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## Bridging climate change financing and trade-related assistance:

### Relevant issues for vulnerable developing countries

By Ana Maria Kleymeyer and Gloria Carrión

Financing climate adaptation and mitigation in developing countries poses a daunting challenge to the world, making an effective and equitable agreement in this area a top priority of the Conference of the Parties in Copenhagen this December. Development and climate change are considered by some to be the two greatest challenges of our era. They are also closely related in their goals and approaches. Addressing both - especially in Least Developed Countries, Small Island Developing States and Small and Vulnerable Economies - requires dedicated resources, capacity building, institutional strengthening, and coordination across a broad spectrum of stakeholders and initiatives.

The current gap between existing financing and what is needed, as well as the institutional arrangement to manage climate financing, pose two of the greatest challenges to the negotiations. As countries discuss the sources and governance of finance, re-enforcing synergies with existing programmes under the trade regime could bolster funding effectiveness. Aid for Trade is a development assistance approach that focuses on enhancing the trade opportunities of the most vulnerable countries, thus improving their economic resilience.

The two predominant issues in Copenhagen will be mitigation and financing. These topics are fundamentally related. Increased and immediate mitigation efforts will avert climate impacts and reduce the costs of adaptation. At the same time, an immediate upscaling in financing is critical to support these measures as well as address adaptation needs in developing countries.

### Climate finance - Great needs and great expectations

Securing new and effective financing for climate change adaptation and mitigation is critical to the Copenhagen agreement, as is ensuring an equitable and effective de-

livery of each element of that agreement over the long term. Addressing the global challenges that climate change poses will require strong political commitment in Copenhagen, but also enormous and costly structural changes for every country. These changes, which would be difficult and costly for any country to undertake, pose particular challenges to developing countries.

Because climate change is caused by emissions from a broad spectrum of economic activities, mitigation of those emissions will impact the way goods and services are produced and traded around the globe. Furthermore, the inevitable impacts of a changing climate implies vast social, environmental



and economic challenges, especially in the most vulnerable areas of the world, such as in Least Developed Countries (LDCs), Small Islands Developing States (SIDS) and Small and Vulnerable Economies (SVEs - an important category in the trade context, which partly overlaps with the two categories mentioned above). For these countries, effective and predictable sources of funding are fundamental to ensuring their economies can transition to low-carbon development while adapting to the impacts of climate change or, in the worst of cases, respond to disasters.

**Mitigation:** Enabling developing countries to implement mitigation measures required to avert global warming of more than 2°C - the scientifically determined level at which the world can avoid catastrophic impacts - will cost between US\$ 140 billion and US\$175 billion annually over the next twenty years (World Development Report 2010). Financial studies estimate that an extra US\$ 563 billion above and beyond business-as-usual investments will be needed to jump-start the process, yet note that these figures are within the capacity of the global financial markets (McKinsey 2009).

**Adaptation:** Investments necessary to assist developing countries in meeting the costs of equipping their countries for the inevitable could average between US\$30 to US\$100 billion, above and beyond the current development assistance of US\$100 billion. Nevertheless, the allocation of adaptation funding in 2007 was a mere US\$279 million.<sup>1</sup>

The relationship between the sources and objectives of development and climate finance is distinct, yet inseparable. For example, even slight rises in mortality rates in developing countries due to droughts or food shortages can result in increased costs to the development of those countries, slowing efforts for poverty reduction and setting countries back in terms of their development paths. At the same time, slow economic development increases the vulnerability of these countries to eventual climate impacts. Thus, sufficient and coordinated support for both adaptation and development is key.

Current financing for both mitigation and adaptation falls far short, amounting to less than five percent of estimated requirements. The financing chasm is evident on both sides of the climate change equation, yet political promises from developed countries indicate that there may be a change in tides. In addition to G8 and G20 statements earlier this year, political leaders have individually indicated their understanding that financing can make or break the deal in Copenhagen and have signaled readiness to come to the table with concrete proposals.

### Tapping the public and private wells for financial support

Identifying new and additional sources of financing has been one focus of the climate negotiations. There is a general acceptance that developed countries will need to scale up financial resources, yet there is little agreement on the levels and reliability of support over the long term. Many developing countries assert that financing for climate change - and especially for adaptation - should come primarily from the public sector. But most rich countries counter that public monies should only be used to leverage the much greater levels of financing that are available through the private sector.

Countries also continue to debate whether climate financing should be bundled into overseas development assistance

(ODA) or kept strictly separate. Proponents of the former stress the efficiency of using existing institutions and the clear overlap of objectives and activities. Opponents assert that the intermingling of ODA and climate funds will result in less per-country financing for each objective, that current institutions already struggle to deliver finance effectively, and that ODA decision-making is an inherently unbalanced process.

According to the OECD, the total volume of private investment flows that aim to mitigate greenhouse gas emissions is between six and ten times larger than the amount of public money devoted to the same cause. At the same time, OECD member countries currently give around 0.3 percent of the GDP in ODA; if they devoted 0.7 percent, as they have promised to do by 2015, there would be an extra US\$150-200 billion of public financing available a year.

Further exploration of how to catalyse foreign direct investment (FDI) to help finance the climate fight is critical. According to the OECD, FDI in developing countries amounted to US\$ 259 billion between 2003 and 2005. However, over half of that financing did not involve emissions mitigation-related activities. Likewise, less than a quarter of bilateral ODA between 2003 and 2007 included mitigation-relevant activities.

#### UNFCCC - Proposals for additional financing currently under consideration by Parties:

- a uniform global levy on CO2 emissions (LDCs would be exempted);
- levies on international aviation and maritime transport, except for journeys from or to LDCs;
- extending the two percent levy on the Clean Development Mechanism - which is earmarked for the Adaptation Fund - to Joint Implementation projects and emissions trading;
- external debt swap/relief for sustainable development in developing countries.

### Additional sources of financing: Exploring the Aid for Trade Agenda

Discussions on additional sources of international financial support for climate change under the UN Framework Convention on Climate Change (UNFCCC) address the fundamental issues of principles, sources, and governance of future funds. Developing countries place much importance on principles of equity, transparency, direct access, sufficiency, among others. Notably, these principles are echoed in the Paris Declaration on Aid Effectiveness of 2005, set out by global development agencies and developing countries, indicating that countries could ally on these issues. Nevertheless, a continued tendency from developed countries to steer financing through traditional financial institutions and a lack of support for proposals from the Group of 77 and China developing country negotiation block has cast a shadow over potential consensus on these issues at the global level.

An unexplored option for leveraging additional financial support to developing countries in a way that is coherent with development policies and that respects developing country guiding principles is through "Aid for Trade" and its supporting Enhanced Integrated Framework for Trade-

Related Technical Assistance (EIF). Aid for Trade is a development assistance mechanism established during the 2005 WTO Hong Kong Ministerial. Its main aim is to help developing countries build the supply-side capacity they require to link to the world economy on better terms and strengthen their ability to assess and represent their interests in trade negotiations. Aid for Trade focuses on and channels financial resources mainly into four areas: 1) trade-related technical assistance and capacity building (e.g. training trade officials and helping governments implement trade agreements); 2) trade-related infrastructure; 3) building productive capacity; and 4) trade-related adjustment programmes.

The Integrated Framework, which provides support to LDCs and dates from 1997, was enhanced at the Hong Kong Ministerial to work coherently with the Aid for Trade programme. The Enhanced Integrated Framework supports LDCs through capacity building and mainstreaming trade issues into national development plans. It also facilitates the disbursement of funds based on LDCs' own assessment of their productive capacities and identified priorities for trade-related assistance. Ultimately, both Aid for Trade and the EIF projects intend to foster economic resilience in developing countries, and in particular the least developed and vulnerable ones.

