Stalemate at the Negotiations on Environmental Goods and Services at the Doha Round *

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Abstract

Pursuant to article 31 of the Doha mandate, WTO members have been asked to reduce or eliminate tariffs and NTBs on a list of Environmental Goods and Services (EGS) to be determined during the negotiations. This paper reviews progress so far. First, it reviews the identification process under the Committee on Trade and the Environment in Special Session (CTESS) since 2002, while discussing the difficulties in identifying EGS and the different approaches on the table. The paper then concentrates on tariff reductions and import responses that occurred since the start of the negotiations, focusing on the 26 products identified as “clear environmental goods”. On average, tariffs have been reduced for an average of 6 percentage points (pp), ranging from 2 pp for high-income to 11 pp for low-income countries. The gap in protection between EGs and other goods remained constant across income groups. While imports did rise for EGs in which average tariff reduction was at least five percentage points, imports grew as much for tariff lines with no tariff reductions. Taken together, the evidence here suggests the lack of a ‘mandate effect’ on EGS since the initiation of the negotiations and that these negotiations fall short of helping ‘the protection of the environment’.

Keywords: Environmental Goods, Doha Round, Tariff Reductions,

JEL Categories: F18 and Q56

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1 Introduction

Until recently, trade and climate negotiations have been pursued separately: Trade only appeared in climate negotiations at the Conference Of the Parties meeting in 2007 (COP13), where one of the four pillars of the ‘Bali roadmap’ involved trade and finance compensation under the “common but differentiated responsibility” agreed under the UN Framework Convention on Climate Change. Environmental issues entered trade negotiations earlier as the text of the Preamble to the Agreement establishing the WTO in 1994 stated that it would have as an objective to promote sustainable development and the protection of the environment (WTO, 1994a). Environmental issues were then introduced formally into the Doha Round dubbed the Round for the “Developing Countries and for the protection of the environment”. Pursuant to article 31, WTO members have been asked to negotiate on the reduction, or, as appropriate, elimination of tariff and Non-Tariff Barriers (NTBs) on Environmental Goods and Services (EGS).¹

The aim of these negotiations is to create a triple win situation, for trade, for the environment, and for development. Indeed, if negotiations are successful, trade will be facilitated through reduced or eliminated tariffs and NTBs on environmental Goods and Services (EGS). This would in turn decrease the cost of environmental technologies, increase their use, and stimulate innovation and technology transfer. As a consequence, the environment would be better preserved, especially if a wide definition of environmental goods were adopted to include as EGS all those environmental products and services with production, usage and disposal characteristics that avoid damaging the environment. Lastly, developing countries would benefit in two ways from better market access in EGS. Producers of EGS would have better access to large markets in Europe, the US and high income Asia and it would be easier for developing countries as a whole to obtain high quality environmental goods on world markets. Such access should increase energy efficiency and improve the water and sanitation situation in developing countries.

As of this writing, in September 2011, almost ten years into negotiations in the Doha Round, WTO members have failed to reach an agreement on a comprehensive package. In June 2011, in a last ditch effort to rescue the negotiations, the WTO director-general Pascal Lamy called for a “plan B” with three lanes. The first ‘fast lane’, which has to be concluded in December 2011, is the “LDC+” minimal package. It should concentrate on preserving some market access for LDCs, with the plus component yet to be determined but that could include Trade Facilitation and progress towards a framework for concrete negotiations on EGS.

¹ The Doha ministerial decision of November 2001, paragraph 31(iii) stated that “…With a view to enhancing the mutual supportiveness of trade and the environment, we agree to negotiations, without prejudging their outcome, on: (…) (iii) the reduction or, as appropriate, elimination of tariff barriers to environmental goods and services”. Negotiations take place in the Special Session of the Committee on Trade and the Environment (CTE in Special Session or CTESS). The other two mandates under paragraph 31 are on coordination and dispute settlement and on information exchange with Multilateral Environmental Agreements (MEAs).
This paper takes stock of the difficulties encountered during the negotiations around article 31, and assesses progress so far on trade liberalization in EGS. Section 2 gives an analytical description of those “goods and services which measure, prevent, limit, minimize or correct environmental damage” (OECD/EUROSTAT, 1999, p.9). It discusses the difficulty in dealing with these aspects under the straitjacket of the Harmonized Commodity Description and Coding System (hereafter HS) and of the WTO articles defining members’ rights and obligations. This analytical description serves to interpret the following inquiries in the paper. Section 3 discusses how countries have responded to article 31, and the different approaches they have proposed. We then focus on what is called the “list approach”, describing the different Environmental Goods (EGs) submissions and the extent of overlap across them. Section 4 explores the extent of tariff reduction that has occurred for the goods on these lists since 2002. It shows that tariff reductions have not been greater than in other goods and that the hoped-for increased import response has been, at best, weak, leading us to conclude in section 5 that the Doha negotiations fall short of being a Round for ‘the protection of the environment’.

2 Environmental Goods: An Analytical Description

2.1 Defining EGs

Under the Committee on Trade and Environment in Special Session (CTESS) Work Programme (see WTO, 2008), WTO members were invited to make submissions that would help define a “universe” of ‘environmental goods’ that would be concerned by tariff reductions. There are no provisions in the WTO legal system related specifically to environmental goods and services (EGS), except for the application of the MFN clause and a general interdiction of quantitative restrictions. As a result, there is no agreed-upon definition of what an ‘environmental good’ or an ‘environmental service’ is. Figure 1, extended from OECD/Eurostat (1999) and Hamwey (2005), suggests classifying goods into two broad categories: on the left, Goods for Environmental Management (GEM), and on the right, Environmentally Preferable Products (EPPs). These are now described in turn.

