

Diffusion of Climate Friendly  
Technologies: The potential for  
Trade Policies in the transition  
towards a Green Economy

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at Singapore, 19<sup>th</sup> February 2009

# Structure of the presentation

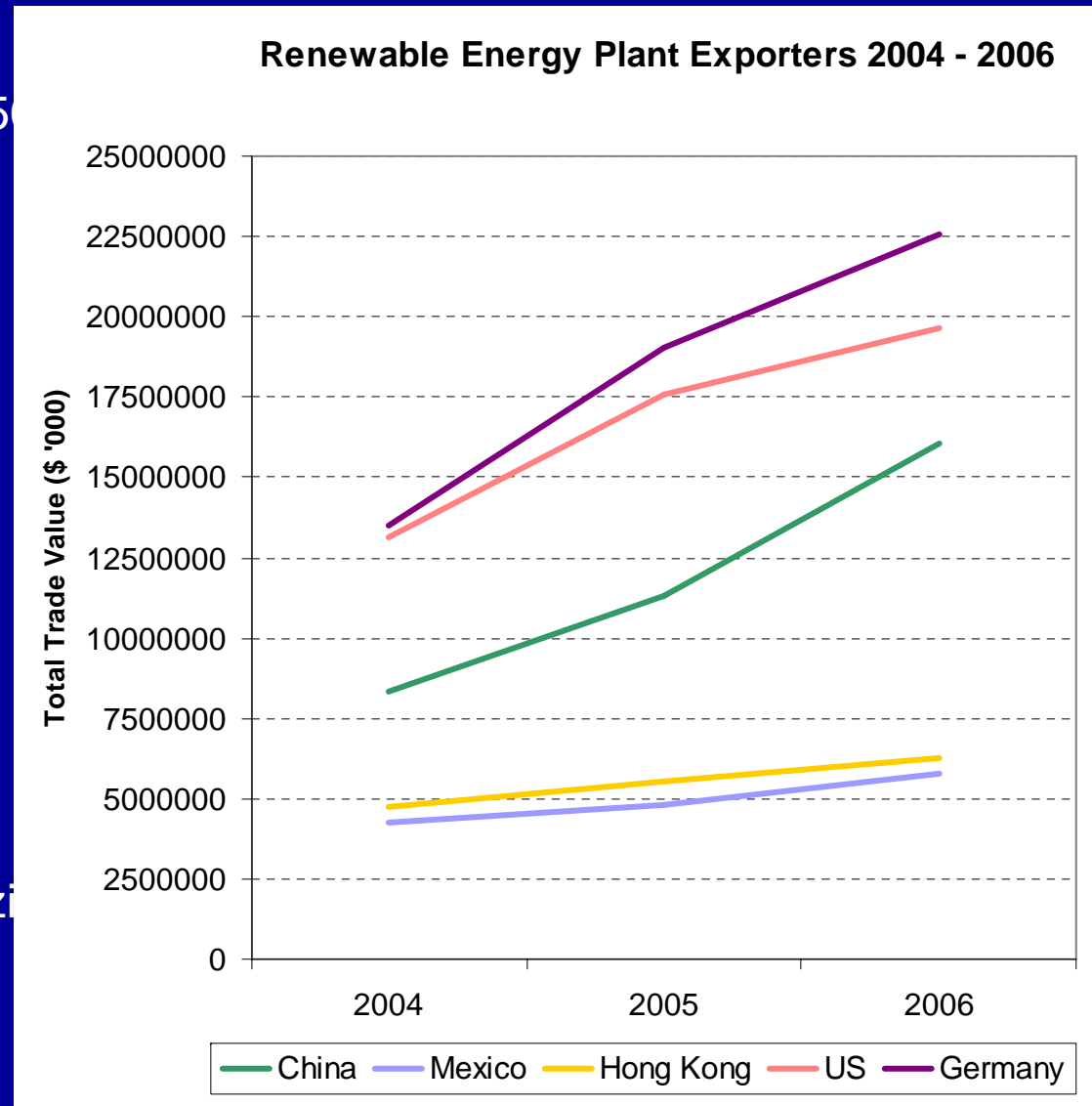
- **How is the Green Economy initiative linked to production and trade of environmental goods in the energy supply sector?**
- **Linking trade flows with Environmental problems related to Climate Change and its associated technologies**
- **Trends in trade of EGS related to Climate Change**
- **Factors behind imports of these products by developing countries**
- **Policy implications**