Aid for Trade and climate change financing address many common objectives. If conceived and implemented in a coherent and supportive manner, Aid for Trade and EIF could be crucial to establish and strengthen the economic resilience that developing countries, and in particular LDCs and SIDS, need in order to address both climate change challenges and promote their effective trade performance in world markets.

Two major Aid for Trade categories in which climate change adaptation objectives could be targeted are economic infrastructure and building productive capacity. In the case of economic infrastructure, strengthening transport and storage (road transport, rail transport, water transport, storage) and building effective energy supply and generation capacities (power generation/renewable resources and hydro-electric power plants) through Aid for Trade projects can clearly support both mitigation and adaptation objectives in developing countries. Moreover, in terms of building productive capacity, key sectors such as agriculture, fisheries, and industry could be bolstered from the perspective of economic resilience and climate change.

In the case of agriculture - a sector of strategic importance for many LDCs, particularly in Africa - adaptation measures such as soil rehabilitation, water conservation, and land terracing and fertilization could be furthered through Aid for Trade. Targeted projects could effectively foster agricultural diversification - including improvements in the mix of livestock breed, fish species, and crop mix - by helping build national and/or regional agricultural research and development centres, fostering education and training capacities, and strengthening the links between and improving the bargaining power of agricultural cooperatives and associations *vis-à-vis* large national and transnational agricultural companies.

Another synergistic opportunity involves linking National Adaptation Plans of Action (NAPAs under the UNFCCC are plans that assist developing countries to identify their ad-

aptation needs and integrate them into national planning) and Aid for Trade. NAPAs could be cross referenced with trade-related technical assistance projects and funds aimed at integrating trade into national development strategies in order to build economic resilience, explore economic diversification, and identify the most viable options for adaptation (as well as mitigation). Notably, financial support to implement NAPAs is insufficient. Well targeted and additional EIF and Aid for Trade funds could be used to supplement existing NAPA development and implementation funds, while strengthening the supply-side capacity of LDCs and SIDS in a reinforcing manner.

## Overcoming capacity restraints and claiming ownership

For LDCs, SIDS, and SVEs, ownership - in the sense of exercising control over the determination and implementation of strategies - of Aid for Trade projects and resources represents a fundamental challenge. Due in part to technical capacity and institutional challenges, most of these countries end up having little say over project conception and delivery, leaving donors to prescribe or impose Aid for Trade projects. In this sense, integration with NAPAs might offer a more equitable and inclusive approach. Although they only reflect countries' specific short-term priorities in terms of climate change, they are crafted on the basis of national consultation processes with stakeholders.

Constructing and strengthening the absorptive capacities in SIDS, LDCs and SVEs will be fundamental to addressing pressing climate change challenges and concurrently fostering sustainable development. Many LDCs face significant institutional challenges in terms of human resources and effective national financial mechanisms. These can be addressed through a range of programmes involving among other: capacity building, transfer of know-how, establishment of collaborative research centres, and strengthening information systems. As many of the same challenges impair both dealing with climate change and strengthening trade capacity, they may be concurrently addressed through collaborative approaches.

The potential sustainable development gains of climate change projects in SIDS, LDCs and SVEs are the touchstone of effectiveness for building both economic and climate resilience. In order to maximise the mutual supportiveness of climate financing and existing development instruments, such as Aid for Trade, it is critical to evaluate, and where possible align, the needs, development priorities, and implementation strategies of developing countries. Alternatively, lack of coordination can lead to lost opportunities, higher costs, and impaired effectiveness in terms of climate readiness and poverty reduction - a lose-lose equation for all involved. Ultimately, a collaborative spirit and careful planning can exponentially improve results of all objectives in developing countries, and especially the most vulnerable ones, and increase chances of achieving the win-win solutions the whole world needs.

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<sup>1</sup> United Nations Development Program (2007), p 25.

# The microcosm of climate change negotiations

## - What can the world learn from the European Union?

By Håkan Nordström

The relatively heterogeneous European Union has become a leader on climate change despite many odds. The mobilisation of the member states to move together provides insight into elements needed to ensure momentum also at the global level. These include leadership, burden-sharing, and financial support for weaker economies. While tools to address competitiveness concerns may be needed, the most confrontational ones - border tax adjustments - can hopefully be left untouched in the bottom drawer of the tool box.

The EU has played a leading role in the international efforts to combat climate change since the issue emerged on the agenda in the 1980s. The EU was the first party to commit to a stabilisation target in 1990; it assumed the toughest target under the 1997 Kyoto Protocol; and it has made the most ambitious offer for Copenhagen with an autonomous target of 20 percent emission reductions by 2020 relative to the 1990 level, or 30 percent if its key counterparts join in. The EU has also indicated a willingness to contribute significant funding to support adaptation and mitigation actions in developing countries.

The EU has emerged as a leader on climate change against all odds. Collectively, the EU is responsible for 13.8 percent of current emissions of greenhouse gases, with individual country shares ranging from 0.01 to 2.8 percent. None of the member states is large enough to influence the global emission trajectory in any significant way, nor is the EU as a collective able to do so, since global emissions are growing faster than what the EU can offset alone. The leadership is intriguing also in that the member states have veto power over key aspects of climate policy, including fiscal measures and energy policy. The EU cannot order member states to phase out fossil fuels in favour of renewable energies. Nor can the EU impose a carbon tax or cap-and-trade system without the agreement of *all* members.

This raises a number of questions that are of potential interest for climate negotiators and NGOs. What formula did the EU use to get all member states in line? How did the EU deal with competitiveness concerns, carbon leakage and the distribution of burdens among the member states? Can the internal formula be transposed to the global level? With these questions in mind, this article reports the findings of a study that followed the paper trail of the internal EU climate change negotiations from the first stabilisation target in 1990 to the adoption of the 2008 energy and climate package,

which is the basis for the EU negotiations in Copenhagen. The analysis generates two interlinked lessons.

*“How did the EU deal with competitiveness concerns, carbon leakage and the distribution of burdens among the member states?”*

### Lesson one: The EU cannot move further

*First*, it will not be easy for other parties in Copenhagen to squeeze out more concessions from the EU than what the member states have agreed beforehand. The EU will speak with one voice in Copenhagen, but behind that voice there are 27 voices with different national interests to protect; all with an effective veto power. It would be a mistake to assume that the EU can be pushed to the 30 percent conditional target without significant commitments from other industrialised countries as well as economically more advanced developing countries. Even the 20 percent target was the result of difficult bargaining. The energy-intensive industry had to be “bought off” with free emission allowances; less developed member states with generous allocation of emission rights and redistribution of the auction revenue; and developed member states with flexible rules on clean development mechanism (CDM) credits. No formula has been agreed for the sharing of the burdens if the target were to be raised from 20 to 30 percent. If the negotiation breaks down in Copenhagen, it may be difficult enough to maintain the political support for the 20 percent target. Even the current Kyoto target has been hard for the EU to meet. Less than half of the distance has been covered thus far, and four member states are 20-35 percent above their national assignments. The appetite for taking on additional burdens for the 2013-2020 period is likely to be low if other parties shirk their responsibility in Copenhagen. A breakdown will also increase the pressure from industry and some member states to introduce a “carbon equalisation system” (border tax adjustment), an option that was included in the revised Emissions Trading Scheme (ETS) Directive. The climate stakes are thus very high



in Copenhagen, as are the stakes for the global trading system. The EU may be leader on climate change, but it cannot move much faster than “competing” nations.