On the left belong products whose use is to improve the management of the environment (Goods for Environmental Management, GEM). The OECD defines them as “products [and services] that reduce environmental risk and minimize pollution and resource use” (OECD/Eurostat, 1999, p.9). This includes goods and services used in “pollution management” services (e.g. tubes, pipes, filters and chemicals used in sewage and wastewater treatment; mixing, kneading, grinding machines used for solid waste recycling services; pumps, air compressors used to control air pollution; and measuring equipment to monitor the environment (optical instruments for example)). This category also comprises “Resource management” products such as renewable energy equipment (towers and lattice masts for wind turbines, photosensitive devices and optical fibers used to generate, concentrate or
intensify solar power) or indoor air pollution control equipment.\(^2\) These goods generally have multiple end-uses, only part of which serves environmental purposes.

Environmentally Preferable Products (EPPs)\(^3\) are on the right-hand-side of figure 1. These are single-use products that produce less environmental damage either in their production, their use or their disposal. For each EPP there exists a close substitute with a similar use but which is less environmentally friendly (for example the use of biodegradable products in a manufacturing process). Another example of an EPP would be an energy-efficient washing machine or the use of low-emission technology in aluminum production (e.g. Pre-bake rather than Soderberg technology).

However, in some cases, there is some overlap between these categories (Hamwey, 2005, p.4): first, some EPPs may be used to prevent or treat environmental problems as well (e.g. cleaner recycling machinery). Second, renewable energy equipment could be in either GEM of EPPs: equipment used in renewable energy plants would fall under GEM whereas consumer good could fall under EPP (solar cars, biofuels).

### 2.2 Problems in identifying EGs

Apart from their different rationale for inclusion in EG lists, when it comes to WTO negotiations, GEM and EPPs face different problems. Multiple end-uses related problems are specific to GEM. The next three problems (relativism, attribute disclosure, and ‘like’ products) primarily apply to EPPs. Finally, some problems are common to both GEM and EPPs (agricultural goods and services negotiations in the WTO, no coverage in the HS nomenclature, and lock in). Issues relating to each are now reviewed briefly.

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\(^2\) This category comprises both the “Pollution Management” and “Resources Management” groups identified by the OECD and Eurostat (1999). UNCTAD refers to these products as “Type A EGs” (Hamwey, 2005), while the ICTSD refers to them as “established environmental technologies” (EET) (Howse and Bork, 2006).

\(^3\) Hamwey (2005, p.2) refers to as “Type B products” and defines them as “industrial and consumer goods not primarily used for environmental purposes but whose production, end-use and/ or disposal have reduced negative, or potentially positive, environmental impacts relative to substitute goods providing similar function and utility.”
Goods for Environmental Management (GEM) (Pollution, Resources)  
Multiple end-uses ("good" for the environment)  
--- Filters, pumps, used for air pollution control,  
--- Tanks pipes for sewage treatment, etc.  
--- Towers and lattice masts for wind turbines  
--- Measuring instruments  

Environmentally Preferable Products (EPPs):  
Single use  
(less harmful for the environment during production, use or disposal)  

Production  
-- Aluminium (Prebake vs Soderberg production technology)  
-- Organic cotton vs conventional cotton;  
-- Rainfed vs irrigated cotton  

Use  
-- Solar stoves  
-- Solar furnaces  
-- Energy efficient consumer goods (cars, electrical appliances, lamps)  

Disposal  
--- packaging (glass vs. plastic)  
--- Cotton fiber versus synthetic fiber  

Identification of use  
Project Approach  
Finer/alternative HS-classification problematic  

Identification  
Relativism: to the frontier (static and dynamic)  
Attribute Disclosure (requires an efficient disclosure mechanism (e.g. certification and harmonization)  
Processes and Production Methods (PPMs) and the like products at WTO  

Difficulties to negotiate on agricultural products (e.g. biofuels) and environmental services  
Lock-in if characteristics are embodied in HS code  
No coverage in the HS (products and services)
Multiple end-uses

The problem for Goods for Environmental Management (GEM) is that they generally have multiple end-uses (also referred to as the “dual use” or “multi-purposes” problem). For example, tubes and pipes used in water treatment can also be used for the transportation of gas. Several WTO members, including developing countries, have tabled an informal document stressing the importance of only liberalizing trade in environmental goods that serve a single environmental end-use (Claro et al., 2007, p.8). However, if a list approach is used to identify EGs, there is a major identification problem as the Harmonized commodity code System (HS) was not designed according to end-use. A finer HS classification specifying “ex/outs” (goods which are not separately identified at the 6-digit level of the HS system and that have to be identified in national tariff schedules at the 8- or 10-digit level) could help solve the multiple-use problem, but this would be particularly costly and difficult to implement for developing countries. Moreover, this is only a partial solution.

Another way to deal with multiple end-uses is to use a project approach in assessing whether the product (e.g. a turbine) is being used is to improve the environment which is the justification for the define-by-doing-approach. For example, among competing approaches that have been proposed to liberalize goods, those proposed by India (“the project approach”) and Argentina (“the integrated approach”) avoid the dual use problem. In these approaches, only EGs selected by national authorities for environmental projects would temporarily benefit from enhanced market access (see Annex I for more details).

Relativism

Relativism applies to EPPs and refers to the fact that criteria to judge what “environmental friendly” is are lacking. Apart from the divergence in preferences (conceptions of the “environment”), this is also due to the hurdles facing the completion of a life-cycle assessment (LCA) as a same good may be used and disposed of in different ways (Hamwey, 2005). For other goods or human activities, criteria are lacking because of scientific knowledge gaps (particularly for those goods differentiated by Process and Production Methods (PPM) of which the impact is “indeterminate”, see Balineau and Dufeu, 2010). As examples, Steenblik (2007) and Hufbauer et al. (2009), stress that the use of bio-fuels to save on energy and reduce CO2 emissions is doubtful. Likewise cotton production may have high environmental impacts, potentially offsetting positive end use and disposal benefits of cotton products (Hamwey, 2005). This problem is all the more critical when knowledge that was thought to be stabilized could be challenged periodically (for example, some studies stated that environmental impacts of recycling processes may offset benefits of recycling (ibid.)). Scientific knowledge progress is also related to another form of relativism, namely the “changing

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4 See e.g. Brenton et al. (2009) for the difficulty in establishing carbon footprints for food systems, especially in developing countries where emissions from land use change are difficult to evaluate.
technology frontier”: today’s cleanest available technology will change as technological progress occurs. This problem is critical for trade liberalization as it would imply regular updates of the list of goods that would benefit from tariff exemptions.