## Potential benefits from EGS liberalisation

- Both IPCC and Stern Review have highlighted the potential gains from trade-liberalisation in clean technologies.
- EGS liberalisation =>expansion of markets for climate friendly technologies and services=>incentive for innovation.
- Diffusion of and access to EGS =>Puts economy on low-carbon trajectory.
- Asia Pacific a producer and user of these technologies-
- Asia Pacific also most vulnerable to the effects of climate change-

# Environmental Goods and Services, a Growing Market with New Players

- Global EGS industry: USD 65 billion.
- Trade in EGS estimated at roughly a tenth of that amount
- Few developing countries are participating but
- A handful of emerging economies are becoming important players
- China, India (wind energy, fluorescent lamps) Mexico, Hong Kong, Korea, Malaysia, Colombia, South Africa or Brazil (Bio-fuel)



# Where are the Environmental Hotspots

- **Asia – Pacific has increased its energy use by 190 % over the period 1987-2002 compared to a global average of 130%.**
- **According to UNFCC-CDIAC sources (2005), this region has increased its share of global CO<sub>2</sub> emissions from 32% in 1992 to 36% in 2002.**
- **North East Asia contributes to 63% of the region's emissions.**
- **On the other hand, Central Asia has recorded a 24% decrease.**

# Where are the Environmental Hotspots

- **Asia Pacific also most vulnerable to climate change.**
- **The small island States of the South Pacific are extremely vulnerable to sea-level rise and global climate change. Countries such as Thailand, India, Myanmar and China are exposed to coastal flooding and erosion due to sea-level rise and meteorological changes.**

## Are the major emitters or the major vulnerable countries trading in relevant EGS?

- The top ten importers from developing countries of renewable energy products include China, Hong Kong, Korea, Malaysia, India, over the last three years for which data is available.
- Among the top ten developing and developed country importers, China and Korea figure prominently.

# ICTSD Mapping Study on 'Energy Supply' Sector

- **Identify key climate relevant technologies** (based on their relevance to GHG mitigation) **and associated goods** using IPCC Working Group III report on Mitigation as the starting point.
- This would avoid selection of goods on a mercantilist basis as often happens in the WTO.
- **Assign specific goods under each technology category different HS codes** (used to classify goods in international trade).
- **Survey trade flows and trade barriers** in these goods on the basis of these HS codes.
- Study is the first of a series of 4 sector mapping studies. Others are- Buildings, Transport and Industry.



Preliminary Results Identified 84 Products.

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## Higher Tariffs on EGs Are Often Higher than Average Industrial Tariffs in DC: The Case of Photovoltaic Technology and Energy Efficient Lighting

Average Applied Tariffs and NTBs on Fluorescent Lamps in 18 High-GHG-Emitting Developing Countries

Country	Average Tariffs on Fluorescent Lamps	Average Industrial Tariffs	NTBs on Fluorescent Lamps
Zambia	30	12	83
Malaysia	30	9	85
Colombia	20	12	
Nigeria	20	27	91
Thailand	20	16	
Venezuela	20	12	
Bangladesh	19	18	
Argentina	18	12	
Brazil	18	14	96
Egypt	18	13	87
South Africa	17	8	
India	15	29	102
Mexico	15	17	
Philippines	11	16	93
China	8	10	
Chile	6	6	
Indonesia	5	7	
Kazakhstan	0	3	
High-income OECD countries	4	4	

Source: WITS database.

