



# VALUE OF THE ENVIRONMENTAL GOODS AGREEMENT

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HELPING CHINA MEET ITS ENVIRONMENTAL GOALS

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## SUMMARY

As 17 members of the World Trade Organization (WTO) advance negotiations on the Environmental Goods Agreement (EGA), it is important to understand the potential impacts that tariff elimination can have on the participants' economies and the environment.

The EGA aims to eliminate tariffs on a diverse set of green technologies – from air pollution controls, to clean and renewable energy, to energy efficiency technology, to water treatment technologies, to high-end recycling technologies.

This study focuses on the largest producer and consumer of environmental technologies participating in the EGA negotiations - China. China is an increasingly important player in international energy and environment-related negotiations. This rising profile is in line with China's growing economy and the environmental challenges that the Chinese government is taking steps to address.

This paper demonstrates that full implementation of EGA commitments would have a clear positive benefit for the Chinese economy. The result is based on Trade Partnership Worldwide (TPW)<sup>1</sup> analysis and modeling of the impact of EGA tariff elimination on China.<sup>2</sup>

The analysis finds that China's full participation in an agreement that eliminates tariffs on the environmental goods studied would have a significant net positive impact on the Chinese economy, with important environmental, health and social benefits. Both GDP and net national income would increase by billions of dollars. Such an ambitious agreement would also boost China's exports of these goods by

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<sup>2</sup> TPW examined China's 2014 two-way trade, using an economic model to assess the impacts on Chinese producers and consumers of the elimination of Chinese and foreign tariffs on environmental goods. The scope of the environmental goods examined is detailed in Appendix A. While the ultimate product coverage of the EGA is not yet agreed among the participants, TPW used publically available information, including product proposals made by WTO member governments in earlier negotiations and related papers published by the OECD, World Bank, and others.

nearly \$27 billion, or 9.8 percent, over what they would be in the absence of tariff elimination on these goods. The majority of these additional exports (just over 69 percent) would likely go to three major markets: the European Union, the United States, and Korea. And spending within China on goods designed to mitigate environmental damage would significantly increase as a result of a decline in the costs of those goods in China.

While the emphasis of this study is on direct economic effects of tariff elimination, the primary benefits for China are likely to come from environmental effects. It is well known that investment in a cleaner environment carries economic benefits related to improved human health as well as to the environment that far outweigh immediate costs.

Based on the analysis, TPW estimates the elimination of import tariffs on environmental goods would result in an effective change in real spending in China of roughly \$22 billion annually on environmental goods as a result of the lower prices of and greater access to a range of those goods. Based on the literature assessing cost-benefit ratios for investment in improved environmental conditions, such an increase suggests China could gain approximately \$659 billion annually in economic benefits linked to improved environmental quality as a result of the costs savings (when reinvested in environmental quality) achieved from an environmental goods agreement.

Section III below summarizes China's current trade in environmental goods and the average tariffs affecting it. Section IV reports the assessment of the economic impact of tariff elimination on these goods on China's economy. Section V provides an overview of how these economic impacts would help or hinder China's effort to meet its environmental goals and describes how the benefits would outweigh the costs by billions of dollars. An Appendix details the methodology for the economic impact assessment.

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## KEY TAKEAWAYS

- ⇒ **Increases China's GDP and national income by billions of dollars;**
- ⇒ **Increases exports by nearly \$27 billion, up by 9.8 percent;**
- ⇒ **Increases real spending of roughly \$22 billion annually on environmental goods; and**
- ⇒ **Results in gains of approximately \$659 billion annually in economic benefits linked to improved environmental quality.**

# INTRODUCTION

Negotiations to conclude an Environmental Goods Agreement were launched in July 2014 to facilitate trade in environmental products. The EGA is a WTO plurilateral initiative that will be applied on a most favored nation (MFN) basis, once critical mass is achieved. This negotiation builds on the APEC environmental goods agreement, where the economies agreed to reduce applied tariffs to 5 percent or less by the end of the 2015.

