describe the three types of sector-based approaches by discussing policy proposals and existing policy initiatives for each of the three categories.

3.1 Government Targets and Timetables

Sectoral government targets and timetables are similar to the Kyoto architecture in that targets would be determined in an inter-governmental process and implemented by national governments. The advantage of sectoral government targets as opposed to industry targets lies in the fact that national governments hold the legal authority to enforce targets (Schmidt, Helme et al. 2006). In the eyes of many, the direct participation of governments remains the most realistic option for a sectoral agreement if it is to be integrated into the existing UNFCCC framework (Bradley, Baumert et al. 2007). Sector-level targets-and-timetables approaches have been proposed for both developed and developing countries, though the political spotlight is clearly on sectoral approaches for developing countries. In both cases, however, a sector-based approach can be understood as a low-entry barrier alternative to economy-wide targets. This section, first, discusses sectoral government targets and timetables that apply to both developed and developing

countries, before it focuses on sectoral government targets and timetables for developing countries.

Sector-based calculation of economy-wide targets

Government-led sectoral targets and timetables can be conceived as applying to both developed and developing countries (cf. Bodansky 2007). Governments would agree to cap the absolute or relative emissions of a global energy-intensive sector by implementing the targets domestically. Such an architecture could possibly maximize the number of participants by reducing the comprehensiveness of a global climate agreement. It represents a low-threshold agreement that might get emerging economies and reluctant developed countries on board. While proposed in the academic debate, such global government-led sectoral agreements have not received much political attention. It is often suggested that approaches that set sectoral targets and timetables for developed countries represent a step back compared to the economy-wide targets agreed at Kyoto. They, therefore, do not account for differential mitigation responsibilities between developed and developing countries. These criticisms, however, only apply if a global inter-governmental agreement on sectoral targets and timetables is understood to substitute for a comprehensive economy-wide agreement. Overall, sectoral government targets and timetables for developed countries are not a serious policy option in the current debate.

However, sector-based calculation methods of economy-wide emission reduction targets feature prominently. The Japanese government⁸, the Center for Clean Air Policy (CCAP) and others have proposed to add the emission reduction potential of energy-intensive industry sectors as a means to arrive at a national reduction target (Schmidt, Helme et al. 2007). The idea is that targets are derived bottom-up based on the potential to reduce emissions in a given sector. The reduction potential is calculated on the basis of benchmarks on energy efficiency or best available technologies. While this approach has gained considerable political attention, it is not a sectoral approach in the sense of a policy design, but a calculation method. Sectoral government targets and timetables as a policy proposal have real political significance with regard to the participation of developing countries.

⁸ Japan's Submission on Application of Sectoral Approaches.
http://unfccc.int/files/kyoto_protocol/application/pdf/japanapplicationofsectoralapproaches271108.pdf. Accessed 12/10/08.

Sectoral targets and timetables for developing countries

It has been widely argued that one of the failures of the Kyoto Protocol is that major developing countries that are big emitters do not take on reduction targets. In this respect, it has been proposed that developing countries, in particular emerging economies such as China and India, take on sectoral targets under an incentive structure. This so-called “**no-lose**” targets approach has been developed by the CCAP, a Washington-based think tank (Schmidt, Helme et al. 2006; Schmidt, Helme et al. 2008). It envisages developing country governments taking on sectoral intensity targets. These would be negotiated in a comprehensive international agreement alongside the commitments of developed countries (Bradley, Baumert et al. 2007). If they reduce more than their initial commitment, they will receive credits for the additional emission reductions. These could, for instance, be traded on the global carbon market. They are considered “no-lose” because there is no penalty for non-compliance. This positive incentive, with the added promise of technical and financial assistance, is expected to secure the participation of all major emitting countries in sectors that are responsible for the bulk of GHG emissions.

