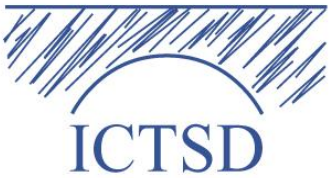

International Centre for Trade
and Sustainable Development

The Environmental Dimension of a Possible Switzerland-China FTA: Options to Promote Sustainability

Commissioned by the Federal Office for the Environment (FOEN)

Contents

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Note: This study/report was prepared under contract to the Federal Office for the Environment (FOEN). The contractor bears sole responsibility for the content.

FOEN had requested this study during an initial phase of its engagement in the negotiations of the free trade agreement. The study's focus, depth and evidence is limited. It is not a comprehensive analysis and assessment of the specific environmental impacts of the concrete free trade agreement between China and Switzerland.

1. Executive summary

China and Switzerland initiated negotiations on a bilateral Free Trade Agreement (FTA) in April 2011. Such an agreement would be accompanied by a diverse set of implications for the environment, through different impact routes – ranging from increasing trade volumes to possible changes in the composition of production and trade in the two countries. Positive elements involve possible increases in the trade in environmental goods and services and closer cooperation in areas such as environmental standards and implementation of multilateral environmental agreements (MEAs). These implications for the environment will vary depending on the design of the FTA, as well as policy-making in the two countries concerned.

This paper provides background information on the trade between China and Switzerland, as well as on their environmental situations and commitments in the form of MEAs. The paper focuses on environmental challenges and opportunities affected by trade in particular, and concludes by outlining possibilities to address these issues in the development of an FTA.

Key Trade and Environment Issues

China is Switzerland's third largest trading partner. The value of trade in goods between the two countries was estimated at between USD 9.56 billion and USD 9.83 billion in 2009, with China running a bilateral trade deficit. This number reflects an increase in bilateral trade of 20% year-on-year from 2002 to 2009.

Table 1: Composition of Bilateral Trade in Goods in 2009 (in millions of USD)

Sector	Chinese Exports to Switzerland	Swiss Exports to China
Agricultural Products	25.84	30.11
Machinery, Electronics, Instruments and Devices	1,070	3,170
Pharmaceuticals and Chemicals	121.2	648.7
Textiles and Clothing	839.9	196.74
Watches and Parts	24.83	869.5
Others	578	1985
Total	2,660	6,900

Source: Joint Feasibility Study on a China-Switzerland Free Trade Agreement

The two countries also trade in services, with China a net importer. The total volume of trade in services between the two amounted to USD 3.76 billion in 2008.

In terms of environmental issues, Switzerland has implemented a range of policies and measures over the past decades to prevent environmental pollution and protect endangered species and ecosystems. The Swiss Government's *Sustainable Development Strategy: Guidelines and Action Plan 2008–2011* focuses on the development of a knowledge-based and highly productive, yet low-resource economy.

Much of the environmental degradation and pollution facing China today is a result of the country's rapid process of industrialisation and economic development. While the central government has enacted increasingly stringent policies to protect the environment, implementation is often lagging at the regional and provincial levels. Among the issues facing China today are water pollution and scarcity, high levels of greenhouse gas (GHG) emissions and air pollution, land degradation and desertification. These environmental problems cost the Chinese economy approximately 7-10% of its GDP every year.

In the *Twelfth Five Year Plan*, published in March 2011, the Chinese government has set itself a binding target to decrease CO2 emissions by 17% per unit of GDP. Other priorities include: the construction of waste treatment facilities; restoring environmental health to rivers and lakes; preventing soil pollution from hazardous waste; and controlling and preventing heavy metal pollution. The government has been earmarking funding in these areas.

Environmental concerns are increasingly being addressed within the context of trade policy. Principle 12 of the Rio Declaration on Environment and Development provided guidelines stating that:

> 'States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade.'

Both Switzerland and China are parties to a number of multilateral, regional and bilateral trade agreements. Both are members of the World Trade Organisation (WTO), with Switzerland also forming part of the European Free Trade Association (EFTA) and already having trade agreements with over 60 countries, territories and regional trade blocs. China has concluded a number of regional and bilateral agreements, such as the ASEAN+1 (Association of South-East Asian Nations + China) FTA, and is in the process of negotiating numerous further agreements.

Both countries are parties to a large number of bilateral environmental cooperation agreements and MEAs, many with direct and indirect implications for trade. The most important ones in this regard include the UN Framework Convention on Climate Change (UNFCCC), the Montreal Protocol on Substances that Deplete the Ozone Layer, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Cartagena Protocol on Biosafety, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and the Stockholm Convention on Persistent Organic Pollutants.

Environmental challenges associated with key sectors in bilateral economic relations

One of the reasons China's economic development has been accompanied by a number of environmental challenges is due to the composition of Chinese exports. Approximately half of China's exports consist of products such as transport equipment and machinery. China's other main exports include textiles, leather products, chemicals, cement, steel and iron, all of which are resource-intensive and highly polluting industries.

The production and trade of machinery and equipment is associated with chemical pollution, partially controlled under the Montreal Protocol (ozone-depleting substances) and the Basel Convention. The handling or recycling of electronic waste (e-waste) poses particular problems in rural China. Swiss machinery that is exported to China needs to be properly recycled and disposed of after its use to prevent the accumulation of e-waste and toxic metals in the environment. Conversely, machinery that is exported to Switzerland from China causes pollution during its production. Cooperation between the two countries on the management of production processes could help ensure that Swiss demand for Chinese machinery and electronics does not lead to environmental problems in China.

The pharmaceutical and chemicals industries are large in Switzerland and rapidly growing in China, where companies were reluctant to set up until China's WTO accession in 2001. China is set to become the third largest consumer of pharmaceuticals this year, after the United States and Japan, and Swiss pharmaceutical companies have been investing heavily in production capacity in China. All of the world's top twenty pharmaceutical companies now have established wholly-owned facilities or joint ventures in China. The pollution associated with pharmaceutical production bears high environmental and health costs. Every stage of production involves risks. These include: organic chemical residues from manufacturing processes; biological waste-products such as vaccines serums, plasma derivatives, and biological extracts; contaminated gloves, syringes, and filters; low-level radioactive waste; and returned pharmaceuticals. The disposal of this waste is highly regulated in Switzerland under the Environmental Protection Law and the Basel Convention, with all non-recyclable waste being incinerated. The proposed FTA could be the driver of change. More trade in

pharmaceuticals and chemicals could help increase the production capacity of Chinese firms. In addition, the FTA may be a vehicle for ensuring that Swiss pharmaceutical and chemicals companies step up their Environmental Impact Assessments (EIAs) and start to apply the Swiss environmental standards with regards to pharmaceutical waste management in China.

