TRADE SUSTAINABILITY IMPACT ASSESSMENT FOR THE NEGOTIATIONS OF A PARTNERSHIP AND COOPERATION AGREEMENT BETWEEN THE EU AND CHINA

Sectoral Study 2 of 5:

Environmental Goods and Services

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1. Background

The achievement of the United Nations' Millennium Development Goals (MDGs) is closely linked to environmental quality, as negative environmental impacts typically affect the poor most severely.[1] The WTO Doha Development Agenda (DDA) aims to support the MDGs and one proposed initiative to facilitate environmental stewardship is substantially liberalising the environmental goods and services sector (EGS).

At the World Trade Organisation's Fourth Ministerial Conference in 2001 the EGS sector was specified as warranting special attention in forthcoming rounds of negotiations. Liberalisation of trade within the EGS sector is recognised as a means to increase developing countries' access to technologies and services which can provide significant improvements in their environmental quality and citizen's quality of life. Predicted benefits of improved market access for developing countries include a reduction of air and water pollution, improved resource efficiency and safer disposal of solid wastes. Furthermore, liberalisation of EGS is expected to accelerate economic development through the inherent skills creation that will accompany technology transfers towards least developed countries (LDCs).[2]

While all global trading partners at the WTO recognise that liberalisation of the EGS sector can be a key facilitator in achieving sustainable development, there has been an ongoing debate during the DDA negotiations as to how the sector should be defined. Under existing commodity classification systems, environmental goods (EG) are not clearly delineated from non-environmental goods. In addition, many potential EG have multiple usages with environmental as well as non-environmental applications. Initial attempts to define EG have been split into two broad categories: established environmental technologies (EET) and environmentally preferable products (EPP). Included within the EET definition are industrial goods which contribute directly towards the provision of environmental services such as air, water or soil pollution remediation or prevention. EET need not have applications strictly in the provision of environmental services. This includes goods such as chemicals to purify water for drinking, machinery used in solid waste disposal and equipment which measures environmental quality. Goods listed as EPP differ from EET in that they need not provide an environmental service in the first instance, but rather have environmentally preferable characteristics relative to substitute goods. Conceptual examples of EPP include energy efficient light bulbs (substituting traditional light bulbs), equipment used to generate renewable energy (substituting coal fired power plants) and biofuels (substituting fossil fuels).[3]

Prior to the current round of WTO negotiations, the Organisation for Economic Cooperation and Development (OECD) and Asia Pacific Economic Cooperation (APEC) also established their own lists for these goods. Although still undergoing debate within the WTO framework, the OECD list will serve as the

[1] Global Environmental Outlook 4, 2007, United Nations Environmental Programme
[2] Alavi, Rokiah. Tariff and Non-tariff Measures on Exports of Select Environmental Goods. ICTSD Programme on Trade and Environment, 2007
[3] *Ibid*

quantitative basis for analysis within this report.[4] The OECD list was formed with statistical research in mind and for the purposes of this report provides a consistent basis for analysis. Where prudent and possible this report will also provide qualitative analysis of significant environmental goods or services for which statistical data is not available.

The OECD list includes elements of both the EET and EPP approaches (see **Table 1**). The list is split into three primary product categories: pollution management, cleaner technologies and products, and resources management, with the first corresponding to EET and the latter two to EPP. The pollution management category contains air pollution control, wastewater management, solid waste management, remediation and cleanup, noise and vibration abatement, and environmental monitoring, analysis, and assessment. Within cleaner technologies are a limited number of chemical products with desirable environmental applications; notably this sector excludes energy efficient products (which are further discussed below). The resources management category includes indoor air pollution control, water supply products, recycled materials, renewable energy plants, heat and energy savings and management, and several categories on sustainable resource management and eco-tourism. A notable number of categories within the resources management group and cleaner technologies group (and, to a lesser extent, pollution management) lack corresponding disaggregated sub-sector HS codes, highlighting the inherent difficulty the OECD and all subsequent working groups experienced in establishing clear guidelines for classifying the EGS sector using the current HS system.

Table 1: Classification of OECD Environmental Goods Subsectors[5]

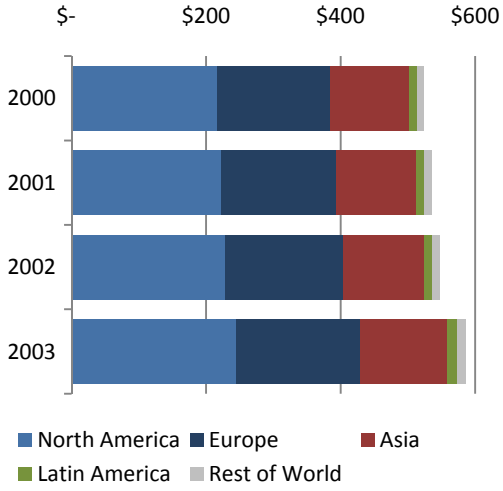
Established Environmental Technologies (EET)	Environmentally Preferable Products (EPP)
- Air Pollution Control - Wastewater Management - Solid Waste Management - Remediation and Cleanup - Noise and Vibration Abatement - Environmental Monitoring, Analysis and Assessment	- Cleaner Technologies - Water Supply - Renewable Energy - Heat and Energy Savings Management

[4] Within the current Doha round of negotiations debate has taken place regarding liberalisation of the OECD and APEC lists, along with new lists proposed by a number of countries, including a joint offer by the EU and US which further extends prior lists to include climate friendly technologies. Concerns have been raised that dual use products, which are not inherently beneficial to the environment (i.e. heavy machinery and chemicals involved in pollution treatment), will be overly liberalised under pressure from developed countries with already mature sectors. Furthermore, the rapid rate of technological innovation is cited as difficult to address in the list approach, which requires lengthy negotiations. One proposal to address these concerns is the 'project approach'. As opposed to the list approach, wherein goods are liberalised according to their HS code without exception, under the project approach guidelines will be established whereby environmental projects, such as a wind power project, will enjoy zero tariffs on all inputs and services. While the project approach is strong in its specificity, it is criticised as overly subjective, prone to graft, contravening WTO rules and non-inclusive of EPP. Additionally, opposing countries have noted that the project approach provides no new substance, as individual countries are currently able to unilaterally grant preferential treatment to priority projects. Recent proposals have combined the two methods in an attempt to capture the strengths of both, however negotiations continue without a foreseeable outcome.

[5] Note: This list does not differentiate environmental services, although the subsectors of EET closely correspond to environmental service subsectors which are involved in the design, installation and management of facilities employing these goods. Additionally, within the EPP category renewable energy plant management is another service subsector.

1.1. Global Competitive Sector Context

Figure 1: Worldwide Trade in Environmental Goods and Services 2000-2003 (US$ Billions)



Source: Hight (2007)

It is estimated that global trade in environmental goods and services exceeded US$613 bn in 2006, up from US$200 bn in 1990, with an average annual growth of 15% since 2000.[6] Within this, developed countries have traditionally accounted for 90% or more of market share, however, saturation of developed markets since 2000 has lead to increasing growth rates in developing countries such as China and India (see **Figure 1**).[7] Between 2000 and 2001 sector growth was a mere 1.6% in developed countries, while it grew at an average of 7.5% in developing countries.[8] Within Europe, the sector accounted for €227 billion in 2004, employing some 3.4 million Europeans.[9] Like the rest of the developed world, growth in Europe's EGS sector has been moderate, at a total of 7% between 1999 and 2004. Due to the highly interdependent nature of environmental goods and environmental services, estimates indicate that each composes approximately half of these trade figures.[10]

EGS growth in developing markets has been especially focused on water and wastewater management, solid waste management and air pollution control. Growth in these sectors is due to two key factors – rapid urbanisation, which tends to exacerbate development related environmental problems and concentrate them on highly dense populations, thus raising awareness; and economic development, which provides both public and private entities a greater ability to mitigate these problems. While growth has accelerated in developing countries' consumption patterns, production growth has lagged. In 2003 developed countries accounted for 79.9% of US$ 369 bn in global EG exports.[11] This underscores the strengths which developed countries, such as those of the EU, due to an established history in the technical aspects of combating or preventing environmental degradation.

Water Supply and Wastewater Treatment

Within the individual subsectors, water supply and wastewater treatment, i.e. water distribution and purification, is often viewed as the most critical in the context of development. Although market reforms in many developing countries have improved efficiency in this sector since the 1980s, a large number of developing countries are still over-regulated and poorly serviced, lending to an increasing urgency to privatise utilities, fully or partially, in order allow water prices to reach market levels and encourage infrastructure investment. Issues surrounding water scarcity are noted as heavily influencing social instability, especially in African nations which are already under severe social strain.[12] Recent reports have indicated that the United Nations Millennium Development Goals related to water access and sanitation will not

[6] USTR Schwab to Announce New Climate Initiatives for WTO. United States Department of State. Nov 30, 2007. Available at: http://www.state.gov/g/oes/rls/or/95967.htm
Alavi, Rokiah. Tariff and Non-tariff Measures on Exports of Select Environmental Goods. ICTSD Programme on Trade and Environment, 2007
[7] Alavi, Rokiah. An Overview of Key Markets, Tariffs, and Non-tariff Measures on Asian Exports of Environmental Goods. ICTSD Programme on Trade and Environment, 2007
[8] UNCTAD (2003) Report of the expert meeting on definitions and dimensions of environmental goods and services in trade and development.
[9] Eco-industry, its size, employment, perspectives and barriers to growth in an enlarged EU. European Commission DG Environment, Sep 2006.
[10] European Commission (1999), "The EU Eco-Industry's Export Potential", final report to DGXI of the European Commission, EG/C1490/SO, http://www.environmental-export.com
[11] Hamwey, R. 2005. Environmental Goods: Where Do the Dynamic Trade Opportunities for Developing Countries Lie? Working Paper prepared to support discussions at the Hong Kong Trade and Development Symposium and the Sixth WTO Ministerial Conference in Hong Kong in December 2005.
[12] Kennet, M. and Steenblik, R. Environmental Goods and Services: a Synthesis of Country Studies. OECD Trade and Environment Working Paper No. 2005-03.

be met if current trends do not improve, with over 2.6 bn people lacking improved access to water or sanitation in 2007.[13] The OECD estimates that waste water management accounts for 34% of global trade in environmental goods.[14]

Solid Waste Management

Another key sector in the global context is solid waste management. Consisting primarily of municipal waste management, it is viewed as another subsector in need of critical investment and development in the near future, given the rapid rate of urbanisation in the developing world and associated levels of consumption and waste. According to OECD estimates the sector accounts for 13% of global trade in environmental goods.[15] The sector is inclusive of collection, treatment, transport and storage or recovery or recycling of non-hazardous wastes. In 2006 worldwide output of municipal solid waste totalled 2.02 billion tonnes, with an expected growth to 2.77 billion tonnes (a 37.4% rise) by 2011.[16] Recycling, seen as a central means to combat the growth in waste output, has risen in developed European countries to rates as high as 65%, although the global figure remains low at 13%.[17] The sector, whose revenue is among the highest in EGS, is largely funded by public procurement, where reforms have been urged to improve efficiency.[18] Low public awareness of what constitutes hazardous waste often leads to its inclusion in solid waste management facilities, with examples such as discarded agrochemicals and consumer electronics, which are often made up of carcinogenic heavy metals that pose a risk to ground water supplies.

Air Pollution Control Equipment

The air pollution control subsector is composed of goods and corresponding services which improve air quality, primarily through treatment of exhaust gases and particulate matter from their primary source. The importance of the sector to public health is clear, given that acute respiratory illness induced by poor air quality is the leading cause of death in children worldwide, causing over 2 million premature deaths annually.[19] Furthermore, studies by the World Health Organisation indicate that air pollution is increasingly a burden on Asian countries in particular, with over 1 billion people in Asia exposed to air which does not meet WHO safety standards.[20] The OECD estimates that air pollution control goods compose 10% of world trade in the environmental goods sector.[21]

Global Obstacles to Trade in EGS

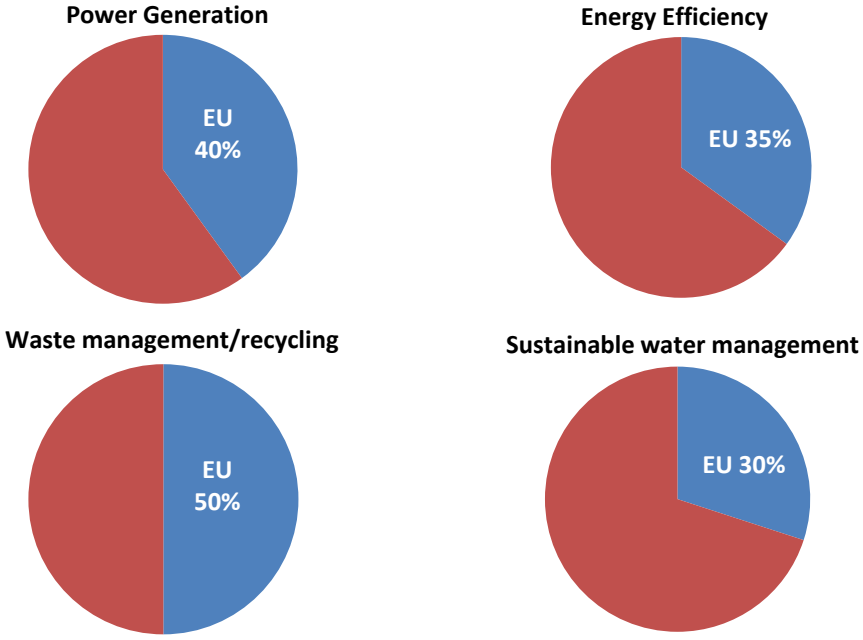
[13] Global Environmental Outlook 4, 2007, United Nations Environmental Programme
[14] OECD Observer Policy Brief. Sep 2005. Available at: http://www.oecd.org/dataoecd/63/15/35415839.pdf
[15] OECD Observer Policy Brief. Sep 2005. Available at: http://www.oecd.org/dataoecd/63/15/35415839.pdf
[16] Global Waste Management Market Assessment 2007. Key Note Publications Ltd. 1 Mar 2007
[17] EurActiv.com. Parliament votes in favour of waste recycling over incineration. 14 Feb 2007. Available at: http://www.euractiv.com/en/sustainability/parliament-votes-favour-waste-recycling-incineration/article-161681
United Nations Statistics Division. Environmental Statistics – Municipal waste treatment. April 2007. Available at: http://unstats.un.org/unsd/environment/wastetreatment.htm
[18] Kennet, M. and Steenblik, R. Environmental Goods and Services: a Synthesis of Country Studies. OECD Trade and Environment Working Paper No. 2005-03.
[19] Global Environmental Outlook 4, 2007, United Nations Environmental Programme
[20] WHO (2000). Guidelines for Air Quality. WHO/SDE/OEH/00.02, World Health Organization, Geneva
[21] OECD Observer Policy Brief. Sep 2005. Available at: http://www.oecd.org/dataoecd/63/15/35415839.pdf

Despite the needs of most developing nations to improve their environmental goods and services sector, for the benefit of human health and environmental stewardship, many still maintain stringent barriers to trade within the sector. Worldwide, EET goods face an average *ad valorem* equivalent tariff of 4.3%, however this figure is low (1.9%) in developed countries and relatively high (11.7%) in emerging economies.[22] A 2006 survey by the OECD found the five leading non-tariff barriers in the sector to be: testing and certification, customs procedures, regulations on payments, inadequacy of intellectual property protection and government procurement procedures.[23] Amongst policy makers recognition of the consequences of these barriers has become apparent, with increasingly ambitious liberalisation schemes provided by both developing and developed countries in current negotiations.