The incentive structure of “no lose” sectoral targets for developing countries is a form of a **sectoral crediting mechanism (SCM)**. Developing countries receive credits for emission reductions on a sector basis instead of a project basis as in the current form of the Clean Development Mechanisms (CDM). The idea to scale up the CDM to the sectoral level was introduced by Samaniego and Figueres (2008) and has since gained considerable political momentum. Like the CDM, the purpose of sectoral crediting is to allow abatement efforts to occur where they are cheapest. In the no-lose target approach the sectoral target is the baseline for emissions crediting. Ellis and Baron (2002) suggest that the electricity sector is well-suited for the use of sectoral crediting in a country-specific approach.

In the current negotiations, Japan has been the most vocal advocate of sector-based reduction targets for developing countries and emerging economies. The Japanese proposal mainly considers technology transfer and financial support as additional measures, while also mentioning sectoral crediting as a possible incentive structure for developing countries to take on sectoral emission reduction commitments.⁹

To sum up, sectoral government targets and timetables could principally be set for both developed and developing countries, although developed countries are generally expected to con-

⁹ Ibid. and personal communication with member of Japanese delegation to Poznan (12/22/08).

tinue taking on economy-wide targets. Sectoral government targets are, however, considered a real option for energy-intensive sectors in major developing countries.

3.2 Industry Targets and Timetables

The industry targets-and-timetables approach is a form of industry self-regulation. In this respect, the approach is not new, but a variant of classic voluntary commitments by industry. Such sector-based voluntary agreements are usually governed by global industry associations or industry initiatives. The primary goal of these agreements is to include firms from countries without carbon regulation under a voluntary cap to create a level playing field for competitors in global industries. They would thus address carbon leakage, i.e., the shift of energy-intensive production to pollution havens that do not cap greenhouse gas emissions. This type of sectoral approach has already been implemented as a number of business groups experimented with the approach.

However, several concerns are raised as to what extent private actors should be directly involved in formulating climate policy. While most studies agree that industry plays a critical role in gathering and organizing data for benchmarking purposes as well as in playing key advisory roles to government¹⁰, there are numerous political and legal concerns surrounding direct industry involvement. Baron et al. (2007) note that the industry associations lack legal standing under international law, barring them from entering into any legal agreement in a global climate regime. Therefore, “any agreement of global scope entered into by an international industry association would thus have to be essentially voluntary, or translated into a set of national policy instruments” (Ellis and Baron 2005: 44). While industry targets and timetables could possibly be linked to the inter-governmental process and in particular to the UNFCCC process (Baron, Reinaud et al. 2007; Egenhofer and Fujiwara 2008), precise ways of integrating the two are not yet evident.

Some sectors are better candidates for a sectoral approach than others, and the literature outlines several factors that are conducive to sectoral treatment. Obviously a starting condition would be that the sector represents a significant portion of GHG emissions and that the opportunity is significant for its reduction. Therefore, energy-intensive industry sectors are the most likely candidates. Other criteria include homogeneity of products and/or production processes,

¹⁰ Industry initiatives have made considerable progress on benchmarks. Benchmarks are the tools to evaluate margins of improvement for existing sector facilities, based on international or regional comparison. By identifying the current best practice or level of performance, industry and government can better assess abatement potential and costs of a given sector.

high concentration of actors¹¹, high trade exposure and ease of data collection, monitoring and administration (Bodansky 2007). Based on these criteria, most of the literature suggests that the highly-concentrated, homogeneous, and energy-intensive sectors of steel and aluminium are ideal candidates for sectoral approaches (Baron, Reinaud et al. 2007; Bradley, Baumert et al. 2007).

Especially in the **aluminium** sector, recent industry consolidation has left five companies representing 41% of world production, and the top ten accounting for 54% (ibid.: 62). Furthermore, more than 75% of global output is traded internationally and the technologies employed for production are relatively uniform (although energy intensity has varied across regions due to the unique fuel mix for electricity to which production is highly dependent) (ibid.: 63). The International Aluminium Institute (IAI), a group of major companies, has been active in voluntary sectoral measures, pledging an 80% reduction of perfluorocarbons and a 10% reduction in energy intensity by 2010 with an eye to more stringent targets for 2020.¹² The APP has launched a task force on the industry for data-gathering and sharing, while the European Commission and the US government have engaged the industry within their respective jurisdictions to also reduce emissions (Baron, Reinaud et al. 2007).