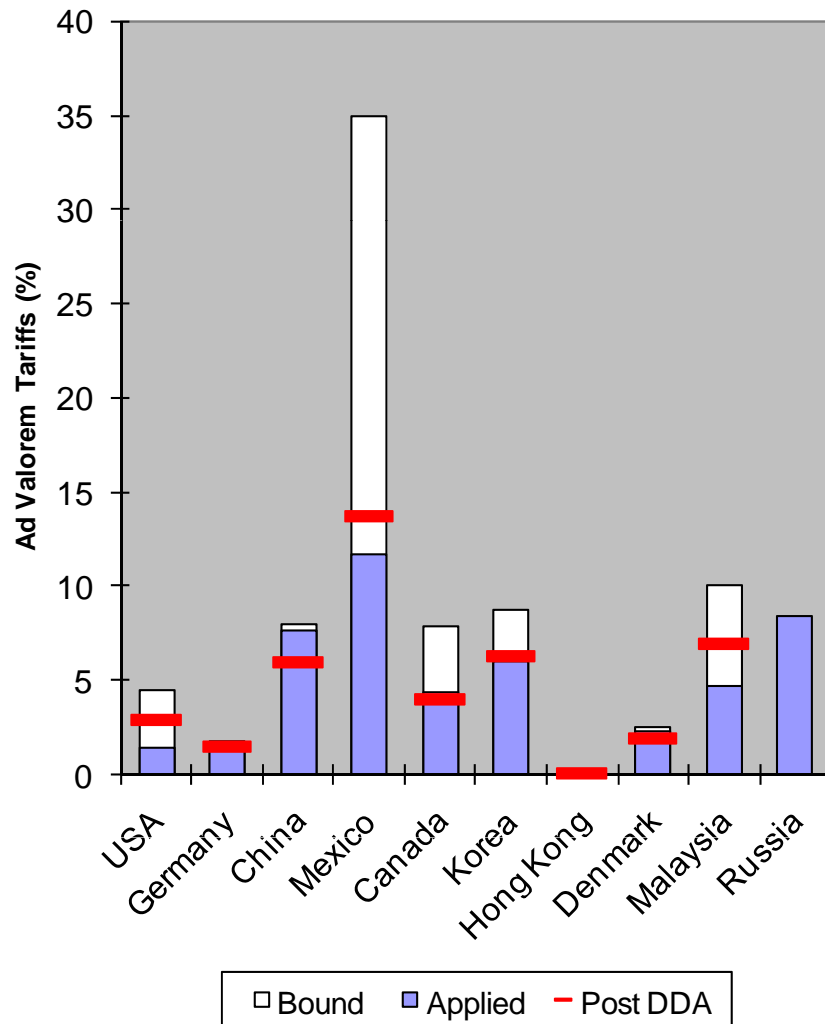
Applied Tariffs and NTBs for Solar Photovoltaic Technology in 18 High-GHG-Emitting Developing Countries (%)

Countries	Average Tariffs on PV	Average Industrial Tariffs	NTBs on PV
Egypt	32	13	
Bangladesh	25	18	
Zambia	30	12	
Nigeria	20	27	70
Argentina	18	12	57
Brazil	18	14	53
Malaysia	18	9	
Colombia	15	12	
Indonesia	15	7	
India	15	29	
Philippines	15	6	70
Venezuela	15	12	
Mexico	13	17	62
South Africa	12	8	
China	10	10	
Thailand	10	16	
Chile	6	6	
Kazakhstan	0	3	
High-income OECD countries	3	4	