1.2. EU-China Specific Sector Context

Encouraged by a supportive policy framework, European companies have a first-mover advantage in the field of environmental goods, placing a high value on environmental quality and quality of life which has in turn fostered strong sectors in the fields of water and wastewater treatment infrastructure, waste management and operations, air pollution control technologies and renewable energy products. Furthermore, European companies are industry leaders in fast growing environmental services such as waste treatment, environmental monitoring and pollution remediation (see **Figure 2**).[24]

Figure 2: EU Share of World Trade in Select Environmental Subsectors (2006)



Source: German Federal Ministry for the Environment (2007)

[22] Claro E., and Lucas, N. Trade Flows and Domestic Policy Considerations in Environmental Goods. ICTSD Programme on Trade and Environment, 2006
[23] Fliess, Barbara and Kim, Joy. Business Perceptions of Non-tariff Barriers Facing Trade in Selected Environmental Goods and Associated Services: Survey Results. COM/ENV/TD(2006)48/FINAL. OECD, 12 Sep 2006
[24]. Future Opportunities and Challenges in EU-China Trade and Investment Relations 2006-2010. Available at: http://ec.europa.eu/trade/issues/bilateral/countries/china/legis/index_en.htm

Given the escalating scale environmental issues in China, which cost over 2.68% of GDP in 2003 according to the World Bank, China's environmental stewardship was targeted for improvement in the 17th National People's Congress. President Hu Jintao's new edict included "build[ing] an ecological civilisation and a model of growth and consumption, as well as industries, which are frugal in their use of energy and resources and protect the environment". The implementation of this edict's concept will focus on adoption of renewable energy technologies, pollution reduction and mitigation, and increased public awareness.[25] A strong trade component can be expected in the environmental sector's growth, given the State Environmental Agency's assessment that of 9,000 domestic environmental services companies, over 95% operate on a small scale, along with a mere 4% of Chinese produced environmental goods meeting international levels of technical quality.[26]

President Hu's proclamation is one of many steps in recent years towards environmental protection in China. Since 1990 China has produced at least 40 acts of legislation to reduce pollution through either prevention or remediation (see **Table 2**). Furthermore, in China's Catalogue on Foreign Investment in Industry, updated 1 December 2007, a number of sectors have been highlighted for encouragement or restriction with environmental stewardship in mind. Within encouraged categories are items relevant to recycling, clean production methods, renewable energy, ecological environment protection and comprehensive utilisation of resources. Notably, projects involving non-renewable mineral resource extraction are no longer encouraged, and projects which entail high resource consumption as well non-renewable resource exploration are now restricted.[27] The changing legislative and investment climate in China highlights the country's rising concerns for environmental stewardship, as well as representing emerging opportunities for European companies with experience in these increasingly promoted markets.

With China's growing recognition of its environmental challenges, trade in EGS has grown correspondingly (see **Figure 3**). Bilateral trade between the EU27 and China has grown from €2.6 bn in 1999 to over €12.3 bn in 2006, at an average annual growth rate of over 18.8%. Until recently, the EU enjoyed a healthy trade surplus within this growing sector. In the first nine months of 2007, however, China's 2006 surplus of €555 mn ballooned to €1.3 bn, or 12% of trade in the sector. These figures are counter-intuitive given the EU's historically strong comparative advantage in the EGS sector and China's apparently increasing demand for environmental stewardship.

25 Jun, Ma. Ecological Civilization is the Way Forward. 2007. Available at: http://www.chinadialogue.net/article/show/single/en/1440-Ecological-civilisation-is-the-way-forward

26 Ruqiu, Ye. Trade, environment and Sustainable Development Perspective in China. State Environmental Protection Administration, October 2003. Available at: http://www.iucn.org/themes/pbia/themes/trade/training_readings.htm

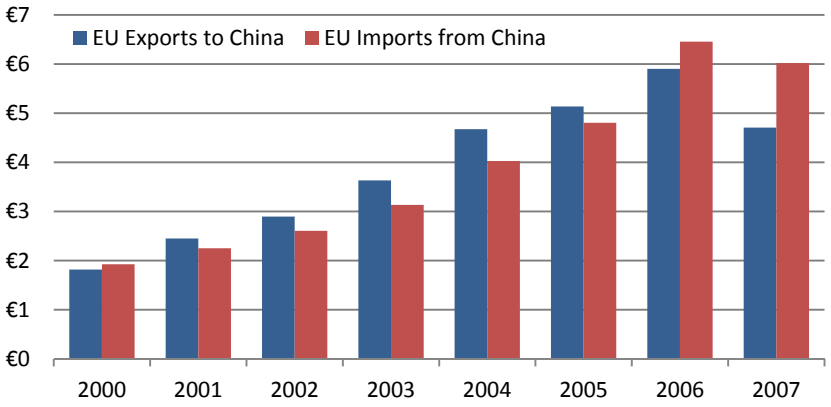
27 Decree of the State Development and Reform Commission, the Ministry of Commerce of the People's Republic of China No. 57 – Catalogue for the Guidance of Foreign Investment Industries (Amended in 2007). 31 Oct 2007

Table 2: Pollution Legislation in China since 1990

Air & Atmosphere
Measures for the archival administration of local standards for environmental quality and pollutant discharge (2004)
Ozone Layer Protection Ordinance (Chapter 403) (2003)
Law on the Prevention and Control of Air Pollution (2000)
Technical Policy on the Prevention and Control of Pollution by Motor Vehicles Emissions (1999)
Circular on Publishing the First Catalogue of the Eliminated Technologies and Equipment Causing Serious Air Pollution (1997)
Enforcement Regulations for Law on Prevention of Air Pollution of the People's Republic of China (1991)
Measures on Supervision of Exhaust Pollution from Automobiles (1990)
Energy
Renewable Energy Law (2005)
Cleaner Production Promotion Law (2002)
Energy Conservation Law of China (1997)
Waste & Hazardous Substances
Administrative Measures for the prevention and control of environmental pollution by electronic waste (2007)
Administrative Measures for the Recovery of Renewable Resources (2007)
Guiding Rules for Identifying Solid Wastes (2006)
Measures for the Administration of Automatic Monitoring of Pollution Sources (2005)
Measures for the prevention and control of environmental pollution by discarded dangerous chemicals (2005)
Provisions on the administration of the road transport of dangerous goods (2005)
Measures for the administration of licenses for the purchase and road transportation of highly toxic chemicals (2005)
Provisions on the administration of urban construction garbage (2005)
Law of the People's Republic of China on the prevention and control of environmental pollution by solid wastes (2005)
Measures for the Administration of Permit for Operation of Dangerous Wastes (2004)
Interim Provisions on the administration of dumping sites (2003)
Circular of the General Office of State Environmental Protection Administration on some issues concerning the approval administration of wastes restricted from import (2003)
Law of the People's Republic of China on prevention and control of radioactive pollution (2003)
Regulations on the Administration of Medical Wastes (2003)
Technical Policies for the Municipal Refuse Disposal and the Prevention and Control of Pollution (2000)
Circular on Strengthening the Management of Hazardous Chemicals (1999)
Measures on the Management of Hazardous Waste Manifests (1999)
Law on Prevention of Environmental Pollution Caused by Solid Waste (1996)
Interim Provisions on the Administration of Environmental Protection of Waste Imports (1996)
Circular of the General Office of the State Council on the Strict Control on Transboundary Movements of Foreign Waste to China (1995)
Water
Hydrology Regulation (2007)
Administrative Measures for urban drainage licences (2006)
Provisions of the People's Republic of China on the prevention and control of vessel pollution of the inland water environment (2005)
Measures for the supervision and control of sewage outlets on rivers (2004)
Groundwater Control Measures (2002)
Rules for implementation of the Law of the People's Republic of China on the prevention and control of water pollution (2000)
Soil and Groundwater Pollution Remediation Act (2000)
Decision of the State Council on several issues concerning environmental protection (1996)
Quality Standard for Groundwater of the People's Republic of China (1993)
Law of the People's Republic of China on Water and Soil Conservation (1991)

Source: Ecolex. Full texts available at: http://www.ecolex.org/indexen.php

Figure 3: EU27-China Bilateral Trade in Environmental Goods 1999-2007 (€ billion)

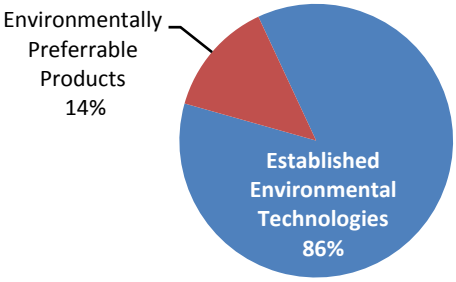


Note: Year 2007 figures are for January through to September due to data availability.

Source: Eurostat

Prior studies indicate that a number of barriers to market entry contribute to this EU trade deficit. Barriers which discourage or even outright prevent European producers from competing in Chinese markets include government regulation, IPR infringement, poor legal framework, local favouritism, and unfair commercial practices by local producers.[28] Increasingly, China's possible undervaluation of the RMB has magnified its surplus with the EU, with the EU trade deficit growing at a rate of €15 mn per hour in 2007.[29] While the Euro appreciated against the RMB by over 10% in 2006 and 2007, the EU trade deficit with China tripled over the same period.[30] Although environmental goods constitute a relatively small percentage of overall bilateral trade in 2006 (0.5%), they have nonetheless contributed to the EU's deficit with China at a rate of over €4.8 mn per day in the first nine months of 2007. While this remains a small portion of the overall deficit, in absolute terms it is illustrative of the significant imbalances emerging in EU-China trade.[31]

Figure 4: EU27-China Total Trade in Environmental Goods by Subsector 2006



Top Subsectors	
Wastewater Management	41%
Solid Waste Management	13%
Air Pollution Control	12%
Environmental Monitoring, Analysis and Assessment	10%
Renewable Energy	9%

Source: Eurostat

Within the context of the EU-China trade relationship in EGS in 2006 several subsectors are clearly dominant (see **Figure 4**). Wastewater management, solid waste management, air pollution control and environmental monitoring, analysis, and assessment together account for over 76% of total trade

[28] Fliess, Barbara and Kim, Joy. Business Perceptions of Non-tariff Barriers Facing Trade in Selected Environmental Goods and Associated Services: Survey Results. COM/ENV/TD(2006)48/FINAL. OECD, 12 Sep 2006

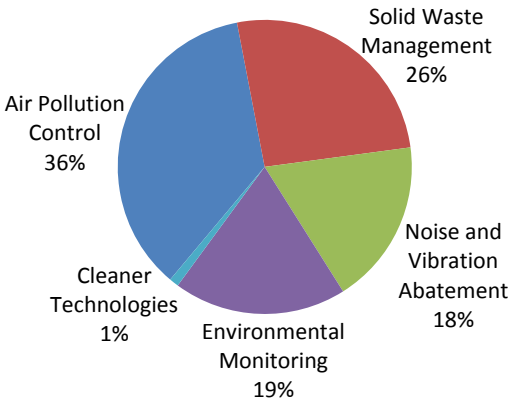
[29] DG Trade. EU-China trade in facts and figures. Nov 27. Available at: http://trade.ec.europa.eu/doclib/docs/2007/november/tradoc_136870.pdf

[30] Euro-Yuan exchange rates for 2006-2007 obtained from http://www.x-rates.com/

[31] DG Trade. Mandelson in China: EU-China trade deficit "measure of our untapped potential". Nov 2007. Available at: http://ec.europa.eu/trade/issues/bilateral/countries/china/pr271107_en.htm

between the EU and China within the sector.[32] Wastewater management alone accounts for €5.9 bn (41%) of total trade in the EGS sector, followed by solid waste management with €1.9 bn (13%), air pollution control with €1.7 bn (12%), and environmental monitoring, analysis and assessment with €1.5 bn (or 10% of total trade). The remaining 24% of EU-China EGS trade is composed of renewable energy plants with €1.2 bn (9%), remediation and cleanup with €856 mn (6%), heat and energy savings management with €697 mn (5%), and noise and vibration abatement with €624 mn (4%). The water supply and cleaner technologies subsectors each account for less than €30 mn, or under 1% of total trade. When viewed from a broad perspective of EET and EPP categorisation, in 2006 EET goods accounted for 86% of EGS trade between the EU and China, while EPP goods amounted to 14%.

Figure 5: EU27-China Trade - EU27 Surplus by Environmental Subsector (2006)



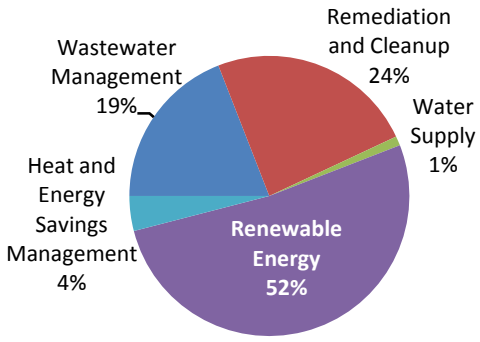
Source: Eurostat

Additional subsectoral trends emerge when trade data is analysed beyond just bilateral trade totals. In 2006 the EU had a €555 mn deficit in trade of EGS with China, however, this figure masks the EU's strengths in several subsectors (see **Figure 5**). When viewed at a subsectoral level, the EU actually had a surplus of €2 bn in air pollution control, solid waste management, noise and vibration abatement, environmental monitoring, analysis and assessment, and cleaner technologies. Of these, air pollution control accounted for 36% with a surplus of €748 mn, followed by solid waste management with a €540 mn surplus (26% of the overall surplus), environmental monitoring, analysis, and assessment with €396 mn (19%), noise and vibration abatement with €379 mn (18%), and cleaner technologies with €21 mn (1%). These figures highlight Europe's sustained comparative advantage in these sectors, which have developed in line with the high value which the EU places on stringent environmental stewardship in urban centres. Significantly, when the EU surplus is viewed from a perspective of EET and EPP goods, a clear dominance emerges of EET goods, which accounted for 99% of the EU surplus with China in EGS trade in 2006. This further reinforces prior OECD studies which indicated that developed countries often outperform developing countries in the field of EET goods.

In addition to clear trends which signify the strengths of European producers at a subsectoral level, a number of subsectors exist in which a disadvantage is implied by the trade deficit. If surplus subsectors are excluded, however, the deficit totals over €2 bn. Notably, 52% of this deficit is encapsulated in the renewable energy subsector, which had a trade deficit of €1.07 bn in 2006 (see **Figure 6**). This is followed by remediation and cleanup, claiming 24% with a deficit of €494 mn, followed by wastewater management with 19% and €393 mn deficit, heat and energy savings management with 4% and €83 mn deficit, and finally water supply with 1% and €22 mn deficit. While deficits are relatively moderate in most subsectors, the fact that renewable energy accounts for over half of the deficit, while accounting for only 13% of total trade in the EGS sector, demands close analysis in addition to the competitive sectors listed above. From a historical perspective, these weights have remained relatively constant since 1999, with only slight shifts of several percent in any one subsector, save renewable energy, which has grown from 2% of EU imports in 1999 to 16% of

[32] Note: due to the overlap of HS codes between different EGS subsectors, as well as the limited availability of trade data for other HS codes, subsector trade comparisons provided here do not total to the 2006 total trade figure of €12.6 bn. Percentages are calculated using trade totals per subsector based on all HS codes listed under the OECD list provided in Annex 1.

Figure 6: EU27-China Trade - EU27 Deficit by Environmental Subsector (2006)



Source: Eurostat

imports from China in 2006. When analysed using the larger classifications of EET and EPP goods, prior OECD findings are reinforced with evidence that China holds a comparative advantage in the field of EPP goods, which accounted for approximately 57% of the EU deficit with China in EGS in 2006.