Although less concentrated than aluminium, the **steel** sector has been considered another strong candidate for the sectoral approach, not the least because it accounts for 5% of total man-made greenhouse gas emissions.¹³ The World Steel Association (WSA; formerly International Iron and Steel Institute) boasts a membership of 180 producers accounting for 85% of global production, including 18 of the world's 20 largest steel companies¹⁴. In 2003, the association unanimously launched the "CO₂ Breakthrough Programme" to undertake a multi-phase approach to "radically reduce emissions from production."¹⁵ The industry has also endorsed voluntary initiatives at the regional (e.g., APP) and national levels (e.g., Japan, Korea and Australia.) Once

¹¹ Bodansky (2007) argues that a sector may not need a high concentration of actors; small number of firms representing the lion share of emissions may be enough if one can anticipate a "tipping and network effect." If the adoption of a new technology by a smaller number of actors could tip the balance, it could cause other actors to adopt the technology as well.

¹² For IAI's recent publications in this area, see <http://www.world-aluminium.org/Downloads/Publications/Most+recent>.

¹³ Centre for European Policy Studies (CEPS), "Global Sectoral Industry Approaches to Climate Change: the Way Forward," April 2008, (quoted in Mayer, "Sector Agreements. Big Emitters Facing Carbon Limits" <http://www.climatechangecorp.com/content.asp?ContentID=5693>)

¹⁴ World Steel Association website membership factsheet. <http://www.worldsteel.org/index.php?action=storypages&id=71>. Accessed 12/21/08.

¹⁵ World Steel Association press release. <http://www.worldsteel.org/index.php?action=newsdetail&id=79>. Accessed 12/21/08.

the technologies, methodologies, and emission reduction potential are identified, both the WSA and the APP envision a final stage of setting mid-term sectoral (intensity) targets.¹⁶

The **cement** industry, albeit less exposed to trade and less concentrated, is also considered a candidate sector because of the product's homogeneity, as well as its overall weight in GHG emissions (4.6% of global emissions¹⁷). In fact, the cement industry has emerged as the most-outspoken advocate for industry-led sectoral approaches through the Cement Sustainability Initiative (CSI). Promoted by the World Business Council for Sustainable Development (WBCSD), the CSI gathers 18 major producers accounting for more than 50% of production. The CSI has proposed sectoral intensity targets that could be linked to a sectoral crediting mechanism for developing countries (CSI 2008). While the CSI proposal considers industry as the major negotiating party in setting up the sectoral agreement, it also sees a role for government in enforcing the regime.

The industry targets-and-timetables approach could potentially also be applied to two of the largest emitting sectors: electricity and transport. While the jury is still out on these sectors' suitability for such an approach, Egenhofer and Fujiwara (2007) argue against a transnational sectoral approach for **electricity** because it is not trade-exposed and therefore is better suited for country-specific sectoral approaches. While conceding this point, Bodansky (2007) still argues that emissions from the electricity sector are well quantified and that the possibility of long-term capital decisions locking in emissions for decades justify international sector-specific regulation. The imperative to develop and deploy such technologies as carbon capture and storage necessitate cooperation and focus that are arguably conducive to an international sectoral approach.

Leaving aside international transport fuels, which have already been designated for sectoral treatment, the **transport** sector and, in particular, the automobile manufacturing sector is considered to be a good candidate for the sectoral approach (Egenhofer and Fujiwara 2008). However, some caution that the transport value chain is so complex, involving many different actors and processes, that the sectoral approach is "inapplicable" for transport (Egenhofer and Fujiwara 2008). On the other hand, a recent idea for an "integrated approach for transport" has been proposed that acknowledges the need to recognize and assess the potential contribution to emission

¹⁶ Japan's Submission on Application of Sectoral Approaches, Annex 2 ("The Case of Iron and Steel Sector"). http://unfccc.int/files/kyoto_protocol/application/pdf/japancaseofironandsteelsector271108.pdf, Accessed 12/22/08