The participants agreed that eliminating tariffs on these goods would reduce costs and make a significant contribution to efforts to reduce air pollution, transition to clean and renewable energy, improve energy efficiency, increase recycling, and improve waste water management and mitigate effects of climate change. While increased trade is one benefit of the EGA, it has the co-benefit of helping economies tackle their most challenging environmental issues. Diffusion and uptake of environmental goods are accelerated by trade. As noted in a recent International Trade Center report, “[t]rade can ease the access to affordable and appropriate environmental goods and services to enable a faster and less costly adjustment to a green economy; while at the same creating new business and job opportunities.”<sup>3</sup>

The products being negotiated fall into 10 sectors which describe the environmental use. The 10 sectors are: Air pollution control (APC); Cleaner and renewable energy (CRE); Energy efficiency (EE); Environmental monitoring analysis and assessment (EMAA); Environmental remediation and clean-up (ERC); Environmentally preferable products (EPP); Noise and vibration abatement (NVA); Resource efficiency (RE); Solid and hazardous waste management (SHWM); and Waste water management and water treatment (WMWT).

The negotiations are focused on goods in each of these categories that:

- have an environmental use;
- contribute to addressing environmental challenges in the 10 areas, and
- are complementary to the APEC list.

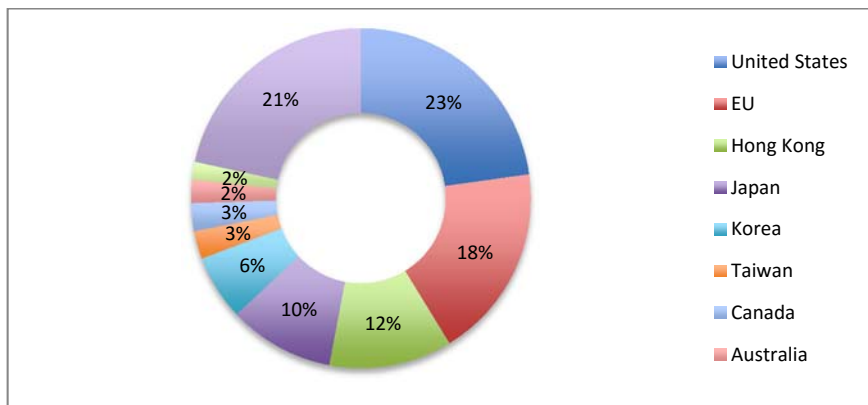
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<sup>3</sup> International Trade Centre (ITC), *Trade in Environmental Goods and Services: Opportunities and Challenges*, 2014, p. 3

# CURRENT TRADE PATTERNS

In 2014, China had a sizable trade surplus – over \$50 billion – in environmental goods and exported more than \$271 billion in environmental goods. The leading markets are concentrated (Chart 1), with 63 percent of China’s exports in that year going to four important markets: the United States (22.8 percent), the European Union (18.5 percent), Hong Kong (11.7 percent), and Japan (10.1 percent).

**Chart 1**  
**China’s Exports of EGA Goods to Leading Destinations, 2014**



Source: Derived from WITS

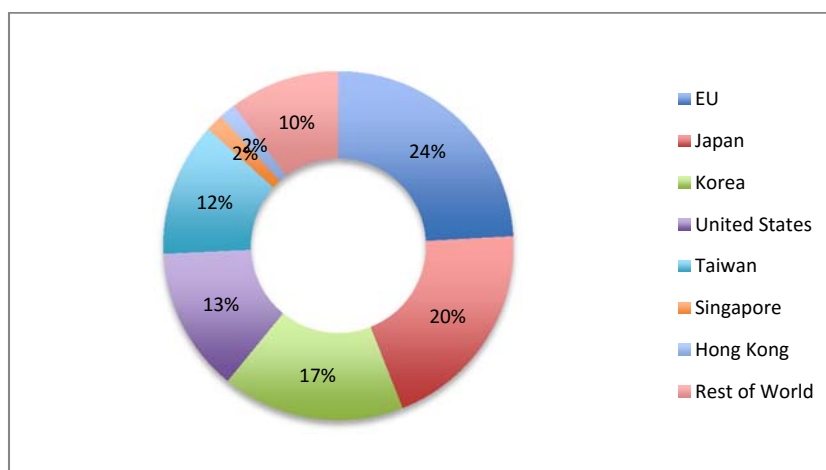
Those exports frequently face tariffs, ranging from 1.34 percent in Canada (trade weighted tariff rate on EGA goods imported from China) to 4.87 percent in Korea. Tariffs assessed on Chinese EGA exports to the United States averaged 1.62 percent; to the EU, 2.29 percent; to Japan, 0.09 percent, and to Hong Kong, zero. It should be noted that these trade-weighted tariffs hide the fact that some individual products face relatively high specific tariffs. For example, Australia assesses tariffs of 10 percent on imported parts for water treatment systems; Israel assesses tariffs of 12 percent on imported geothermal heat pumps; Taiwan assesses tariffs of 10 percent on imported wind towers. China’s tariffs on imported biogas water heaters are 35 percent.