## Lesson two: Elements for an international agreement

*Secondly*, to the extent that the “microcosm” analogue is valid, the analysis may give some insights on what elements are needed to conclude a comprehensive international agreement. The internal negotiations suggest that four ingredients are necessary to make any progress.

### Leadership

The first ingredient is *strong leadership*. In the EU, this is provided by the Commission and some climate-conscious member states in northern Europe, with support from green members of the European Parliament. It is more difficult to see where this leadership will come from at the international level. The secretariat of the UN Framework Convention on Climate Change (UNFCCC) does not have the executive powers of the European Commission, although it provides invaluable intellectual leadership together with the Intergovernmental Panel on Climate Change (IPCC). The leadership must instead come from the parties themselves. Developing country leadership would be particularly valuable. The EU example clearly shows that progress can only be made by a multi-polar effort that speaks both for and to different constituents. The Annex I countries cannot halt climate change alone.

### Burden-sharing

The second ingredient is an equitable *burden/effort sharing formula*. The first stabilisation target of the EU12 in 1990 was made possible because of the pledges of a handful of member states, in particular Denmark and Germany that had adopted national plans to reduce emissions by 20/25 percent by 2000/2005. This allowed the less developed member states to take on a lighter burden in accordance with their social and economic needs, subject only to an undertaking to enhance their energy efficiency per unit of output. The burden sharing dispute became more difficult under the Kyoto protocol, requiring a reduction of the overall emissions by eight percent. Member states that were not in a position to reduce emissions in absolute terms had to accept a cap on their emission growth. The national assignments under the 1998 burden sharing agreement ranged from minus 28 percent for Luxembourg to plus 27 percent for Portugal. The latter, while being far more generous than for any other Annex I country, represented a significant cut from the business-as-usual scenario. The sticking point of the internal negotiations was to find a formula that ensured some degree of “comparability of efforts”. A similar solution was used in the 2008 energy and climate package. The global burden sharing formula in Copenhagen would presumably have to be based on a similar equation, factoring in both per capita incomes and “comparability of efforts”.

### Financial support

The third ingredient in the internal recipe is *financial support* to the less developed member states to ease the transition to a low-carbon development path. The

financing issue was solved in an ingenious way in the EU, through redistribution of auction rights under the EU Emission Trading System. Specifically, 12 percent of the auction rights will be redistributed to the member states in the lower income brackets. Some member states will receive more than 50 percent more auction rights than their basic allocation (“needs”). The additional revenue may be worth 0.5 percent of GDP by 2020, depending on the market price of the allowances. The income transfer is earmarked for climate investments. The financing issue would have to be solved also at the global level, somehow. One could for instance imagine that a share of the revenue from a future global carbon market could be set aside for mitigation and adaptation actions in developing countries, as within the EU. But a global carbon market is a long way off. In the meantime, the EU has proposed a formula for sharing the financing burden based on (a) ability to pay and (b) responsibility for emissions. It remains to be seen if such a formula, or version thereof, will be accepted in Copenhagen.

### Dealing with competitiveness and carbon leakage

The fourth ingredient in the internal recipe is *provisions that reduce the competitiveness and climate leakage concerns*. This is bound to be a controversial issue in Copenhagen (and in the WTO) but there is no way around it. Competitiveness and carbon leakage concerns have been a restraining factor for the climate policy of the EU from the early days in the 1990s. It was also the reason for why the US backed down from the Kyoto Protocol. In the absence of such concerns, the EU (and other Annex I parties) would have moved both faster and more forcefully. As explained by the President of the Commission, José Manuel Barroso, when introducing the energy and climate package to the European Parliament, “there is no point in Europe being tough [on itself] if it just means production shifting to countries allowing a free-for-all on emissions.” For its part, the EU left the option of a “carbon equalisation system” in the bottom drawer in wait for the outcome of Copenhagen. But it came at the cost of having to concede free allowances to sectors and sub-sectors exposed to a significant risk of carbon leakage. The forgone auction revenue would have gone a long way towards financing EU’s contribution to international climate finance.

In the best of all worlds, Copenhagen will be a success, with all parties making meaningful commitments in accordance with the principle of common but differentiated responsibilities. Auctions could then be phased in at a faster rate in the EU and other countries considering domestic cap-and-trade systems. A share of the revenue could be used to finance mitigation and adaptation actions in developing countries, which would reduce the cost for developing countries to undertake ambitious commitments in the first place. And there would be no need to reach for the bottom drawer - border tax adjustments - with all the tensions it would create for the global trade system.

The full study this article is based on is available online at <http://ictsd.org>

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# Access to climate change technology by developing country: A practical strategy

By Cynthia Cannady

Enhancing developing country access to climate change technologies is a key objective within the climate change negotiations. However, some of the proposed approaches are likely to fall short of delivering effective solutions that work in the real world. Instead, a fundamentally different approach, strategically focusing on the capacity of developing countries themselves to innovate and contribute to climate technology development - on fair and equal terms with developed country partners - is needed.

Climate change presents a momentous challenge for developing countries. Water scarcity in arid regions, island inundation, bacterial contamination and immunity deficit, food shortages, expensive energy and infrastructure collapse due to energy shortages are all foreseeable crises with catastrophic consequences for poor people. Developing countries need to employ climate change technologies in order to avert climate catastrophe.

## Effectiveness of some approaches in question

Various approaches have been suggested for facilitating access to climate change technology by developing countries, including compulsory licensing, patent pools, patent databases and structured voluntary licensing “mechanisms”. These are, however, non-solutions, or at best partial solutions, because they would not achieve adequate results.

In this regard, some of them could potentially be detrimental to developing countries. For example, in some cases patent pools may cover patents not legally valid in many developing countries, while requiring developing countries to contribute their own intellectual capital and/or pay royalties for the use of patents that they otherwise would not be legally required to pay. Patent information databases are compilations of public material that is already accessible to developing countries, while diverting funding opportunities to lucrative information technology (IT) contracts (to change the search parameters or organisation of the data) to developed nation enterprises and experts. Proposals for structured voluntary licensing mechanisms entail royalties, and they place too much reliance on management by developed country professionals, international bureaucratic arrangements (of what must be an agile business process), expensive software, and packaged technology portfolios selected by developed country parties.

## A new approach: Climate change innovation strategies and ‘win-win’ contracts

What can work to secure access to climate change technology for developing countries is a sustained two-pronged effort to implement a climate change innovation strategy (CCTIS) in developing countries, and to enter into mutually beneficial development collaboration and intellectual property (IP) licensing agreements between developed country

companies and research institutions and their counterparts in developing countries.

Under the first prong, developing countries should target climate change research in their universities and research institutions, strengthen innovation infrastructure to support their researchers, claim the economic value of their human capital as IP, and participate as owners in the growing global market for climate change technology. An innovation strategy should target the funding and infrastructure deficit that cripples research, development and commercialisation by developing country actors in developing countries. International funding initiatives should support developing country-originated CCTIS.

CCTIS is the foundation for the second prong of this approach: mutually beneficial technology transfer contracts. Such contracts, generally technology licences and development collaboration agreements should be “win-win” contracts. A win-win contract results when the material terms of the contract provide that both parties contribute relatively equal value to a technology transaction and stand to gain relatively equal benefit. Without the support of a realised innovation strategy, attempting to negotiate beneficial technology transfer agreements is like constructing a building without a foundation.

### BOX: Win-win Technology Contracts

- *Example 1:* A licensing agreement whereby a scientific team at a university owns a patent, which it licenses to a business that will pay royalties to the university upon sale of products using the claims of the patent.
- *Example 2:* A joint venture whereby both parties invest human capital, funds or use of facilities, and other items of value, in order to develop a wind turbine design for high rainfall climates, and the parties agree to joint ownership of IP with distribution rights in different geographic territories.
- *Example 3:* A developing country puts out a bid for a magnetic, high-efficiency public transport system and accepts an offer from a developed country company that offers an IP license to patents and documentation relating to the transport system, plus engagement with engineers from the local university.