Attributes Disclosure

Even if problems linked to relativism were solved (i.e. if there were a consensus about what EPPs are), liberalization in EPPs would require their identification. However, most countries have avoided classifying EGs based on their production characteristics because of the difficulties in distinguishing between the same products produced using different methods.\(^5\)

Indeed, EPPs mainly differ in non-observable attributes (which include not only products that are differentiated by PPM but also energy efficient products). Their identification thus requires an efficient disclosure mechanism which can be very costly when attributes are not observable in the final product (e.g. efficient third-party certification for “credence goods”).\(^6\) This implies that multilateral liberalization for many EPPs would further require an international standard and certification process harmonization, one of the reasons why countries are now converging on the view that only a restricted and widely accepted list of goods should be put for negotiation.

Like Products in the WTO

Because all EPPs, if not most, have conventional counterparts, further liberalization would require dealing with the problem of like products so that the promotion of trade in EGs would not create unnecessary restrictions to international trade (contrary to GATT art. XI). This problem affects goods which differ in their Processes or Production Methods (PPMs) without being modified in their final physical characteristics (in that case PPMs are referred to as “non-product-related” PPMs), as WTO members cannot discriminate among products based on the way they are produced. For instance, while some governments may want to discriminate between wood products derived from sustainable grown forests from other wood products, they cannot do so if the unlikeliness of these two types of wood products is not established.

While discrimination according to PPMs seems possible, especially if human health or the conservation of exhaustible natural resources is concerned, the jurisprudence at the GATT/WTO on PPMs is still in flux. Moreover, several members, including developing countries, are against designating PPM-based EGs. Developing countries actually fear that this would open the door to discrimination against their products based on other than

\(^5\) This also raises the question of non-tariff barriers and international standards. There are some proposals on the table, relating in particular to the harmonization of standards on organic products (JO8(07)/146, Brazil, 1 October 2007) and energy efficient goods (TN/TE/W/75/Add.1, Japan, 16 February 2010). See WTO documents TN/TE/19, paragraph 16.

\(^6\) While the definition of “credence goods” given by Darby and Karni (1973) is somewhat more complicated, “credence goods” generally refers to those goods whose attributes cannot be observed before their purchase (“search goods”, e.g. the price of tuna) or their consumption (“experience goods”, e.g. the taste of tuna). For example, consumers cannot know if tuna have been fished in dolphin-safe conditions before, during, or even after consumption (see Balineau and Dufeu, 2010). Credence characteristics disclosure thus requires other mechanisms than repeated purchases and reputation.
environmental concerns (“social concerns” for example, based on the absence of legislation on domestic workers’ rights). Other members (e.g. the European Union and Switzerland) suggested that product-related PPMs (i.e. PPMs that modified the final physical characteristics of products in a way that their use or disposal is less harmful for the environment) could benefit from additional discussions. Peru proposed to include organic products in EGs [JOB(09)/177, Peru, 27 November 2009]. The difficulty here is to prove that organic production methods are product-related (e.g. consumers may want to rinse thoroughly a chemically treated apple while waste less water with an organic apple, see UNEP and IISD, 2005).

Additional Problems

First, some WTO members’ submissions call for some agricultural goods to be included in EGs (e.g. Brazil proposed the inclusion of biofuels [JOB/TE/6, 1 July 2010]). However, to date no formal link has been made between the Doha mandate under Paragraph 31(iii) and the WTO Committee on Agriculture (CoA). Similarly, while a number of EGs only become “environmental” through their use in delivery of environmental services, they have not received much attention. Little progress has occurred in the Committee on Trade in Services Special Session where the negotiations are taking place (see WTO, 2011, TN/TE/20 for more details). Second, as with all classifications, but especially in areas of rapid technological change, once a classification is adopted, one is subject to lock-in which can be an impediment to R&D and a subject of conflict over changing use of goods as in the recent EC-IT case brought up to the Appellate Body. Finally, while the HS nomenclature has some advantages among which lending itself to higher level of disaggregation than other product nomenclatures, these have to be balanced against its drawbacks. First, using the HS implies the exclusion of environmental services. Second, some EGs have no equivalent HS commodity code. For example in the lists proposed by WTO members, 3 products do not have HS-2002 codes.

7 Relevant environmental WTO cases are: US-Gasoline, US-Shrimp and Brazil-Retreaded Tyres. In a first decision by the Appellate Body in the Tuna-dolphin case involving the US and Mexico (under the GATT (1991)), the US lost the case when it argued that tuna could only be imported if it was caught in purse-seine nets, jurisprudence that was overturned later in the shrimp-turtle decision which in effect allowed that process and production methods (PPMs) could be invoked at the WTO for contingent protection. Technically the shrimp-turtle case did not explicitly approve the so-called non-product related process and production methods (NPR-PPMs), but as a result of the case, it could under certain circumstances be justified under the GATT’s article XX exception clauses. In the EC-asbestos case opposing Canada and the EU (DS 135), the Appellate Body upheld the EU position that discrimination according to PPM could be applied when human health was involved.

8 In the “EC-IT Products” case, the issue was how to treat increasingly multifunctional hi-tech goods, i.e. should flat monitor screens initially duty-free as they were used for computers pay the 14% tariff applied to televisions because they are also used as televisions. See Conconi and Howse (2011) “Panel Report on EC-IT Products WT/DS/375”.