1.3 Market Access Obstacles in China

Previous studies indicates that despite the aforementioned European deficits with China, both in terms of overall trade as well as on a EGS specific basis, European companies remain highly competitive on a global scale.[33] This fact, coupled with rising deficits, raise concerns that impediments to trade, such as tariff and non-tariff barriers, are in place which put European operators at a disadvantage. In the case of tariffs, China's tariff and duty regime has improved steadily following WTO accession. Despite China's progress, however, tariffs on environmental goods remain significantly high, limiting the ability for China to combat its domestic environmental problems with assistance from international operators. Although China's tariff averages in the sector remain below the developing country average of 11.7%, the ongoing scale of China's environmental problems raise concerns that vital technology from foreign sources continues to face prohibitively high barriers (see **Table 3**). With an average tariff rate of 7.9% on environmental goods, China serves only to limit access to technologies which, by its own admission, it does not have the capacity or technology to produce domestically.[34] Furthermore, sector averages mask tariff peaks which are as high as 40% on selected goods. Notably, the fact that European goods in the renewable energy subsector face such high average tariffs raises concern that China's tariff regime may contribute significantly to Europe's noted growing deficit in the subsector. Tariff reductions in China beyond its bound WTO commitments will likely remain a sensitive issue, keeping in mind that tariffs on environmental goods in China generated approximately US$2 billion in government revenues in 2007.[35] While substantial agreements to reduce tariffs bilaterally are not foreseen in the EU-China PCA negotiations, they may lay the groundwork for future reductions through establishment of a negotiating framework.

Table 3: Average Tariff Rates in Environmental Goods Subsectors

Subsector	China	EU
Air Pollution Control	6.3%	1.7%
Wastewater Management	7.4%	2.5%
Solid Waste Management	7.5%	2.7%
Remediation and Cleanup	5.3%	2.5%
Noise and Vibration Abatement	8.0%	1.8%
Environmental Monitoring, Analysis and Assessment	4.3%	0.0%
Cleaner Technologies	8.5%	6.2%
Water Supply	5.8%	4.9%
Renewable Energy	23.1%	7.7%
Heat and Energy Savings Management	8.3%	2.1%
Environmental Goods - Sector Average	**7.9%**	**2.3%**

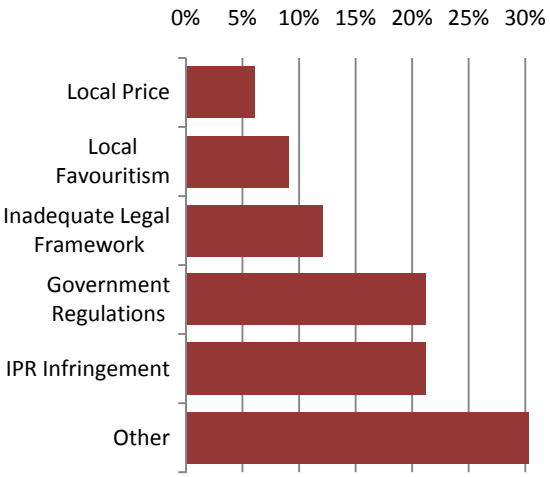
Source: TARIC Database. European Commission, Taxation and Customs Union

[33] Future Opportunities and Challenges in EU-China Trade and Investment Relations 2006-2010. Available at: http://ec.europa.eu/trade/issues/bilateral/countries/china/legis/index_en.htm

[34] Ruqiu, Ye. Trade, environment and Sustainable Development Perspective in China. State Environmental Protection Administration, October 2003. Available at: http://www.iucn.org/themes/pbia/themes/trade/training_readings.htm

[35] Lynch, D. Opportunity shines in China's haze, USA Today, 18 Sept 2007. Available at: http://www.usatoday.com/money/industries/environment/2007-09-17-china-green_N.htm

Figure 7: Obstacles to European Producers in China's EGS Sector



Source: DG Trade (2007)

In addition to tariff rates, which at the very least are foreseeable from a European operator's point of view, a number of non-tariff barriers (NTBs) exist in China which limit access for European environmental goods and services (see **Figure 7**). Previous studies on European experiences by the European Commission have indicated that in addition to common barriers in foreign markets, such as intellectual property right concerns, government regulations and local price, a host of other behind the border barriers exist in China. These include, but are not limited to, unclear licensing regimes, economic needs test for market entry with unspecified criteria and discrimination in the public procurement process against foreign operators.[36] Additionally, other studies have found that the contractual obligations of Chinese partners may not be upheld to the degree European operators expect.[37]

While a number of barriers are perceived by European operators, reports indicate the licensing environment has improved significantly in recent years, with many requirements approaching acceptable levels of transparency or international harmonisation. Complaints have been raised, however, regarding the provision of a broad portfolio of environmental services.[38] In these situations European operators with historically broad offerings, which include construction and engineering services in the design of new projects, fall under separate licensing requirements which are significantly more stringent for engineering services. This limits the ability of European businesses to provide their full range of environmental services. Furthermore, local experience and local staffing requirements, wherein foreign operators must have at least 8 years of China experience to be granted a license or Chinese staff with at least 15 years of sector experience, have been cited as a barrier to a number of potentially competitive foreign operators.[39]

Subsidies are a further barrier which limits opportunities to European businesses that do not enjoy similar government support. Although in many cases evidence is anecdotal, a recent study on energy subsidies in China's steel production industries indicates that the problem is empirically demonstrable, if not in all sectors. Within the steel industry it has been estimated that approximately US$27.11 bn in energy subsidies have been supplied by the Chinese government between 2000 and 2007.[40] Of this, 96% went towards traditional, coal based energy production, 4% towards cleaner electricity generation via natural gas, and none towards energy from renewable sources. This example, in which a subsidy in a seemingly unrelated industry (steel production), distorts separate markets, such as that of the energy market (specifically disenfranchising renewable energy), highlights the complexities which surround subsidy regimes.

[36] Future Opportunities and Challenges in EU-China Trade and Investment Relations 2006-2010: Study 11 - Sustainable Technologies and Services. Available at: http://ec.europa.eu/trade/issues/bilateral/countries/china/legis/index_en.htm

[37] Private Sector Involvement in Solid Waste Management – Avoiding Problems and Building on Successes. German Federal Ministry for Economic Cooperation and Development, 2005. Available at: http://www2.gtz.de/dokumente/bib/05-0412.pdf

[38] Personal correspondence, EU-China Trade Project, February 2008

[39] *Ibid*

[40] Haley, Usha. Shedding Light on Energy Subsidies in China: An Analysis of China's Steel Industry from 2000-2007. Alliance for American Manufacturing, 8 Jan 2008. Available at: http://www.americanmanufacturing.org/wordpress/wp-content/uploads/2008/01/energy-subsidies-in-china-jan-8-08.pdf

2. Baseline Scenario

2.1. Established Environmental Technologies

Established Environmental Technologies (EET) concerns those goods whose primary use provides a direct solution to an environmental problem, most often in the areas of pollution reduction and remediation. Notably, all EET subsectors sectors have corresponding service subsectors, which entail the design, construction, management and maintenance of facilities which employ these goods. OECD subsectors which fit under the EET classification include air pollution control, wastewater management, solid waste management, remediation, noise and vibration abatement, and environmental monitoring, analysis and assessment. These subsectors and their justification for inclusion under EET are further explained below.

As defined by the OECD EGS list, air pollution control consists of goods which mitigate the effects of air pollution. This is done through reduction of contaminants released into the air, either through destruction prior to emission or removal via exhaust systems. The air pollution control subsector is subdivided into six smaller subsectors: air handling equipment, catalytic converters, chemical recovery systems, dust collectors, separators and precipitators, incinerators and scrubbers, and odour control equipment.

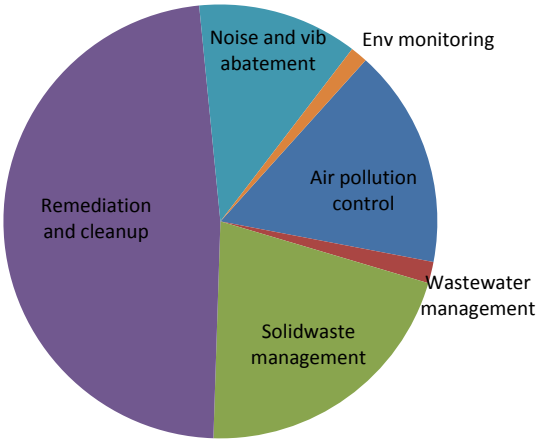
The wastewater management subsector is composed of goods which assist in the treatment of wastewater so that it may be safely discharged or reused. The subsector is divided into nine categories: aeration systems, chemical recovery systems, biological recovery systems, gravity sedimentation systems, oil water separation systems, screens and strainers, sewage treatment equipment, water pollution control and water handling goods.

Solid waste management goods and services aid in the safe disposal of municipal solid waste and hazardous industrial wastes. The subsector is composed of seven categories: hazardous waste treatment and storage equipment, waste collection equipment, waste disposal equipment, waste handling equipment, waste separation equipment, recycling equipment and incineration equipment.

Remediation and cleanup is the practice of reducing, isolating, or removing contamination from a polluted environment with the goal of preventing or reducing human and animal exposure to contaminants which pose a health risk. Within the OECD's definition, the subsector is subdivided into three categories: absorbents, cleanup goods and water treatment equipment.

Noise and vibration abatement's purpose is to reduce noise pollution. The OECD definition includes the categories mufflers and silencers, noise deadening material (i.e. dampening), vibration control systems and highway barriers (sound barriers constructed between highways and adjacent residential complexes) is representative of the global sector, however the OECD listed goods, which all fall under mufflers and silencers, indicate the inherent weaknesses in the HS system which make selecting appropriate goods for the other categories difficult. Despite the ambiguity of the OECD's list, the sector serves to reduce several types of noise pollution. The first and last category, mufflers and silencers and highway barriers, are intended to

Figure 8: Chinese Output in EET Goods and Services by Subsector - 2006



Source: China Yearly Industrial Data, China Data Center, EMG Analysis

mitigate noise generated by automobile traffic, primarily from large diesel vehicles used for commercial transportation. Noise deadening materials and vibration control systems aim to reduce noise generated by heavy industry as well as construction.

Environmental monitoring, analysis and assessment is unique from other EGS subsectors in that independently it does not produce any benefits for the environment. Rather, analysis and assessment is a crucial starting point in improving environmental quality, and can help shape mitigation policies so that efforts to reduce pollution are effective and focused. Monitoring is equally important to ensure that environmental quality is maintained or improved over a long term, as well as enabling public information campaigns, as seen in Europe with the European Environmental Agency's EuroAirnet and Ozone Today services. Within the monitoring, analysis and assessment subsector are the categories measuring and monitoring equipment, sampling systems, process and control equipment, data acquisition equipment, and 'other instruments and machines'.

Within China, baseline production data for 2006 indicates the EET sector was worth approximately US$ 17 billion in gross value output. Among this figure remediation and cleanup goods and services accounted for nearly half, followed by solid waste management, air pollution control, noise and vibration abatement, wastewater management and environmental monitoring (see **Figure 7**).[41] It should be noted that higher or lower production levels within China do not necessarily imply their relative levels of implementation in China – high output in one sector may be due to high global demand, while low output in another sector may see a larger share consumed within China.

2.1.1. Economic Significance

In total the established environmental technologies sector accounted for over 86% of bilateral trade in environmental goods in 2006, signifying the continued importance of traditional means of combating pollution, such as treatment, control and remediation. When viewed independently of EPP goods, the EU has a surplus of over €1.1 bn. It is important to note that all EET subsectors also entail accompanying services which are involved in the efficient utilisation and maintenance of these goods. On a global scale, estimates show that EET goods accounted for some 90.2% of world trade in environmental goods in 2003.[42]

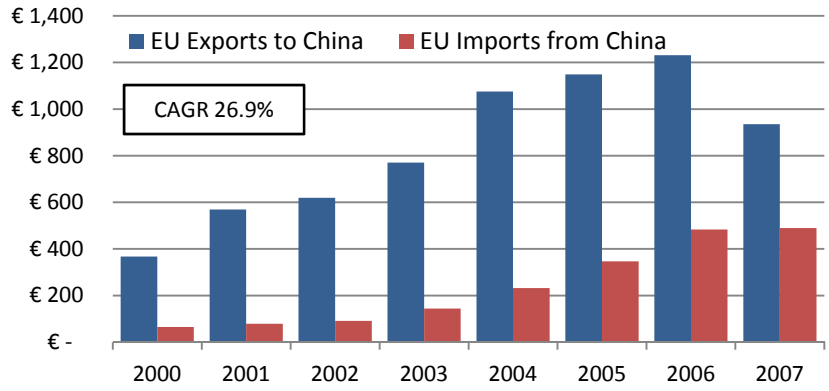
Air Pollution Control Equipment

Under the OECD definition of EGS, the air pollution control subsector constitutes a significant portion of EU-China trade, with €1.7 bn in total trade in 2006 and a EU27 surplus of €748 mn. This follows an average growth rate of 26.9% in bilateral trade in the subsector since 1999 (see **Figure 8**).

[41] For additional information on base data, sources, methodology, and analysis, please see **Chapter 6**.

[42] Bora, B. and Teh, R. 2004. Tariffs and Trade in Environmental Goods. Workshop on Environmental Goods, Geneva, 11 October 2004.

Figure 9: EU27-China Trade in Air Pollution Control (€ million)



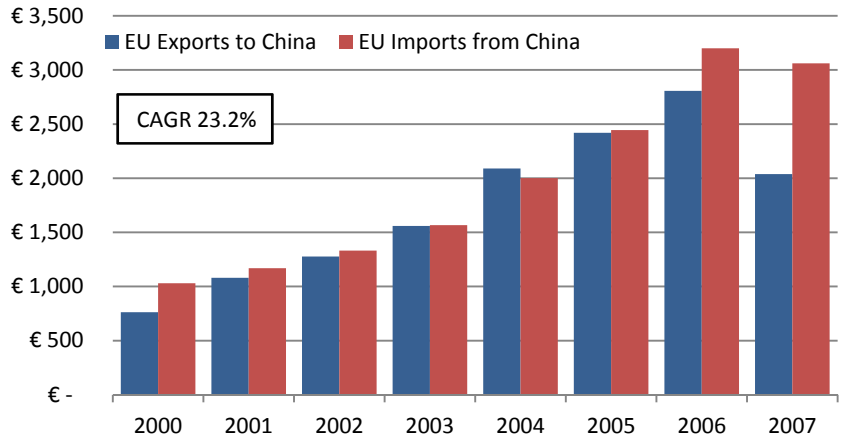
Note: Year 2007 figures are for January through to September due to data availability.
Source: Eurostat

Preliminary data for January through September 2007 indicates that imports from China are expected to remain on this growth path, reaching €652 mn by the year's end from €483 mn in 2006, however EU exports to China will remain flat, reaching only €1.27 bn from €1.23 bn in 2006, if 2007 trends hold steady. Within the air pollution control subsector five items are dominant in terms of EU-China trade. Various types of compressors (HS 841480, HS 841490, HS 841430) account for 57% of EU imports and 44% of EU exports with China in the first nine months of 2007. Machinery which mitigates changes in air temperature (HS 841989) accounted for 3% of imports, but 16% of exports, and odour control equipment (HS 842490) 13% of imports and 3% of exports.