China is one of the main global centres of textiles production, accounting for 24% of global trade in textiles, or USD 117.5 billion, in 2005. Apparel is one of China's top five exports to Switzerland. The textiles industry contributes greatly to water pollution and scarcity. Depending on the various processes of de-sizing, bleaching and dyeing, the chemicals used and water consumption will vary. The chemicals and dyes utilised in the production processes contain many toxins, yet only 2% of wastewater is treated before being dumped into estuaries and waterways. Today, over 28% of Guangdong province's rivers are severely polluted, and the province faces some of the country's worst water pollution-related chronic health problems. In addition to treating wastewater, another key aspect of environmental protection is to control the water consumption of the industry. As many of these textiles products are destined for export, trade has the potential to change the current situation. Foreign companies could exercise more control over their supply chains and only source from factories that are responsible with their water management.

Agriculture is not a large component of Sino-Swiss bilateral trade, totalling only USD 56 million. However, it is one of the most dominant sectors in the Chinese economy, and as such holds great potential for cooperation between Switzerland and China. There are potential environmental benefits: Switzerland has more efficient agricultural technologies and machinery, as well as knowledge of sound agricultural techniques and processes that are conscious towards water and energy consumption. It also has experience implementing farming practices that limit the use of chemical fertilizers and pesticides without compromising productivity. More efficient and greener agricultural machinery and practices are essential to the sustainability of the agricultural industry in China. At present, Switzerland exports more agricultural products to China than China does to Switzerland. This could change with the implementation of the FTA. The FTA could encourage knowledge partnerships between the two states and support the transfer of technology and expertise.

In all the sectors discussed above, one cross-cutting component of relevance from a trade perspective of that of embedded resources, and embedded carbon in particular. While China's comparative advantage is based on factors beyond resource intensity – mainly labour costs – studies do show that significant amounts of embedded carbon are exported from China to western countries, Switzerland included. This is due to the coal-based energy system in China, as well as low levels of energy efficiency. Other embedded resources include virtual or embodied water, contained both within agricultural and industrial products. The model of the ecological footprint seeks to calculate all natural resource use associated with the production and consumption of goods. For more detailed data applying to Swiss-Sino trade, additional research would be required.

The role of trade in the dissemination of environmentally sound technology, goods and services

China's speed and scale of development combined with its large population and resource scarcity provides an exceptional opportunity for increased international exchange of sustainable solutions. Ideally, an FTA would enhance mutual environmental technology exchange between Switzerland and China and provide new opportunities for Swiss firms wishing to expand operations in, or exports to China.

China is also a large player in the green technology market. It has the largest existing capacity for renewable energy generation in the world and is a leader in solar energy. It accounted for more than half of the global solar water heating capacity in operation in 2007. As costs have decreased for the production of photovoltaic power, China has become a large producer of photovoltaic cells and modules. Additionally, in the past few years, China increased its wind-turbine capacity by more than any other country. In 2010 as well as each of the four years preceding it, China has consistently doubled its capacity for wind energy. This form of renewable energy has been highlighted as a key economic growth area by the Chinese government in response to the financial crisis.

Recent policy developments in China have placed strong emphasis on environmental clean-up and protection. Overall, the Chinese market is divided into two different segments, composing the urban,

increasingly wealthy part of the country and the poorer rural areas, respectively. These require different environmental technology solutions, at different costs.

Given the current stalemate in the WTO negotiations on environmental goods and services, specific commitments in these areas could be built into a Swiss-Sino FTA, focusing on a most up-to-date understanding of how to address classification issues.

Table 2: Bound and applied tariffs on some climate-friendly goods in Switzerland and China

HS code	Description	China: applied tariff	China: bound tariff	Switzerland: applied tariff	Switzerland: bound tariff
841011	Hydraulic turbines< 1 MW	10%	10%	0%	0%
730820	Lattice masts	8,4%	8,4%	0%	0%
850231	Wind turbines	8%	8%	0%	0%
854140	PV devices	0%	0%	0%	0%
841861	Heat pumps	10%	10%	0%	0%
841869	Heat pumps: parts	10%	15%	0%	0%
850720	Lead-acid accumulators	10%	10%	0%	0%

Source: WTO Tariff Download Facility, accessed 27 October 2011

While China does impose tariffs on environmental goods (see table above), a series of interviews with Swiss companies in the area of environmental goods and services revealed that domestic and provincial policy in China has as at least as much effect on Swiss firms' potential on the Chinese markets as changes of tariffs and quotas in the current trade regime. An FTA could benefit Swiss-Chinese environmental technology exchange through:

1. highlighting institutional complications in the Chinese system;
2. promoting connections between Swiss firms and Chinese counterparts and authorities; and
3. contributing to awareness of environmental challenges and management thereof.

Horizontal Issues

Competitiveness: countries with high carbon costs are concerned that their energy-intensive industries, in sectors such as steel, chemicals, fertilizer and cement, lose market share to producers in other countries. In this regard, countries taking on stringent carbon reduction measures, such as the European Union - as well as the US, in draft climate change legislation which has not passed so far - are contemplating so called border carbon adjustments (BCAs). So far, BCAs are potential instruments that have not yet been put into use. The issue of BCAs has never been contemplated nor discussed in FTAs – however, for a new-generation of FTAs, this could potentially be addressed with countries looking for greater parity in their measures to address carbon. Countries could both boost their technical cooperation with regard to emissions-limiting and clean energy technology, and ensure that the carbon intensity of their production processes begin to converge.

Export restrictions on raw materials, including rare earths: China's export restrictions with regard to a number of raw materials - bauxite, coke, fluorspar, magnesium, manganese, silicon carbide, silicon metal, yellow phosphorus, and zinc – have been challenged at the WTO by the US, EU and Mexico. China lost this case.[1] Rare earths constitute another important category of minerals, used in particular for high-tech products and green technologies. China has recently closed several mines, started stockpiling the elements and instituted export quotas. This has lead to rapidly rising prices on the global market and concerns among importers. Switzerland currently only produces and exports a limited range of raw materials yet has strong vested interests in the import of rare earth minerals for its previously discussed high-tech manufacturing sector. While the disciplines on export restrictions

[1] China has since appealed the ruling and Appellate Body ruling is expected, at the earliest after six months, though it could take up to two years.

included under the GATT are relatively weaker than those on imports, recent FTAs and RTAs have been designed to fill this gap.