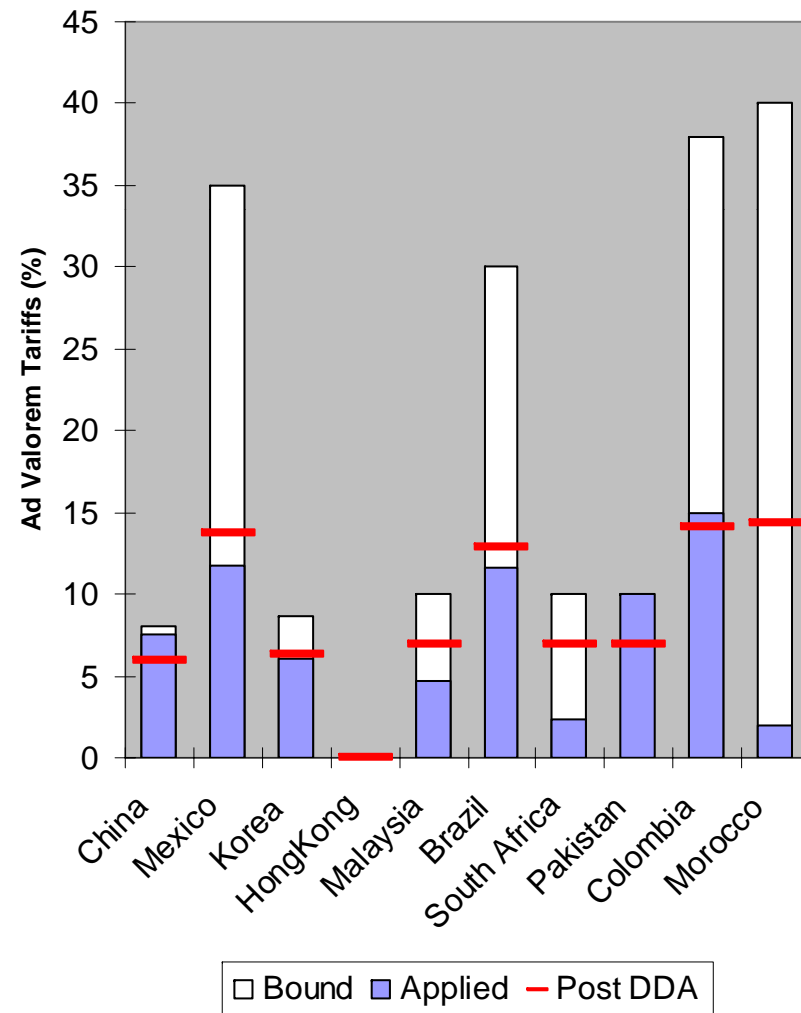
Source: WITS database.

# Fairly low tariff protection unlikely to be significantly affected by Doha Round Negotiations (if not singled out for special treatment)

**Bound and Applied Tariffs on EGs as Defined