Climate change technology development will benefit developing nations directly by providing useful technologies, and bargaining power in negotiation of licensing and collaboration agreements, but also indirectly by providing jobs and other spillover effects. Regional research and development (R&D) networks will extend opportunities to least developed countries (LDCs). China and Cuba provide examples of developing countries that have successfully implemented innovation strategies.

### Developed country responsibilities

CCTIS is not an excuse for developed countries to place responsibility solely on developing countries for solving their own economic and climate change problems. Developed country actors must also be willing to commit to change, opening towards open innovation with developing country partners. One reason why open innovation in new markets is attractive today is the scarcity that has hit the developed world with the global economic crisis, concomitant with the gradual realisation that traditional sources of financing may have shifted. Another is the critical need for markets for climate change technologies in order to achieve the traction that new technologies need to pull through to mature commercialisation. Developing countries are potential markets with additional customers that developed countries need in order for their green industries to survive and grow. Further, technology is not a zero sum game: the larger the green platform, the more space there is for many players.

Consensus can be achieved on this practical strategy for several reasons. It respects the logic of the IP system: that human capital is valuable and creates technical solutions to human needs as well as economic effects. It is hard to argue with the premise - once it is squarely posed - that developing countries should participate in the IP system as owners and traders in technology.

This is a medium- to long-term strategy that is likely to work. The tendency to insist on immediate technology transfer by shallow devices and ineffective measures has proven illusory in the past.

*“The tendency to insist on immediate technology transfer by shallow devices and ineffective measures has proven illusory in the past.”*

This does not mean that project-oriented approaches for prompt results should not be attempted (e.g. a solar photovoltaic field installed in a developing country), but rather that such initiatives should be implemented as part of a longer-term strategy (e.g. the solar facility agreement includes explicit terms to engage the local university).

### Elements of change

In order to implement this strategy, including initiatives appropriate for the Copenhagen agenda, five elements stand out as being important: support for endogenous climate change research and development; management of developing country intellectual assets; climate change technolo-

gy commercialisation; awareness programmes; and periodic assessment.

Each country must tailor innovation strategy to its own needs and policies. Still, innovation strategies have common elements, including identification of one or more target technology clusters (e.g. biomass or solar or waste to gas or geothermal). Including funding for related science education at primary, secondary and tertiary levels in national budgets, as well as funding graduate student research is also important. In terms of providing a conducive business environment, countries can operate technology incubators to provide legal and business services, train professionals in key skills such as patent drafting and contract negotiation, bridge financing and loan guarantees for small and medium-sized enterprises (SMEs) in target areas, and clarify laws and policies on technology commercialisation at research institutions.

Small, very poor countries will have a more difficult time than BRICS (the emerging economies - Brazil, Russia, India, China and South Africa) in trading on their human capital, but these handicaps would be true for any programme of development. Least developed countries (LDCs) will need to tailor innovation strategies to their needs and capacities. LDCs can join networks and engage in south-south collaborations as a way to gain economies of scale and participate in larger regional innovation strategy. IP, far from hindering that participation, can be helpful because small actors can claim economic value in intellectual capital.

### The need for action

Finally, the international climate change discussions leading to Copenhagen and beyond present an opportunity to link climate change technology transfer with development of national innovation systems in order to achieve concrete results for developing countries. Theoretical and legalistic discussion concerning IP and technology in developing countries, without action and application, does not yield concrete results. Mythologies that have failed should not be repeated, such as the notion that enforcement of IP laws per se promotes innovation (the favoured myth of developed countries), or that “technology transfer” can occur in a one-way flow (the favoured myth of developing countries).

To date, the developing country scientist has been the “invisible man” in the big picture of the pre-Copenhagen negotiations. Scant attention has been paid to climate change technology R&D in developing countries.

Urgent action to implement CCTIS is critical because the human capital of developing countries is the sine qua non for their access to climate change technology. Furthermore, only full engagement of all human beings in the search for climate change solutions will make our collective survival feasible.

The full study this article is based on is available online at <http://ictsd.net/i/publications/58385/>

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# Climate change, agriculture and international trade: Potential conflicts and opportunities

By Jane Earley

Examining the nexus between climate change, agriculture and international trade is not easy, but a necessary task. Understanding these linkages is a high priority for those who will be called on to shape policies and response measures to massive changes in the global economy and the global environment.

Two factors complicate the analysis. First, while the state of the science is indisputable in some areas, much remains to be done. Shaping trade policies, as well as climate mitigation and adaptation measures, will call for a good deal more analytical precision than has ever previously been employed. This is an area where models build on other models, both in the international trade and in the international climate context.

Second, the role of trade measures in the context of international negotiations on climate change stabilisation is unclear. While some refer to trade measures as a useful incentive to promote adherence to climate goals, others see them as a potential threat to mutually agreed climate solutions.

## Climate change impacts on agricultural production

Climate change is estimated to affect agricultural ecosystems in many ways, but perhaps most notable is that it will affect different regions of the globe differently. Tropical regions - and thus developing countries - will generally be more severely affected than temperate regions, primarily because growing temperature ranges and changes in precipitation regimes will add to water use demand. Also, while moderate warming actually benefits crops in the short term in mid and high latitudes, even slight warming would decrease yields in seasonally dry and low-latitude regions.

Densely populated developing countries in tropical and drought-stressed regions could experience increased food insecurity. While total *potential* world food production is projected to increase with increases in local average temperatures of 1 to 3C (but to decrease at higher temperatures), world food security is very vulnerable to extreme weather events and socioeconomic factors.

## Food security and the role of trade

In this context, trade in agricultural products may be vital to food security even in low and moderate climate change scenarios. The principal impact of climate change on trade in agricultural products will likely be higher trade flows of

mid-to-high latitude products to the low latitudes, where production and therefore export potential will be reduced.

Volatility will continue to be part of agricultural trade patterns. Climate change is projected to increase wide variations in the net global food supply, as droughts and extreme weather events become more common. This will both increase prices, at least on local levels, and volatility of supplies. Resource and food scarcity may become more common.

It should be noted that the dire predictions of the Intergovernmental Panel on Climate Change (IPCC) about agricultural productivity in low latitude countries are not backed by detailed and country specific studies, nor do they sufficiently factor in potential adaptation measures. However, the implications for food security are very sobering. All four dimensions of food security (food production, trade, stability of food supplies, access to food and food utilisation) would be affected. Climate change would add to the burden of developing countries already faced with serious food insecurity problems and it would exacerbate them.

Many of the issues at the forefront of the Doha Round trade negotiations will assume new relevance considering climate change. Dealing with food security is not new to the trading system, and safeguard mechanisms exist to deal with an influx of imports and collapsing prices for domestic producers. Whether new special safeguard mechanisms are needed has been the subject of much debate in the Doha Round, but climate change underscores their relevance. It also underscores the need to help developing countries deal with food and energy price increases.

Also relevant to volatile food supplies and food and energy prices are differential export tariffs and export prohibitions. The former are disciplined by WTO Agreements, but some countries feel that the latter need to be limited to cases where countries act to prevent or relieve critical shortages, and applied on a temporary and non-discriminatory basis.

Given current projections, an open trading regime for food and agriculture will be vital for global food security in that it can allow for increased productivity in some regions to offset - via trade - climate-induced constraints in other re-



gions. However, it would be unwise to believe that trade alone is a sufficient adaptation to climate change.