SPS and TBT requirements: As tariff barriers come down, standards are increasingly important for trade, and are regulated under the WTO Agreement on Sanitary and Phytosanitary Standards (SPS Agreement) and the Agreement on Technical Barriers to Trade (TBT Agreement). Chapters or articles on these topics will likely also be included in the new Switzerland-China FTA, affirming adherence to the WTO SPS and TBT Agreements and possibly going beyond them. While countries can set their own standards to enforce public policy goals, their international trade agreements' chapters in this area seek to ensure that standards are not used as disguised barriers to trade.

Private standards, labelling and PPM: While government-set standards need to conform with the SPS and TBT agreements, private sector standards and burgeoning labelling schemes do not. The number of environment-related standards and labelling initiatives is rapidly growing, spanning areas such as carbon content, water and pesticide use (organic agriculture), sustainable forestry and fisheries as well as fair trade initiatives. Advances in this area are led by the private sector, which is developing standards affecting both sourcing decisions and decision-making within supply chains. Under an FTA, Switzerland and China could set up a framework under which their respective private sector entities could work more closely together to ensure that labels are developed in a transparent and collaborative manner. They could exchange information on initiatives underway at an early stage, and also cooperate in relevant international fora outside the trade realm, such as the ISO.

Intellectual property: The role of intellectual property rights (IPRs) in the transfer of environmental technologies has been particularly contentious in the negotiations under the United Nations Framework Convention on Climate Change (UNFCCC). One of the key findings of ICTSD's research on IPRs is that the differences in conditions across countries and sectors require flexibility in both domestic and international policies that are put in place to promote international technology transfer. The effectiveness of IPRs in promoting both the development and deployment of environmental technologies in global markets depends on both industrialized and developing countries, including how well innovation policies function in industrialized countries, the institutions in place in developing countries to facilitate the absorption of new technologies, and ensuring an appropriate balance in both domestic and multilateral IPR systems, in both originating and recipient countries. Another aspect of intellectual property is the link between intellectual property rights and biodiversity that could be incorporated into the potential Swiss-China FTA. The inclusion of provisions on biodiversity in an FTA is one manner by which it is possible to recognise and secure the economic value of biological resources and traditional knowledge.

Table 3: ***Options to address trade and environmental concerns in the framework of a possible FTA***

Trade Policy Topics and Instruments	Linkage with environmental objectives?					Where to address in a Swiss-China FTA
	Transfer and diffusion of environmental technologies.	**Biodiversity conservation.**	**Carbon intensity/ footprint/ leakage.**	**Conservation of exhaustible resources (e.g. rare earths).**		
	No global agreement on the diffusion of EGS.	Convention on Biological Diversity. Both CH/China signatories.	Many uncoordinated private labelling schemes.	No comprehensive international agreement on conservation of resources.	Governance gap (environmental policy) / Governance gap (trade policy)	
Tariff Measures	Identification of environmentally-friendly goods. Scheduling of commitments.		BCAs		Negotiations on liberalization of EGS stalled in Doha.	*Under Goods or in separate environment chapter together with environmental services.*
Standards/ TBT (including private standards and PPMs)	Mutual recognition of standards/ testing procedures. Transparency of standards and information sharing. Designated points of contact, conflict resolution/complaint process. Support for international standard-setting.	SPS standards for pesticides and disease outbreaks, including potential invasive species.	How to address the numerous private labelling schemes.		Lack of harmonisation/mutual recognition of a number of standards on environmental equipment and biofuels. Private standards not regulated.	*Include under SPS/TBT provisions.*
Export restrictions				Dual pricing Quotas Licensing Export taxes	Weak disciplines under GATT on export restrictions.	*In Goods article on export restrictions or separate annex on export restrictions that reaffirms China's commitments from its WTO accession protocol.*
Government procurement	Procurement of environmentally preferable products. Policy space for both parties to procure EPPs in order to help develop market. Transparency; environmental criteria; local content/sourcing.				Applies only to GPA members. Transparency discussions dropped from 'Doha' round.	*Under government procurement.*
Services	Identification of environmentally-friendly services. Scheduling of commitments.				Unresolved classification of environmental services and domestic regulation issues.	*Under services or in separate environment chapter together with environmental goods.*
Investment	Performance requirements & right of establishment. Local content requirements. Investor-state disputes.				No multilateral framework beyond TRIMS. Mostly dealt with in bilateral negotiations. Issue dropped from Doha Round.	*Investment or environment chapter.*
Intellectual Property Rights	Speed of granting for green patents. Licensing arrangements. Tech-transfer and cooperation.	Disclosure requirements. ABS Traditional knowledge.			Ongoing discussions in TRIPS Council, WIPO, UNFCCC & CBD.	*Possibility to follow the example of the EFTA-Colombia/Peru agreement as a model for biological diversity IPR.* *Could expand the provisions of the CBD technology categories.* *EU-CARIFORUM EPA as basis for provisions for tech-transfer.* *Chapter/Annex on IP.*

Source: Compiled by ICTSD

2. Key trade and environment issues

Objective

On 7-8 April 2011, the Swiss and Chinese governments held the first round of meetings to negotiate a Free Trade Agreement (FTA) between the two countries. The proposed FTA is likely to increase bilateral trade flows. This, in turn, may impact the environment both positively and negatively in a number of ways. In simple terms, it can lead to positive environmental outcomes by facilitating the exchange of environmental technologies and knowhow, and negative ones, by leading to an increase in energy-intensive production in China, destined for Switzerland. This study aims to give a more thorough picture of the environmental dimension of trade between China and Switzerland.

The paper will first provide an overview of the two countries' existing bilateral trade relations and identify the main environmental challenges facing China and Switzerland today, and their association with production and trade. It will then discuss the composition of trade between the two countries and pinpoint which Multilateral Environmental Agreements (MEAs) are relevant to their main production sectors, namely machinery and electronics, pharmaceuticals and chemicals, textiles and clothing and agricultural sectors. Following that, there will be an analysis of how trade plays a role in the dissemination of environmentally-sound practices and green technologies. After a short discussion of horizontal issues, such as competitiveness concerns and intellectual property rights, the paper will conclude with recommendations on how to address environmental concerns within the framework of trade and, more specifically, how to incorporate them into the proposed FTA.

Trade Relations

China

The Chinese economy - led by its industries sector that accounts for almost half of the nation's GDP - has experienced rapid growth over the past several decades. China's economic growth model is highly trade-oriented; the value of Chinese exports reached an all-time high in 2008, at USD 1.43 trillion.[2] Such openness and dependence on trade leaves the country vulnerable to fluctuations in foreign demand. This indeed occurred when the value of exports dropped in 2009 as a result of the global financial crisis. This decrease in demand for Chinese goods had repercussions for China's trade surplus, which declined to USD 196 billion in 2009 from 298 billion in 2008.[3] Nevertheless, trade remains an important part of the economy. China still runs a trade surplus with North America and Europe, whereas with its trading partners in Asia it runs a deficit.