in WTO 153 List in Top 10 Importers**



**Bound and Applied Tariffs on EGs as Defined in WTO 153 List in Top 10 Importing Developing Countries**



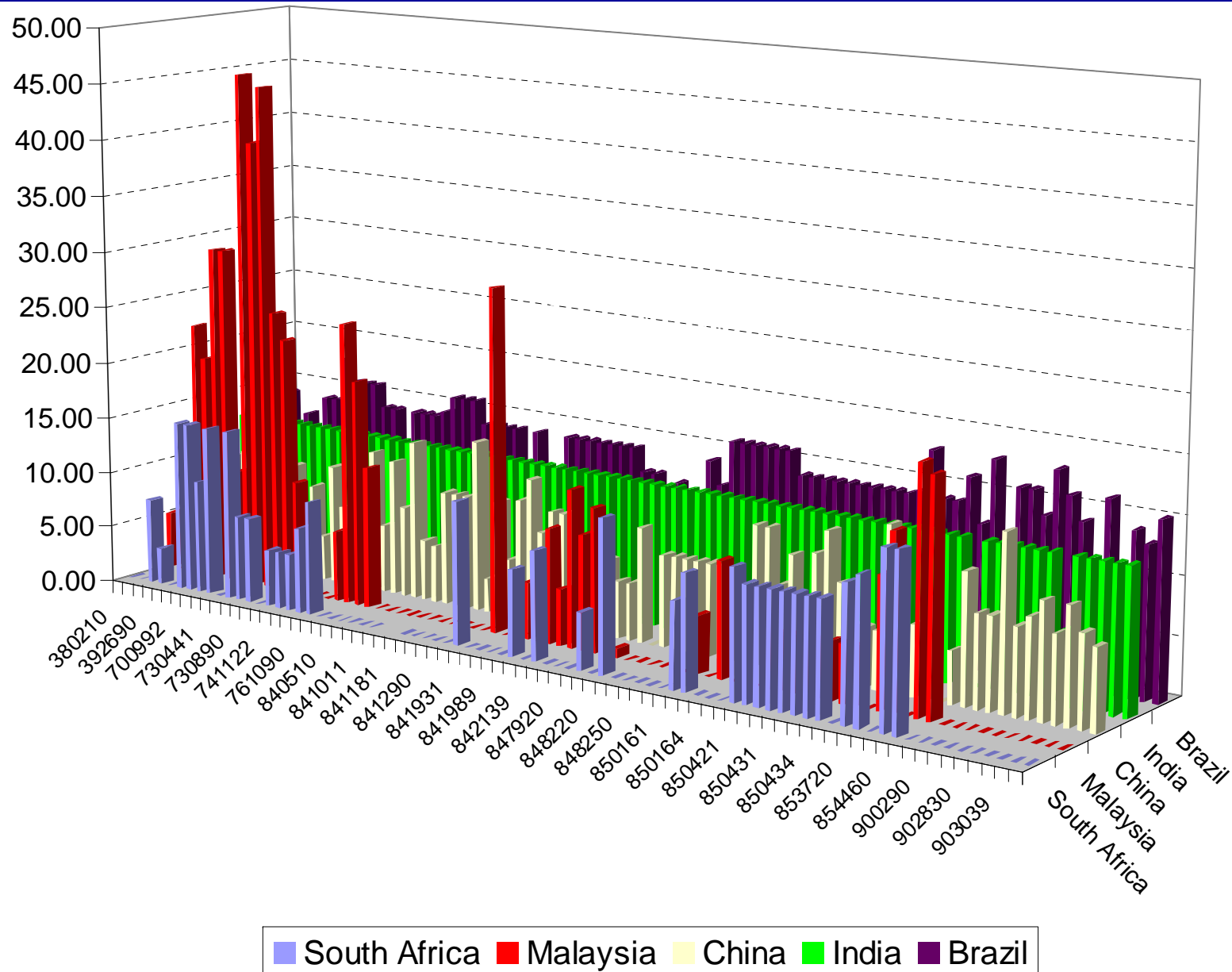
# Exports of solar energy products in billions of US dollars