As part of China's new environmental budget, which is expected to grow to RMB 880 billion per annum by 2010, the central government is expected to spend RMB 580 bn (€54 bn) between 2006 and 2010 on air pollution control, at an annual growth rate of 15% during that period.[43]

Wastewater Management Equipment

Figure 10: EU27-China Trade in Wastewater Management goods (€ million)



Note: Year 2007 figures are for January through to September due to data availability
Source: Eurostat

Analysing the OECD defined list of goods in the wastewater management subsector reveals a slow erosion of a previous European competitive

[43] China Commits $200 billion to clean up pollution. TIME. November 29 2007. Available at: http://www.pacificenvironment.org/article.php?id=2637

advantage in the sector in the context of EU-China trade which has accelerated in 2006 and 2007 (see **Figure 9**). Total bilateral trade in the subsector reached €6 bn in 2006, with an average annual growth rate of 23.2% since 1999. In 2006 the EU ran a deficit with China in the subsector totalling €393 mn. Based on preliminary data for 2007, this figure will grow to €1.3 bn in 2007, due to a contraction of EU exports to €2 bn from €2.4 bn in 2006, while imports from China will expand to €4.08 bn.

Within the sector two products comprise 58% of EU imports from China, while exports are more evenly dispersed with the top three items comprising 34% of exports. In imports from China, plastic screens and strainers (HS 392690) and taps, cocks and valves for water handling (HS 848180) each accounted for over €900 mn, or 29% each of imports in the first nine months of 2007. Analysis of exports reveals that taps, cocks and valves for water handling (HS 848180) account for 15%, compressors for aeration systems (HS 841480) for 12% and plastic screens and strainers (HS 392690) for 7% of exports in the same period.

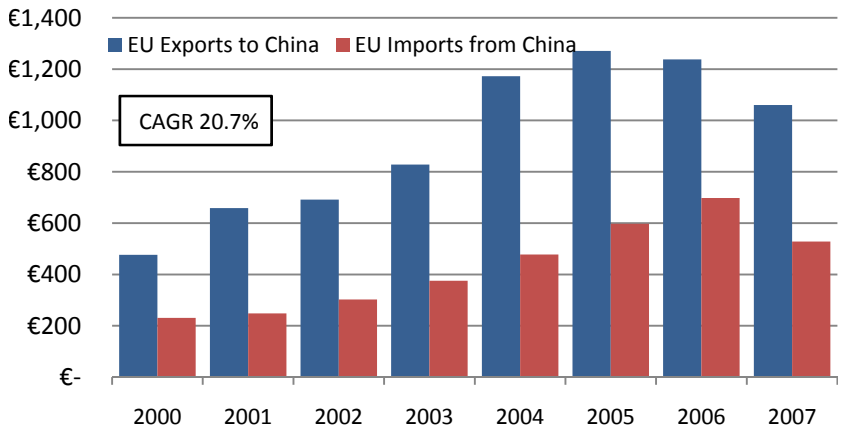
In 2006, China launched a massive water pollution control project worth several billion RMB, making it the country's largest environment-related scientific research project in terms of investment. The project will develop technologies to ensure drinking water security, limit environmental deterioration of river valleys and control water pollution in cities.[44] The Chinese government plans to spend a further RMB 620 bn (€57 billion) by 2010 to build waste-water treatment plants and upgrade water distribution systems around China.[45]

Solid Waste Management

Since 1999 the EU has maintained a strong competitive advantage in the solid waste management goods sector, with EU-China bilateral trade in the sector growing at a average annual rate of 20.7%, reaching €1.94 bn in 2006 (see **Figure 10**). Of this, the EU held a surplus of over €540 mn. Notably, this figure represented a decline from the EU's 2005 surplus of €673 mn, however, early 2007 trends indicate that the surplus will rebound to over €708 mn, with exports to China growing to €1.4 bn and imports from China to €700 mn.

[44] SEPA (2006)
[45] China Commits $200 billion to clean up pollution. TIME. November 29 2007. Available at: http://www.pacificenvironment.org/article.php?id=2637

Figure 11: EU27-China Trade in Solid Waste Management Goods (€ million)



Note: Year 2007 figures are for January through to September due to data availability.
Source: Eurostat

In the solid waste management sector EU exports to China are dominated by non-electric furnace parts (HS 841790) and recycling machines having individual functions (HS 847989) which constitute respectively 22% and 54% of all exports in 2007. EU imports from China are concentrated within three goods: Household and toilet articles of plastic (HS 392490) with 30% of imports, electric space heating and solid heating apparatus (HS 851629) with 28% of imports, and recycling machines having individual functions (HS 847989) with 18% of imports.

Studies by the World Bank indicate that China's municipal solid waste sector should grow strongly in the near future, with waste output expected to grow by 150% by 2030, to 480 million tons per annum.[46] This increase is expected to require at least 1,400 additional landfills to be developed over the same period; furthermore, the Chinese government plans to simultaneously expand incinerator usage to cover 30% of all waste disposal, up from 3% in 2006, in order to reduce land use and contamination.[47] Concurrent with this growth in solid waste output, the Chinese government is expected to increase expenditures on solid waste management facilities and services by 15% annually until 2010, with 2006-2010 expenditures topping RMB 204 bn (€19 bn). To fully meet demand and effectively eliminate environmental degradation in the sector, however, budget outlays 2 to 3 times greater are expected to be necessary.[48]

Electronic waste disposal is another subsector which is expected to grow rapidly in coming years in China. In 2005 China produced approximately 2 million tons of e-waste, or 4% of world output, however this figure is expected to double by 2010.[49] China's relatively weak policy regime towards e-waste reduction and disposal has improved significantly in recent years, most recently with the March 2007 adoption of regulations similar to the EU's

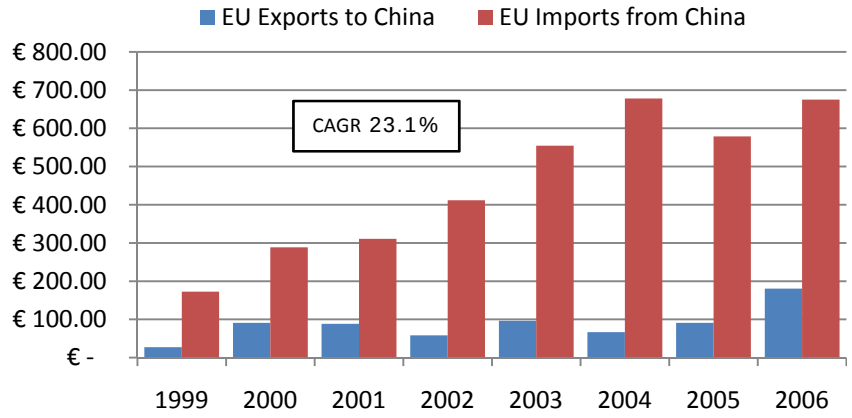
[46] World Bank "Waste Management in China: Issues and Recommendations." 2005
[47] OECD "Environmental Performance Review of China" 2007
[48] China Commits $200 billion to clean up pollution. TIME. November 29 2007. Available at: http://www.pacificenvironment.org/article.php?id=2637
[49] Zhou Guomei. E-wastes management in China. State Environmental Protection Agency, 2006. Available at: http://www.env.go.jp/recycle/3r/en/asia/02_03-4/08.pdf

Restriction of Hazardous Substances Directive (RoHS), although adoption of more stringent policies, similar to the European Directive on Waste Electrical and Electronic Equipment (WEEE) would greatly improve the situation. European producers and service suppliers in this currently niche field would likely perform well if provided adequate market access, given their familiarity with both environmental regulations and sanitary best practices.

Remediation and Cleanup

In 2006 EU-China bilateral trade in the remediation and cleanup sector grew to €856 mn, up from €669 in 2005 and consistent with an average growth trend of 23% since 1999 (see **Figure 11**). Although sector growth occurred from 2005 to 2006, a decline of €74 mn, or 10%, was experienced from 2004 to 2005, a result of imports from China falling by €98 mn while EU exports grew steadily by €24 mn. Preliminary 2007 data indicates that these trends will continue, with EU exports expected to grow by 43% to €259 mn and imports from China declining by 25%, to €503 mn.

Figure 12: EU-China Trade in Remediation and Cleanup goods (millions



Source: Eurostats

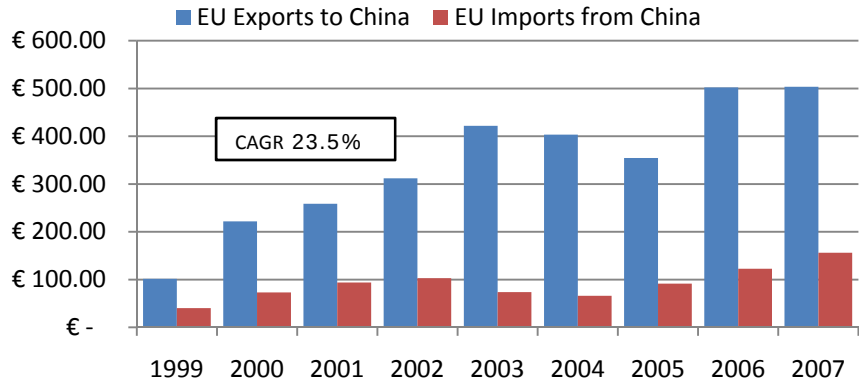
Under the current OECD definition the remediation and cleanup subsector is comprised of only three sectors, due to the inherent difficulties of using the HS system. These goods are: soil heating apparatus (HS 851629), water treatment machines with one function (HS 854389) and lasers for cleanup (HS 901320). Of these goods 'water treatment machines with one function' constituted 64% of total trade, with over 58% of imports from China and 81% of exports to China. Soil heating apparatus accounted for 31% of bilateral trade, including 39% of imports from China, and lasers accounted for 5% of trade, however, of this they made up 16% of EU exports, signifying EU producers' technical strengths.

Noise and Vibration Abatement

In 2006 EU-China trade in the noise abatement subsector grew by over 40%, to €624 mn from €445 mn in 2005 (see **Figure 12**). This growth was significantly accelerated from the long-term trend of 23% annual growth since 1999. Within the 2005-2006 growth of €178 mn, €147 mn or 82%, was due to growth in European exports to China, signifying that as Chinese cities continue to rapidly modernise their demand for automotive transport as well as suitably

low noise pollution will continue to rise. Preliminary 2007 data confirms this, with bilateral trade growth expected to maintain at 40%, again dominated by exports which may grow to as high as €671 mn.

Figure 13: EU-China Trade in Noise and Vibration Abatement goods



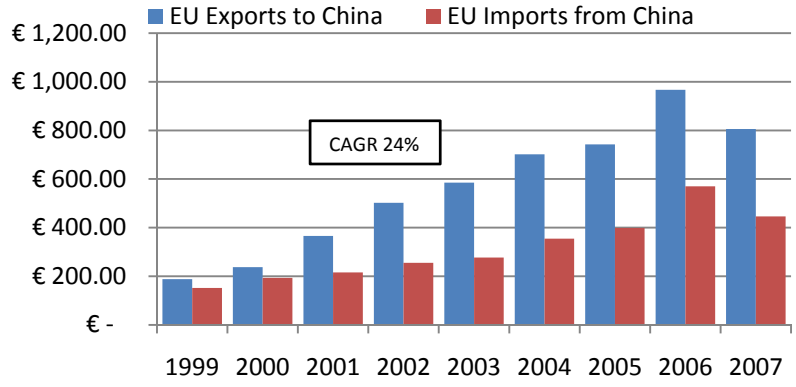
Source: Eurostats
Note: Year 2007 figures are for January through September due to data availability.

Environmental Monitoring, Analysis and Assessment

Bilateral trade between the EU and China in the environmental monitoring, analysis and assessment subsector constituted 10% of trade in EGS in 2006, reaching €1.53 bn (see **Figure 13**). This represented growth of 34% from 2005, 10% higher than the average annual growth rate of 24% since 1999. Furthermore, in 2006 the EU maintained a long running surplus, reaching €396 mn. Preliminary 2007 data indicates that growth will slow significantly, tapering out at only 8%. While overall bilateral trade may only reach €1.67 bn, a majority of this growth will be in European exports, with the EU surplus growing 20% to €479 mn.

In 2006 49% of EU imports from China occurred in 4 goods: thermometers and pyrometers (HS 902519) (14%), hydrometers, barometers and hygrometers (HS 902580) (11%), instruments for physical or chemical analysis (HS 902780) (13%) and other measuring instruments (HS 903180) (12%). In the same year 44% of EU exports were composed of just two goods: other measuring instruments (HS 903180) (32%) and instruments for automatic control and regulation (HS 903289) (12%).

Figure 14: EU27-China Trade in Environmental Monitoring goods (millions)



Source: Eurostats
Note: Year 2007 figures are for January through September due to data availability.

2.1.2. Social Significance

Air Quality

Over half of the urban population in China is exposed to poor air quality with an annual average PM10 levels exceeding 100 μg/m^3. Over 11% are exposed to PM10 levels in excess of 150 μg/m^3, approximately triple EU standards for healthy air. The provinces with the largest percentage of people exposed to PM10 levels are generally in the north.[50] Suspended particulate levels are higher in northern cities, due in part to heavy industrial activity but also geographic and meteorological conditions that make these cities more vulnerable to particulate pollution than cities in the south.[51] Epidemiological research has found a consistent and coherent association between air pollution and medical conditions such as reduced lung functions, respiratory symptoms, chronic bronchitis, cardiovascular and cerebrovascular diseases and premature death. World Bank studies have indicated that the costs of healthcare due to diseases incurred by poor air quality in China may have been as high as RMB 520 bn in 2003, or 3.8% of GDP.[52]

Moreover, research shows that air pollution has a higher impact on the less economically advanced parts of China, which have a higher share of the country's poor population. Ningxia, Xingjiang, Inner Mongolia and other low income provinces are more affected by air pollution on a per capita basis than high income provinces such as Guangdong.[53]

Water Supply

Around 700 million Chinese do not have access to drinking water that meets minimum purity standards, leading to a high prevalence of cholera and other waterborne diseases. Furthermore, between 300 and 500 million rural residents lack adequate sanitary facilities, aggravating the risk of contracting these diseases.[54] Biological and chemical pollutants, which continue to contaminate China's limited water supplies, have a number of major health implications to those who consume untreated water, including a variety of birth defects, cancers and other terminal health risks (see **Table 4**). Although health risks to rural Chinese are significant, an estimated water supply shortfall of 30 billion cubic meters means that utilising untreated water sources remains the only means of survival for many millions of Chinese.[55] It is estimated that in 2003 health complications raised by water contamination cost Chinese citizens up to RMB 66 bn, although this figure notably excludes costs of cancer treatment.[56]

[50] The World Bank and State Environmental Protection Agency of the P.R.C., Cost of Pollution in China, 2007
[51] Pandey et al., 2005
[52] The World Bank and State Environmental Protection Agency of the P.R.C., Cost of Pollution in China, 2007
[53] The World Bank and State Environmental Protection Agency of the P.R.C., Cost of Pollution in China, 2007
[54] The World Bank and State Environmental Protection Agency of the P.R.C., Cost of Pollution in China, 2007
[55] DG Trade (2007) Future Opportunities and Challenges in EU-China Trade and Investment Relations – Study 10: Sustainable Technologies and Services
[56] The World Bank and State Environmental Protection Agency of the P.R.C., Cost of Pollution in China, 2007

Table 4: Health Impacts of Biological and Chemical Water Contamination

Biological Contaminants	Chemical Contaminants	
Bladder Cancer	Bladder Cancer	Skeletal fluorosis
Colorectral Cancer	Liver Cancer	Central nervous system defects
Gastric Cancer	Lung Cancer	Mental retardation
Ovarian Cancer	Renal Cancer	Peripheral neuropathy
Non-Hodgkin Lymphoma	Skin Cancer	Hepatomegaly (enlarged liver)
Hypertension	Pre-malignant Lesions	Adverse birth outcomes
Cholera	Peripheral vascular disease	Spontaneous Abortion
Diarrheal Diseases	Hypertension	Diabetes Mellitus
Dysentery	Bronchiectasis	Renal Dysfunction
Hepatitis	Bone deformity	
Typhoid Fever	Dental fluorosis	
Renal Dysfunction		