Of all of China's exports, machinery and transport equipment takes the largest share, accounting for 49.2% of exported goods in 2009. Other manufactured goods account for another 40.3%. 40.6% of China's imports are also attributed to machinery and transport equipment, with the other main imported products being inedible crude materials, animal and vegetable oils, fats, waxes and mineral fuels, lubricants and other related materials.[4]

Switzerland

Switzerland is considered one of the world's most stable economies, with a high per capita income and low unemployment. In contrast to China, Switzerland's services sector is the most dominant, accounting for 71.1% of its GDP in 2008.[5] Nonetheless, its relatively small size makes Switzerland a very open economy, with trade in goods amounting to USD 345.7 billion in 2009 and a USD 17.9 billion trade surplus.[6] Switzerland's main trading partners are the European Union's twenty-seven Member States, accounting for 59.7% and 78.0% of its exports and imports respectively in 2009.

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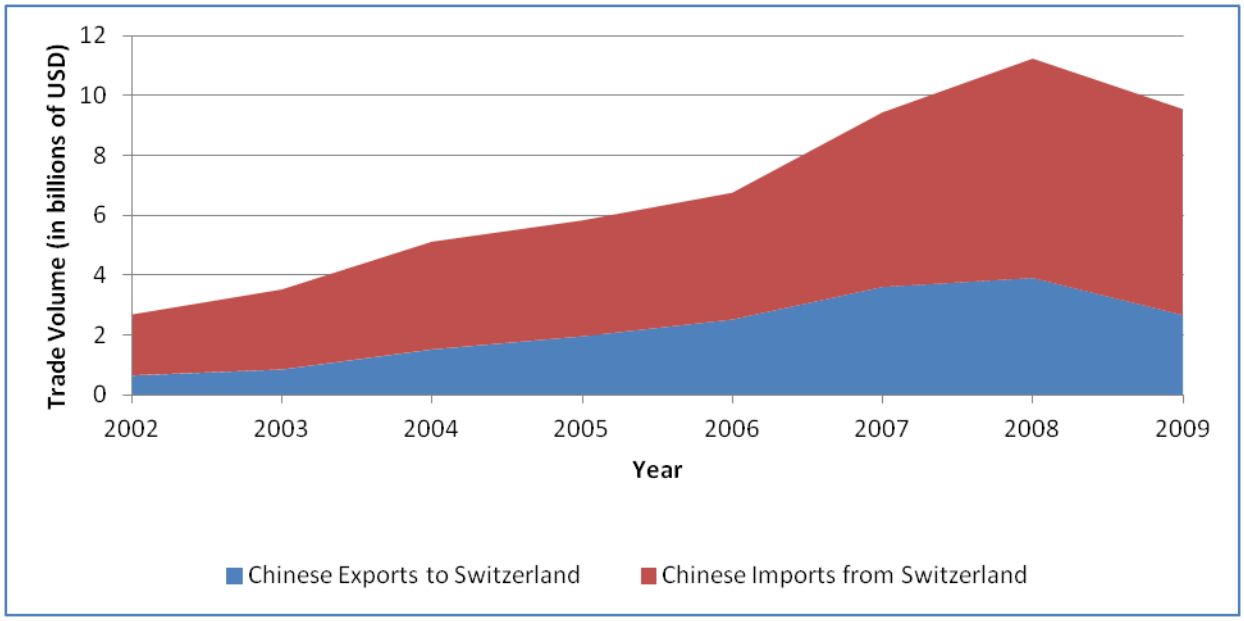
[2] *Country Profile: China*; 2011; UN Data; http://data.un.org/CountryProfile.aspx?crName=CHINA
[3] Ibid.
[4] Ibid.
[5] *Joint Feasibility Study on a China-Switzerland Free Trade Agreement*; August, 2010; Joint Study Group, Beijing, China, www.seco.admin.ch/themen/00513/02655/02731/04118/index.html?lang=en&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ad1IZn4Z2qZpnO2Yuq2Z6gpJCFen58gWym162epYbg2c_JjKbNoKSn6A--: p.21
[6] Ibid.: p.14

Switzerland's main physical exports are chemicals and pharmaceuticals, together accounting for 38.3% of its exports. It also produces many precision instruments, watches and jewellery, as well as machinery and electronic devices. Switzerland also imports chemicals and pharmaceuticals, machinery and electronic devices, but a large part of its imports is made up of agricultural and fisheries products and energy sources.[7]

Bilateral Economic Relations

The two countries established diplomatic relations in 1950, although bilateral trade did not pick up until the latter part of the twentieth century. Today, China is Switzerland's third largest trading partner. The value of trade in goods between the two countries was estimated at between USD 9.56 billion and USD 9.83 billion in 2009, with China running a bilateral trade deficit.[8] This number reflects an increase in bilateral trade of 20% year-on-year from 2002 to 2009.

Figure 1: Sino-Swiss Bilateral Trade



Source: General Administration of Customs of the People's Republic of China; Joint Feasibility Study on a China-Switzerland Free
Trade Agreement

Looking to the composition of trade in goods, China mainly imports machinery, watches and jewellery, and chemicals and pharmaceutical products from Switzerland. Its main exports to Switzerland include apparel and textiles, electrical machinery and seafaring vehicles.

[7] Ibid.: p.15
[8] Ibid.: p.19

Table 4: Composition of Bilateral Trade in Goods in 2009 (in millions of USD)

Sector	Chinese Exports to Switzerland	Swiss Exports to China
Agricultural Products	25.84	30.11
Machinery, Electronics, Instruments and Devices	1,070	3,170
Pharmaceuticals and Chemicals	121.2	648.7
Textiles and Clothing	839.9	196.74
Watches and Parts	24.83	869.5
Others	578	1985
Total	2,660	6,900

Source: Joint Feasibility Study on a China-Switzerland Free Trade Agreement

The two countries also trade in services, with China a net importer. Switzerland, on the other hand, is a net exporter. The total volume of trade in services between the two amounted to USD 3.76 billion in 2008. China is also the fourth largest recipient of Swiss foreign direct investment (FDI). In 2009 itself, Swiss FDI totalled USD 301.7 million.[9] There are no detailed statistics about Chinese investments in Switzerland.

Main Environmental Challenges

In the past, Switzerland has faced persistent problems related to air pollution and natural resource use, mainly due to industry, agriculture, transport and tourism, buttressed by its high population density. Over the past few decades, Switzerland has implemented a range of measures, including the "polluter pays" principle, to prevent further damage to the environment and protect endangered plant species. The government seeks to collaborate with businesses and civil society to promote environmentally-friendly practices without sacrificing economic viability. [10] The Swiss Government's *Sustainable Development Strategy: Guidelines and Action Plan 2008–2011* has as its aim for Switzerland to achieve a knowledge-based and highly productive yet low-resource economy. It stresses that the change process also should strengthen socioeconomic development and be compatible with the need to achieve an absolute reduction in the consumption of the environment and its resources.