¹⁷ CEPS, Op.cit.

reduction by all actors – consumers, industry, and government.¹⁸ In Europe, this “integrated approach” has been developed by relevant stakeholders - policy makers, industry, and NGOs - to propose a Competitive Automotive Regulatory Systems for the 21st Century (CARS21). Meanwhile, the sectoral treatment of international aviation and maritime fuels are being considered (Ahman 2008; Zetterberg 2008). Discussions take place in the two international organizations that oversee the sectors, the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) respectively, focusing on sector-specific standards and best practices as well as (market-based) emission reduction mechanisms¹⁹.

3.3 Transnational Technology Cooperation

The third type of sectoral approach is aimed at various steps in the process of research, development, and deployment/transfer of technologies that help to mitigate GHGs (Philibert 2004; De Coninck, Fischer et al. 2007). While targets and timetables create a technology pull, RD&D cooperation is meant to provide a technology push. Such forms of voluntary cooperation can be conceived of as purely private or public in nature, though they usually involve both governments and firms across national boundaries. This is why we label them “transnational.” Compared to the two previous variants of sector-based approaches, transnational sectoral technology cooperation is less politically controversial. The need for technology transfer and technological leapfrogging of developing countries is widely recognised (cf. Gallagher 2006). Moreover, some of the targets-and-timetables-based proposals foresee a technology cooperation component. Transnational sectoral technology cooperation can be designed as a stand-alone agreement as is the case for most existing initiatives. Alternatively, they could be linked in a number of ways to international organisations such as the IEA or broader policy frameworks such as the UNFCCC (Bradley, Baumert et al. 2007).

Transnational sectoral technology cooperation can include knowledge sharing and coordination; joint funding of research, development and demonstration projects; technology deployment and transfer; and the harmonization of technology mandates, standards and incentives (cf. Barrett 2007; De Coninck, Fischer et al. 2007). To date, a number of initiatives exist that address one or

¹⁸ World Energy Council (2007), *Transport and Technologies and Policy Scenarios to 2050*. http://www.worldenergy.org/documents/transportation_study_final_online.pdf. Accessed 8/11/2008.

¹⁹ Both ICAO and IMO submitted to the UNFCCC during the Poznan Conference progress reports on their respective sectoral approaches. See ICAO, “Shared Vision on International Aviation and Climate Change” (<http://unfccc.int/resource/docs/2008/smsn/igo/023.pdf>) and IMO, “International Maritime Organization input to the FCCC/AWGLCA/2008/16” (<http://unfccc.int/resource/docs/2008/smsn/igo/026.pdf>). Accessed 12/22/2008.

more out of the above-mentioned goals. As for knowledge sharing and coordination, the Carbon Sequestration Leadership Forum, the International Partnership for the Hydrogen Economy, and the Methane to Markets Partnership are examples. An example of sectoral cooperation on RD&D funding can be found in the WSA's aforementioned research initiative to generate radical innovations for producing steel with much lower CO₂ emissions (Jitsuvara 2007). The WSA advocates a sector-specific agreement on the phase-out of high-carbon production technologies as a precursor to sectoral targets.

Deployment of existing technologies and their transfer to developing countries plays a particularly important role in global climate politics. Accordingly, this aspect of technology cooperation has attracted considerable interest. The APP, which has been championed by the US, is a prominent example. The APP focuses on industry sector cooperation across countries to deploy and transfer technologies as well as on regulatory reform to remove barriers to technology development and deployment. In sectoral task forces business, governments, and academia cooperate on data gathering and benchmarking exercises for energy and energy-intensive manufacturing sectors. Cooperation on technology transfer is included as a complementary element in a number of proposals on government targets and timetables for developing countries. The CCAP's "no-lose" approach considers a technology finance and assistance package (Schmidt, Helme et al. 2007), and the Japanese government suggests accelerating technology transfer through "cooperative sectoral approaches"²⁰. A precedent for a sectoral cooperation on technology transfer is found in the Multilateral Fund for Implementation of the Montreal Protocol.