9 Japan (TN/TE/W/75/Add.1) submitted two products descriptions, with HS codes to be determined. These are: “LED lamp (LED light bulb etc.) and lighting” and “Energy efficient liquid crystal displays which conform to the energy efficiency standard and are so certified by the authority in destination country”. Besides, Saudi Arabia (JOB(09)/169) submitted “Cut-outs of a kind used in conjunction with internal combustion engine” with HS code 841160 that cannot be found (see TN/TE/20, p.18).
3 WTO Environmental Goods submissions

The classification difficulties described above have given leeway for countries to reflect their conflicting interests under three main approaches: (i) the “list approach”, favored by most developed countries, (ii) the “request and offer” approach, used in early GATT negotiations, favored by some developing countries (e.g. Brazil), and; (iii) the “Integrated-Project Approach” that would address the problem of multiple end-uses. These and two other proposals combining elements of these main approaches are described in Annex I. Since reductions in barriers to trade in EGs are on HS products, we discuss briefly two lists, the ‘WTO combined list’ which combines products from all lists, and the smaller ‘core list’ presently viewed as the list around which any negotiations might take place.

3.1 The ‘WTO combined list’ (411 HS codes)

Following an initial period of illustrative submissions between 2002 and 2005, under the 2008 CTESS Work Programme, WTO members were officially invited “to make submissions identifying environmental goods of interest to them across as many categories as possible, and/or environmental goods identified in any requests/offers they would have made to other Members” to determine the “universe” of environmental goods and to identify environmental categories for the project approach. For fears discussed above, with the exception of the Philippines, developing countries did not participate. Thirteen countries participated to the submission process resulting in 6 lists (number of HS-2002 6-digit codes in parenthesis): Saudi Arabia (262), Japan (57), Philippines (17), Qatar (20), Singapore (72), and the group of nine Friends (164).10 (Since Japan’s list is an additional list, there are only thirteen countries that participated to the submission process).

Due to partial overlaps, the combined list (hereafter the “WTO list”) contains 411 unique HS-2002 6-digit level codes11 (see Annex II). The very limited overlap (see Figures III-A and III-B in Annex III) indicates the diverging positions as to countries’ perceptions about which goods should be considered as “environmental”. It also confirms the difficulties in identifying the two categories of environmental goods discussed in Figure 1. In fact, there is not a single product that appears on all six lists, and more than two thirds of the products proposed are on only one list. Only 7 products are common to four lists. More than 80% of the 90 duplicates are common to the Friends’ list, of which almost three quarters (54 HS codes)

10 It is likely that the submission from the Philippines was under the pressure of the then chairman of the CTESS, Manuel A.J. Teehankee, the Philippine Permanent Representative to the WTO in Geneva. The “friends” lists includes a merger of individual submissions made by Canada, the European Union, Japan, Korea, New Zealand, Switzerland, Taiwan, and the United States with Norway joining the list without making individual submissions.

11 The final list compiled by the WTO (TN/TE/20, 21 April 2011) contains 408 6-digit HS-2002 six-digit level codes. However, the list we use for this work contains 411 6-digit HS-2002 six-digit level codes. This is because we make additional corrections looking at products descriptions provided by Members (see Annex II). Because some countries prefer the Project or Request approaches, members were also asked to submit their products under pre-identified categories and/or suggest new categories (see Annex II, Table II-B and Table 1, column “Categories”).
are also common to Saudi Arabia’s list, and another quarter (20 HS codes) common to Singapore’s proposal (Annex III further discusses the overlaps).

3.2 The ‘Core List’ (26 goods)

From this combined list of 411 codes, Australia, Colombia, Hong Kong, China, Norway, and Singapore, have drawn a ‘core list’ of 26 goods that could serve as a starting point for WTO negotiations. Table 1 lists these 26 HS codes, the countries that proposed the good in individual submission, and the categories under which that good was classified.

<table>
<thead>
<tr>
<th>N°</th>
<th>HS 2002 CODE</th>
<th>HS CODE DESCRIPTION</th>
<th>MEMBERS</th>
<th>CATEGORY(IES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>460120</td>
<td>Mats, matting and screens of vegetable materials</td>
<td>PHL</td>
<td>WM/WT</td>
</tr>
<tr>
<td>2</td>
<td>730820</td>
<td>Towers &amp; lattice masts</td>
<td>FRD, PHL, SGP</td>
<td>RE</td>
</tr>
<tr>
<td>3</td>
<td>732111</td>
<td>Cooking appliances and plate warmers: For gas fuel or for both gas and other fuels.</td>
<td>FRD</td>
<td>ET</td>
</tr>
<tr>
<td>4</td>
<td>732490</td>
<td>Other sanitary ware and parts thereof, of iron or steel</td>
<td>FRD, SAU</td>
<td>WM/WT, ET, CCS</td>
</tr>
<tr>
<td>5</td>
<td>840290</td>
<td>Steam or other vapour generating boilers (other than central heating hot water boilers capable also of producing low pressure steam); super-heated water boilers: Parts</td>
<td>FRD, SAU, PHL</td>
<td>WM/WT, ET, CCS</td>
</tr>
<tr>
<td>6</td>
<td>840410</td>
<td>Auxiliary plant for use with boilers of heading 84.02 or 84.03 (for example, economisers, super-heaters, soot removers, gas recoverers); condensers for steam or other vapour power units</td>
<td>FRD, SAU, PHL</td>
<td>WM/WT, ET, CCS</td>
</tr>
<tr>
<td>7</td>
<td>840510</td>
<td>Producer gas or water gas generators, with or without their purifiers; acetylene gas generators and similar water process gas generators, with or without their purifiers</td>
<td>FRD, SAU, PHL, SGP</td>
<td>APC, RE, WM/WT, ET, CCS</td>
</tr>
<tr>
<td>8</td>
<td>840681</td>
<td>Steam turbines and other vapour turbines for marine propulsion: Of an output exceeding 40 MW</td>
<td>FRD, SAU, PHL</td>
<td>RE</td>
</tr>
<tr>
<td>9</td>
<td>840999</td>
<td>Parts suitable for use solely or principally with the engines of heading 84.07 or 84.08 other</td>
<td>FRD, SAU, SGP</td>
<td>APC, ET, CCS</td>
</tr>
<tr>
<td>10</td>
<td>841011</td>
<td>Hydraulic turbines and water wheels of a power not exceeding 1,000 kW</td>
<td>FRD, SAU, PHL</td>
<td>RE, ET, CCS</td>
</tr>
<tr>
<td>11</td>
<td>841012</td>
<td>Hydraulic Turbines and Water Wheels, Power 1, 000-10, 000kw</td>
<td>SAU</td>
<td>ET, CCS</td>
</tr>
<tr>
<td>12</td>
<td>841090</td>
<td>Hydraulic turbines, water wheels, and regulators ; parts, including regulators</td>
<td>FRD, SAU, PHL</td>
<td>RE, ET, CCS</td>
</tr>
<tr>
<td>13</td>
<td>841181</td>
<td>Other gas turbines of a power not exceeding 5,000 kW</td>
<td>FRD, SAU, PHL, QAT</td>
<td>RE, ET, CCS, OTH</td>
</tr>
<tr>
<td>14</td>
<td>841182</td>
<td>Other gas turbines of a power exceeding 5,000 kW</td>
<td>FRD, SAU, PHL, QAT</td>
<td>RE, ET, CCS, OTH</td>
</tr>
<tr>
<td>15</td>
<td>841861</td>
<td>Other refrigerating or freezing equipment; heat pumps: Compression-type units whose condensers are heat exchangers</td>
<td>FRD</td>
<td>RE</td>
</tr>
<tr>
<td>16</td>
<td>841919</td>
<td>Instantaneous or storage water heaters, non-electric: Other</td>
<td>FRD, PHL</td>
<td>RE</td>
</tr>
<tr>
<td>17</td>
<td>841950</td>
<td>Heat exchange units</td>
<td>FRD, SAU, PHL</td>
<td>RE, ET, CCS</td>
</tr>
<tr>
<td>18</td>
<td>847989</td>
<td>Other machines and mechanical appliances: Other</td>
<td>FRD, SGP</td>
<td>APC, WM/WT, RE</td>
</tr>
<tr>
<td>19</td>
<td>850231</td>
<td>Other generating sets: Wind-powered</td>
<td>FRD, PHL, SGP</td>
<td>RE</td>
</tr>
</tbody>
</table>
Table 1 – The ‘Core List’