Much of the environmental degradation and pollution facing China today is a direct result of the country's rapid progress of industrialisation and economic development. Policies to protect the environment enacted by the central government have often been poorly implemented at the regional and provincial level, as local leaders prioritise economic development over environmental protection.

Among the most pressing issues facing China today are water pollution and water scarcity, air pollution, as well as land degradation and desertification. These environmental problems cost the Chinese economy approximately 7-10% of its GDP every year.[11] This brings increased risk not only to China's economic sustainability but also affects social stability and its reputation. China is therefore seeking ways to balance its economic ambitions with its need to protect the environment and its people.

[9] Ibid.: p.23
[10] *Environmental Performance Review of Switzerland*; 2007; Environmental Performance Review; Organisation of Economic Co-operation and Development, Paris, France, www.oecd.org/document/6/0,3746,en_2649_34307_38525446_1_1_1_1,00.html
[11] Yang, Tony; 2009; *Environmental Problems in China*; World Wildlife Foundation, Hong Kong, Hong Kong SAR, http://wwf.panda.org/who_we_are/wwf_offices/china/environmental_problems_china/

The environmental concerns of these two countries are not mutually exclusive. While the direct effects of industrial development have been felt in both Switzerland and China to varying degrees, the long-term effects of climate change must also be considered. An attempt to meet this challenge has been the United Nations Framework Convention on Climate Change (UNFCCC), an international treaty established in 1994 with the goal of beginning to consider what can be done to reduce global warming. The Kyoto Protocol was designed as the legally binding arm of the UNFCCC so as to ensure any pledged emissions reductions and global warming containment measures would be applied.

Established in 1997, the Kyoto Protocol was a landmark, binding agreement to reduce emissions. Organized through the UNFCCC, the Protocol sets binding emission targets for 37 industrialized countries that amount to an average reduction of 5% against 1990 levels over the five year period of 2008-2012. However, China as a developing country falls under Common but Differentiated Responsibility whereby as a Non-Annex I country, it is not bound to emission reduction commitments but is rather bound to mitigation actions. Switzerland as an Annex I country has committed to reducing emissions to 98% of 1990 GHG levels. This agreement recognizes that developed countries are principally responsible for GHG emissions and therefore places a heavier burden upon them for emissions reductions. China has maintained that its designation as a developing country should continue into any formal treaty limiting emissions after 2020.

Air Pollution

The leading cause of death in China is respiratory and heart disease attributable to air pollution. There are a number of causes for the air pollution crisis in China, much of it relating to energy production and consumption. First, about 75% of energy production in China is still dependent on coal.[12] Second, thermal insulation is poor or nonexistent, leading to high levels of energy consumption. According to the World Bank, 95% of buildings do not meet Chinese regulations and laws for energy efficiency. Third, much of China's increased energy use is due to the growth in infrastructure. In 2005 alone, China added 66 gigawatts of energy to its power grid, the equivalent amount of energy the entire United Kingdom uses in a year.[13] Fourth, the rapid rise in living standards associated with the economic boom has swelled the ranks of the middle class. Automobile purchases are on the rise, and China is now the world's second largest consumer of oil, after the United States. Energy consumption per capita in 2007 was the equivalent of 1379.0kg of oil.[14]

Water Pollution and Scarcity

Approximately 40% of the water in China's rivers has a quality index of 3 or worse and is as such unsuitable for human consumption.[15] The practice of dumping industrial and chemical waste into rivers, lakes and streams has led to the contamination of a large portion of China's surface water as well as ground water, and has led to algal blooms in many areas. These algal blooms decrease the oxygen supply available in water and endanger fish populations and other aquatic life. Similarly, the presence of untreated sewage in water has led to an increase of red phytoplankton. Red tides are becoming increasingly common, and also contribute to the decimation of marine life.

With the degradation of China's rivers, particularly the Yangtze, entire ecosystems are now at risk. Biodiversity in many areas is threatened. Moreover, the diversion of water for agriculture has led to water scarcity in places that were traditionally fertile.

Desertification and Erosion

Already, approximately 30% of China's land surface is desert. The Gobi Desert's surface area expands by 2,500 km^2 each year, bringing strong dust storms, which can spread airborne toxins over a wide area. The problem is particularly acute in the province of Inner Mongolia, where the relocation of residents has been necessary as the land has become increasingly uninhabitable. The 'Great

[12] Ibid.
[13] Kahn, Joseph; Yardley, Jim; August, 2007; *As China Roars, Pollution Reaches Deadly Extremes*; The New York Times, New York, USA, www.nytimes.com/2007/08/26/world/asia/26china.html?pagewanted=5
[14] *Country Profile: China*; op. cit.
[15] Yang, Tony; 2009; *Environmental Problems in China*; op. cit.

Green Wall' project was initiated in 2001 to try to stop the spread of the desert by planting over 36,000 km^2 of forest. The project was completed in 2010, and its success remains to be seen.

Soil erosion is not unique to the northern part of China. Overgrazing and the expansion of agriculture and the resultant construction of dams and irrigation structures have greatly altered the Yellow River's natural course. There have been reports of increased droughts, flow stoppages and water shortages in traditionally lush areas. When soil is eroded, many valuable nutrients are also lost. The amount of nutrients lost from soil every year is equivalent to 40 million tonnes of fertilizer - the of chemical fertilizer used by the agricultural sector annually.[16]

Existing Bilateral and Multilateral Agreements

Trade

Switzerland is a member of the European Free Trade Association (EFTA). EFTA, consisting of Liechtenstein, Iceland, Norway and Switzerland, is a free trade bloc that runs parallel to the European Community. EFTA members have jointly concluded preferential trade agreements (PTAs) with the European Union and 23 other states and customs unions. They have also signed declarations on cooperation with Argentina, Brazil, Paraguay, Uruguay, Mongolia, Mauritius, Malaysia and Panama. Including the treaties concluded by EFTA as well as Switzerland's own bilateral FTAs, Switzerland has trade agreements with over 60 countries, territories and regional trade blocs in total.[17] It is also negotiating or preparing to negotiate with other countries.[18]

Likewise, China has concluded a number of regional agreements, including the Asia-Pacific Trade Agreement, a PTA currently signed by China, Bangladesh, India, Laos, Republic of Korea and Sri Lanka, as well as with ASEAN (composed of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam). China has also concluded a number of bilateral FTAs[19] and is in the process of negotiating[20] or considering[21] a number of others, including a trilateral trade pact with Japan and South Korea.