### **Mitigation strategies examined: biofuels, biotech and nitrogen fertilizer**

Climate change mitigation measures that will affect food production and agricultural trade, as well as food security, involve emissions reductions from many sources. The following section reviews mitigation measures related to biofuel production and subsidies, biotechnology and intellectual property protection, and how reducing emissions from fertilizer production could negatively affect global productivity and food security.

**Biofuels:** Ambitious biofuel mandates in both the European Union and the United States were created in part to act as a climate change mitigation tool by substituting biofuels for fossil fuels in transport fuels. In time, cellulosic feedstocks and other processes and crops are projected to substitute current biofuel feedstocks, but existing capacity using present agricultural feedstocks (rapeseed, maize, canola, sugarcane, soy, palm oil) will likely be in production for the next 20 years.

The significance of biofuels in mitigating climate change is currently the subject of much research involving complex life cycle analyses and questions surrounding indirect land-use change caused by biofuel development and other factors increasing global demand for arable land. Biofuels have also been blamed for hiking up food prices and contributing to food insecurity. In addition, the extent to which biofuel production distorts agricultural production and trade systems has yet to be definitively assessed.

Most governments have more recently become more cautious in their approach to biofuels. Overall, development has been scaled back due to the global economic recession and a growing portfolio of other renewable energy supplies.

**Biotech:** Three aspects of agricultural biotechnology are relevant to tradeoffs between climate change mitigation and agricultural trade: the potential of biotechnology to intensify production of food and biofuel on existing agricultural land (and thus reduce pressure to develop additional land for agriculture); the restrictions on trade that apply to the technology; and the implications for food security of the technology transfer required by the climate change agreement.

Many kinds of new technologies will be important to mitigating and adapting to climate change, agricultural biotechnology among them. New traits include pest and drought resistance and carbon sequestration, and varieties to produce increased yields and survive on marginal lands.

However, biotechnology dissemination has been controversial and limited by demands for extensive product labelling and tracing, and by environmental concerns requiring an extensive and complex international system of approvals and controls under the Biosafety Protocol to the UN Convention on Biodiversity. Whether governments can be encouraged to find ways to monitor and enable biotechnology without

detracting from their mitigation potential is an important question for climate change mitigation.

To what extent biotechnology developers will be called on to transfer these technologies is an issue yet to be discussed. Protection of intellectual property did not become an international trade obligation until the completion of the Uruguay Round Agreement. In the climate change context, transfer of technology is critical to implementation of widespread and effective mitigation and adaptation, and it is an obligation under the Convention.

**Nitrogen fertilizer:** Reducing emissions related to the production and use of nitrogen fertilizer will inevitably increase its cost. This will have important implications for agricultural producers in developed and developing countries alike, and for existing patterns of trade in fertilizer. The dilemma is that although use of, and emissions from nitrogen fertilizer may decrease, so might crop yields. This would come at a critical juncture when increasing crop yields is vital to global food security for increased populations.

It is not, however, simply a food production vs. climate change mitigation dilemma. Since land-use change is such an important contributor to climate change, the question may also be whether intensifying agricultural production with the use of fertilizers and thus averting land-use change is a more effective mitigation tool than reducing emissions from fertilizer production, which may lead, in turn, to stagnant yields and pressure on forests and grasslands.

The right balance will have to be struck: intensification of agricultural productivity is a key component for meeting food security needs and climate change mitigation. Fertilizers should not be priced out of reach for agricultural producers, yet their use must become more sophisticated. Good fertilizer practices, including adjusting fertilizer rates to crop demand and synchronising application to crop uptake, can reduce fertilizer use without negatively affecting yield. In the long-term, agricultural production is expected to rise in response to high prices and technology enhancements, but there will be limited ability to expand planted area, and inputs - particularly tied to energy costs - will increase in price.

### **Climate change mitigation and trade rules**

A number of climate change mitigation policies are potentially affected by trade rules. Among these, some may also have implications for agriculture trade, food security and development.

**Border taxes to deal with competitiveness and leakage:** National mitigation measures that make the production of carbon-intensive products more expensive in the domestic market and therefore less competitive relative to imports may cause such production to move to other countries without mitigation measures. In order to counter such "leakage," countries may seek to impose measures on imports. More specifically, countries implementing a carbon tax may opt to impose border tax adjustments, and those implementing a cap and trade system may impose corresponding allowance adjustments at the border. Without international agreement

on climate policy, the potential for border tax adjustment to become the focus of WTO litigation is relatively high.

Border tax adjustments in the agricultural context could focus on the most carbon-intensive or greenhouse gas-emitting parts of the sector, with implications for agricultural chemical and fertilizer production, or livestock.

**Standards and labelling schemes:** Standards and certification systems are important tools in climate change mitigation and adaptation, but their use, particularly by governments, is somewhat vulnerable to interpretation of WTO rules.

The status of standards as international or national, public or private, and voluntary or mandatory, will influence their uptake and use. Standards and labels have assumed new significance in the WTO context as a source of non-tariff barriers. This is particularly relevant to the food and agriculture context, where private sector standards systems used by large retailers now dominate in some sectors of the global produce market.

The challenge of creating viable standards for use in a global climate change context should reinforce the utility of existing WTO disciplines requiring that they be transparently developed and applied.

Standards and certification systems have added value in agriculture and forestry because they can unite a number of disparate producers in long global value chains in adherence to generally acknowledged best practices. If they are suitably tailored, they can also provide a basis for award of offsets, or tax rebates and other benefits from reduced emissions. However, they can discriminate against producers in developing countries and small producers without abilities to generate data necessary to provide a basis for certification, and they can be expensive to join and costly to maintain.

**Environmental payments:** Environmental payments have significant potential to address climate change mitigation. The negotiations on Reduced Emissions from Deforestation in Developing Countries (REDD) are based on the proposition that payment for avoided deforestation can sequester significant amounts of forest carbon and avoid the release of existing carbon stocks. Agriculture has been discussed somewhat differently in the international climate change negotiations, but will clearly be a significant source of soil carbon sequestration in some national climate mitigation schemes.

Payments for forest and soil carbon sequestration, if granted by governments, could be viewed as subsidies in the WTO context. If so, they could be subject to trade disciplines. The situation could be different for a voluntary market for carbon offsets. In this case, the carbon offsets - likely viewed as financial instruments - could be covered by the General Agreement on Trade in Services (GATS).

### **Assessing tradeoffs: Resolving conflicts and creating opportunities**

In principle, there are no conflicts between trade and environmental protection, including climate protection. Yet

there is considerable apprehension that climate change-related measures can distort trade, and alternatively, that trade rules could stand in the way of greater progress on climate change.

In the short term, opportunities for conflict exist in terms of the political choices countries have made and are preparing to make to stabilise emissions through regulatory regimes, taxation and other instruments.

In the longer term, trade rules that do not allow internalisation of the cost of carbon would negatively affect climate change mitigation. Both the future climate and the future trade negotiations provide ample operating space for eliminating confusion and streamlining coherence in this regard.

### ***Using the trade agenda to assist in climate change mitigation and adaptation***

The objectives of the current trade negotiations in the realm of agriculture - reducing and eventually eliminating tariffs, phasing out export subsidies and trade-distorting domestic support - would also serve the climate change agenda well. Yet, many issues would need to be resolved in order for the negotiations to yield climate-friendly results.

Considering the predictions that developing countries will experience particularly severe effects from climate change, it could be argued that lower tariffs in these countries would be consistent with climate change adaptation. As North-South trade in agricultural products is likely to become important for food security, this should be enabled without high costs in the form of agricultural tariffs. Issues surrounding developing country tariffs and import safeguards are highly controversial, however.