China imported a total of just over \$220 billion in environmental goods in 2014. China’s imports EGA goods are even more concentrated than exports among a small number of economies. The EU, Japan, Korea, Taiwan and the United States, together, represent 87 percent of China’s total EGA imports (Chart 2).

China assesses a range of average tariffs on those imports. Trade-weighted average tariffs range from none at all (New Zealand and Singapore, for example) to more than 5 percent on imports from Norway, Korea and Taiwan. The trade-weighted average

tariff assessed on EGA goods imports from the EU in 2014 was 4.53 percent, and 3.59 percent on imports from the United States.

**Chart 2**  
**China's Imports of EGA Goods, 2014**



Source: Derived from WITS

China's trade in EGA goods is relatively concentrated in two of nine categories. More than half of China's EGA exports (59.2 percent) and imports (53.7 percent) is used by purchasers engaged in developing cleaner and renewable energy, and energy and resource efficiency (Table 1). So tariffs (both assessed by China and assessed by China's trading partners) have a particularly adverse impact on China's exports and imports of these goods.

**Table 1**  
**China's Exports and Imports of EGA Goods by Environmental Protection Category, 2014**  
(Billions of U.S. Dollars)

	Exports	Imports
Air Pollution Control	\$19.6	\$14.2
Cleaner and Renewable Energy	76.3	83.1
Energy Efficiency and Resource Efficiency	84.3	35.2
Environmental Monitoring, Analysis, and Assessment	8.3	17.0
Environmentally Preferable Products	18.3	4.6
Environmental Remediation and Cleanup	6.0	3.5
Noise and Vibration Abatement	2.9	3.9
Solid and Hazardous Waste Management	21.8	39.8
Wastewater Management and Water Treatment	33.9	19.2
TOTAL	271.4	220.5

Source: Derived from WITS

## ECONOMIC IMPACT OF TARIFF ELIMINATION

Reduction of tariffs on EGs has been part of the climate change mitigation and adaptation discussion for some time. Many experts concede that it is an important piece of the puzzle. De Melo and Vijil (2014, 2) claim that “unimpeded trade in Environmental Goods and Services...is recognized to be a center-piece of the needed mitigation measures to combat climate change.” An ambitious EGA, for de Melo and Vijil, would be an important step in the right direction.

What impact would the elimination of tariffs on selected environmental goods have on China’s producers, consumers and the economy generally? To answer this question, TPW employed a set of globally-linked partial equilibrium models that examine the impacts not only of China’s change in trade policy for these environmental goods on the Chinese economy itself, but also the impacts of changes in policy for sub-groupings of these environmental goods. The analysis looked at these impacts not only on China, but also for other major markets engaged in the environmental goods agreement talks. This means the analysis is able to capture the effect of improved market access in third markets (the EU for example) on the global market at the product level as well as for individual markets. This provides a more complete analysis than focusing strictly on China’s own policies and its own market in isolation. Details of the methodology are provided in Appendix A.

The results for the environmental goods products as a whole are shown in Table 2. It shows that overall China’s full participation in an agreement that eliminates tariffs on products will have a net positive impact on the Chinese economy. Both GDP and net national income increase by billions of dollars. Tariff elimination will also boost China’s exports of these goods significantly. Exports increase by nearly \$27 billion, up by 9.8 percent over what they would be in the absence of tariff reductions on these goods. Most of those exports (just over 69 percent) will go to three major markets: the European Union, the United States, and Korea. Spending within China on goods (domestically-produced and imported goods in the aggregate) designed to mitigate environmental damage increases as a result of a decline in the costs of those goods. As the costs decline, spending on environmental protection is more affordable and can increase, making it easier for the Chinese government to meet their environmental goals.



**Table 2**  
**Estimated Impacts of Environmental Goods Tariff Elimination on China, 2014**

Change in Chinese exports, %	+9.80%
Change in Chinese exports, value	+\$26.6 billion
Change in Chinese GDP, value	+\$9.0 billion
Change in Chinese GDP, %	+0.01%
Change in prices paid by Chinese purchasers of environmental goods	-0.47%
Change in quantity of Chinese investment in environmental goods, value at current prices	+\$21.97 billion
Net impact on Chinese economy (national income)	+\$2.5 billion
Net impact on Chinese economy (national income)	+0.004%

Source: Authors' estimates

The results for each of the nine subcategories of environmental goods are detailed in Appendix B.