<table>
<thead>
<tr>
<th>N°</th>
<th>HS CODE</th>
<th>HS CODE DESCRIPTION</th>
<th>MEMBERS</th>
<th>CATEGORY(IES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>850410</td>
<td>Ballasts for discharge lamps or tubes</td>
<td>SAU</td>
<td>ET, CCS</td>
</tr>
<tr>
<td>21</td>
<td>853710</td>
<td>Boards, panels, consoles, desks, cabinets and other bases, equipped with two or more apparatus of heading 85.35 or 85.36, for electric control or the distribution of electricity, including those incorporating instruments or apparatus of Chapter 90, and numerical control apparatus, other than switching apparatus of heading 85.17For a voltage not exceeding 1,000V</td>
<td>FRD, PHL</td>
<td>RE</td>
</tr>
<tr>
<td>22</td>
<td>854140</td>
<td>Photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes.</td>
<td>FRD, PHL, SGP</td>
<td>RE</td>
</tr>
<tr>
<td>23</td>
<td>900190</td>
<td>Optical fibres and optical fibre bundles; optical fibre cables other than those of heading 85.44; sheets and plates of polarising material; lenses (including contact lenses), prisms, mirrors and other optical elements, of any material, unmounted, other than such elements of glass not optically worked: other</td>
<td>FRD</td>
<td>RE</td>
</tr>
<tr>
<td>24</td>
<td>900290</td>
<td>Lenses, prisms, mirrors and other optical elements, of any material, mounted, being parts of or fittings for instruments or apparatus, other than such elements of glass not optically worked: other</td>
<td>FRD</td>
<td>RE</td>
</tr>
<tr>
<td>25</td>
<td>902730</td>
<td>Spectrometers, spectrophotometers and spectrographs using optical radiations (UV, visible, IR)</td>
<td>FRD, SGP</td>
<td>ET</td>
</tr>
<tr>
<td>26</td>
<td>903210</td>
<td>Thermostats</td>
<td>FRD, SAU, SGP</td>
<td>ET, CCS</td>
</tr>
</tbody>
</table>

Source: Compiled from country submissions by the authors and TN/TE/20
APC=Air Pollution Control, RE=Renewable Energy, ET=Environmental Energy, CCS=Carbon Capture and Storage, WM/WT=Water Management / Water Treatment, OTH=Other

Among these goods identified as “clear environmental goods”, 7 are singles, 5 are common to two submissions, 11 are common to 3 submissions, 3 are quadruplicates and 23 are on the Friends’ list.

Figure 2 describes the combined (411 goods) and core (26 goods) lists under the two-digit HS-2002 Chapter classification (96 product categories).
It is apparent that the 411 codes fall within 24 of the 96 HS Chapters with almost one third under HS Chapter 84 (machinery and mechanical appliances, for example pumps for air handling equipment, turbines, and machinery for waste management). Chapter 85 (electrical machinery such as generators), Chapter 90 (Precision instruments to monitor and analyze the environment), and Chapter 73 (articles of iron or steel like tubes, pipes, tanks and reservoir for water treatment) respectively accounts for 16%, 13%, and 11% of the WTO combined list of EGs. Energy efficient or cleaner vehicles (chapter 87) proposed by Japan account for 7% of the list. Ethers and ketones of chapter 29 (proposed by Saudi Arabia as “Carbon Capture and Storage” (CCS), “Gas flaring emission reduction”, or “Efficient Consumption of Energy (EC)” technologies) account for another 7%. Plastics articles (chapter 39) mainly suggested by Saudi Arabia as CCS- or EC- technologies account for 5%.