Environment

Environmental concerns are increasingly being addressed within the context of trade policy. In particular, the Rio Declaration on Environment and Development has provided some clear guidelines as to how economic development and trade may be conducted in an environmentally-conscious way. One of the most important principles for the purposes of this paper is Principle 12, which states:

> 'States should cooperate to promote a supportive and open international economic system that would lead to economic growth and sustainable development in all countries, to better address the problems of environmental degradation. Trade policy measures for environmental purposes should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade. Unilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided. Environmental measures addressing transboundary or global environmental problems should, as far as possible, be based on an international consensus.[22]

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[16] *Ibid.*
[17] *List of Free Trade Agreements of Switzerland*; June, 2011; State Secretary for Economic Affairs, Bern, Switzerland, www.seco.admin.ch/themen/00513/00515/01330/04619/index.html?lang=en
[18] Ibid.
[19] *China's Free Trade Agreements*; 2010; Ministry of Commerce, Beijing, China, http://fta.mofcom.gov.cn/english/fta_qianshu.shtml
[20] *China's Free Trade Agreements Under Negotiation*; 2011; Ministry of Commerce, Beijing, China, http://fta.mofcom.gov.cn/english/fta_tanpan.shtml
[21] *Free Trade Agreements Under Consideration;* 2011; Ministry of Commerce, Beijing, China, http://fta.mofcom.gov.cn/english/fta_yanjiu.shtml
[22] *Rio Declaration on Environment and Development*; June, 1992; E.73.II.A.14; United Nations Conference On Environment and Development, Rio de Janeiro, Brazil, www.unep.org/Documents.Multilingual/Default.asp?documentid=78&articleid=1163

China has bilateral environmental cooperation agreements with 42 countries, Switzerland included. It has also signed more than 50 multilateral agreements and conventions relating to environmental protection, including the United Nations Framework Convention on Climate Change (UNFCCC). In general, these MEAs may be divided into two categories: The first relates to product standards, measures that seek to regulate and control the import of goods that contain certain banned chemicals or hazardous materials. These measures may be challenged as barriers to trade, but if agreed on multilaterally, may succeed in curbing the use of harmful substances. The second relates to production processes and aims to create measures to limit the amount of environmental pollution, such as by setting up mechanisms for monitoring emissions levels.

The MEAs most relevant to key production sectors include the UN Framework Convention on Climate Change (UNFCCC), the Montreal Protocol on Substances that Deplete the Ozone Layer, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the Cartagena Protocol on Biosafety, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, and the Stockholm Convention on Persistent Organic Pollutants.

Many Swiss companies are global leaders in environmental technologies. They have the requisite technological expertise and experience for the development of green technologies and have long played an important role in the global development of clean technologies, including those relating to water treatment, air pollution control, measuring equipment and control systems, waste treatment and recycling, power generation and distribution and natural hazards management.[23] China has recently become a large player in the area of green technology, with a particular focus on renewable energy. As costs have decreased for the production of photovoltaic power, China has become a large producer of photovoltaic cells and modules. Additionally, in the past few years, China increased its wind-turbine capacity more than any other country.

The two countries signed a Memorandum of Understanding on Environmental Cooperation in February 2009, stipulating that a dialogue be established to allow for an exchange of information on ways to facilitate technology transfer and cooperate on renewable energies, amongst others. China and Switzerland have cooperated on technological R&D and will continue to do so in the future. The FTA currently being negotiated could further re-enforce this cooperation by including provisions supportive of environmental protection and sustainable development.

3. Environmental challenges associated with key sectors in bilateral economic relations

As one of the world largest traders, China is on the hot spot in terms of the environmental challenges that its trading has brought. Those challenges are two-fold. One is the environmental impacts of the manufacturing process, i.e. the way of making those products. For instance, sectors such as textile, leather products, cement and machinery are resource intensive and the production process may cause serious pollution if there is restrictive environmental management. The other type of challenges is troubling too because some traded products are not only contaminating during the production process but also contain polluting materials in its final products. Polluting materials such as plastic PVC have toxins building up in water, air and the food chain. Other substances in final products may have serious environmental and health problems such as paints. The World Health Organisation (WHO) has reported a 20%-40% increased risk of certain types of cancer (in particular lung cancer) for those who come into regular contact with, or work with paints.

This paper will only focus on a broad selection of sectors for the purpose of illuminating those challenges related to trading between Switzerland and China. It will also discuss how that particular sector is linked to Multilateral Environmental Agreements (MEAs).

Machinery and Electronics

38.7% of the goods exported from Switzerland to China in 2009 consisted of machinery, worth USD 2.1 billion. This follows a decrease of 10.7% from 2008.[24] Switzerland also imports an

[23] *Joint Feasibility Study*; op. cit.: p.79
[24] *Joint Feasibility Study*; op. cit.: p.20

approximately equal amount of machinery and electronics from China. As such, this sector plays a very important role in Sino-Swiss bilateral relations.

The Montreal Protocol on Substances that Deplete the Ozone Layer, which entered into force in 1989, contains many provisions that are relevant to the production of machinery and electronics. In particular, it aims to control the production and consumption of ozone-depleting substances (ODS). Many of these ODSs, most famously chlorofluorocarbons, were once used in the majority of air conditioning and refrigeration units. The Montreal Protocol continues to play an important role in regulating certain consumer products and industrial processes that emit halogen source gases, the main culprits of ozone depletion. Article 2 contains schedules for phasing out the various ODSs. These schedules have been modified a few times to accelerate the phasing out of the substances, and it is hoped that by the middle of the twenty-first century, the amount of ozone-depleting gases in the atmosphere would fall to early 1980s levels.

The 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, to which both Switzerland and China are parties, was created to address the problems posed by the increased shipment of hazardous waste to countries that are not equipped and trained to handle the waste properly, resulting in indiscriminate dumping and inappropriate recycling. The Basel Convention aims to minimise the amount of waste produced and to encourage the treatment and disposal of waste as close as possible to their place of generation, as well as promote the use of clean technologies and the transfer of technological know-how. Under the Convention, transboundary movement of waste is conditional upon the prior consent of the state for which the waste is destined. Information about the reason for waste export, as well as special handling requirements and methods of disposal must also be provided. Another requirement is the labelling of wastes, which will have a positive effect on the identification and potential elimination of the more toxic substances.

Within China, machinery and electronic waste are frequently transported to regions with low labour costs, where the valuable metals are recovered. The dismantling of e-waste is often performed by hand, without proper protective equipment. This creates a potential health hazard for China, with heavy metals and toxic pollutants contaminating both the environment and the workers. This increases the strain on the environment and on healthcare services, and the future clean-up costs of these operations will be staggering.