Besides the agriculture negotiations, an expansion of the mandate of the Environmental Goods and Services negotiations to include all biofuels would advance more efficient and resource-friendly biofuel production. Yet, these negotiations are fraught with disagreement.

In the future, climate change mitigation policies will include measures designed to internalise the environmental costs of resources. The question may arise whether tariff structures should be tailored towards internalising the cost of carbon and greenhouse gas emissions so that countries assess higher tariffs on carbon-intensive goods than on goods with lesser carbon footprints.

Also central to existing trade policies are domestic subsidies (for both production and export performance) in agriculture, biofuels and forest products. WTO members have committed to reduce them, yet climate change will undoubtedly exacerbate the need to provide domestic support for agriculture and biofuels.

*Jane Earley is Senior Partner, Earley & White Consulting Group, LLC*

# Competitiveness and climate policies: Is there a case for unilateral trade measures?

By Ingrid Jegou

Unless the world moves ahead on a global track to address climate change, countries addressing the problem may opt to take action to protect the competitiveness of their energy-intensive industries through unilateral trade measures. How such border carbon measures might work in practice - and especially, what their impacts would be on poorer countries - is not yet known.

The world is facing a situation in which temperatures are rising as a result of human activities involving unprecedented levels of emissions of greenhouse gases. Climate change is already causing and will continue to cause a rise in sea levels, a decrease in snow and ice, more frequent droughts, more intense tropical cyclones and other extreme phenomena. This in turn is affecting, and will affect, living conditions all over the world. Poor countries, which have contributed the least to climate change and are the least equipped to deal with the consequences, are being hit the hardest.

## The key to success: A global solution

Further climate change seems inevitable. However, the damages can be limited if concrete and substantive action is taken to significantly reduce carbon and other greenhouse gas (GHG) emissions. This response has to be global. If the industrial countries alone were to severely restrain from emitting greenhouse gases it would not be enough. This is a big challenge. The last attempt to curb emissions through a global deal among nations, the Kyoto Protocol, failed to include the United States of America, the world's biggest emitter of carbon dioxide at the time. Under the Kyoto Protocol, developing countries were exempt from making binding reduction commitments based on the principle of "common but differentiated responsibility." Moreover, although marking an important first step, reductions resulting from the Protocol have so far been very modest. Hence, the international community has embarked on a quest for a global arrangement that will entail considerably larger reduction commitments and much broader participation, while respecting historical responsibility and the differences in capabilities among nations.

Although the optimal solution, a global deal resulting in the necessary cuts in global emissions, is well understood, it is by no means certain that world leaders will be able to achieve it. Views differ on who bears the responsibility and who should pay.

## Risks inherent to a partial solution

If only some countries take action, this may result in distortions to competitiveness particularly for en-

ergy- and emission-intensive industries, as producers in mitigating countries would face costs for reducing emissions and compete against firms without or with less such costs. The efforts of mitigating countries risk being rendered futile as some emissions could simply move to countries with less strict climate-change regulations, thereby resulting in so-called carbon leakage.

In response to these considerations and in order to leverage participation of developing countries in an eventual global deal, legislators, industry leaders and lobbyists have come up with the idea of using measures at the border, so-called border carbon adjustments (BCAs). Such measures appeal to politicians as they allegedly protect both the environment and domestic jobs. At the same time, they are hard to accept by countries whose trade is likely to be affected. In the US, there are concrete proposals for border measures in the American Clean Energy and Security Act of 2009 (based on the "Waxman-Markey bill") and in the Boxer-Kerry bill, currently being debated by the US Senate. In France, president Sarkozy recently proposed a carbon tax, which should be accompanied by border measures. Other OECD countries are to an increasing extent discussing along similar lines.

## How do border carbon adjustments work?

BCAs could either take the form of a tax at the border, or, as discussed more frequently, a requirement for importers to purchase allowances in the cap-and-trade system of the importing country. The tax or emission allowance would be calculated based on the quantities of carbon that have been emitted during the production process.

Multiple objections have been raised against such measures. These objections are based on questions of effectiveness as well as economic and legal concerns.

Theory and economic modelling give some support to the effectiveness of BCA in addressing carbon leakage and competitiveness concerns. High administrative costs risk marginalising the benefits, however. In order for BCAs to be effective, a number of criteria regarding their design would need to be fulfilled. For

example, product coverage would need to be broad to avoid firms trying to bypass the BCAs by further transforming the goods. Calculating the emissions related to the production of highly processed goods would - as one can easily imagine - be a daunting task, and associated with considerable administrative costs.

*“In order for BCAs to be effective, a number of criteria regarding their design would need to be fulfilled”*

Moreover, in order to fully address competitiveness issues, exports would need to be rebated as competition takes place not only at home but also to a high degree in export markets. This criterion is not fulfilled in any existing proposal on BCAs. In other words, as most existing proposals do not fulfil the criteria, border carbon measures would probably not be fit to do the job they are intended to do.

Looking at the compatibility of border measures with the obligations of the WTO, the situation is unclear. The legal option that seems to have the most support as a ground for border carbon measures would be to show that they are necessary deviations from the general principles of the WTO in order to protect exhaustible natural resources. However, the discussions related to the existing proposals on BCAs have focused mainly on the protection of domestic jobs and economies. Therefore, it may be difficult to persuade a WTO panel that the environment is the real reason for restricting trade.

*“Discussions have focussed mainly on the protection of domestic jobs and economies”*

#### The high political price of border measures

More worrying is that there seem to be important political risks associated with BCAs. In particular, BCAs risk creating bad will both in the climate change negotiations and in the multilateral trading system. Indeed, many countries that have done little historically to contribute to the problem of climate change and now risk facing taxes at the border, claim they are being unfairly pushed in the climate change negotiations. Additionally, some have indicated that they are reluctant to further open their economies through trade liberalisation if industrial economies plan on raising new barriers to trade. Moreover, BCAs could risk opening a Pandora's box of protectionist measures, which could lead to a veritable trade war.

Should BCAs be the last straw in causing climate change negotiations - and maybe even the trade ne-

gotiations in the WTO - to collapse or to seriously lower the ambitions and fall back on second or third best alternatives, the real consequences would be considerable both for climate change and for the world economy.

#### Development implications of BCAs - the big unknown

The effects of BCAs on developing countries would need to be studied in great detail by countries imposing such measures. The debate today focuses mainly on China and India as likely targets for BCAs. However, preliminary analysis of the Waxman-Markey bill indicates that as many as some 25 countries could be targeted. What would that mean to the trade and development of those countries? Would other developing countries also be affected, through changed world market prices of energy-intensive goods or through altered trade patterns following the new trade restrictions? These questions should be studied in order to avoid adverse effects on the trade and development of poor. Indeed, the world is committed through the Agenda 21, the Millennium Development Goals as well as through the UNFCCC and the WTO to strive for sustainable development. Policies that protect the environment at the expense of welfare and opportunities for the poor and poor countries cannot be sustainable.

*“Effects on developing countries would have to be studied in great detail by countries imposing such measures”*

Today, we lack knowledge of the consequences of BCAs. We simply have no experience to fall back on. Dealing with carbon and greenhouse gas emissions, economy-wide, has never been done before and lacks precedents. Therefore, we must rely on simulations and prognostics. However, as long as we do not know what the final design of the measures will look like, and how much trade is likely to be affected, all simulations and prognostics must be based on a great number of assumptions.

Understanding the possible merits and impacts of the eventual use of BCAs is particularly relevant in the current context of uncertainty with respect to the outcome of the Copenhagen Climate Conference in 2009. If a full-fledged global deal cannot be secured, national policies and measures, eventually including BCAs, may end up acting as the primary instruments in curbing global carbon emissions.