Transnational sectoral technology cooperation could also entail the harmonization of sector-specific policies and measures including technology mandates (e.g., renewable energy portfolio standards), standards (e.g., fuel economy and other efficiency standards) and incentives (e.g., subsidies). Unlike the three previous forms of technology cooperation, the harmonization of technology-oriented regulation is a form of technology pull. Further, it is a distinctly regulatory task that requires coordination among governments. An example for such technology cooperation is the European Union Renewables Directive. In the context of a future climate framework, Barrett proposes a form of transnational technology cooperation that includes both joint R&D funding and technology standards (Barrett 2005). Transnational sectoral cooperation on technology

²⁰ Japan's Submission on Application of Sectoral Approaches.
http://unfccc.int/files/kyoto_protocol/application/pdf/japanapplicationofsectoralapproaches271108.pdf. Accessed 12/10/08.

standards is a theoretical possibility, yet it has played only a marginal role in the current political debate. In fact, such policies and measures had been advocated by the EU prior to the Kyoto conference, but were dropped in favour of the targets-and-timetables architecture as the main design element of the international climate framework (Grubb, Vrolijk et al. 1999). Against this background, this approach has not gained much currency in the current phase of agenda-setting for a post-2012 framework.

In sum, transnational sectoral technology cooperation is primarily targeted at complementing targets and timetables through technology push. Firms and governments cooperate in information sharing; research, development, and demonstration; and technology deployment and transfer. The latter aspect is politically the most important given the different stages of technological development of developed and developing countries.

This section has identified three ideal types of sectoral approaches: government targets and timetables, industry targets and timetables, and transnational technology cooperation. For each of these types we have portrayed and discussed specific policy proposals and ongoing initiatives. Against this backdrop, we will now turn to the politics of sectoral approaches: Who is advocating which type of sectoral approach, for what reasons, in the debate on the post-2012 climate policy framework?

4 The Politics of Sectoral Approaches

As the debate and negotiations on a future climate framework continue, political actors seek to set the agenda for specific types of sectoral approaches. The sheer variance of proposals reflects not least the different interests involved in shaping the agenda. While sectoral approaches are often portrayed as a new and innovative silver bullet, the political struggle reflects old lines of conflict between north and south and between environmental leaders and environmental laggards. Different types of sectoral approaches correspond more or less with a particular agenda. The idea of sectoral targets and timetables for developing countries and industries is intrinsically linked to the goal of creating a level playing field in international economic competition in energy-intensive industries. This agenda is primarily driven by Japan and energy-intensive industries. In contrast, transnational sectoral technology cooperation is favoured by developing countries seeking technology transfer and rejecting emission reduction targets. In the following, we describe the two opposing key agendas and identify the main drivers in the current political debate.

4.1 The Competitiveness Agenda: Japan, Industry

The fact that major developing countries did not take on emission reduction targets under the Kyoto Protocol has long been considered a major flaw of the treaty. For reasons of environmental effectiveness and global economic competition, it has been considered necessary that big emitters among developing countries take on emission reduction commitments. Both sectoral government targets and timetables and sectoral industry targets and timetables are meant to mitigate competitiveness issues by including energy-intensive sectors in developing countries under a cap. Japan and energy-intensive industries from industrialized countries have emerged as the major drivers of the competitiveness agenda. Partly due to competitiveness concerns, Japan and other developed countries seek more feasible economy-wide reduction targets by using a sector-based calculation method. Hence, the competitiveness agenda is twofold: it aims to get emerging economies to participate in binding emission reduction agreements and it seeks to reduce the mitigation burden of developed countries operating under the Kyoto Protocol.