Switzerland is helping a number of developing countries implement the Basel Convention. Since 2003, the State Secretariat for Economic Affairs (SECO) has donated CHF 4 million towards establishing e-waste recycling systems in China, India and South Africa.[25] Indeed, Swiss machinery that is exported to China needs to be properly recycled and disposed of after its use to prevent the accumulation of e-waste and toxic metals in the environment. Conversely, machinery that is exported to Switzerland from China causes much pollution and damage during its production. Cooperation between the two countries on the management of production processes could help ensure that Swiss demand for Chinese machinery and electronics does not lead to environmental problems in China.

Pharmaceuticals and Chemicals

China's pharmaceutical market has traditionally been small and not commensurate with its large population. However, recent changes instituted by the central government, including the improvement of healthcare infrastructure and the steps taken to make health coverage universal have led to a boom in the pharmaceuticals market. China is set to become the third largest consumer of pharmaceuticals this year, after the United States and Japan.[26] Many of these chemicals and pharmaceuticals are imported from Switzerland, with the value of exports to China at USD 1.25 billion, a 12.6% increase from 2008.[27] Swiss pharmaceutical companies have also started investing heavily in China in recent years.

[25] *Development cooperation for e-waste recycling: A Swiss contribution to the implementation of the Basel Convention*; State Secretary for Economic Affairs, Bern, Switzerland, www.basel.int/Portals/4/Basel%20Convention/docs/convention/XX%20Anniversary/Press%20kit/Swiss%20Project%20leaflet.pdf

[26] *China could be third largest pharma market by 2011*; March 2010; Manufacturing.net, New Jersey, USA, www.manufacturing.net/News-China-Could-Be-3rd-Largest-Pharma-Market-By-2011-031610.aspx

[27] *Joint Feasibility Study*; op. cit.: p.20

On the production side, China's pharmaceutical industry includes the production of synthetic chemicals and drugs, medical devices, apparatus and instruments, prepared Chinese medicines, pharmaceutical machinery and hygiene and packing materials. Before China joined the WTO in 2001, many foreign firms shied away from investment in China, owing to the lack of patents and protection of intellectual property, the lack of transparency for drug approval processes and little R&D funding. The industry was characterised by its fragmentation, with production centres scattered throughout diverse geographical locations. They were also mostly small-scale, leading to weak international trading competitiveness.

Nonetheless, the situation has greatly improved since 2001, the key reason being the tightening of regulations regarding patents, in compliance with the WTO's Agreement on Trade Related Aspects of Intellectual Property Rights (the TRIPS agreement). The growth of medical insurance in China has also aided this trend. Indeed, over the past few decades, the Chinese pharmaceutical industry has been growing at an average rate of 16.7% annually. The world's top twenty pharmaceutical companies have now all established wholly-owned facilities or joint ventures in China. Many more are setting up R&D centres, including GlaxoSmithKline, Novo Nordisk and Swiss pharmaceutical firms such as Roche and Novartis. Roche in particular has chosen to increase its employee numbers in China by 25% whilst cutting back that of Europe and the United States. It has invested more than USD 1.5 billion in China, and now earns more than 40% of its turnover in the Asia-Pacific region from China.[28] According to the Chinese Ministry of Industry and Information Technology, China's pharmaceutical industry's value-added output is increasing by 14.9% annually.

The waste of pharmaceutical production has high environmental and health costs associated with it. At every stage of production there are risks. These include: organic chemical residues from manufacturing processes; biological waste-products such as vaccines serums, plasma derivatives, and biological extracts; contaminated gloves, syringes, and filters; low-level radioactive waste; and returned pharmaceuticals. The disposal of this waste is highly regulated in Switzerland under the Environmental Protection Law and the Basel Convention, with all non-recyclable waste being incinerated. For hazardous waste this is done in specialised incinerators in Dottikon and Basel. These incinerators are some of the most technologically advanced of their kind in the world. The incinerators are operated in a sustainable manner by utilising a multi-process approach: with the energy produced by incineration being utilised for electricity production as well as district heating; as well as all emissions being passed through electrostatic filers, gas scrubbers and denitrification equipment. The slag is then contained in controlled landfills.[29]

At present, there is a lack of research conducted on the environmental impact of pharmaceuticals and personal care products (PPCPs). Some of the most commonly-used pharmaceuticals, including steroids and non-prescription drugs, as well as antibiotics and prescription medication, have been detected in China's water supply systems. The lack of sufficiently advanced waste-disposal facilities means that the chemicals from pharmaceutical production may enter the environment through wastewater, especially since sewage sludge and effluents are commonly reused for irrigation. Plants and crops then take up the chemicals. The health effects of consuming these crops or of consuming livestock that have ingested these crops is uncertain. Moreover, the production of certain pharmaceuticals may involve the use of persistent organic pollutants (POPs) such as Lindane that has been used both as an agricultural insecticide and as a pharmaceutical treatment for lice and scabies[30]. As stated above, POPs are harmful to humans and the environment, and are now regulated by the Stockholm Convention. Nonetheless, more empirical and statistical studies are needed to establish the links between pharmaceutical production and the environment.

The proposed FTA could be the driver of change in this area. More trade in pharmaceuticals and chemicals would help increase the production capacity of Chinese firms. In addition, the FTA may be a vehicle for ensuring that Swiss pharmaceutical and chemicals companies step up their

[28] *China's pharmaceutical industry – Poised for the giant leap'*; 2011; KPMG Advisory, China, www.kpmg.com/cn/en/IssuesAndInsights/ArticlesPublications/Documents/China-pharmaceutical-201106-2.pdf

[29] *Waste treatment processes: Municipal solid waste incineration*; 2009; Federal Office of the Environment; Bern, Switzerland; http://www.bafu.admin.ch/abfall/01495/01496/index.html?lang=en

[30] *The new POPs under the Stockholm Convention,* http://chm.pops.int/Implementation/NewPOPs/TheNewPOPs/tabid/672/Default.aspx

Environmental Impact Assessments (EIAs) and start to apply the Swiss environmental standards with regards to pharmaceutical waste management in China.