As a first check on progress in reducing barriers on EGS, Figure VI-A in Annex VI plots the import shares by income group for the core and combined lists over the period 2000-10. The graph shows that the share in total imports of the core list is between 0.5 % and 1.0% for the low-income countries and 1.5% and 2.0% for the lower-middle income countries. With the combined list, the share rises to the range of 20% for all income groups except for the low-income group for which the share rises from 12% to 38%. Since many multi-use goods are
included in the combined list (e.g. vehicles or parts), it is best to rely on the figures for the core list. Importantly, there is no rising trend in the share for core EGs in total imports over the period.

In conclusion, no single technology or sub-set of technologies is likely to meet the objective of preserving the environment and particularly to mitigate or adapt to the adverse effects of climate change. This reflects conflicting interests across countries, some of which are due to political economy considerations (see Balineau and de Melo, 2011) and others reflect the fact that environmental problems are different across countries. So it should not be surprising, especially for environmental goods relating to climate change, that there is only limited overlap across the lists. Finally, recognizing that technical progress could be rapid in this field (as in the IT sector), leads to the conclusion that any agreement is likely to be challenged either when negotiations take place, or later on when new information about climate change and about the appropriate accompanying technologies to mitigate and adapt become available (see the EC-IT products case recently adjudicated by the WTO Appellate Body mentioned earlier).

4  Trade liberalization in EGs and Imports

At this late stage in the Doha negotiations, it is likely that any measures towards trade liberalization in EGs will either involve some tariff reductions on the ‘Core list’ or agreement on a standstill fallback (countries agree to bind tariffs at their current applied rates). Here we address the following: how much tariff reduction has taken place and how has the pace of tariff reduction compared with that for non-EGs? For those EGs for which trade liberalization was substantial, we look at the import response. Data are described in Annex IV. We take 5-year averages over intervals starting in 1996 to see if there are any noticeable tendencies. We summarize results for the ‘core list’ by income group and by region and report the (very similar) results for the ‘combined list’ in Annex V.

4.1 Tariff Reductions in EGs

Four patterns are apparent in the data. First, protection in EGs remains highest in the low-income group, i.e. the group that would benefit the most from imports of EGs (Figure 3). With few exceptions, these are the countries that specialize in ‘end-of-pipe’ activities using imported clean technologies that reduce pollution and protect the environment. Second, the absolute gap in protection between the low income group and the other developing groups has remained constant during the period, and the number of duty-free tariff-lines is still very low for the low-income group, standing barely above 10% at the end of the period (see Figure VI-B in Annex VI). Third, the data show a steady decline in tariffs over the period across income groups, all groups reducing tariff by about 50% over the period. Fourth, for all income
groups, EGs are less protected on average than other goods, but the gap in average protection has remained fairly constant for all products and across groups.\textsuperscript{12}

Turning to the pattern of reduction in protection for the EG group, the data fail to show a “mandate effect” as one observes no acceleration in the reduction of EGs tariffs relative to other products as the Doha negotiations proceeded, especially for the low-income group where the reduction in protection was greatest in the 2002-2004 period.\textsuperscript{13}

[Figure 3 - Evolution of the average rate of protection, 1996-2010]

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure3.png}
\caption{Evolution of the average rate of protection, 1996-2010}
\end{figure}

Should the negotiations end up in a standstill compromise, as expected, the high income group would not lose much leeway in tariff setting since for most countries in the group applied tariffs are their bound levels. Figure 4, which compares average applied and bound tariffs for those products that are bound on a trade-weighted basis across products within and countries (and across countries within groups), shows that the upper middle-income countries would lose the most leeway. This is due to the combined effects of the larger unilateral tariff reductions in this group of countries and their having a greater proportion of bound tariff lines.\textsuperscript{14} Otherwise, as expected, the removal of flexibility in tariff setting would hit the low-income group more than the lower-middle income group (figure 4).

\textsuperscript{12} The average percentage point tariff reductions in Core list EGs (in parenthesis) over the period 1996-2010 were: High income (2.1), Upper-middle income (5.4), lower-middle (6.1) and low-income (11.1). See Table VI-C

\textsuperscript{13} The same conclusion emerges when the comparisons are carried out on the number of HS-6 lines with zero protection over the period. High-income countries had about one third of tariff lines duty-free by the end of the period while low-income countries who would presumably gain the most from the adoption of imported technologies only had 15% of duty-free tariff lines (even though there was a 50% increase in the number of zero-tariff lines) (see Figure VI-B).

\textsuperscript{14} Most Latin American countries in the sample (Brazil, Chile, Colombia, Mexico and Venezuela) have bound tariffs in the 30% range and applied tariffs around 10%.
4.2 Import Response to Tariff Reductions

The triple-win presumption motivating the negotiations rests on the assumption that reductions in protection would take place through the adoption of cleaner imported technologies and of greater investment in cleaner technologies. We use COMTRADE data to investigate import response. A satisfactory approach would stipulate a structural model of import demand at the HS-6 level that would identify the elasticity of import demand as in e.g. Kee et al. (2008). However, the quality of the data (missing data for tariffs and imports that had to be filled – see Annex IV) prevented us from obtaining a stable relationship between import volumes and tariff reductions across samples, the implied elasticities often being insignificant and of widely fluctuating magnitudes.

To iron out the often extreme fluctuations in the yearly data we turned to ‘event analysis’ which is well-suited to study the correlates of a variable that is highly unstable (e.g. 22.60 4.75 5.52 2.42 12.14 5.28 1.23 0.84

15 We use data deflated by the GDP deflator going back to 1996 for a sample of over 700,000 observations at the HS-6 level. This date corresponds to the beginning of the period with much less missing data giving us a data base of 15 years for 123 countries and 411 HS-6 products, i.e. 758,295 observations of which 54,450 are tariff reductions (see Annex IV for a complete description of the data used).