Given China's pressing water supply concerns, increasing stewardship would be expected. In reality, however, a number of high profile incidents have continued to highlight that regulatory controls remain poorly implemented and as a result many Chinese citizens continue to lack adequate access to clean drinking water. Most recently, in May 2007 China's third largest freshwater lake, Lake Tai in Jiangsu province, suffered a massive algal bloom which stained its waters fluorescent green due to extensive dumping by the over 2,800 chemicals factories lined its shores. As a result over 2.8 million locals whom depend on the lake lacked clean drinking water for over a week, with cleanup costs expected to exceed RMB 108.5 bn (€9.9 bn).[57] This event occurred despite orders from SEPA in 2006 for 50% of China's 7,555 chemicals factories to improve their preventative safety measures at a cost of over RMB 14.05 bn in order to address water pollution concerns.[58]

E-Waste

Within China, e-waste is rarely disposed of in a responsible manner from a human health perspective. Typically, e-waste is burned by night and hand stripped by day with the use of hydrochloric acid in an attempt to collect precious metals such as gold and copper. Because this re-collection is done in such a crude manner, workers are exposed to a variety of carcinogenic chemicals, such as lead, cadmium, phosphorus, polychlorinated biphenyls (PCBs) and polybrominateddiphenyl ethers (PBDEs). These chemicals are capable of causing stomach disease, lung disease, miscarriages, birth deformities and premature deaths. Case studies on the e-wastes industry, which is concentrated especially in China's Guangdong province, indicate that towns such as Guiyu are heavily dependent on the hazardous industry, with

[57] Yardley, Jim. China Vows to Clean Up Polluted Lake. New York Times, 27 Oct 2007. Available at: http://www.nytimes.com/2007/10/27/world/asia/27china.html

[58] Xinhua. Half of China's chemical plants endanger environment. 11 July 2006. Available at: http://news.xinhuanet.com/english/2006-07/11/content_4818672.htm

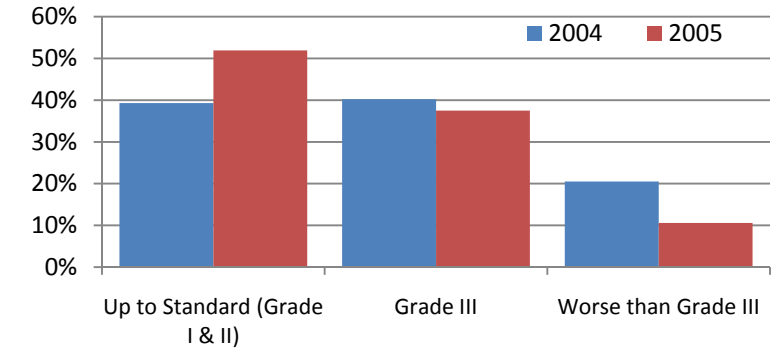
over 150,000 citizens and 75% of business directly involved in e-waste processing.[59]

2.1.3. Environmental Significance

Air Pollution

Energy consumption, particularly coal, is the main source of the air pollutants SO_2, NO_x, and CO_2 in China.[60] In 2005 SEPA conducted a monitoring programme on 522 cities assessing their air quality standards; 22 cities (4.2%) met Grade I of the national air quality standard; 293 (56.1%) met Grade II; 152 (29.1%) met Grade III and 55 (10.6%) failed to meet Grade III. Compared with the previous year, the proportion of cities with air quality at or better than Grade II has increased by 12.6% while the percentage of cities with air quality worse than Grade III decreased by 9.9% (see **Figure 14**). The monitoring study showed that particulate matter, rated using the PM10 scale, is still the major pollutant affecting air quality in Chinese cities, although the quantity was significantly reduced in 2005. 40.5% of the cities monitored had particulates exceeding the Grade II standard requirements but registered a decrease by 12% compared to 2004 figures; 5.5% were over Grade III standard, registering a decrease of 9.4% compared to 2004. Notably, China's State Environmental Protection Agency classifies Grade II as having a PM10 range of 50-150, a rating considered to have a medium to high impact on health by European standards. Furthermore, SEPA's Grade III rating represents a PM10 rating of 150-250, while European standards classify any rating about 180 as having a very high health impact.[61]

Figure 15: Chinese Cities by Air Quality Rating

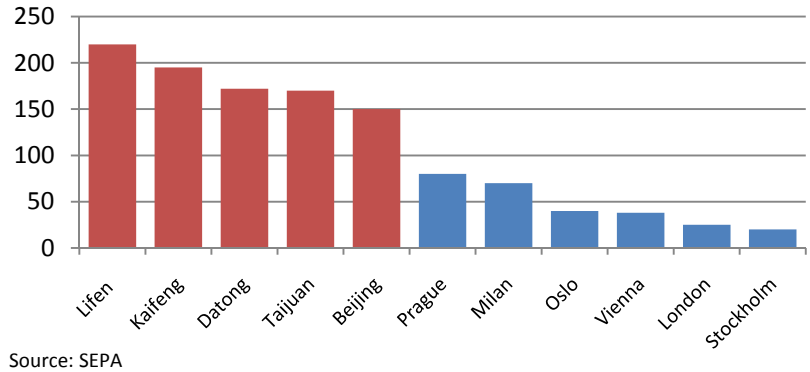


Source: SEPA

Although a reduction in air pollution has been achieved, Chinese cities are still some of the most polluted cities in the world with annual average PM10 concentrations two or three times higher than those of European capitals (see **Figure 15**).

[59] Jones, Samatha. China as e-waste dumping ground: A growing challenge to ecological and human health. China Environmental Health Project, USAID. 1 Feb 2007
Bodeen, Christopher. China not fighting off e-waste. Washington Post,
[60] China Statistical Yearbook 2004
[61] Air Quality in Europe. Indices definition. Available at: http://www.airqualitynow.eu/

Figure 16: Chinese and European Cities by Average PM10 Rating



Source: SEPA

In addition to poor air quality ratings, China's increasing SO_2 emissions have had a knock on effect of exacerbating water quality problems. Acid rain, caused primarily by high SO_2 emissions which have grown at a rate of over 5% annually since 2000, has occurred with increasing frequency in recent years.[62] As a result, it is estimated that in 2003 acid rain was the cause of over 80% of crop losses nationally, at a total cost of RMB 30 billion.[63] Additionally, acid rain also causes material damages to buildings, at a cost of over RMB 7 billion the same year. Notably, acid rain's contribution to forest damages is unaccounted for, with a poor monitoring framework cited as the primary reason. In 2007 SEPA revised their figure for direct economic losses due to acid rain in 2005 to a staggering RMB 500 billion.[64]

Water Pollution

In 2005 a Ministry of Water Resources study found that approximately 25,000 km of Chinese rivers were below environmental quality requirements to be deemed suitable for aquatic life. The same study also found that 90% of waterways near urban centres suffered from 'serious' pollution.[65] **More widely, in 2008 SEPA reported that 25% of all waterways in China were unfit for even limited human contact, failing to meet standards for even SEPA's lowest water rating, Grade V.**[66] In recent years pollutants to waterways, historically composed primarily of industrial discharge, have increasingly originated from 'nonpoint' sources, particularly agriculture where use of nitrogenous fertilizer has grown by 40% and use of chemical pesticides has doubled from 1990 to 2004.[67] Nonpoint sources of pollution are more difficult to combat compared to industrial sources, due to their distributed nature which makes monitoring, enforcement and remediation complicated. In 2003, over six million kilograms per day of organic pollutants were released into China's waterways.[68] This has led to approximately 38% of China's rivers and

[62] SEPA. State of the Environment 2005
[63] The World Bank and State Environmental Protection Agency of the P.R.C., Cost of Pollution in China, 2007
[64] Rosen, D., Houser, T. China Energy: A Guide for the Perplexed. Center for Strategic and International Studies and the Peterson Institute of International Economics
[65] Ministry of Water Resources. Annual Report 2005. Available at: http://www.mwr.gov.cn
[66] Graham-Harrison, Emma. China says pollution goals low as unveils ministry. Reuters, 11 March 2008. Available at: http://uk.reuters.com/article/idUKSP25601120080311?sp=true
[67] China Statistical Yearbook 2004
[68] Emissions of organic water pollutants are measured in terms of biochemical oxygen demand, which refers to the amount of oxygen that bacteria in water will consume in breaking down waste (World Bank 2006).

75% of its lakes to be severely polluted, while only 20% of water waste is treated in China, compared to 80% in most developed countries.

Exacerbating the severity which pollution has on water resources is an increasing scarcity of water supplies. China's per capita volume of water resources is small at only 2,170 cubic meters, equivalent to less than 28% of the world average. By 2030, when China's population is expected to reach 1.6 billion, this figure will drop to 1,760 cubic meters, dangerously near the international water-shortage benchmark of 1,700 cubic meters. [69] By comparison water resources per capita for the Euro zone stands at 2,942 cubic meters per capita. [70] Furthermore, water resources are more equally distributed in the EU than in China, making water availability in Europe a less pressing concern.

A result of consistently high release of pollutants in China's waterways has contributed to increasing occurrences of algal blooms, also known as red tides, which caused over RMB 69 million in direct economic losses (primarily to coastal fisheries). Algal blooms are caused primarily through water pollution which contains high levels of nutrients, known as 'eutrophication', as is often the case in agricultural runoff and some forms of chemical dumping. The risk of this phenomenon is significant throughout China, with 75% of lakes suffering from eutrophication in 2008. [71]

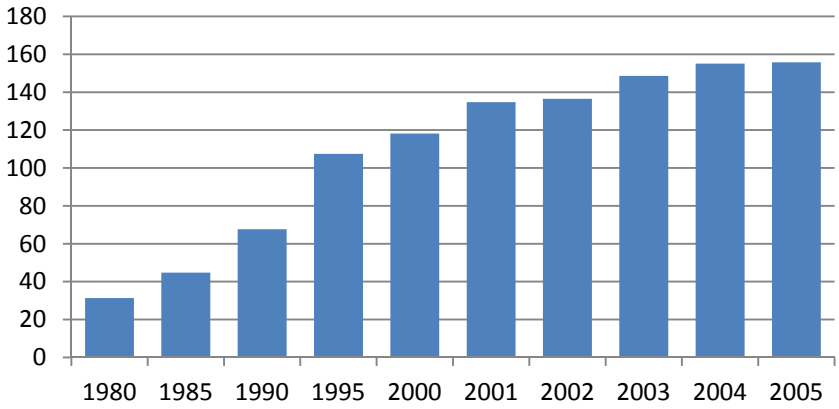
Solid Waste Pollution

Solid waste is typically described as intentionally discarded waste, originating from residential, industrial, commercial and institutional sectors, although excluding hazardous and medical waste. **In 2005 China produced over 155 million tons of waste, surpassing the US' 133 million tons, and well above the EU's 114 million tons, to become the world's largest producer of solid waste** (see **Figure 16**). [72] Urbanisation, urban population growth and increasing affluence are seen as the key determinants of China's already significant growth in waste output and will continue to contribute to future solid waste growth. Solid waste is considered a multi-generational environmental problem due to the long decomposition time of many modern consumer goods, which coupled with growing waste production imply a potential solid waste crisis in the future if more efficient disposal patterns are not established. A recent study by the Chinese government found that plastic goods can take up to 450 years to fully decompose, while glass products never naturally decompose. [73] Currently 80% of China's municipal solid waste (MSW) is disposed of in landfills, however, less than 10% meet international sanitary standards, with many operating at overcapacity and lacking feasible expansion options. As a result, in 2005 approximately 133 million tons of methane was released from Chinese landfills, a figure expected to grow to 179 million tons by 2015. Were this

[69] People's Daily (5 June 2002) 'Water Resources Set to Reach Critical Levels'
[70] Worldbank 2006
[71] Graham-Harrison, Emma. China says pollution goals low as unveils ministry. Reuters, 11 March 2008. Available at: http://uk.reuters.com/article/idUKSP25601120080311?sp=true
[72] United States Environmental Protection Agency; China Statistical Yearbook 2006; Eurostats
[73] China.org.cn. How Long Does It Take for Solid Waste to Decompose?. Sep 12 2007. Available at: http://www.china.org.cn/english/environment/224191.htm

methane to be captured and utilised for energy needs it could provide as much as 3700 trillion kilowatt hours annually by 2020.[74]

Figure 17: Municipal Solid Waste per annum (million tons)



Source: China Statistical Yearbook 2006

While environmental degradation due to solid waste is relatively nonexistent in Europe when compared to China, several pressing issues do exist, most recently in the field of electronics waste, which is also a growing concern in China. Within Europe legislation such as WEEE has been introduced to address the problem; however it has excluded small and medium enterprises from market participation through its stringent reporting requirements. Unfortunately, while WEEE is viewed as unique in its attempts to tackle electronic waste, the problem continues, with Europe producing over a third of worldwide electronic waste in recent years, and total output growth expected to continue to grow at a rate as high as 2.7% annually through 2020.[75]

Remediation and Cleanup

By the end of 2005 an estimated 40,000 square kilometres of land had been destroyed by unsustainable mining practices in China, prompting regulators in the Ministry of Land and Resources to establish new remediation funds in 2007, which will be composed of mandatory contributions from operators.[76] Also in 2007, SEPA began revising its fining regime against water polluters, following several years of highly public spills. The new regulations, which are currently available in draft form, raise fines on polluters by up to 2000%, with businesses expected to pay up to 30% of remediation costs.[77]

[74] Gao Weijun, Zhou Nan, Li Haifeng, Kammen, Daniel. Possibility and potential of clean development mechanisms in China. Environmental Research Letters, November 2007. Available at: http://www.iop.org/EJ/article/1748-9326/2/4/044005/erl7_4_044005.html

[75] Hammerschidt, Christoph. UN Study: EU falls behind e-waste recycling targets. EE Times Asia, 26 Nov 2007. Available at: http://www.eetasia.com/ART_8800490559_480300_NT_b2c31056.HTM

[76] Hornby, Lucy. China to require environmental deposits from mines. Reuters UK, 16 Nov 2007. Available at: http://uk.reuters.com/article/environmentNews/idUKPEK14536720071116

[77] Xinhua. China's environmental watchdog plans to raise fine on water polluters. 26 Nov 2007. Available at: http://news.xinhuanet.com/english/2007-11/26/content_7147127.htm

2.2. Environmentally Preferable Products

Environmentally preferable products (EPP) differ from EET in that they do not directly provide a benefit to the environment, such as pollution reduction during their utilisation. Rather, EPP goods are substitutes to comparatively more polluting standard goods, either through their means of production, such as organic agriculture, their lower required amount of natural resource inputs, such as energy efficient appliances, or their ability to reduce emissions from traditional sources of energy production, such as solar photovoltaic cells. Within the EPP category four separate subsectors exist: cleaner technologies, water supply, renewable energy and heat and energy savings management.

Cleaner technologies are defined as goods which are intrinsically cleaner than the goods which they substitute. Currently under the OECD definition the sector is poorly defined, covering only a small number of chemical goods and excluding energy and resource efficient goods, which are found in other EPP subsectors. Due to cleaner technologies' relative insignificance in the context of EU-China trade relations, with €25 mn accounting for less than 1% of total EGS bilateral trade in 2006, as well as an average annual growth rate of only 7% since 2002, the sector is not analysed in a deeper context within this report. The relative insignificance of the sector is partially due to definitional constraints, as many of the items listed under the OECD definition lack a corresponding HS code and therefore lack appropriate and comparable trade data.