<b>EU</b>	<b>60.4</b>	<b>China</b>	<b>45.3</b>
<b>US</b>	<b>47.2</b>	<b>Korea, Rep of</b>	<b>23.3</b>
<b>China</b>	<b>45.3</b>	<b>Taiwan, China</b>	<b>13.3</b>
<b>Japan</b>	<b>32.3</b>	<b>Hong Kong</b>	<b>10.6</b>
<b>Ger</b>	<b>29.5</b>	<b>Mexico</b>	<b>2.8</b>
<b>Korea, Rep of</b>	<b>23.3</b>	<b>Thai</b>	<b>2.4</b>
<b>Taiwan, China</b>	<b>13.3</b>	<b>Malay</b>	<b>1.2</b>
<b>Italy</b>	<b>11.8</b>	<b>Brazil</b>	<b>1.1</b>
<b>Hong Kong</b>	<b>10.6</b>	<b>Philippines</b>	<b>0.8</b>
<b>Netherlands</b>	<b>9.1</b>	<b>Turkey</b>	<b>0.5</b>

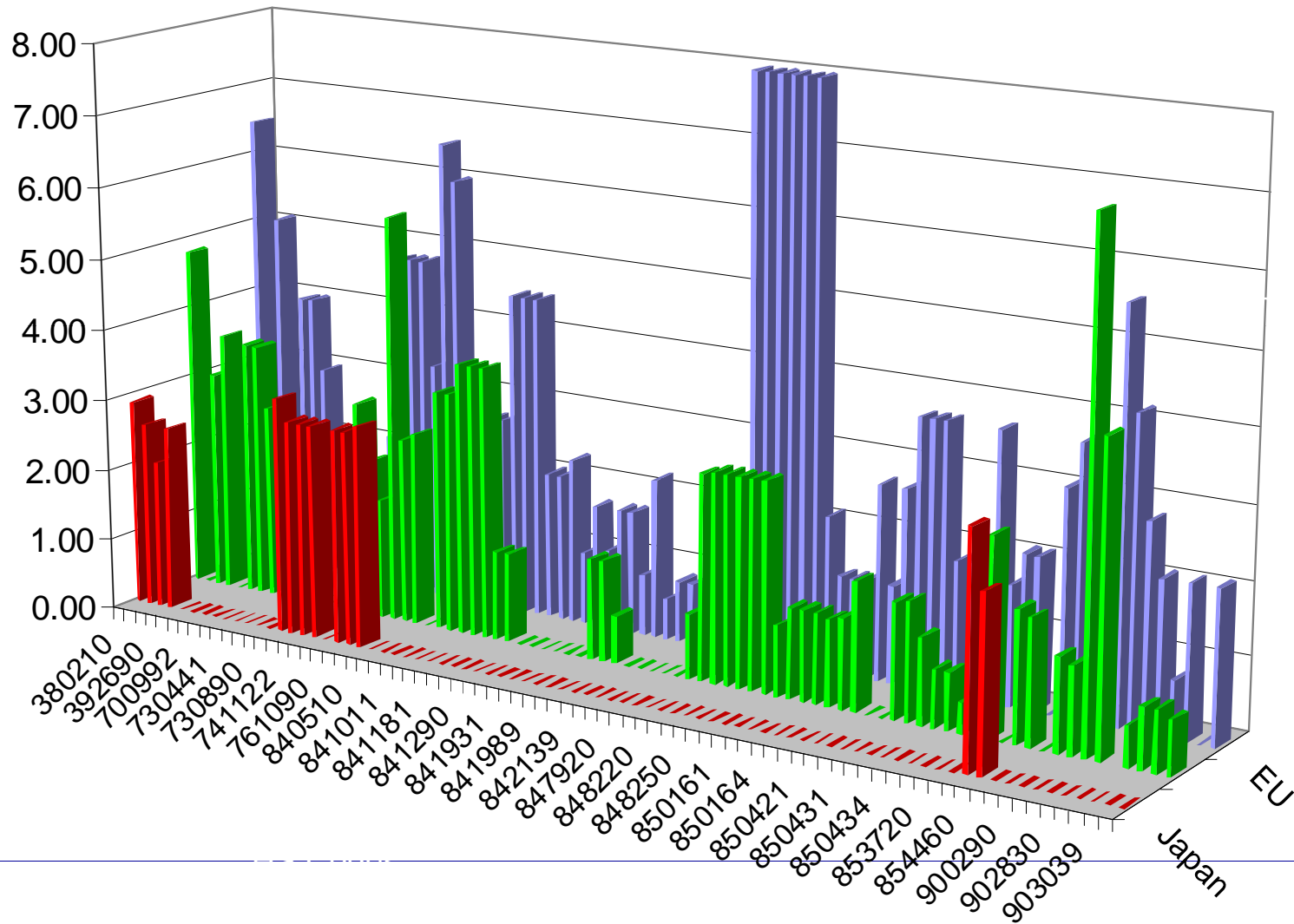
# Top ten importers of solar energy

China	67.2	China	67.2
European Union	41.3	Hong Kong, China	11.8
Japan	30.3	Mexico	10.75
United States	28.5	Korea, Rep of	8.42
Germany	27.3	Taiwan, China	6.4
Hong Kong, China	11.8	Thailand	3.5
Mexico	10.75	Singapore	3.1
Italy	10.3	Malaysia	2.1
Netherlands	9.1	Brazil	2.1
Korea, Rep of	8.42	Slovak Republic	1.1

# Applied Tariffs in Large Developing Country Importers of Energy Supply Goods



# Applied Tariffs in Large Developed Country Importers of Energy Supply Goods



■ Japan 
 ■ USA 
 ■ EU

# Exports of wind energy products in billions of US dollars

<b>EU</b>	<b>25.689</b>	<b>China</b>	<b>8.774</b>
<b>Germany</b>	<b>16.432</b>	<b>Mexico</b>	<b>3.881</b>
<b>US</b>	<b>12.501</b>	<b>Korea Rep.</b>	<b>2.793</b>
<b>Japan</b>	<b>10.703</b>	<b>Singapore</b>	<b>2.788</b>
<b>China</b>	<b>8.774</b>	<b>Hong Kong</b>	<b>2.648</b>
<b>Italy</b>	<b>7.31</b>	<b>Hong Kong</b>	<b>2.648</b>
<b>France</b>	<b>7.199</b>	<b>Malaysia</b>	<b>2.208</b>
<b>Mexico</b>	<b>5.719</b>	<b>Brazil</b>	<b>1.031</b>
<b>UK</b>	<b>3.673</b>	<b>India</b>	<b>0.901</b>
<b>Austria</b>	<b>2.883</b>	<b>Slovak Rep.</b>	<b>0.88</b>