Creating a level playing field

Key developed countries and industry aim to create a level playing field in global competition by including energy-intensive sectors in major developing countries under a sectoral target. This is meant to prevent “carbon leakage”, i.e. the shift of energy-intensive production from economies with carbon mandates to countries without caps on GHG emissions. Leakage would be economically detrimental to developed countries and would undermine the environmental effectiveness of a climate policy regime. Continuously rising emissions in developing countries have underlined this need. In 2007, China caught up with the US as the world’s biggest GHG emitter, with emissions continuing to rise quickly.

Japan has emerged as the key champion of sectoral government targets and timetables for developing countries, with the US, Canada, Australia, and some EU member states such as the UK supporting the approach (Harrabin 2008).²¹ At the World Economic Forum in Davos in January 2008, Japan’s Prime Minister Yasuo Fukuda first promoted the sectoral approach (Hongo 2008). The Japanese proposal was officially introduced at the G20 environment ministers meeting in March 2008 and has evolved since then in response to criticism. At the G8 Summit in July

²¹ Japan’s Submission on Application of Sectoral Approaches. 11/27/08.
http://unfccc.int/files/kyoto_protocol/application/pdf/japanapplicationofsectoralapproaches271108.pdf. Accessed 12/10/08.

2008, Japan's call for sectoral approaches was supported by the G8 leaders.²² A key component of Japan's proposal is sectoral intensity targets for developing countries. In addition, major developing countries such as China are asked to set economy-wide intensity targets. All of these targets would be determined in a "bottom-up" way by estimating the emission reduction potentials of sectors on the basis of available technologies. Instead of imposing targets based on total emissions, this approach would differentiate mitigation responsibilities based on industry circumstance and feasibility.

Next to Japan, the cement, aluminium and steel industries are the main advocates for a sectoral approach as a way to deal with competitiveness issues. While private-sector proposals share with Japan's proposal the interest in mitigating competitiveness issues, they advance industry targets instead of government targets. Key champions are Geneva-based WBCSD and associated initiatives and the Center for European Policy Studies (CEPS), a Brussels-based think tank. The WBCSD and the CSI have actively been designing and promoting sectoral initiatives (WBCSD 2007a; CSI 2008). Moreover, the WBCSD organised a task force on "Global Sectoral Industry Approaches to Climate Change" in collaboration with CEPS (cf. Egenhofer and Fujiwara 2008). The report recommends that governments "support the development of global sectoral industry approaches" by helping to harmonize data and standards, build capacities in developing countries as well as further engage the industries so that the latter can "provide guidance on what it wants to see in a global agreement" (ibid: 34).

Reducing the Kyoto burden

A number of Annex I parties to the Kyoto Protocol, including Japan, have been struggling to meet their targets. Therefore, next to widening participation in a climate agreement, Japan's sectoral approach also aims at creating a more feasible economy-wide emission reduction target for the country (ECO 2008; Johnson 2008). The economy-wide target is derived by adding sectoral reduction potentials based on technology benchmarks. Since Japan already has relatively efficient industrial sectors, a sector-based calculation method for economy-wide targets would lead to a

²² The Summit Leaders Declaration says: "Sectoral approaches can be useful tools to improve energy efficiency and reduce GHG emissions through dissemination of existing and new technologies in a manner compatible with economic growth. We ask the IEA to enhance its work on voluntary sectoral indicators through improved data collection, complemented by business initiatives. We emphasize the importance of expeditious discussions in the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) for limiting or reducing GHG emissions in the international aviation and maritime sectors, bearing in mind the distinct processes under the UNFCCC toward an agreed outcome for the post-2012 period." 07/08/08. http://www.mofa.go.jp/policy/economy/summit/2008/doc/doc080714_en.html. Accessed 12/19/08.

more modest target for Japan. The US government has also warmed to the idea, perhaps because it may allow the US to make commitments only after coming to a clear understanding of those commitments and their feasibility based on sectoral reduction potentials. Indeed, a senior White House official told reporters after the G8 Summit in Japan in July 2008 that “technology cooperation and sectoral approaches...[is] clearly one that the U.S. and Japan had shared” (Connaughton 2008). A number of EU member states are, however, highly sceptical of a sector-based approach to determining national reduction targets. They fear that targets developed in this way will not be enough to curb global warming. They argue that targets should not be determined by what seems feasible in each sector but that they should be science-driven. Japan’s proposal has been met with staunch criticism from some EU member states, developing countries and environmental groups. The proposal is seen as an escape route from stringent economy-wide Kyoto targets.²³ Further, bottom-up targets based on “feasibility” may not be sufficiently high to curb global warming (ECO 2008).