The full paper is available at <http://ictsd.org>

Ingrid Jegou is Global Platform Research Fellow at ICTSD



# Trade flows, barriers and market drivers in renewable energy supply goods: The need to level the playing field

By Veena Jha

A switch to renewable energy is expected to provide a major part of the solution to climate change. In this regard, understanding the conditions that facilitate their production, trade and uptake is important.

A number of renewable energy generation technologies are commercially available and many others under development. This article, based on a comprehensive trade analysis, focuses on trade flows and barriers to commercially available renewable energy generation technologies and their associated goods. It seeks to identify and examine the role of various market and trade drivers including tariffs in the uptake of these technologies.

## Background

The trade analysis builds on a 2008 mapping exercise<sup>1</sup> that identified key climate mitigation technologies and associated goods relevant to the renewable energy supply (RES) sector. The technologies covered included: solar energy; wind energy; ocean energy; geothermal energy; hydro power; and biomass/biofuel technologies. These were classified under relevant customs codes within the international 'Harmonised System (HS)'. For the purposes of the trade analysis, the authors added a few additional categories, namely: bio-ethanol, bio-diesel, solar air-heaters, solar water-heaters as well as parts and components deemed important to include in certain cases, notably hydraulic turbine parts (for hydro-electric generation) and wind-turbine parts.

Customs classification is a key challenge for the trade analysis of RES goods. Trade analysis on the basis of more general, so called HS '6-digit' codes is relatively easy, as common codes and product descriptions are used by all WTO members. At a more detailed product level (8 or 10 digit) - which might capture the specific RES good in question - different countries use different codes and product descriptions. The trade figures produced in the current analysis, based on 6-digit HS codes, have to be interpreted with extreme care, as most 6-digit HS codes that cover 'single end-use' (meaning they can only be used for one specific purpose) RES products also include unrelated products. Further, in the case of components, total trade under a particular 6-digit HS code is included although only a small part, if any, may be related to renewable energy technologies and products. For instance, ball bearings are included because ball bearings are used in the production of wind turbines, but the trade figures inevitably include total trade in ball bearings for any purpose.

## Europe dominates renewables trade; China tops developing country trade

Only about six percent of global energy is supplied by renewables. European firms dominate the production of re-

newable energy and Europe is also a leading exporter of RES goods.

Based on the analysis of trade flows, it appears that intra-European trade in RES is among the highest in the world. Developing countries accounted for only 30 percent of global exports of RES products in 2007 and among these China accounted for 40 percent. In terms of imports, developing countries account for a slightly higher 38 percent, although the top importers by and large also are OECD countries. Other prominent developing countries - particularly in solar and wind energy technologies - include India, Mexico, Hong Kong, the Republic of Korea, Malaysia, South Africa, Singapore and Thailand. Brazil and a few other developing countries also figure among the top ten exporters of bio-ethanol.

Solar and wind figure quite prominently in terms of traded technologies. Wind-power generating sets (HS 850231) provide the main example of a 'single end-use' good at the HS-6 digit level in the RES sector. Going beyond the 6-digit level, solar panels stand out as important single end-use items, categorised as 'ex-outs' (including photovoltaic cells whether or not assembled in modules or made up into panels, and light-emitting diodes) under the 6-digit HS item "Photosensitive semiconductor devices." With a few exceptions, the same countries that are among the top exporters for 'single end-use' products are also top exporters of a much larger list of products. This does not come as a surprise as exports of RES products are closely correlated with the capacity to export industrial goods in general.

## Traders and users of renewable energy technology

An interesting finding is that the top deployers of renewable energy may not always be the same as the top traders of the technologies and components. This implies that the products being exported and imported are multiple-use items and only a part of them are used in the RES sector. Products may also be exported in response to conducive conditions in external markets, but may be too expensive to deploy on a large scale locally. The export of solar panels from China to take advantage of the feed-in tariffs in Germany and Spain are a good example. In some cases, exports are driven by factors that are largely unrelated to the deployment of renewable energy capacity in the exporting country, such as preferential access to export markets. For example, some Central American and Caribbean countries are among the top 20 exporters of bio-ethanol because the US import re-

gime allows them, within certain limits, to import “wet” bio-ethanol from Brazil and Europe and export dehydrated ethanol to the US market.

Similarly, there may or may not be a correlation between imports of RES products and local deployment of renewable energy. For example, nine of the ten countries that expanded their wind energy capacity the most in 2008 are also included in the list of top importers of wind turbines. In cases where this correlation is not found, it again suggests either that the imports are made up of multiple-use items or that major parts of the industry are not tradeable. In wind, however, Asian manufacturers have increased their share of the market and two Chinese manufacturers (Goldwind and Sinovel) and an Indian manufacturer (Suzlon) presently comprise 18 percent of the global supply.

In hydroelectricity, the top producers also feature among the top exporters of hydroelectric equipment (with the exception of Canada and Brazil). However, the equipment imports of top hydroelectric generating countries do not appear to be very high. While major countries that produce geothermal do appear on the list of key exporters, several countries that deploy geothermal energy, including Iceland and New Zealand, do not figure on the list of top exporters or importers. The correlation between the top traders in ocean energy equipment and deployers of ocean energy also seems to be very weak. Overall, this appears to indicate that for hydro, geothermal and ocean, traded components of technologies may not be the most important items with regard to the deployment of these technologies.

### Tariffs on renewable energy technologies

Applied tariffs on most RES products in the top trading nations are in the single digits. India provides an exception in this regard. For solar technologies and components, the global average tariff is around 15 percent. Major importing countries such as China have applied tariffs of about eight percent and most developed countries have low or zero tariffs. One should keep in mind that most of the RES products considered are ‘multiple end-use’ products and many developing countries may be applying higher tariffs as part of their industrial development strategy or possibly to attract ‘tariff-jumping’ investment.

Most developing countries have higher applied tariffs on the whole than developed countries do, and with the exception of China, many developing countries also have some ‘tariff water’ between bound and applied tariffs. Ethanol is an exception to this trend. The US, a major importing country, has an ad-valorem tariff of 2.5 percent, and more significantly, a specific tariff of 14.27 cents per litre. On the other hand, tariff-free access is granted to ethanol imports to the US from Central American and Caribbean countries as part of the Caribbean Basin Initiative (CBI) and the Central American Free Trade Agreement (CAFTA) if they are produced from at least 50 percent local feedstock. Up to seven percent of the US market may be supplied duty-free and without local feedstock. This enables wet ethanol to be

shipped from Brazil to dehydration plants in CBI countries for reprocessing and re-exportation to the US.

### What drives the market and trade in renewable energy technology?

**Subsidies:** Public policies and subsidies are key drivers for renewable energy. The main measures used in developed countries to stimulate markets have been laws requiring utilities to purchase all electricity generated from renewables, laws requiring a certain percentage of renewables within all power generation, subsidies for investments and exemptions or reductions of taxes in component manufacturing, and preferential tariffs for electricity from renewables.

While supportive measures are required for the development of a renewable energy market, many of these measures are also likely to provide an unfair competitive advantage to developed country manufacturers of RES products. On the other hand, the main developing country exporters have traditionally relied on tariff protection - and in the case of China, localisation requirements - to stimulate their domestic RES industry. A lowering of tariff protection on RES goods without a reform of the subsidies affecting the trade in such goods is therefore likely to expose developing countries to subsidised competition. Tariff liberalisation should therefore be accompanied by subsidy reform. A number of policies also act as important non-tariff measures. Localisation measures are particularly notable in this regard. In China, localisation regulations require 70 percent of the equipment used for a renewable energy project to be sourced and built domestically.