# Exports of ocean energy products in billions of dollars

<b>EU</b>	<b>7</b>	<b>China</b>	<b>4.1</b>
<b>US</b>	<b>4.3</b>	<b>Hong Kong</b>	<b>2</b>
<b>Germany</b>	<b>4.3</b>	<b>Mexico</b>	<b>1.9</b>
<b>China</b>	<b>4.1</b>	<b>Korea, rep of</b>	<b>1.7</b>
<b>Italy</b>	<b>2.7</b>	<b>Thailand</b>	<b>0.7</b>
<b>France</b>	<b>2.1</b>	<b>Turkey</b>	<b>0.5</b>
<b>Hong Kong</b>	<b>2</b>	<b>Singapore</b>	<b>0.5</b>
<b>Mexico</b>	<b>1.9</b>	<b>Brazil</b>	<b>0.4</b>
<b>Korea, Rep of</b>	<b>1.7</b>	<b>Croatia</b>	<b>0.3</b>
<b>Poland</b>	<b>1.7</b>	<b>India</b>	<b>0.3</b>

# Top ten exporters of wind powered turbines

European Union	1,902,068.667
Denmark	1,718,601.575
Germany	969,479.000
Japan	354,009.471
India	335,817.506
Spain	197,977.299
China	78,019.421
Italy	44,382.913
Australia	36,859.894
Netherlands	15,758.659

# Exporters of geo thermal products in billions of US dollars

<b>EU</b>	<b>3.9</b>	<b>China</b>	<b>1.7</b>
<b>Germany</b>	<b>2.2</b>	<b>Korea, Rep of</b>	<b>0.8</b>
<b>France</b>	<b>2</b>	<b>Hong Kong, China</b>	<b>0.4</b>
<b>Italy</b>	<b>1.8</b>	<b>Mexico</b>	<b>0.3</b>
<b>China</b>	<b>1.7</b>	<b>Slovak Republic</b>	<b>0.2</b>
<b>Japan</b>	<b>1.4</b>	<b>India</b>	<b>0.1</b>
<b>Sweden</b>	<b>1.1</b>	<b>Singapore</b>	<b>0.1</b>
<b>United States</b>	<b>1</b>	<b>Malaysia</b>	<b>0.09</b>
<b>Korea, Rep of</b>	<b>0.8</b>	<b>Jordan</b>	<b>0.06</b>
<b>Ireland</b>	<b>0.4</b>	<b>Thailand</b>	<b>0.06</b>

# Exporters of Hydro power in billions of US dollars

<b>EU</b>	<b>3.9</b>	<b>China</b>	<b>2.3</b>
<b>China</b>	<b>2.3</b>	<b>Mexico</b>	<b>1.2</b>
<b>Germany</b>	<b>2.1</b>	<b>Hong Kong, China</b>	<b>1.2</b>
<b>US</b>	<b>1.3</b>	<b>Korea, Rep of</b>	<b>0.7</b>
<b>Italy</b>	<b>1.2</b>	<b>Brazil</b>	<b>0.3</b>
<b>Mexico</b>	<b>1.2</b>	<b>India</b>	<b>0.3</b>
<b>Hong Kong, China</b>	<b>1.2</b>	<b>Croatia</b>	<b>0.3</b>
<b>France</b>	<b>0.9</b>	<b>Turkey</b>	<b>0.2</b>
<b>Austria</b>	<b>0.9</b>	<b>Singapore</b>	<b>0.2</b>
<b>Japan</b>	<b>0.7</b>	<b>Belarus</b>	<b>0.1</b>

# Exporters of biomass products in billions of US dollars

<b>EU</b>	<b>25</b>	<b>Korea Rep.</b>	<b>5.209</b>
<b>US</b>	<b>20.8</b>	<b>South Africa</b>	<b>3.257</b>
<b>Japan</b>	<b>19.847</b>	<b>China</b>	<b>2.827</b>
<b>Germany</b>	<b>15.291</b>	<b>Mexico</b>	<b>2.476</b>
<b>Italy</b>	<b>7.149</b>	<b>Taiwan</b>	<b>1.61</b>
<b>Netherlands</b>	<b>6.892</b>	<b>Singapore</b>	<b>1.258</b>
<b>South Africa</b>	<b>6.284</b>	<b>Hong Kong</b>	<b>1.177</b>
<b>Korea, Rep.</b>	<b>5.209</b>	<b>Brazil</b>	<b>0.645</b>
<b>UK</b>	<b>3.849</b>	<b>Malaysia</b>	<b>0.588</b>
<b>France</b>	<b>3.49</b>	<b>India</b>	<b>0.537</b>