The expected global export gain from the environmental goods agreement would be about \$119 billion. Of that total, China's gain in exports of \$26 billion exceeds gains for all other EGA economies. The next largest gain goes to the European Union, with estimated increases in exports to the world of EGA products of \$21 billion. The U.S. export gains are estimated to be \$13 billion.

## IMPACT ON CHINA'S EFFORTS TO PROTECT THE ENVIRONMENT

China has clearly-stated goals to address a number of environmental concerns. The 13th Five Year Plan (13FYP), released March 2016, contains a number of reforms to be implemented between 2016 and 2020 relating to environmental issues – reforms that could be expedited by an ambitious EGA. For example, the aim to implement a nationwide emissions trading market by 2017 and introduce similar schemes to cover power and water for industrial users will necessitate that producers of iron and steel, power generation, chemicals, building materials, paper making and non-ferrous metals shift towards energy-reduction and emissions-abatement technologies. Having ready access to such technologies without the unnecessary added cost of tariffs will be instrumental in increasing access to these technologies by these producers.

China also plans to increase the ratio of non-fossil fuel resources in its energy mix. The government intends to promote new energy sources with cleaner, safer and more efficient technology. China's energy industry will be restructured so that a competitive, efficient market environment is established, and access to lower-cost related equipment will be important to the success of this effort.

As part of China's shift to the circular economy, China also plans to further boost development of the recycling industry. The government has introduced a number of policies and instruments to increase recycling and the re-use of products and parts. Greater access to high-end recycling equipment at lower costs will enhance energy savings, environmental protection and economic gains.

In 2015 at the Twelfth National People's Congress, Premier Li Keqiang called pollution a "blight on people's quality of life and a trouble that weighs on their hearts. We must fight it with all our might." And, as a result of the "war on pollution," China tightened its air pollution regulations to prevent airborne particles measuring less than 2.5 microns in diameter, known as PM2.5. PM 2.5 levels in China at more than 10 times the safe levels recommended by the World Health Organization have forced school closings and been the source of significant global news coverage.<sup>4</sup> The particulates are potent global warming agents and are also carcinogens.

Other priorities include targets for water pollution discharge and cleaning up enterprises in heavy water-polluting industries, improving air quality nationwide, and increasing the use of electric and hybrid cars and buses.

Reducing the costs of imports of environmental goods that will be needed to achieve these and other environmental goals in China will reduce the costs of these projects to the government and to companies participating in the projects. It will also boost the competitiveness of Chinese producers of these goods in international markets, increasing their exports.

Finally, it is well documented that investment in a cleaner environment can carry significant additional benefits. Governments across the world have estimated and documented the economic benefits attributable to a cleaner environment. In the United States, for example, the investments related to the Clean Air Act have led to a 63 percent reduction in air pollution since 1980<sup>5</sup> while the economy has grown by 147 percent over the same period. The United States Environmental Protection Agency

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<sup>4</sup> "China pollution: First ever red alert in effect in Beijing," BBC, December 8, 2015, PM 2.5 levels in China at more than 10 times the safe levels recommended by the World Health Organization have forced school closings and been the source of significant global news coverage. (Source: <http://www.bbc.com/news/world-asia-china-35026363>).

<sup>5</sup> U.S. Environmental Protection Agency, "Air Quality Trends," <https://www3.epa.gov/airtrends/aqtrends.html>.

(USEPA) estimates that the cost-benefit ratio for economic benefits from cleaner air have been roughly 30:1 (USEPA 2011, 254).<sup>6</sup> These benefits are linked to improvements in human health and the quality of ecological resources as well as other aspects of the environment. In the case of China, where the environmental challenges are far greater and there is chronic under investment in environmental quality, the benefits are likely to be even higher relative to investment costs (World Bank 2013, Zheng and Khan 2013).<sup>7</sup>

From the quantitative analysis, it's estimated an effective change in real investment [purchases] in the environmental goods of roughly \$21.97 billion annually (Table 2), resulting from lower prices and access to an improved range of environmental goods. Applying a similar methodology as utilized by the USEPA, the benefits linked to improved environmental quality to China would translate to approximately \$659 billion annually in economic benefits in China linked to improved environmental quality (Table 3).