**IP:** Intellectual property rights may also affect the diffusion of technologies. The number of patents registered in the renewable sector in different countries could provide an indication of the dissemination of renewable energy technologies across borders. Patent holders usually register patents in a particular country if they want to commercially exploit the particular technology in that country. The difference between developed and developing countries in terms of the number of patents registered has been wide but is narrowing fast. Even more striking is the difference between groups of developing countries. A small group of emerging market economies account for nearly all the patents registered. China is particularly notable for the rapid growth in the number of resident-owned patents between 1998-2008. In China, 40 percent of the sampled technology patents are locally owned, while in India less than 14 percent are.

Fuel cell and solar energy patents account for 80 percent of the growth in global patents from 1998-2000, with wind energy a distant third. The export rate of climate technology inventions - measured by the share of technologies that are patented in at least two countries - is around 25 percent. Most transfer flows still occur between developed countries, although north-south flows are increasing. Flows between emerging markets are very small. Imports of technologies seem to crowd out local innovations. The higher the number of imported inventions, the lower the share of contemporaneous local inventions in the set of technologies used in the recipient country<sup>2</sup>.

### The relationship between trade flows in RES goods and the key market drivers

A regression analysis was conducted on the sensitivity of exports and imports of RES goods to four variables - namely

tariffs on imports, the percentage of renewables in the electricity grid, the percentage of inventions as shown by the share of the country in global patents, and subsidies provided to renewables (using a dummy variable showing the presence or absence of subsidies). The regression results show that in general, the major exporting and importing countries of RES goods are also likely to patent inventions, use a high percentage of renewables showing high deployment of renewable energy, provide subsidies and have low tariffs. Tariffs were, however, found to be less significant as an explanatory variable for increased exports or imports as compared to a composite variable comprising the share of renewables in a country's grid and subsidies. This appears to indicate that tariff reduction by itself may not generate trade in RES goods without supportive market drivers and policies, such as feed-in tariffs and other forms of subsidies. Markets in developed countries have grown exponentially during the last few years in response to the subsidies provided for renewable energy consumption, tax breaks, subsidies for components and the huge volume of venture capital investment.

While subsidies are important in generating a market for renewable energy, some may serve to distort trade and create an unlevel playing field. Such subsidies look set to increase further, as part of fiscal stimulus packages, given the economic crisis at the time of writing and the consequent drying up of venture capital. Discussions at the WTO should therefore address the two pillars of the RES sector, subsidies and tariffs.

However, as technology develops, other countries join in production, bringing down costs and increasing the divisibility of the supply chain. Thus there is a logical case to be made for liberalising trade in these components as they are likely to generate win-win solutions. Production particularly for the Chinese and Indian markets will also serve, through the economies of scale involved, to bring down the costs of RES technologies and goods.

## Lessons for the future

In terms of trade negotiations at the WTO, one should bear in mind that only a handful of developing countries are important players in the markets or trade in renewables. This implies that negotiations on environmental goods could involve a 'request and offer' approach in order to achieve quick and effective results among the top 20 exporters and importers. This is the case in particular where the environmental end-use of products may not be as significant at the HS 6-digit level as for predominantly single end-use products. In the latter case, a larger group of countries could participate in reducing tariffs and non-tariff barriers.

Further barriers to the dissemination of RES technologies need to be identified and addressed. While patents may not pose an insurmountable barrier to the dissemination of renewable energy technologies, other forms of intellectual property protection, such as trade secrets, may be important. Patents have been seen to correlate positively with trade in renewable energy components.

Many other non-technological and economic factors many hinder developing countries from achieving their carbon abatement objectives, such as insufficient technical knowledge and absorption capacity to produce these innovative technologies locally, insufficient market size to justify local production units, and insufficient purchasing power and financial resources to acquire the innovative products. Each of these factors deserves considerable discussion. Solutions should be sought in policies that aim to overcome these insufficiencies. Creating the right enabling environment for the market drivers for renewable energy in developing countries should therefore be a key deliverable of the climate negotiations at the UN Framework Convention on Climate Change (UNFCCC) and a necessary complement to any trade liberalisation initiative on climate-friendly environmental goods and services at the WTO.

The full study this article is based on is available online at <http://ictsd.org>

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<sup>1</sup> Accessible at: <http://ictsd.net/downloads/2009/09/ictsd-ecn-renewable-energy-supply-mapping-report.pdf>

<sup>2</sup> Dechezleprêtre, A., Glachant, M., Hascic, I., Johnstone, N., and Ménière, E. (2008). "Invention and Transfer of Climate Change Mitigation Technologies on a Global Scale: A Study Drawing on Patent Data." CERNA, Paris, France.

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# Bridges BioRes

## Upcoming events & resources

### ICTSD EVENTS AT UNFCCC COP 15, COPENHAGEN

Date	Time	Event	Venue
Tuesday 8th	18:15-19:45	UNFCCC Side Event on "Trade Liberalisation, Market Drivers and Technology Diffusion: A Look at the Renewable Energy and Buildings Sector" organised by ICTSD	Bella Centre, room 7
Thursday 10th	13:00-14:30	ICTSD Lunch Discussion on "Climate Change, Agriculture and Trade" (by invitation)	tbc
Friday 11th	09:00-13:15	ICTSD-IPC Dialogue on "Climate Change and Food Security: Taking Stock at the COP 15" (by invitation)	tbc
	20:00-21:30	UNFCCC Side Event on "Climate Change and Cooperation; LDCs ,SIDS and SVEs" organised by the Commonwealth Secretariat and ICTSD	Bella Centre, room 1
Monday 14th	13:00-14:30	ICTSD Lunch Discussion on "Leveraging Trade Flows and Aid for Trade to Maximize Benefits for LDCs and SIDS" (by invitation)	tbc
Tuesday 15th		Trade and Climate Change Day (by invitation)	
	09:00-10:00	Plenary Session	
	10:00-12:30	Roundtable on "Competitiveness and Emissions Leakage: Border Measures and Beyond"	tbc
	10:00-12:30	Roundtable on "Clean Energy Generation and Lean Energy Use: Interweaving Trade and Regulatory Frameworks"	tbc
	13.30-16.00	Roundtable on "Aid for Trade and Climate Change Financing: Key Implications for LDCs and SIDS"	tbc
	16.15-18.30	Roundtable on "Bunker Fuels: On Course or in the Air?"	tbc
Wednesday 16th	09:00-13:00	Dialogue on "Transfer of Climate Change Technologies: Challenges and Opportunities at Copenhagen and Beyond" (by invitation)	tbc
Thursday 17th	10:00-11:30	Climate Consortium Denmark Side Event on "Competitiveness Impacts and Carbon Leakage: Assessing the Evidence and the Policy Options" organised by ICTSD and IISD	Bella Centre, Climate Consortium Denmark
Friday 18th	11.00-12.30	UNFCCC Side Event on "Patents and Clean Energy: Bridging the Gap between Evidence and Policy" organised by ICTSD, UNEP and EPO	Bella Centre, room 3

For more information and updates on all events, please visit the ICTSD website at <http://www.ictsd.org> or contact Samantha Derksen at [sderksen@ictsd.ch](mailto:sderksen@ictsd.ch)

### RESOURCES

#### ICTSD Resources

SECTORAL APPROACHES TO CLIMATE CHANGE MITIGATION: COMPETITIVENESS, TRADE AND DEVELOPMENT ISSUES IN SMALL DEVELOPING COUNTRIES. ICTSD Trade and Sustainable Energy Series Information Note 11. October 2009. To access this paper, visit <http://ictsd.org/i/publications/57607/>

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#### Other resources

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