16 In a typical estimation, the change in imports was regressed (usually at the HS-2 level to reduce measurement error) on the change in tariffs and a host of dummy variables to control for omitted variables, usually yielding an (expected) negative, but very unstable, coefficient on tariffs.
growth or imports at a disaggregated level). This approach has been used by, among others, Hausman et al. (2006), to study the correlates of significant growth events across developing countries. We do the same here, asking whether significant tariff reductions (to be defined shortly) are followed by significant changes in corresponding imports.

Since we wish to concentrate on ‘substantial tariff reductions’ (one would not expect much import response to a tariff reduction of a few percentage points) we restricted an ‘event’ to tariff reductions of 5 percentage points or more, e.g. a tariff that is reduced from 12% to 7%. The alternative is option of a 10 percentage point reduction was not considered as it would have reduced the sample considerably, notably by excluding the high-income group from the overall comparisons. More specifically, we defined a tariff event in year t (i.e. a “tariff-event year”) for country i (i ∈ [1, ..., 123]) and good j (j ∈ [1, ..., 411]) if the following two conditions are met:

(i) \( \text{Tari}ff_{ij,t} - \text{Tari}ff_{ij,t-1} \geq 5 \) (the tariff reduction exceeds 5 percentage points). We choose this threshold because the average sample reduction is around this threshold (6 pp, see table VI-C) and this is a plausible magnitude that could be expected to engender an import response. This gives a sample of 24,560 tariff reductions exceeding 5pp in our database (13,907 after 2001).

(ii) The tariff reduction is not followed by a rise in tariffs that exceeds 1pp in the 3 following years (t+1, t+2, t+3). We assume that a rise that does not exceed 1pp is either due to noise or measurement error in the dataset or either that it is not significant.\(^\text{17}\)

(iii) Finally, we consider all events, even if one event is immediately followed by another. With this definition, we have 586 events (table 2) since the initiation of the Doha round negotiations in 2002 and up to 2008.\(^\text{18}\) To see if imports responded to a so-defined ‘tariff-event’, we then compared average imports of good j in country i 3 years before the event (t, t-1 and t-2), “M\(_{\text{before}}\)”, with the average import 3 years after the event (t+1, t+2, t+3), “M\(_{\text{after}}\)”, that is:

\[
\bar{M}_{\text{Before}} = \sum_{n=0}^{2} M_{ij,t-n} \quad ; \quad \bar{M}_{\text{After}} = \sum_{n=1}^{3} M_{ij,t+n}
\]

where \( M_{ij,t} \) are the imports of good j by country i at time t; for i, j and t which are concerned by an event. Caution in interpretation is called for, as a tariff reduction can take place any time during the year and that when tariff data was missing in t, t-1 and t-2 we replaced the missing data for t+1 or t+2. Also the results would be sensitive to the choice of averaging period before and after the tariff change which could also be spread over a longer period. Table 2 shows that half the countries (63) had at least one substantial tariff reduction in between

\(^{17}\) Tariff increases were due either to temporary increases following a macroeconomic crisis (e.g. Argentina) or to tariff harmonization following establishment of a customs union (e.g. Rwanda and EAC).

\(^{18}\) Figure VI-D in Annex VI shows the distribution of events on the larger sample in the ‘combined list’ where there are over 12,000 events. The average per year events is 1,421 with peaks in 2003, 2004 and 2005. The very similar results based on the combined list are reported in Annex V.
2002 and 2007 (i.e. a reduction of at least 5 percentage points). With this choice of ‘event’, we have an average of 9 events per country.

Two patterns emerge: (1) events were concentrated in the middle-income group even though, on average, protection was higher in the low-income group; (2) the upper-middle income group had the highest average absolute reduction per event (the same patterns hold for the ‘combined’ list – see table V-B Annex V). Considering that the average reduction was more than 17 percentage points for this upper-middle group, it is likely that the greatest efficiency gains from tariff reduction took place in the upper-middle income group.

Figure 5 ranks the top 20 countries in terms of events and their corresponding average tariff reduction per event. The left-hand part of figure 5 shows the average reduction in protection per event and the right-hand side the corresponding number of events. India had 36 events averaging a reduction of 10 percentage points per event. In the sample of top reducers, Iran and Mauritius have the largest average reduction per event and the two big countries, India and China had average reductions of respectively 10 and 8 percentage points per event. The same pattern holds for the ‘combined’ list (see figure V-C, Annex V).

<table>
<thead>
<tr>
<th>Income group (nbr of countries)</th>
<th>Nbr of countries concerned by at least one event</th>
<th>Nbr of events</th>
<th>Distribution of events</th>
<th>Average nbr of drops by country</th>
<th>Av. reduction (pp)</th>
<th>Standard deviation (pp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High income (20)</td>
<td>10</td>
<td>67</td>
<td>11%</td>
<td>7</td>
<td>6.56</td>
<td>1.69</td>
</tr>
<tr>
<td>Upper middle (31)</td>
<td>17</td>
<td>176</td>
<td>30%</td>
<td>10</td>
<td>17.34</td>
<td>22.19</td>
</tr>
<tr>
<td>Lower middle (38)</td>
<td>22</td>
<td>216</td>
<td>37%</td>
<td>10</td>
<td>9.64</td>
<td>6.36</td>
</tr>
<tr>
<td>Low income (34)</td>
<td>14</td>
<td>127</td>
<td>22%</td>
<td>9</td>
<td>8.20</td>
<td>4.64</td>
</tr>
<tr>
<td>Total (123)</td>
<td>63</td>
<td>586</td>
<td>100%</td>
<td>9</td>
<td>11.23</td>
<td>13.56</td>
</tr>
</tbody>
</table>
Table 3 concludes with an estimate of the import response for these events (Table 3a) and for a control group (Table 3b). Table 3a indicates that prior to these events; the average import value over all the HS lines that had an event was close to $23 million and close to double ($40 million) for the three year average after the event. Column E shows that for about 65% of the events, the average imports were higher after the event than before the tariff reduction and on average, imports were between 50% and 100% higher after the reduction in tariffs (column F). Since under normal circumstances, imports would be growing in real terms, table 3b reports the same estimates for the control group (i.e. the HS-6 tariff lines that did not have an event during the period when there was an event for the tariff lines-years in table 4a).
Table 3 – Import responses (tariff events and control group)