**Table 3**  
**Estimated Value of Economic Benefits of Improved Environmental Quality**  
**from Increased Spending on Environmental Protection Arising from Lower**  
**Costs of Environmental Goods**  
 (Billions of Dollars)

Total	\$659.1
EGA Goods:	
Air Pollution Control	74.8
Cleaner and Renewable Energy	304.0
Energy Efficiency and Resource Efficiency	103.2
Environmental Monitoring, Analysis and Assessment	45.6
Environmentally Preferable Products	10.2
Environmental Remediation and Cleanup	4.4
Noise and Vibration Abatement	14.5
Solid and Hazardous Waste Management	41.9
Wastewater Management and Water Treatment	17.9

Source: Authors' estimates

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<sup>6</sup> The Environmental Protection Agency estimates that the benefit-cost ratio of the U.S. Clean Air Act is 25:1 by 2015 and 31:1 by 2020.

<sup>7</sup> World Bank (2013), "Seizing the Opportunity of Green Development in China," by World Bank and Development Research Center of the State Council, the People's Republic of China, in World Bank report China 2030: Building a Modern, Harmonious, and Creative Society, World Bank Press: Washington DC.

Recent research also demonstrates that Chinese consumers value environmental protection and are willing to pay more to buy goods that lower pollution levels or are perceived as being safer to their health. See for example Zheng, Kahn and Liu (2010), Zheng, Wang, Glaeser and Kahn (2011), Davis (2011), and Zheng and Kahn (2013). Also of interest is research that shows that lowering the costs of compliance with environmental regulations (e.g., through lower tariffs on imported environmental goods) broadens the areas of the country that benefit with lower pollution, and reduces the shifting of population from polluted cities to clean cities.<sup>8</sup>

## CONCLUSION

China's ambitious commitments on the environment, energy and climate change represent significant opportunity for their consumers, businesses and economic partners. The EGA offers a real opportunity for China to leverage its investment in environmental technology and expedite the diffusion throughout its economy. And, while the estimated savings on investment of \$22 billion dollars is significant, an even greater payoff is the benefits, which could easily be hundreds of billions of dollars, that will accrue to China as air and water pollution are reduced, energy efficiency is improved, and renewable energy sources are maximized.

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<sup>8</sup> Zheng, Siqi and Matthew E. Kahn (2013), "Understanding China's Urban Pollution Dynamics," *Journal of Economic Literature* 2013, 51(3), 731-772.

## APPENDIX A: METHODOLOGY

In this study we employed a modeling strategy for industry-focused globally-linked partial equilibrium analysis of tariff policy on a global level.

Based on the product detail of environmental goods listed in Appendix A, we have built a set of product-specific models based on the “global simulation model” framework (GSIM). Francois and Hall (2007) developed GSIM to allow detailed analysis of tariff scenarios across individual products and potentially all major trading countries and blocks. The World Bank and the United Nations adopted the GSIM framework, integrating it into the joint World Bank-UNCTAD trade data portal known as the “World Integrated Trade Solution,” or WITS (see <http://wits.worldbank.org/wits/>).<sup>9</sup> The basic framework employed here can be implemented with a spreadsheet-based interface. We should stress that, in implementation, this set of models is structurally consistent with the recent class of Eaton-Kortum based structural trade models (see Bekkers *et al*, 2015; Costinot and Rodriguez-Clare, 2014 for example).<sup>10</sup>

The basic approach involves specifying global supply and demand for each set of goods produced by a particular country as the sum of individual (national) sources of supply and demand. This is done for goods produced in all regions in the model. We are then able to reduce the solution set of the model to those global prices that clear global markets. Once we have a global set of equilibrium prices, we can obtain national results (changes in prices and quantities). Based on price and quantity changes, we in turn obtain estimates of changes in production, selected taxes collected, trade, consumer and producer surplus, and real national income that result from the elimination of tariffs on the selected environmental goods. Within this context, we work with a non-linear representation of import demand, combined with generic export-supply equations (see Francois and Hall 2007).

Based on input-output tables, we have adjusted the tariff revenue effects in our analysis to reflect the fact that a share of imports of environmental goods, on which tariffs would (otherwise) be assessed, were purchased by government consumers.

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<sup>9</sup> Another application, the MRPE model, is a specialized, scalable extension of the GSIM framework for strategic trade policy assessments at the detailed sector level, developed for the European Commission.