Given China's aforementioned water scarcity issues one would assume that the water supply subsector would be experiencing rapid growth. EU-China trade data indicates otherwise, with the subsector growing at a relatively mild 10% annually since 2004, with its 2006 value at €28 mn. This may be due to a rather restrictive definition under OECD guidelines, as well as a slightly misleading title. As defined by the OECD the sector includes trade in water as well as systems which produce potable water. It would seem, however, that China's demand is primarily for wastewater treatment facilities, which can also produce and distribute potable water, given that sector's high significance in the context of EU-China trade. Given the water supply subsector's relative insignificance in the context of EU-China trade relations, it will not be further examined within this report.

Renewable energy use is a sector which is increasingly recognised as a high priority in developed countries, with the EU no exception. In early 2007 the European Commission released their Renewable Energy Roadmap, mandating a 20% contribution from renewable energy sources to overall energy production by 2020, up from a 2010 goal of 12%.[78] Under the OECD definition, the renewable energy sector is composed of solar, wind, tidal, geothermal, and other, which encompasses biofuels and hydroelectric dams. The EU definition differs only slightly, differentiating solar photovoltaic from solar thermal power, which are grouped together under the OECD list. Notably, the OECD list includes goods only under the solar and biofuels product groups, once again due to the inherent weaknesses the Harmonised System presents

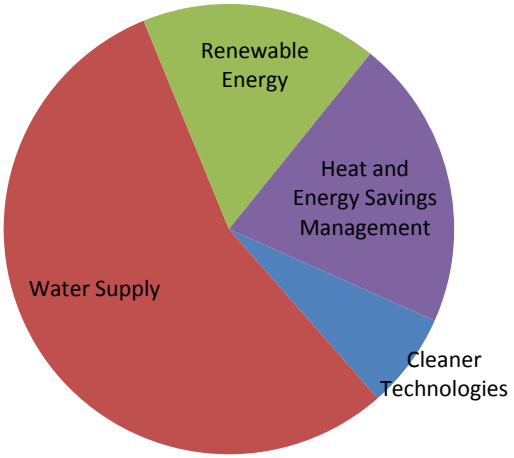
[78] European Commission. Renewable Energy Roadmap – Renewable energies in the 21st century: building a more sustainable future. Jan 10 2007. Available at: http://ec.europa.eu/energy/energy_policy/doc/03_renewable_energy_roadmap_en.pdf

in differentiating environmental goods such as wind turbines from other industrial goods.

The heat and energy savings management sector of products which require a relatively lower energy input for their operation in comparison with traditional products, such as energy efficient light bulbs, along with products which enable energy efficient practices such as calibration devices and thermostats.

Within China, baseline production data for 2006 indicates the EPP sector was worth approximately US$ 12.9 billion in gross value output. Among this figure water supply commands the lions share, while renewable energy and heat and energy savings management each account for approximately 1/5 (see **Figure 18**).[79] It should be noted that higher or lower production levels within China do not necessarily imply their relative levels of implementation in China – high output in one sector may be due to high global demand, while low output in another sector may see a larger share consumed within China. Moreover, low exports (such as in water supply) despite high local production is descriptive of the sector's inherent nature (local provision, and the high cost of liquids transport).

Figure 18: Chinese Output in EPP Goods and Services by Subsector - 2006



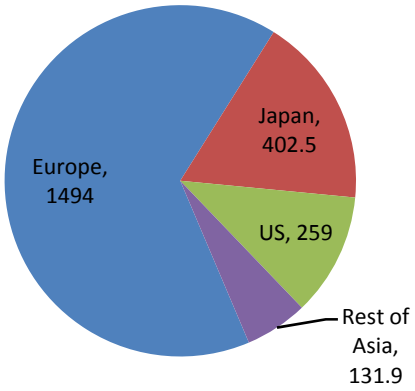
Source: China Yearly Industrial Data, China Data Center, EMG Analysis

2.2.1. Economic Significance

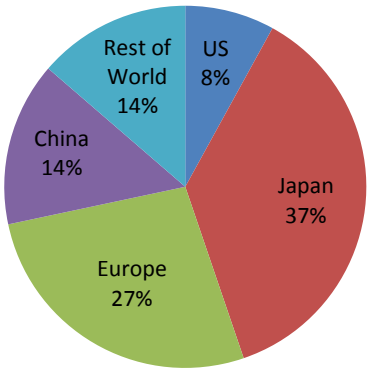
Renewable Energy

EU-China bilateral trade in renewable energy goods has experienced explosive growth in recent years, rising at an average annual rate of 62%. In 2006 total trade reached €1.25 bn, while 2007 growth may accelerate to 65%, reaching €2 bn (see **Figure 17**). Within this bilateral trade, however, is a strong dominance by Chinese exports to the EU. While total trade exceed €1.25 bn in 2006, the EU held a deficit of over €1 bn. Chinese exports to Europe have enjoy a strong growth trend of over 66% since 1999, from €32 mn to €1.16 bn, while EU exports to China have both started lower and grown slower, at 37% annual from €9 mn in 1999 to €92 mn in 2006. In 2007 this trend is expected to continue, with Chinese exports surging with a 70% growth rate while growth in European exports declined to 11%, leading to an EU deficit which may exceed €1.87 bn.

Figure 19: Global Photovoltaic Industry Installations 2007 (Megawatts)

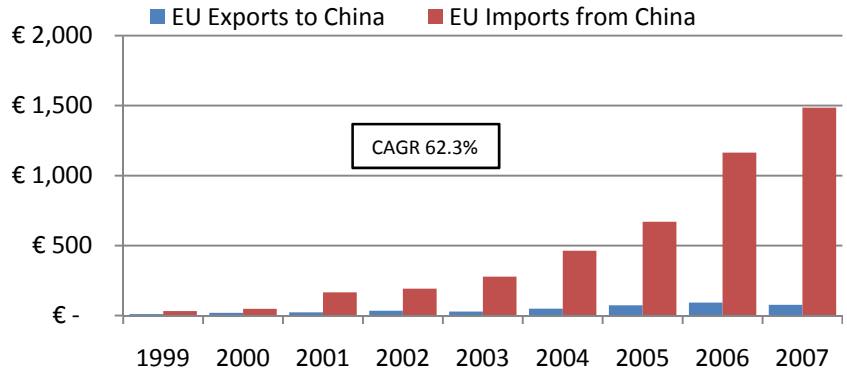


Share of Production 2006



Source: Earth Policy Institute

Figure 20: EU27-China Trade in Renewable Energy goods (millions)



Source: Eurostats
Note: Year 2007 figures are for January through September due to data availability.

[79] For additional information on base data, sources, methodology, and analysis, please see **Chapter 6**.

Within this rapidly growing bilateral trade, and the rapidly growing EU deficit, is a strong dominance of photosensitive semiconductor devices (HS 854140), i.e. solar photovoltaic cells. This single HS code accounted for over 97% of bilateral trade between the EU and China in renewable energy goods between 1999 and 2007. Furthermore, preliminary 2007 data indicates that solar cells made up 99% of imports from China that year in renewable energy goods, as well as 89% of exports to China. Notably, the EU's deficit in this single good, which totalled €1.06 bn in 2006, is the largest single contributor to the EU deficit in EGS. Furthermore, 2007 data indicates that the 2006 deficit in solar cells grew by 60% to €1.7 bn.

While Europe's expanding deficit in photovoltaic cells may be viewed with some trepidation and as a sign of unfair trade practices, it is actually indicative of the growing demand and installation of solar power capacity in Europe. While the EU produced approximately a quarter of global output in recent years, in 2007 it accounted for over 65% of newly installed capacity worldwide (see **Figure 18**). Furthermore, while the EU's deficit to China in solar cells is significant, the EU held a deficit with the world of over €3.7 bn in 2007.[80] Of this total deficit China accounts for approximately 46%, spurred by a surge in national output by a factor of ten between 2004 and 2006, although Japan follows with approximately 28% of EU imports.[81] Although China is expected to become the world's leading producer in 2008, only 10% of its production in 2006 went towards domestic installations, largely due to inadequate pricing schemes when compared to feed-in tariffs utilised by European countries such as Germany, currently the leading country in the world for installed capacity, ahead of Japan in 2007 by a factor of three.[82]

The EU's renewable energy market is viewed as especially influenced through the use of feed-in tariffs and related subsidies. If the market were not 'distorted' by EU policy instruments the deficit would be strongly supported by economic efficiency arguments (comparative advantage). Justification of the market distortions is based primarily on the need to reduce global carbon emissions, as required by international commitments (Kyoto), and justified economically in the Stern report. Stern describes climate change as the biggest market failure that has ever been known - markets cannot manage public goods, and the global climate is a global public good. Market failures can only be rectified by policy interventions. However, there is extensive debate on what might be the most appropriate policy instruments, and on how international cooperation might be strengthened. Subsidies (e.g. for solar panels) are heavily criticised, but may be justified in the short term as a means of stimulating new technologies. In this case, part of the EU subsidy goes to stimulating new technologies in China. This can be argued to be in the global interest, and in the EU's interest in that the EU will be among the sufferers from climate change. It may also be argued that directing the subsidies towards EU production would not be in the EU's interest, since the lower costs

[80] Eurostat
[81] Dorn, Jonathan. Solar cell production jumps 50 percent in 2007. Earth Policy Institute, 27 December 2007. Available at: http://www.earth-policy.org/Indicators/Solar/2007.htm
[82] Ibid

of production in China would stop the EU industry ever becoming internationally competitive.[83]

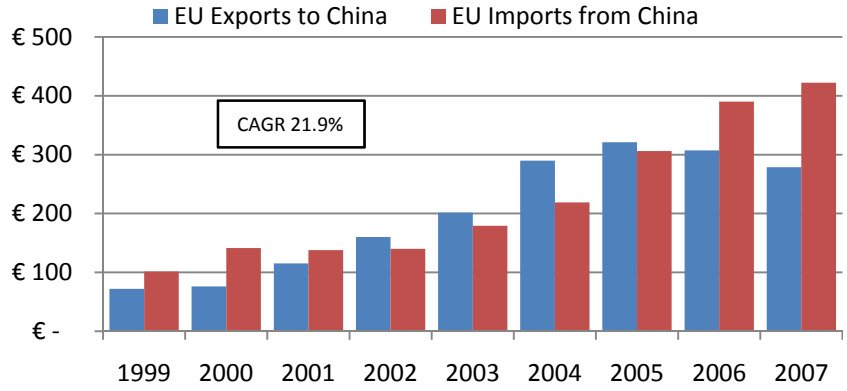
Further complicating a cost-benefit analysis of the EU's high imports of renewable energy goods such as solar panels are opaque labour benefits. Installation costs associated with solar panel arrays can constitute up to 25% of end-user costs.[84] Most of the installation cost is labour, so the employment gains are liable to be bigger than the losses. If low cost imports were blocked, consumer costs would go up, the market would shrink, and the demand for installation labour would probably fall more than manufacturing labour rises. Alternatively, the level of subsidy could be increased to match the higher costs, thus increasing the cost to the taxpayer.

Irrespective of these arguments, and irrespective of whether the subsidies go to EU or Chinese companies and workers, other arguments suggest that the subsidies should be replaced by instruments that are better suited to reducing carbon emissions.[85]

Heat and Energy Savings Management

The heat and energy savings subsector comprises approximately 5% of EU-China trade in the EGS sector, with €697 mn in bilateral trade in 2006. Since 1999 growth in the sector has averaged 21.9% annually, with 2007 growth rising to as high as 33.9%, potentially reaching €934 bn from €697 mn in 2006 (see **Figure 19**). From 2005 a European surplus has been rapidly eroded, until finally reaching a deficit of €83 mn in 2006, expected to more than double to €191 mn in 2007 based on data available for the first three quarters of the year. 55% of the EU deficit within the sector can be attributed to hot cathode fluorescent lamps (HS 853931), while heat exchange units and related parts (HS841950, HS841990) account for 88% of EU exports to China.

Figure 21: EU27-China Trade in Heat and Energy Savings Management (millions)



Source: Eurostats
Note: Year 2007 figures are for January through September due to data availability.

[83] Personal communication – Dr Clive George, Impact Assessment Research Centre, Institute for Development Policy and Management, School of Environment and Development, University of Manchester

[84] Sample hardware and installation costs obtained from http://www.planitsolar.com/html/packagedsystems.htm

[85] See the following for arguments and examples for subsidy alternatives:
Stern N (2006) Stern Review on the Economics of Climate Change, Cambridge University Press, Cambridge, Chapter 15
Global Subsidies Initiative, http://www.globalsubsidies.org/

The fact that hot cathode fluorescent lamps composed such a large portion of this subsector's trade, as well as the overall EGS deficit, is significant. Hot cathode fluorescent lamps (HS 853931) include integrated compact fluorescent lamps (CFL-i), also commonly known as energy efficient bulbs. Since 2001 the EU has maintained a 66.1% anti-dumping tariff on CFL-i imports from China, on the grounds that state intervention was taking place within the Chinese market, thus putting European producers at an disadvantage. These duties, originally established for 5 years, were extended in August 2007 by one year, specified as a 'transition period' during which European producers could prepare for increased competition.[86] Chinese CFL-i's are estimated to hold at least 2/3 of the European market for energy efficient light bulbs.[87]

One argument against Chinese CFL-i bulbs, and perhaps other imported environmental goods, is that they do not meet the environmental standards of EU producers. The World Wildlife Foundation has noted that Chinese CFL-i's contain up to twice the mercury of their European equivalents.[88] Notably, however, all imports into the EU are required to comply with EU standards – and Chinese CFL-i's do indeed meet the EU's stringent RoHS standards.[89] Any failure to do so is a failure of EU import controls and market surveillance. EU competitors may argue that imports are of poorer quality despite complying with standards, but that is a matter for the market to decide (consumers). Many of these imports are manufactured in China by EU firms, with full control of quality standards (e.g. energy efficient light bulbs in China are produced by all the main EU manufacturers except Osram).[90]

2.2.2. Social Significance

While China to date has been able to fuel its energy appetite primarily through increasing utilisation of coal, which rose by 350% between 1978 and 2005, supply shortfalls have become more frequent in recent years. In the summer of 2004, 24 of China's 27 provinces experienced rolling blackouts, darkening first tier cities such as Beijing and Shanghai. The severity of the blackouts prompted government officials to reduce factory working days, limit decorative landscape lighting in large cities and embark on public awareness campaigns for energy conservation the following year.[91] Still, China's energy deficit has continued to grow in recent years, growing at 18.4% annually since 1992 (see **Figure 20**).