# Exporters of bio-ethanol in billions of US dollars

<b>EU</b>	<b>2.7</b>	<b>Korea, Rep of</b>	<b>0.7</b>
<b>GERMANY</b>	<b>1.7</b>	<b>China</b>	<b>0.4</b>
<b>ITALY</b>	<b>0.8</b>	<b>Taiwan, China</b>	<b>0.3</b>
<b>JAPAN</b>	<b>0.8</b>	<b>India</b>	<b>0.2</b>
<b>USA</b>	<b>0.7</b>	<b>Malaysia</b>	<b>0.1</b>
<b>KOREA.REP</b>	<b>0.7</b>	<b>Philippines</b>	<b>0.04</b>
<b>China</b>	<b>0.4</b>	<b>Singapore</b>	<b>0.04</b>
<b>BELGIUM</b>	<b>0.3</b>	<b>Argentina</b>	<b>0.02</b>
<b>NETHERLANDS</b>	<b>0.3</b>	<b>Brazil</b>	<b>0.01</b>
<b>SWITZERLAND</b>	<b>0.3</b>	<b>Thailand</b>	<b>0.007</b>

# Comparison of energy generating costs in the late 1990s

Types of power plants	Generating costs	External costs
Coal or lignite	3.2-5.0	1.8-15
Fuel oil	4.9-5.2	2.9-10.9
Natural gas	2.6-3.5	0.5-3.5
Nuclear Energy	3.4-5.9	0.2-0,7
Biomass	3.4-4.3	0.2-5.2
Solar Photovoltaic	51-85	0.1-0-3
Wind turbine	7.2-	0.05-0.26

# Results of the regression

- Tariffs not significant in 30% of the products.
- Trade in renewable energy products are also sensitive to reduction in tariffs at the 5% level.

# Results of the regression

- Elasticity with respect to tariffs is low, showing that a one percent reduction in tariff leads to 0.15% increase in trade.
- GDP a far more important determinant of trade.

# Results of the regression

- **The higher the EPI ranking of the developing country the higher is the trade in climate friendly products. (about 26 of the 43 products identified by World Bank)**
- **High EPI ranking implies a better framework of implementation of environmental regulations, as well as better chances of attainment of environmental targets.**
- **This high correlation could therefore be interpreted to imply that probably trade in goods in these categories is being put to some environmental end use.**

# Results of the regression

- **The most direct, significant and positive correlation is to be found with respect to technical assistance projects.**
- **Elasticities in most cases is also significantly over 1, indicating the crucial role of technical assistance projects in explaining trade in EGS.**

# Policy Implications and proposals

- **While the Doha Mandate puts environment at the centre of the EGS negotiations, it is difficult to see how products classified in the HS code can be directly related to Climate Change.**
- **However, EGS liberalisation if clearly linked to technology transfer would result in gains.**
- **Also important to look at non-tariff barriers such as IPRs and export restrictions on products.**

# Policy Implications and proposals

- **Examining the list of EGs, the findings of this paper show that roughly 30% products would be sensitive to tariffs.**
- **The list can be further examined in light of the dynamic comparative advantage of developing countries.**
- **In this case, the dynamic comparative advantage of climate friendly technologies and products would not shift in favour of developing countries in the near future.**  
**(2015)**

# Policy Implications and proposals

- **However, other factors such as FDI, GDP, Environmental performance and technical assistance projects are much more important determinants of trade flows than tariffs.**
- **The elasticity with respect to TA of trade in EGs is particularly high.**
- **This shows that international and bilateral donors would have a large role to play in directing the trade of EGs, rather than tariff negotiations.**
- **This also points to the role of donors in developing such TA projects.**

***Thank you very much***

***Please send comments to  
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