<sup>10</sup> Baldwin, R. (1992): “Measurable Dynamic Gains from Trade,” *The Journal of Political Economy*, 100(1), 162-174; Bekkers, E., J. Francois and H. Rojas-Romagosa (2015): “Melting Ice Caps and the Economic Impact of Opening the Northern Sea Route,” CPB working paper; Costinot A. and A. Rodriguez-Clare (2014): “Trade Theory with Numbers: Quantifying the Consequences of Globalization,” in G. Gopinath, E. Helpman and K. Rogoff (editors), *Handbook of International Economics*, volume 4.

The results of the analysis using this methodology are presented in Table 2 of the text.

To examine separately the potential impact of tariff reductions on environmental goods on Chinese government tax revenues, we have also built into the model a “dynamic” element. Based on Baldwin (1992), we solve for a long-run annual value change in GDP by applying multipliers from the Baldwin research to static assessments of GDP gains to derive an estimate of dynamic changes to GDP that reflect capital formation over time. The resulting estimated changes to China’s GDP are larger, as expected (GDP increases by \$17.1 billion, compared to \$9.0 billion using a static model). The additional income generates additional tax revenues that help to offset some of the tariff revenue losses resulting from eliminating environmental goods tariffs. We estimate that the net impact on Chinese government tax revenues would be a loss of \$1.8 billion.

*Market Disaggregation*

Australia (AUS)	Korea (KOR)
Canada (CAN)	Norway (NOR)
Chile (CHE)	New Zealand (NZL)
China (CHN)	Rest of World (ROW)
Costa Rica (CRI)	Singapore (SGP)
European Union (EUN)	Taiwan (TWN)
Hong Kong (HKG)	United States (USA)
Japan (JPN)	

*Data Sources*

Trade data and tariffs are from “World Integrated Trade Solution,” or WITS (see <http://wits.worldbank.org/wits/>)

Production data (domestic sales) are from market input/output tables

Trade elasticities are from the Global Trade Analysis Project (GTAP).

## Trade Weighted Tariffs on Environmental Goods, 2014

		<=== importer ===>														
		AUS	CAN	CHE	CH N	CRI	EUN	HKG	JPN	KOR	NO R	NZL	ROW	SGP	TW N	USA
<=== exporter ===>	AUS		0.25	0.86	0.91	1.71	1.61	0.00	0.04	3.29	0.00	0.00	2.79	0.00	0.47	0.00
	CAN	2.78		0.00	2.97	0.18	1.62	0.00	0.19	4.37	0.00	0.14	5.32	0.00	1.12	0.00
	CHE	2.34	0.00		3.66	1.50	0.00	0.00	0.00	0.00	0.00	3.34	4.20	0.00	1.80	1.01
	CHN	3.65	1.34	0.00		2.81	2.29	0.00	0.09	4.87	0.00	0.01	6.14	0.00	1.74	1.62
	CRI	4.61	0.24	0.00	0.01		0.00	0.00	0.39	0.60	0.00	4.26	3.94	0.00	0.23	1.61
	EUN	3.17	0.42	0.00	4.53	1.12		0.00	0.19	0.58	0.00	3.41	4.66	0.00	1.23	1.01
	HKG	4.04	0.84	0.00	0.15	3.57	2.33		0.12	3.40	0.00	0.00	6.35	0.00	0.59	1.44
	JPN	2.61	0.29	0.00	4.58	1.43	1.87	0.00		4.42	0.00	3.40	3.90	0.00	1.94	1.01
	KOR	4.56	0.14	1.16	5.30	0.25	0.01	0.00	0.42		0.00	4.09	4.90	0.00	1.90	0.19
	NOR	3.09	0.00	0.00	5.61	0.02	0.00	0.00	0.04	0.00		3.71	5.43	0.00	0.78	0.63
	NZL	0.00	0.61	0.85	0.00	3.74	1.87	0.00	0.06	1.37	0.00		3.74	0.00	0.00	0.81
	ROW	2.46	0.41	0.14	4.26	1.84	1.52	0.00	0.13	2.96	0.00	1.37		0.00	1.56	0.87
	SGP	0.00	0.05	0.00	0.00	2.89	1.60	0.00	0.00	0.00	0.00	0.00	2.07		0.52	0.00
	TWN	3.76	1.80	3.17	5.22	3.67	3.58	0.00	0.36	4.20	0.00	0.00	6.75	0.00		1.56
	USA	0.05	0.00	1.06	3.59	2.51	1.83	0.00	0.20	0.34	0.00	2.88	6.04	0.00	0.97	