In a similar vein, sectoral industry targets and timetables represent an opportunity for firms in Kyoto parties to reduce the Kyoto burden by setting bottom-up targets based on reduction potentials in a given sector. It might not come as a surprise that European energy-intensive firms are the main proponents of sectoral industry targets and timetables as a form of industry self-regulation. These industries are currently operating under the EU ETS, while their competitors do not face binding carbon limits. A stand-alone agreement based on sectoral industry targets and timetables could possibly provide an alternate route away from the current regime. Claude Turmes, a Green member of the European Parliament says, “(t)he real agenda of companies (...) is to get completely off the hook from EU climate change efforts” (in: Mayer 2008).

While there exists tension between industry and government proposals for a sectoral approach, they share the interest in creating a level playing field in international competition in energy-intensive industries such as cement, aluminium and steel. Beyond this, both governments and industries are seeking more manageable emission reduction targets than under the Kyoto Protocol. A sector-based calculation of targets would potentially provide these.

²³ A number of EU member states are wary of sectoral approaches given that the EU has invested heavily in implementing economy-wide targets under the Kyoto architecture.

4.2 *The Technology Transfer Agenda: Developing Countries*

Key developed states and firms from energy-intensive industries, particularly in the EU, are the driving forces behind sectoral targets and timetables. Their campaign for this policy solution was met with considerable scepticism from developing nations. It is mainly received as an attempt to get developing countries to accept some form of target and/or to erect trade barriers. In response, developing countries did not dismiss the sectoral approach completely, but promoted their own interpretation of the approach which focuses on technology transfer as the content of a sectoral approach (Reuters 2008; TWN 2008). “We welcome the sectoral approach as a method to reach targets, but targets are for developed countries,” said Nama Narain Meena, India’s environment minister (in: AFP 2008). The old conflict between developed and developing countries has been re-surfacing in new language: developed countries want developing countries to contribute to GHG mitigation, while developing countries demand funding and technology transfer.

At the climate talk in Accra in August 2008²⁴, China submitted the following position which largely represents the position of developing countries on sectoral approaches:

The aim of cooperative sectoral approaches and sector-specific actions is to enhance implementation of Article 4, paragraph 1(c) of the Convention (UNFCCC)²⁵. That is, to enhance cooperation between Parties at sectoral level for the purpose of promoting development, deployment, diffusion and transfer of GHG emissions control technologies, practices and processes. Any twist of this understanding or discussion under the AWG-LCA leading to global sectoral standards, benchmarks or emission reduction targets is not acceptable.²⁶

Interpretation of sectoral approaches in the sense of Article 4, paragraph 1(c), of the UNFCCC is a red thread of the positions of developing countries (TWN 2008). Key arguments of developing countries against sectoral targets and timetables are that they put too much of a mitigation burden on developing countries and that they might result in trade barriers. In the current negotiations, developing countries have been holding the UNFCCC principle of common but differentiated responsibilities against sectoral targets for developing countries which are per-

²⁴ The Ad Hoc Working Group on Long-term Cooperative Action (AWG-LCA) met in Accra, Ghana, in August 2008. At this meeting, a workshop on cooperative sectoral approaches and sector-specific actions was held.

²⁵ Art 4.1(c): “Promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors.”

²⁶ China’s Views on Enabling the Full, Effective and Sustained Implementation of the Convention through Long-term Cooperative Action Now, Up To and Beyond 2012. 09/18/08.

http://unfccc.int/files/kyoto_protocol/application/pdf/china_bap_280908.pdf. Accessed 12/15/08.

ceived to be unfair (Buckley 2008).²⁷ Sectoral approaches are considered the backdoor of target setting because they might make financial assistance and technology transfer conditional upon compliance to a sectoral target.