Table 3a – % of events followed by a rise in imports, core list (distribution by income groups)

<table>
<thead>
<tr>
<th>Country group</th>
<th>Nbr of events(n on issuing)</th>
<th>Av. reduction (pp)</th>
<th>$M_{before}$ (1000 USD)</th>
<th>$M_{after}$ (1000 USD)</th>
<th>% of $M_{after} &gt; M_{before}$</th>
<th>$M_{after}/M_{before}$ *100</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sample</td>
<td>521 (a)</td>
<td>11.1</td>
<td>23,287</td>
<td>40,210</td>
<td>67%</td>
<td>173</td>
</tr>
<tr>
<td>High inc.</td>
<td>65</td>
<td>6.6</td>
<td>8,549</td>
<td>15,690</td>
<td>71%</td>
<td>184**</td>
</tr>
<tr>
<td>Upper middle inc.</td>
<td>148</td>
<td>17.3</td>
<td>5,649</td>
<td>7,829</td>
<td>68%</td>
<td>139</td>
</tr>
<tr>
<td>Lower middle inc.</td>
<td>187</td>
<td>9.7</td>
<td>54,489</td>
<td>95,135</td>
<td>70%</td>
<td>175</td>
</tr>
<tr>
<td>Low inc.</td>
<td>121</td>
<td>8.3</td>
<td>431</td>
<td>919</td>
<td>60%</td>
<td>213**</td>
</tr>
</tbody>
</table>

Table 3b: Import Growth for the “Control Group”, Core list only (i.e. For the HS-6 goods that did not have a tariff reduction event)

<table>
<thead>
<tr>
<th>Av. Tariff change (pp)</th>
<th>$M_{before}$ (1000 USD)</th>
<th>$M_{after}$ (1000 USD)</th>
<th>% of $M_{after} &gt; M_{before}$</th>
<th>$M_{after}/M_{before}$ *100</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sample</td>
<td>0.03</td>
<td>34,555</td>
<td>53,464</td>
<td>62%</td>
</tr>
<tr>
<td>High inc.</td>
<td>-0.02</td>
<td>133,686</td>
<td>211,423</td>
<td>68%</td>
</tr>
<tr>
<td>Upper middle inc.</td>
<td>-0.05</td>
<td>7,673</td>
<td>10,738</td>
<td>62%</td>
</tr>
<tr>
<td>Lower middle inc.</td>
<td>0.01</td>
<td>34,566</td>
<td>52,415</td>
<td>61%</td>
</tr>
<tr>
<td>Low inc.</td>
<td>0.16</td>
<td>565</td>
<td>1,279</td>
<td>62%</td>
</tr>
</tbody>
</table>

Notes: $M_{after}$ and $M_{before}$ defined as in eq. (0.1) either for goods concerned by the event (table 3a) or for goods in control group (table 3b). $M_{after}$ is significantly different from $M_{before}$ at 1% (**), 5% (**), 10*** confidence levels. Similar results with mirror data but significance levels for differences in means higher for the combined list. See table V-D.

Source: Authors’ calculation from TRAINS and COMTRADE data, see Annex IV for a complete database description.

Three results stand out: (1) the volume of imports affected by a tariff event was less than half in volume; (2) as expected, the percentage of tariff lines that experienced growth in the volume of imports was less in the control group where average tariff reduction was negligible (the slight increase in tariffs for lower-middle and low-income groups is due to filling for missing tariff data); (3) import growth was less in the control group except for the low-income group. In sum, the event-analysis does not suggest a noticeable import response to tariff reductions.
5 Conclusions

There are no provisions in the WTO legal system related specifically to environmental goods and services (EGS), except for the application of the MFN clause and a general interdiction of quantitative restrictions. As a result, there is no agreed-upon definition of what an ‘environmental good’ or an ‘environmental service’ is. As reviewed here, identifying EGS is a daunting task facing many hurdles: (i) Multiple-end use (calling, among others, for a finer disaggregation of the HS); (ii) relativism (what is an ‘environmentally friendly’ product?); (iii) attribute disclosure (identifying EGS according to PPMs); (iv) ‘like’ products at the WTO (e.g. wood products derived from sustainable forests). Adding these difficulties to conflicting interests and differing perceptions, has led to few submissions with little overlap across lists in the ‘universe’ of EGS represented by a ‘combined list’ of 411 products.

The paper then concentrates on tariff levels and import-response to tariff reductions for a ‘core list’ of 26 products. Estimates by income group show that protection was (and remains) the highest for low-income countries and that protection for EGS is lower than average protection across country groupings. The gap in tariff rates between country groups and between EGS in the core list and other goods has remained fairly constant suggesting a lack of action with respect to the mandate in article 31.

The number of tariff lines with zero protection rates is lowest (15%) for the low-income group specialized in ‘end-of-pipe’ products using imported clean technologies. These are the countries that would gain the most in efficiency from a reduction in protection. Should the negotiations end up in a standstill compromise, the higher-middle and the low-income groups would lose most leeway in tariff setting.

Import response to tariff reductions of at least 5 percentage points shows that average imports over the next three years were between 50% and 100% higher than in the preceding three-year average. However, this increase in imports was not higher than in the control group of EGS that did not experience substantial tariff reductions.

Average protection for EGS is lower than for other products but, since the initiation of the Doha negotiations, tariff reductions for EGS were not greater than for other products. Neither did the gap in protection across income groups close during the period. Finally, the data fail to show an import response for EGS that experienced substantial tariff reductions.

Assembling this evidence, one cannot escape the conclusion of the lack of a ‘mandate effect’ since the initiation of the negotiations on the objective of reducing barriers to trade in Environmental Goods and Services. It is also apparent that the mild steps at reducing protection fall short of helping ‘the protection of the environment’.
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