Source: WITS

## All Products included in Our "Environmental Goods" Definition

Product HS code			
		30690	
280461	530500		841280
350790	560314	730820	841290
380210	560811	730900	841319
381512	560890	731010	841320
381519	560900	731029	841350
381590	591140	732119	841360
382100	591190	732190	841370
382200	630510	732690	841381
390950	630790	740400	841391
391400	631010	750300	841410
391510	631090	760120	841430
391520	680610	760200	841440
391530	680620	761100	841459
391910	680690	761290	841480
391990	680800	780200	841490
392010	681510	790200	841581
392062	681599	800200	841620

Product HS code			
392091	690919	820330	841690
392119	700100	840211	841780
392190	700800	840212	841790
392390	701939	840219	841861
392690	701990	840220	841869
400400	711230	840290	841919
400941	711291	840310	841939
400942	711292	840390	841940
401150	711299	840410	841950
401320	720410	840420	841960
401519	720421	840490	841989
401693	720429	840510	841990
401699	720430	840590	842119
401700	720441	840681	842121
440130	720449	840682	842129
441872	730300	840690	842139
450410	730431	840790	842191
450490	730439	840810	842199
460121	730441	840991	842220
460122	730449	841011	842290
460129	730451	841012	842641
470620	730459	841013	842833
470710	730490	841090	842839
470720	730630	841111	842890
470730	730640	841121	842959
470790	730650	841181	843139
530310	730661	841182	843141
530390	730669	841199	846291
846599	850422	853990	902730
846694	850423	854140	902750
846711	850431	854330	902780
847410	850432	854370	902790
847420	850433	854390	902810
847490	850434	854460	902820
847982	850440	860210	902830
847989	850490	860290	902890
847990	850519	860791	903010
848110	850520	860900	903020
848120	850590	870510	903031
848130	850680	871200	903032
848140	850690	871491	903033
848180	850720	871492	903039



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Product HS code			
848190	850750	871493	903084
848340	850760	871494	903089
848360	850780	871495	903090
848410	850790	871496	903110
848420	851410	871499	903120
848610	851420	890790	903149
848620	851430	900190	903180
848690	851440	900290	903190
848790	851490	900490	903210
850110	851629	901210	903220
850120	852349	901290	903281
850131	852691	901380	903289
850132	852692	901390	903290
850133	853010	901420	903300
850134	853090	901480	940320
850140	853110	901520	940510
850151	853120	901530	940520
850152	853190	901540	940540
850153	853339	901580	940591
850161	853390	901590	940592
850162	853630	901812	940599
850163	853650	902000	950720
850164	853690	902230	
850211	853710	902511	
850212	853720	902519	
850213	853890	902580	
850220	853910	902590	
850231	853921	902610	
850239	853931	902620	
850240	853932	902680	
850300	853939	902690	
850410	853941	902710	
850421	853949	902720	

## APPENDIX B: RESULTS FOR SUBCATEGORIES OF ENVIRONMENTAL GOODS

### Air Pollution Control

Change in Chinese exports, %	+9.76%
Change in Chinese exports, value	+\$1.9 billion
Change in Chinese GDP, value	+\$834 million
Change in Chinese GDP, %	+0.001%
Change in prices paid by Chinese purchasers of environmental goods	-0.60%
Net impact on Chinese economy (national income value)	+\$232 million
Net impact on Chinese economy (national income % change)	nil

Source: Authors' estimates

### Cleaner and Renewable Energy

Change in Chinese exports, %	+7.46%
Change in Chinese exports, value	+\$5.7 billion
Change in Chinese GDP, value	+\$3.2 billion
Change in Chinese GDP, %	+0.01%
Change in prices paid by Chinese purchasers of environmental goods	-0.83%
Net impact on Chinese economy (national income value)	+\$329 million
Net impact on Chinese economy (national income % change)	+0.001%

Source: Authors' estimates

### Energy Efficiency and Resource Efficiency

Change in Chinese exports, %	+8.67%
Change in Chinese exports, value	+\$7.3 billion
Change in Chinese GDP, value	+\$2.0 billion
Change in Chinese GDP, %	+0.003%
Change in prices paid by Chinese purchasers of environmental goods	-0.62%
Net impact on Chinese economy (national income value)	+\$708 million
Net impact on Chinese economy (national income % change)	+0.001%