[86] European Commission. European Commission proposes to end anti-dumping duties on energy saving lightbulbs in one year. 29 August 2007. Available at http://www.europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1261&format=HTML&aged=0&language=EN&guiLanguage=en

[87] World Wildlife Fund. Why the EU should review its trade defense instruments. 29 August 2007. Available at: http://assets.panda.org/downloads/antidumping_duties_cfl_briefing_070829.pdf

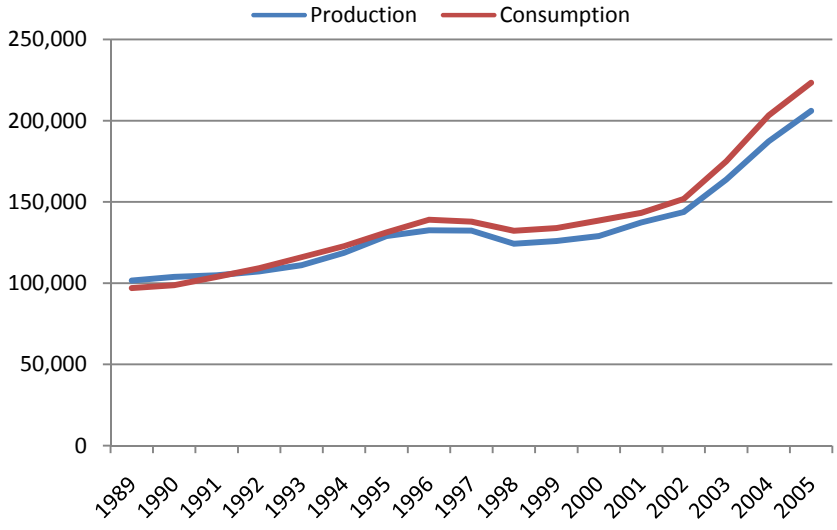
[88] The environmental case for ending anti-dumping duties on energy-saving lamps, World Wildlife Foundation, Brussels, 28 August 2007

[89] Ibid

[90] Personal communication – Dr Clive George, Impact Assessment Research Centre, Institute for Development Policy and Management, School of Environment and Development, University of Manchester

[91] Cheng, Wing-Gar. China braces for power deficit. International Herald Tribune, 16 June 2005

Figure 22: China's Energy Deficit



Source: China Statistical Yearbook 2006

In separate studies liberalisation of environmentally preferable products particularly in the sector of renewable energy, have been found to have a number of positive knock-on effects. As energy capacity grows in poverty stricken areas the feasibility of implementing other environmental services improves, thus improving the chances of greater environmental health. An abundant and sustainable energy supply also reduces poverty by bolstering economic development, allowing work beyond just the hours of sunlight and later allowing for access to vital business tools such as the Internet. Finally, gender equality is found to improve with higher energy availability and security as it reduces the amount of time required on basic survival activities in the house (gathering burning fuel, fetching water, etc).[92]

2.2.3. Environmental Significance

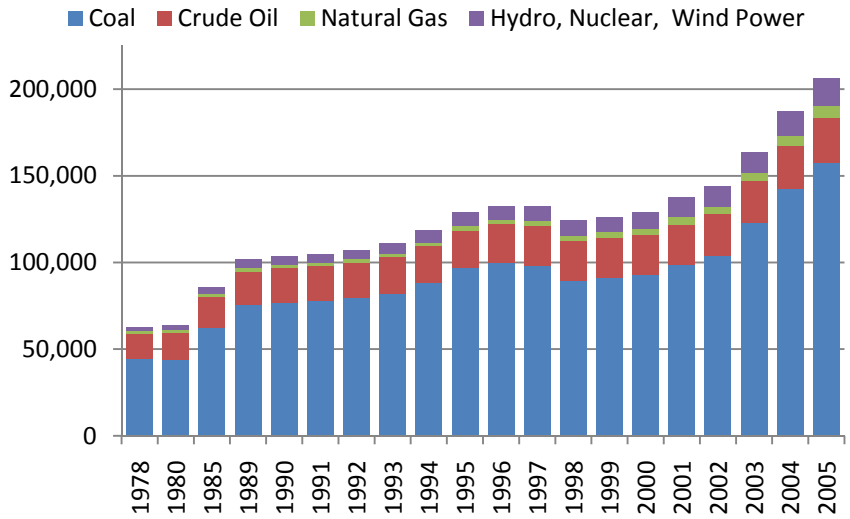
Heat and energy savings management is a subsector of EGS which has received a significant amount of press regarding its potential to help the EU meet its future goals of energy efficiency. In March 2007 the European Council established a 2020 goal of reducing greenhouse gas emissions of member states by 20%. Notably, CFL-i light bulbs consume approximately 1/5 of the energy of a traditional incandescent bulb, although consumption patterns in Europe currently favour incandescent bulbs, which dominate about 80% of the European market, with more than 2 billion sold annually compared to 270 million CFL-i's, due primarily to cost differences.[93] Studies indicate that a replacement of incandescent bulbs with CFL-i's would result in a reduction in European emissions of CO_2 by 23 million tons per year, or 0.5% of annual European emissions, although European production is predicted to be capable of meeting 25% of future demand.

[92] Gender, Poverty and Environmental Indicators on African Countries 2008, African Development Bank Group. Available at: http://www.afdb.org/portal/page?_pageid=473,18884240&_dad=portal&_schema=PORTAL

[93] World Wildlife Fund. EU keeps unfair market barriers on energy-saving lamps. 29 August 2007. Available at: http://www.panda.org/about_wwf/where_we_work/europe/news/index.cfm?uNewsID=112120

Given China's aforementioned environmental challenges, many of which are rooted in high consumption practices, energy efficiency and clean energy production are increasingly viewed as necessary pursuits by policy makers in China. Within both the 11th Five Year Plan (2006-2010) and China's White Paper on Energy are numerous calls for increasing renewable energy contributions to overall production. Indeed, prior to these ambitious plans the contribution of alternative forms of energy (as defined by the China Statistical Yearbook: wind, hydro and nuclear energy) had already begun to rise significantly, as the prices of oil, coal and gas have risen. Between 1978 and 2005 coal and oil's contribution to overall electricity generation has declined from 94% to 89%, while energy from alternative sources rose from 3.1% in 1978 to 7.7% in 2005 (see **Figure 21**).

Figure 23: China's Energy Output by Source (in 10,000 tons standard coal equivalent)



Source: China Statistical Yearbook 2006

2.3. Environmental Services

In 2004 China's domestic environmental services market reached €4.71 bn following 25% annual growth over the preceding decade.[94] Estimates indicate that this figure accounted for about 10% of China's entire environmental goods and services industry compared to an international proportion ranging from 50-65%.[95] This under development of China's environmental services market indicates both a history of underinvestment in the industry as well as a likely surge in the future, considering the ambitious goals set out by China's policy goals. **Indeed, through 2010 China's environmental services industry is expected to grow by up to 17% annually to reach RMB 110 bn (€10.2 bn).**

Given China's water supply restraints, the country faces a difficult future wherein water will become increasingly scarce. In 2007, well water accounted for 19.5% of the country's consumed water; however, heavy demand has

[94] China: Environmental Services. US Commercial Service, September 2006.
[95] Ibid
Kirkpatrick, Colin. Trade in Environmental Services: Assessing the Implications for Developing Countries in the GATS. ICTSD Project on Environmental Goods and Services, Sep 2006

caused groundwater tables to drop at a rate of two meters annually in recent years.[96] It is estimated that for every metre the groundwater table declines, associated access costs may rise by 20% to 500%.[97]

2.4. Future Directions

Legislative Change

The 11th Five Year Plan

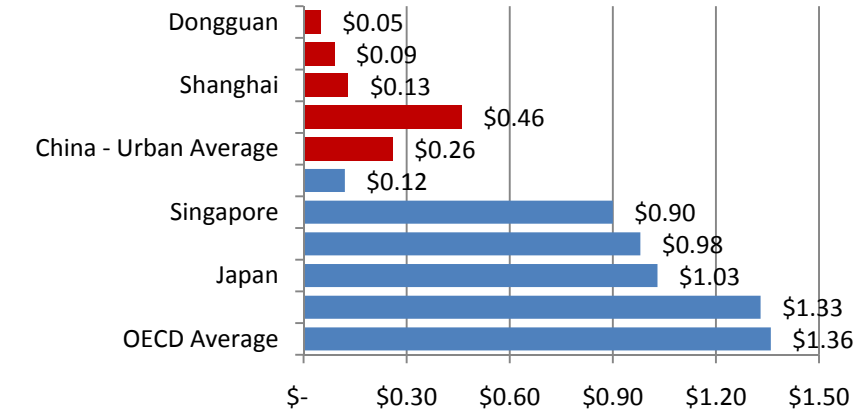
In the absence of successful bilateral or multilateral liberalisation in the coming years, such as through the EU's PCA mechanism or the WTO's ongoing Doha round, change which will significantly affect the business climate in China's EGS sector, from trade to investment to technical regulation, will be based upon unilateral, or domestic legislative changes. Currently, several pieces of key legislation exist which serve as a starting point for analysis. These include China's 11th Five Year Plan and the 2007 White Paper on Energy Policy, both of which place heavy emphasis of increased environmental stewardship within China.

In China's 11th Five Year Plan (2006-2010) an entire chapter is devoted to resource conservation and the reconfiguration of society towards increased "environmental-friendliness".[98] Within the plan are numerous calls for reform, both institutional and market oriented, to reach these goals. With regards to air pollution a number of specific goals exist, including: the elimination of small (under 20 ton) coal boiling broilers; desulphurisation, de-nitrogenation, and dust reduction projects at remaining coal plants; increased vehicle emission standards; and reduction of dust originating from construction sites.[99] These goals will be measured using SEPA's air quality index, which is a composite of NOx, SO2 and PM10 ratings, with a stated obligatory goal of a 10% reduction between 2006 and 2010. [100]

In the area of water use, the 11th Five Year Plan again lists a number of substantive goals, among which are: restrictions on establishment of high water use industries, reduced agricultural water use through methods such as micro-irrigation and dripping irrigation, improving industrial water usage through adoption of high-technologies and liberalise the water pricing system to encourage conservation. Water pricing liberalisation will be a politically sensitive issue, as any significant liberalisation would likely bring about high price growth, given China's current low-price non-market pricing regime (see **Figure 22**). With regards to quantitative goals, industrial water use efficiency is obligated to increase by 30%, agricultural water use to increase by .05% and a reduction of pollutant emissions of 10% by 2010.[101]

[96] Investing in Asia's Water Sector. Association for Sustainable & Responsible Investment in Asia, Feb 2007
[97] Rothman, Andy. Thirsty China: Its key resource constraint is water. CSLA Asia-Pacific Markets, Summer 2006.
[98] The Outline of the 11th Five Year Plan. National Development and Reform Commission. Available at: http://en.ndrc.gov.cn/hot/t20060529_71334.htm
[99] Beijing's 11th Five Year Plan. Translation by Beijing Association of Enterprises with Foreign Investment, 29 March 2006.
[100] The Outline of the 11th Five Year Plan. National Development and Reform Commission. Available at: http://en.ndrc.gov.cn/hot/t20060529_71334.htm
[101] Ibid

Figure 24: Residential Water Prices (US$/ton)



Source: Rothman, Andy

With regards to solid waste, the 11th FYP calls for the construction of 21 new solid waste disposal facilities in Beijing alone. More broadly, similar centres are expected to be constructed as necessary in newly established cities, towns and villages nationwide, with an emphasis on using advanced research and development to boost the rates of industrial utilisation (i.e. recycling of wastes). While no obligatory goals exist in this category, the NDRC has indicated that a 60% overall utilisation rate of industrial solid waste is anticipated by 2010, representing a growth of 4.2% from 2006.[102]

In addition to these explicit goals, the plan also requires an improvement of energy efficiency of 20% by 2010; however, this goal lacks clear steps to its realisation. SEPA has recently stated that due to poor compliance and missed goals in the first two years of the 11th Five Year Plan reductions in energy intensity would have to be raised by 5% annually, a highly costly and ambitious goal, to meet the 2010 target.[103]Also cited is the need to improve noise reduction around fast multiplying sources such as roads, railways, airports, construction zones and recreation sites, although the implementation is left to local legislators, whom are encouraged to strengthen local statues and standards. Finally, increased protection of the general ecosystem in China is highlighted as necessary, to be enforced presumably through increased environmental monitoring coupled with stricter punitive responses to violators.

Notably, the 11th Five Year Plan predicates all of these requirements and expectations on a average GDP growth rate of 7.5% from 2006 to 2010, however in the first two years of this plan alone GDP growth has far exceeded this figure, at 11.2% in 2007 and predicted to hold at 10.8% in 2008.[104] As economic growth outpaces projects, ambitious plans are expected to be necessary to meet many of China's established goals; in the case of energy efficiency, it has been predicted that regulatory enforcement and efficiency

[102] Ibid
[103] Graham-Harrison, Emma. China says pollution goals low as unveils ministry. Reuters, 11 March 2008. Available at: http://uk.reuters.com/article/idUKSP25601120080311?sp=true
[104] Asian Development Bank: China's GDP growth to hit 11.2%, CPI to top 4% in 2007. Xinhua, 17 Sep 2007. Available at: http://news.xinhuanet.com/english/2007-09/17/content_6739427.htm

standards originally foreseen to be phased in by 2020 will have to be implemented by 2010 to meet the 11th Five Year Plan goals.[105]

In addition to the 11th Five Year Plan, China's State Council and National Development and Reform Commission, as well as State Environmental Protection Agency and other regulators have a number of other initiatives intended to improve environmental stewardship. One such initiative by the NDRC aims to improve the energy efficiency of China's top 1,000 enterprises, which together consume approximately 1/3 of China's primary energy. Through efficiency improvements the NDRC has predicted savings of up to 100 million tons of coal used for power generation as well as 242 million metric tons of carbon dioxide emissions reductions between 2006 and 2010.[106] The emissions savings are estimated by the NDRC to be equivalent to a 5% decrease in total carbon emissions from China's 2004 levels.

2007 White Paper on Energy Policy

Another key piece of legislation which will shape development of the environmental sector in China during the coming years is its newly released white paper on energy policy, 'China's Energy Conditions and Policies'. The paper reinforces a number of previous laws such as the Renewable Energy Law of 2005 and the Energy Conservation Law of 1997. The policy paper highlights the need for China's energy markets to shift in the coming years away from highly consumptive, low efficiency patterns towards conservation and thrift complimented by higher adoption of energy efficient products. Furthermore, China's high dependence on coal, which accounted for 69.4% of energy resources in 2006, is targeted for diversification over the coming years towards a balanced energy composition from alternative sources, such as renewables.[107] Within this is a recommitment to prior goals of achieving a renewable energy contribution of 10% by 2010 and 15% by 2020, using hydropower, solar, wind, biomass and methane.[108] Under the 2006 Renewable Energy Law these goals are also outlined – in recent years wind power has received a majority of investment, with US$1 bn between from 2003 to 2008. Under the law, wind power generation capacity is expected to expand tenfold between 2006 and 2020.[109]

China has also enacted a number of efficiency enforcing laws. The China National Institute of Standardisation has passed regulation requiring a reduction in energy consumption by white goods, televisions and lighting which will reduce residential power consumption by 10% by 2010.[110] Additionally, building standards enacted in 2006 require buildings in Beijing, Chongqing, Shanghai, and Tianjin to reduce energy consumption of new buildings by 65% and in other cities by 50%. Under the State Council's Energy

[105] Lin, Jiang, et al. Achieving China's target for energy intensity reduction by 2010: An exploration of recent trends and possible future scenarios. China Energy Group, Lawrence Berkeley National Laboratory, Dec 2006.
[106] Brent, Willam. Cleantech Boom… or Bust?. China Business Review, July/Aug 2007
[107] China's Energy Conditions and Policies. Information Office of the State Council of the People's Republic of China, Dec 2007.
[108] Ibid
[109] Brent, Willam. Cleantech Boom… or Bust?. China Business Review, July/Aug 2007
[110] Ibid

Conservation Law, 25% of buildings are expected to be renovated by 2020 to meet efficiency standards. The Ministry of Construction has noted that on average Chinese buildings consume 2 to 3 times more power than equivalent buildings in other countries; an estimated 10% reduction in residential electricity demand would offset construction of some 30 coal fired power plants.[111] Ongoing Ministry of Construction research indicates that only 53% of new building projects meet national energy standards, while 99% of China's existing building infrastructure fails to meet standards.[112] In total energy consumption by buildings is estimated to currently account for 25% of nation wide energy demand, with this figure as high as 40% in the North. Northern China's relatively building energy inefficiency is due primarily to inefficiency heating and cooling systems, particularly in public buildings. At a replacement rate of 2 billion square meters per year, it will take approximately 20 years to replace China's currently inefficient buildings. The Ministry of Construction estimates that if this happened residential energy consumption would be reduced by up to 40%.