Furthermore, developing countries fear that sectoral government or industry targets and timetables might erect trade barriers. The idea is that technology benchmarks for sectoral targets might create universal standards of best available technology with which firms in both developed and developing countries would have to comply. Sergio B. Serra, Brazil's ambassador for climate change, said: "We have to see how we could have sectoral policies that are equitable and don't - and that's a very important concern - result in trade protectionism" (in: AP 2008). Hence, attempts by developed countries to create a level playing field are met with concerns of developing countries about trade protectionism.

In sum, the position of developing countries on sectoral approaches is to be understood as a response to the idea of sectoral government and/or industry targets and timetables advanced by developed countries and industry. The agenda on sectoral approaches originates very much in developed countries, in particular in Japan, the EU and the US.

5 Conclusion

Immediately preceding the recent climate negotiations (COP-14) in Poznan, Poland, the "Summit on Sectoral Cooperation" was convened in Warsaw, bringing together ministers from 20 major emitting countries and representatives from energy-intensive manufacturing industries as well as the energy sector.²⁸ During the COP-14 itself, on December 9, 2008, WBCSD and the International Chamber of Commerce convened the Poznan Business Day, which featured presentations on sectoral approaches by government, industry and non-governmental representatives²⁹. These meetings demonstrate not only the interest and support that sectoral approaches continue to draw from a broad range of constituents but also the likelihood that some form of sectoral approach will become a key component of a future climate framework.

This paper has categorized the many proposals by governments, business groups, think tanks and academics into three basic types: government targets and timetables, industry targets and timetables, and transnational technology cooperation. Proposals for sectoral government targets

²⁷ Yet, this might amount to strategic maneuvering in the ongoing negotiations. There is some evidence that China is considering sectoral targets for its most energy-intensive sectors.

²⁸ The meeting established the "Warsaw Dialogue" to continue the debate on sectoral approaches.

²⁹ Find the agenda and presentations at <http://www.wbcsd.org/web/poznan/agenda.pdf>. Accessed 12/18/08.

and timetables include sector-based calculation methods for economy-wide targets for developed countries and no-lose targets for developing countries. While sectoral government targets would result from inter-governmental processes, existing sectoral industry targets and timetables for energy-intensive industries, namely the cement, aluminium and steel industries, are the product of voluntary initiatives. A third type of sectoral approach focuses on transnational technology cooperation, in which governments and firms cooperate on technology RD&D and technology transfer.

The international debate over sectoral approaches has largely been played out along the traditional lines of division, namely between those who pursue a competitiveness agenda and those advancing a technology transfer agenda. Sectoral government or industry targets are meant to create a level playing field for international competition in energy-intensive industries by preventing carbon leakage. Moreover, sectoral targets and sector-based calculation of economy-wide targets would most likely reduce the mitigation obligations of countries and industries currently subject to the Kyoto Protocol. Japan and trade associations of energy-intensive industries are the most vocal proponents of this agenda. On the other side of the divide, developing countries and emerging economies such as China and India are highly sceptical of sectoral government or industry targets and timetables. They argue that sectoral targets for developing countries put an unfair burden on them. In addition, sectoral approaches, it is worried, might result in trade barriers. Therefore, developing countries have insisted on interpreting sectoral approaches as technology cooperation on RD&D and technology transfer. Given those opposing agendas, the debate on sectoral approaches runs the risk of ending in a stalemate.

The success of sectoral approaches hinges on their ability to demonstrate that they can reduce the gap between developing countries and developed countries by offering a compromise solution. It is important to guard against sectoral approaches being used as a pretext for lowering existing commitments or imposing undue responsibilities on developing countries. At the same time, it is equally critical to leverage their potential benefits, such as ways to encourage emission reduction from developing countries or to promote technology RD&D cooperation. It remains to be seen if parties on both sides of the controversy will consider sector-based proposals to try to find common ground or use them to further polarize the debate.

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