Source: Authors' estimates

### Environmental Monitoring, Analysis and Assessment

## Value of the Environmental Goods Agreement

Change in Chinese exports, %	+7.13%
Change in Chinese exports, value	+\$591 million
Change in Chinese GDP, value	+\$456 million
Change in Chinese GDP, %	+0.001%
Change in prices paid by Chinese purchasers of environmental goods	-0.58%
Net impact on Chinese economy (national income value)	+\$73 million
Net impact on Chinese economy (national income % change)	nil

Source: Authors' estimates

## Environmentally Preferable Products

Change in Chinese exports, %	+12.08%
Change in Chinese exports, value	+\$2.2 billion
Change in Chinese GDP, value	+\$471 million
Change in Chinese GDP, %	+0.001%
Change in prices paid by Chinese purchasers of environmental goods	-0.41%
Net impact on Chinese economy (national income value)	+\$269 million
Net impact on Chinese economy (national income % change)	nil

Source: Authors' estimates

## Environmental Remediation and Cleanup

Change in Chinese exports, %	+8.30%
Change in Chinese exports, value	+\$498 million
Change in Chinese GDP, value	+\$113 million
Change in Chinese GDP, %	nil
Change in prices paid by Chinese purchasers of environmental goods	-0.27%
Net impact on Chinese economy (national income value)	+\$43 million
Net impact on Chinese economy (national income % change)	nil

Source: Authors' estimates

## Noise and Vibration Abatement

Change in Chinese exports, %	+8.95%
Change in Chinese exports, value	+\$259 million
Change in Chinese GDP, value	+\$152 million
Change in Chinese GDP, %	nil
Change in prices paid by Chinese purchasers of environmental goods	-0.69%
Net impact on Chinese economy (national income value)	+\$30 million
Net impact on Chinese economy (national income % change)	nil

Source: Authors' estimates

## Solid and Hazardous Waste Management

Change in Chinese exports, %	+4.97%
Change in Chinese exports, value	+\$1.1 billion
Change in Chinese GDP, value	+\$475 million
Change in Chinese GDP, %	+0.001%
Change in prices paid by Chinese purchasers of environmental goods	-0.09%
Net impact on Chinese economy (national income value)	+\$104 million
Net impact on Chinese economy (national income % change)	nil

Source: Authors' estimates

## Wastewater Management and Water Treatment

Change in Chinese exports, %	+4.58%
Change in Chinese exports, value	+\$1.6 billion
Change in Chinese GDP, value	+\$373 million
Change in Chinese GDP, %	+0.001%
Change in prices paid by Chinese purchasers of environmental goods	-0.15%
Net impact on Chinese economy (national income value)	+\$118 million
Net impact on Chinese economy (national income % change)	nil

Source: Authors' estimates

## APPENDIX C: REFERENCES

Baldwin, R. (1992): "Measurable Dynamic Gains from Trade," *The Journal of Political Economy*, 100(1), 162-174.

Bekkers, E., J. Francois and H. Rojas-Romagosa (2015): "Melting Ice Caps and the Economic Impact of Opening the Northern Sea Route," CPB working paper.

Costinot A. and A. Rodriguez-Clare (2014): "Trade Theory with Numbers: Quantifying the Consequences of Globalization," in G. Gopinath, E. Helpman and K. Rogoff (editors), *Handbook of International Economics*, volume 4.

Eaton J. and S. Kortum (2002): "Technology, Geography and Trade," *Econometrica*, 70(5), 1741–1779.

Francois, J. and K. Hall (2007), "Global Simulation Analysis of Industry-Level Trade Policy: the GSIM model," J. Francois and K. Hall, IIDE Discussion Papers 20090803, Institute for International and Development Economics.

U.S. Environmental Protection Agency (2011), "Benefits and Costs of the Clean Air Act 1990-2020," [http://www.epa.gov/sites/production/files/2015-07/documents/fullreport\\_rev\\_a.pdf](http://www.epa.gov/sites/production/files/2015-07/documents/fullreport_rev_a.pdf)

World Bank (2013), "Seizing the Opportunity of Green Development in China," by World Bank and Development Research Center of the State Council, the People's Republic of China, in World Bank report *China 2030: Building a Modern, Harmonious, and Creative Society*, World Bank Press: Washington DC.

Zheng, Siqi and Matthew E. Kahn (2013), "Understanding China's Urban Pollution Dynamics," *Journal of Economic Literature* 2013, 51(3), 731-772.