[111] Ibid

[112] Fu, Jing, Yu, Tianyu. Half of new buildings fail energy standards. China Daily, 14 Jan 2008. Available at: http://www.chinadaily.com.cn/bizchina/2008-01/14/content_6391282.htm

Table 5: Impacts Summary Table Legend

(⇧)⇧	(Strong) positive impact
▫	Negligible impact
(⇩)⇩	(Strong) negative impact
⇩⇧	Mixed impacts
(+)+	(Strongly) positive existing conditions
0	Neutral existing conditions
(-)-	(Strongly) negative conditions
⌖	Localised impacts
⊙	Moderately diffuse impacts
◎	Highly diffuse impacts
L	Low capacity to change via policy
M	Moderate capacity to change via policy
H	High capacity to change via policy

Table 6: Sector Scenario Parameters

	Tariffs and NTBs reductions	Exchange Rate
	Multilateral	
Baseline with DDA	10%	-
DDA Modest	25%	-
DDA Ambitious	75%	-
Structural Change only	-	-
DDA Modest with Structural Change	25%	10%
DDA Ambitious with Structural Change	75%	10%

Table 7: Chinese Structural Change used in Projection Scenarios

Environmental Goods and Services	Supply	Demand
Air Pollution Control	43%	54%
Wastewater Management	13%	61%
Solid Waste Management	40%	48%
Remediation and Cleanup	50%	53%
Noise and Vibration Abatement	51%	59%
Environmental Monitoring, Analysis and Assessment	36%	70%
Cleaner Technologies	36%	35%
Water Supply	3%	3%
Renewable Energy	33%	74%
Heat and Energy Savings Management	54%	56%

3. PCA Scenarios

The studies in this section utilise quantitative modelling results, which are then used to qualitatively assess the impacts of a PCA between the EU and China within the themes of economics, society and environment. Finally, summary tables are provided which provide a visual guide to the overall economic, social, and environmental impacts of liberalisation specific to each sector and should be read using the legend provided in **Table 5**. These impacts are addressed in the **Final Report** with an early provision of possible flanking measures, i.e. policy recommendations, which provide negotiators and stakeholders alike with a number of potential options to address both positive and negative impacts.

Liberalisation Scenarios

While the PCA is not designed to be a means of traditional trade liberalisation, i.e. of bilateral or multilateral tariff reductions, it is possible that it may include provisions which assist with the reduction of behind the border barriers, with benefits accruing multilaterally similar to the possibility of a successful Doha Development Agenda. To simulate the impacts of this liberalisation six scenarios have been devised and applied to each sector.

Three types of medium-run experiments were run. Medium-run is taken to be a three year period during which the assumed structural changes take place and the effects of changes in the policy environment on protection and the real exchange rate apply. The first three experiments relate to shallow integration under the DDA with an unchanged real exchange rate. The three experiments shown in **Table 6** were DDA Baseline (10% cut), DDA Modest (25% cut), and DDA Ambitious (75% cut). Second, and more speculatively, a set of medium run projections of domestic demand growth and possible supply curve shift for import competing production and export production were run to obtain a consistent set of projections of imports, domestic production and domestic demand. The same supply curve shifts were applied on the export side.

Impacts of PCA Scenarios

Economic Impacts

Within the liberalisation scenarios, growth in China's environmental goods and services sector is expected to be robust over the following 3 years. Within the theme of **Economic Structure**, trade flows are expected to change significantly under the various scenarios. Notable features of trade flow adjustment under the scenarios include: significantly faster growth of imports into China of goods and services in the subsectors of Air Pollution Control, Wastewater Management, Noise and Vibration Abatement, Cleaner Technologies, Water Supply, and Heat and Energy Savings Management. Meanwhile, under trade policy only scenarios, Chinese export growth to both the EU and rest of world is expected to be positive, although growth will be far milder than imports, resulting in an overall decline in the Chinese trade balance. In the ambitious liberalisation scenarios with fast growth, Chinese exports also continue to grow, but again to a lesser degree than imports, resulting in a reduction of the

Chinese trade surplus. Notably, trade diversion appears to occur in the environmental goods sector under the ambitious scenario, with previously balanced trade between China and the rest of world now being increasingly dominated by reduced tariff goods from the EU. While this creates a more affordable environmental sector for consumers within China and the EU, this trade diversion may come at the cost of implementation of environmental services in third countries, as well as the use of more efficient environmental goods from elsewhere.

With regards to **Consumption and Production Patterns**, patterns of energy use and waste generation and management will improve within both the EU and China under the first three policy scenarios. These estimate that overall levels of production will decline throughout the sector in China, while overall demand (and thus usage) of solid waste management and renewable energy goods will climb slightly under the ambitious scenario. Within the ambitious scenario with structural change a more ambiguous picture is created – renewable energy goods and solid waste management goods enjoy even large growth in demand in China, although this is met to a larger extent through Chinese supply, which may imply increased manufacturing activity of a lower environmental standard in China than under policy scenarios where goods are increasingly manufactured in European factories. Given the large changes in (i) import growth, (ii) Chinese demand growth, and (iii) Chinese production growth in these sectors, it is difficult to determine which change will have a greater effect; the confidence intervals on any estimates are very broad.

Social Impacts

Although the beneficiary of environmental goods and services is obviously the environment itself, and hence human welfare, a number of knock-on effects exist in the realm of social impacts. With regards to **Equity** within the trade policy only scenarios, overall production within the sector in China is expected to decline, while total imports into China will rise significantly and total exports from China will rise only marginally. This implies that under these scenarios an increasingly competitive market environment will emerge, wherein reduced market distortions from tariff and non-tariff barriers allow the most competitive actors in both the EU and China to operate more freely. Within this environment, overall production may contract in China as less efficient operators go out of business, placing pressure on effected workers. Simultaneously, access to and quality of environmental services is expected to increase dramatically, with many effects felt across all levels of society. Many environmental services are managed through government procurement and have basic universal service requirements (e.g. water). Further, the nature of their implementation produces broadly felt effects (e.g. a reduction in air pollution in an urban area). Hence, the increased demand and market access of these goods and services is expected to enhance welfare widely, accompanied by possible positive feedbacks in the areas of **gender equality**, which has previously been found to improve with higher energy availability and security as it reduces the amount of time required on basic survival

activities in the household (gathering burning fuel, fetching water, etc).[113] Moreover, China census data indicates that in the environmental services sector of the economy women contribute 40% of the labour force.[114] This is notable as localised environmental services are expected to expand with the increased availability of internationally traded environmental goods, and may have positive employment effects for female workers.

With regards to **Health**, a number of positive effects are expected to result from any of the proposed policy scenarios. With growth in goods and services related to air pollution and waste water reduction expected in the Chinese market, mortality from air and water pollution as estimated by the World Bank to decline in relative terms. Water supply and waste water treatment facilities will expand in their capacity and areas of coverage, leading to improved access to sanitary sources of water. Notably, a change in the current regime of subsidisation of water prices in China may be a double edged sword which both spurs private investment in infrastructure while also excluding low income earners from basic water rights. Increasing use of solid waste management goods and services, through the increased use of recycling, land-filling, and incineration, is expected to improve overall sanitation in the country; although notably certain lucrative niche sectors such as e-waste processing may remain in the black market, unless there is an increased regime of legislative oversight and enforcement.

In the area of **Labour**, impacts are again mixed in their direction, although magnitudes are perceived to be relatively small. With production in China experiencing slight declines in the trade policy only scenarios, pressure is expected to increase on labour markets which are already in a state of flux in China's manufacturing sector, possibly leading to increased unemployment and a decline in job stability in manufacturing. Meanwhile, increasing use of labour intensive environmental services, such as solid waste collection, will likely see employment rise, however the average skill level of these jobs and therefore their wage opportunities is unclear.

Environmental Impacts

With Chinese domestic demand (absorption) of environmental goods growing in all sectors, even in modest scenarios, the environmental impact of any PCA including the sector is expected to be largely positive. Under the theme of **Atmosphere**, more affordable and available air pollution control goods will lead to improved urban air quality conditions in key areas such as particulate matter (PM10), sulphur dioxides, and nitrogen oxide, and as defined by the WHO, an area where China is currently in dire need of improvement. With Chinese demand and imports growing in this sector under all scenarios, these benefits are expected under all scenarios but to varying degrees. With regards to CO2 emissions a positive or negative impact is not certain. Under the trade policy only scenarios, Chinese production (which is known to be particularly

[113] Gender, Poverty and Environmental Indicators on African Countries 2008, African Development Bank Group. Available at: http://www.afdb.org/portal/page?_pageid=473,18884240&_dad=portal&_schema=PORTAL

[114] Employment by sex and detailed occupational groups, International Labor Organisation, Labor Stats, Accessed 15 July 2008

energy inefficient) is expected to decline, while absorption of renewable energy goods is expected to climb. Within such a change it is likely that overall CO2 emissions will decline in China, although the opposite may be true in Europe as production increases to expand into new markets in China. Under the more optimistic growth scenarios, however, Chinese production will grow in all sectors while implementation of renewable energy goods will increase dramatically, making it difficult to assess which impact – CO2 emitting production or CO2 reducing renewable energy – will have a greater overall influence. Here it is necessary to recognise that a key component of reducing CO2 emissions will be ensuring a lower CO2 footprint not only in alternative sources of energy production (i.e. renewables) but also in future production processes using conventional technology.

In the **Fresh Water** theme, improved waste water treatment systems are expected to reduce the need to draw water from fresh sources, such as ground water and river systems, while also helping reduce the amount of algal blooms and other chemical related ecological disasters which have occurred regularly in China in recent years. If growth in the water supply subsector follows a path of efficiency, it is probable that the reversal of currently wasteful water use and distribution methods in key sectors, such as the agriculture sector, will contribute to a lower overall demand for water per capita. It is also possible, however, that access to improved technologies and services in the subsector of water supply will speed the implementation of major water transfer projects within China (from wet Southern regions to dry Northern regions), which could exacerbate already existing international tensions with regards to water rights for key transnational water systems in China, such as the Mekong River System (China's Nu River). These effects combined could possibly slow or even halt the falling of water tables in key sensitive regions. In the environmental theme of **Land**, mitigation of ongoing desertification is a likely knock-on effect of improved stewardship of water resources, although the degree to which improved water use efficiently can counter a growing population's water use is uncertain. Overall, the mitigation of key emissions and ecosystem erosion may lead to a more secure level of **Biodiversity**, however these effects again are difficult to predict with a large degree of confidence.

A summary of impacts is provided in **Table 8**. Please note that impacts are derived from trade policy only scenarios, while projections scenarios help determine the feasible reversibility and capacity to change within a sustainable development theme.

Table 8: PCA Summary Impacts Table – EGS (China)

Indicator	Existing Conditions	Scenario Impacts		Policy Options	
		Overall Direction Magnitude	Equity	Reversibility	Capacity to change
Economic					
Economic Structure	+	⇧	◎	Y	M
Consumption and Production Patters	--	⇧	◎	Y	H
Social					
Equity	--	⇩⇧	⌖	Y	L
Health	--	⇧⇧	◎	Y	H
Labour	-	⇩⇧	⌖	Y	M
Gender Equality	-	⇧	◎	Y	M
Environmental					
Atmosphere	--	⇧⇧	◎	Y	M
Land	--	⇧	⊙	Y	L
Fresh Water	--	⇧⇧	⊙	Y	M
Biodiversity	--	⇧	⌖	Y	H

Table 9: PCA Summary Impacts Table – EGS (EU)

Indicator	Existing Conditions	Scenario Impacts		Policy Options	
		Overall Direction Magnitude	Equity	Reversibility	Capacity to change
Economic					
Economic Structure	-	⇧⇧	⊙	Y	M
Consumption and Production Patters	+	⇧	◎	Y	H
Social					
Equity	0	⇧	⌖	Y	L
Labour	0	⇧	⌖	Y	L
Environmental					
Atmosphere	+	⇩⇧	◎	Y	H

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Annex 1 – OECD List of Environmental Goods

Using the Harmonised System (HS).

A. POLLUTION MANAGEMENT

1. Air pollution control

1.1 Air-handling equipment			
841490	841430	841440	841480
841410			
1.2 Catalytic converters			
842139	842199		
1.3 Chemical recovery systems			
252100	252220	281610	842139
842199			
1.4 Dust collectors			
842139	842199		
1.5 Separators/precipitators			
701990	841960	841989	842139
842199			
1.6 Incinerators, scrubbers			
841780	842139	842199	851410
851420	851430	851490	
1.7 Odour control equipment			
842490			

2. Wastewater management

2.1 Aeration systems			
841430	841440	841480	841490
2.2 Chemical recovery systems			
252100	252220	280110	281410
281511	281512	281610	281830
282010	283510	283524	380210
282090	283521	283525	842121
282410	283822	283526	842129
283210	283523	283529	842199
283220			
2.3 Biological recovery systems			
2.4 Gravity sedimentation systems			
2.5 Oil/water separation systems			
842119	842191	842121	842129
842199			
2.6 Screens/strainers			
392690	842121	842129	842199
2.7 Sewage treatment			
580190	841003	841011	842490
730900	841004	841012	851410
731010	841005	841013	851420
731021	841006	841090	851430
731029	841007	841780	851490
841000	841008	842381	
841001	841009	842382	
841002	841010	842389	

2.8 Water pollution control, wastewater reuse equipment			
2.9 Water handling goods and equipment			
732510	841360	848110	848180
841320	841370	848130	902610
841350	841381	848140	902620

3. Solid waste management

3.1 Hazardous waste storage and treatment equipment			
681099,	780600	851629	901320
3.2 Waste collection equipment			
392490	960310	960350	980390
3.3 Waste disposal equipment			
392020			
3.4 Waste handling equipment			
3.5 Waste separation equipment			
3.6 Recycling equipment			
842220	847439	847982	847989
3.7 Incineration equipment			
841780	851410	851430	851490
841790	851420		

4. Remediation and cleanup

4.1 Absorbents			
4.2 Cleanup			
851629	901320		
4.3 Water treatment equipment			
854389			

5. Noise and vibration abatement

5.1 Mufflers/silencers			
840991	840999	870892	
5.2 Noise deadening material			
5.3 Vibration control systems			
5.4 Highway barriers			

6. Environmental monitoring, analysis and assessment

6.1 Measuring and monitoring equipment			
902511	902710	902780	903180
902519	902720	902790	903220
902580	902730	903010	903281
902680	902740	903149	903289
902690	902750		
6.2 Sampling systems			
6.3 Process and control equipment			
903210			
6.4 Data acquisition equipment			
6.5 Other instruments/machines			

B. CLEANER TECHNOLOGIES AND PRODUCTS

1. Cleaner/resource efficient technologies and processes

No HS equivalence

2. Cleaner/resource efficient products

280110	320910	320990

C. RESOURCES MANAGEMENT GROUP

1. Indoor air pollution control

2. Water supply

2.1 Potable water treatment		
2.2 Water purification systems		
280110		
2.3 Potable water supply and distribution		
220100	285100	391400

3. Recycled materials

3.1 Recycled paper
3.2 Other recycled products

4. Renewable energy plant

4.1 Solar		
841911	841919	854140
4.2 Wind		
4.3 Tidal		
4.4 Geothermal		
4.5 Other		
290511	220710	

5. Heat/energy savings and management

381500	841950	853931	902820
700800	841990	902810	903210
701990			

6. Sustainable agriculture and fisheries

No HS equivalence

7. Sustainable forestry

No HS equivalence

8. Natural risk management

No HS equivalence

9. Eco-tourism

No HS equivalence