Textiles and Clothing

China is one of the main global centres of textiles production, accounting for 24% of global trade in textiles, or USD 117.5 billion, in 2005. Apparel is one of China's top five exports to Switzerland, valued at USD 839.9 million in 2009. The textiles industry is experiencing an annual growth rate of 17.3%. Guangdong province in the southern part of China is at the heart of the textiles industry, accounting for about a quarter of China's total textiles exports and 12% of China's GDP.[31]

The textiles industry contributes greatly to water pollution and scarcity. Depending on the various processes of de-sizing, bleaching and dyeing, the chemicals used and water consumption will vary. The chemicals and dyes utilised in the production processes contain many toxins, yet only 2% of wastewater is treated before being dumped into estuaries and waterways. For example, in Guangdong Province that has one third of Chinese textile and clothing exporting factories, over 28% rivers are severely polluted, and the province faces some of the country's worst water pollution-related chronic health problems.[32] As such, the industries are set to monitor and decrease the organic and the chemical loading of their wastewater.

Moreover, there are substances that remain in the garment are damaging the environment and human and animal health. A recent study by Greenpeace shows that Nonylphenol Exthoxylates (NPE) in clothing are inching their way into European countries where their use is banned, since the residual levels of NPEs are released when clothes are washed. NPEs can certainly contribute to the increasing incidence of health problems linked to hormonal disturbances.[33]

In addition to treating wastewater and toxic residuals in clothing , another key aspect of environmental protection is to control the water consumption of the industry. When cotton is grown in areas suited for its cultivation, the amount of water needed is limited. Moreover, textile processing is very energy-heavy and water-dependent. 8,000 to 40,000 litres of water is needed to grow 1kg of cotton. Another 700 litres of freshwater is used to produce 1kg of textiles, with 600 litres of wastewater being discharged at the end of the process.[34]

Table 5: Correlation between Growth in the Textiles Industry and Environmental Indicators

Environmental Indicator	*Correlation Coefficient*
Industrial Waste Water	*0.600*
Industrial Waste Gas	*0.917*
Industrial Solid Waste	*0.670*
Industrial Water Consumption	*0.961*
Industrial Energy Consumption	*0.916*

Source: Li, Zheng and Li.[35]

In the above table, a correlation coefficient of 1 corresponds to a perfect correlation between the value of the textiles industry and the environmental indicator. For example, if the value of exports increases by 20%, the amount of industrial wastewater would increase by 20% as well. A correlation coefficient of 0 indicates that the value of the exports and the environmental indicator are not related. As can be seen from the table, there is a strong correlation between growth in the textiles industry and damage to the environment, with water consumption being most significant.

[31] Hwang, Linda; April, 2008; *Water Management in China's Apparel and Textile Factories*; Business for Social Responsibility, San Francisco, USA, www.bsr.org/reports/ChinaWater_IssueBrief_042908.pdf
[32] Ibid.
[33] *Greenpeace finds highly toxic chemicals in branded clothing,* http://www.naturalnews.com/033436_toxic_chemicals_clothing.html#ixzz1mwltr2lz
[34] Ibid.
[35] Li, Ting; Zheng Jie; Li Ying; September, 2009; *Empirical Study on the Environmental Effect of China's Textile Export*; Research Center of Textile Economy and Management; Donghua University, Shanghai, China, http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=05303674

As many of these textiles products are destined for export, trade has the potential to change the current situation. Foreign companies could exercise more control over their supply chains and only source from factories that are responsible with their water management. This would be a more effective way of inducing factories to comply with government regulations, as the regulations themselves offer very little incentive for compliance. Green textiles also have the potential to contribute to China's environmental preservation. There are customers who are willing to pay more in exchange for products that have been manufactured according to ecological requirements. As these textiles start taking up a larger share of the market, it will have a positive effect on China's textiles industry.

Whereas Switzerland has ratified a number of MEAs relating to water pollution with its neighbours,[36] China has not signed any treaties relating to the preservation of its own natural waterways. Indeed, Principle 2 of the Rio Declaration on Environment and Development reaffirms states' 'sovereign right to exploit their own resources pursuant to their own environmental and developmental policies', subject to the condition that the 'activities within their jurisdiction or control do not cause damage to the environment of other States'. Nonetheless, the Rotterdam Convention may also be relevant to the case of textiles, compelling apparel exporters not to use any hazardous substances in the production processes.

Tackling the environmental damage caused by the textiles industry involves the elimination of harmful chemicals from production processes and the promotion of efficient water usage. These two lines of action may further be complemented by conducting life cycle assessments (LCAs) of textiles and encouraging changes in consumer behaviour. Carrying out LCAs to determine the environmental impact of the material inputs and releases of textiles will enable consumers to make more informed decisions, directing demand away from over-consumption and towards more environmentally-responsible producers.

Agriculture

Agriculture is not a large component of Sino-Swiss bilateral trade, totalling only USD 56 million. However, it is one of the most dominant sectors in the Chinese economy, and as such holds great potential for cooperation between Switzerland and China. There are potential environmental benefits: Switzerland has more efficient agricultural technologies and machinery, as well as knowledge of sound agricultural techniques and processes that are conscious towards water and energy consumption. It also has experience implementing farming practices that limit the use of chemical fertilizers and pesticides without compromising productivity.

Agriculture plays an important role in the Chinese economy due to China's need to feed 22 percent of the world's population with only 7 percent of the world's arable land.[37] There are over 0.9 billion farmers in China, and agriculture accounted for USD 383.4 billion of China's GDP in 2005.[38] This is twice the size of that of the United States and the EU. China produces a large percentage of the world's wheat and paddy, as well as corn, soybeans, cotton, beef and milk.

There are a number of problems that the agricultural sector is facing, including water scarcity, reduced soil fertility and the contamination of groundwater by nitrates. Much of this is due to intensive agriculture, characterized by its heavy use of chemical fertilizers and pesticides. The Chinese agricultural sector uses 40 million tonnes of chemical fertilizer annually. This is an average of more than 400kg of fertilizer per hectare of farmland, as opposed to the limit of 225kg per hectare found in developed countries.[39] In addition, fertilizer is not being used efficiently. Instead of being absorbed by

[36] For example, *The Convention on the Protection of Lake Constance against Pollution* (1961) and *The European Agreement on the Restriction of the Use of Certain Detergents in Washing and Cleaning Products* (1968)
[37] Wang Yianliang; Subasinghe, R.P.; Bueno, P.B.; Phillips, M.J.; Hough, C.; McGladdery, S.E.; Arthur, J.R.; 2001; *China P.R.1: A Review of National Aquaculture Development*; The Food and Agriculture Organization of the United Nations, Rome, Italy, www.fao.org/DOCREP/003/AB412E/ab412e19.htm
[38] Tian, Zhihong; June, 2009; *Implications for China of the December 2008 Draft Agricultural Modalities*; ICTSD Programme on Agricultural Trade and Sustainable Development; International Centre for Trade and Sustainable Development, Geneva, Switzerland, www.ictsd.org/i/publications/50467/
[39] *China's Agriculture Causing Environmental Deterioration*; July, 2006; China.org.cn, Beijing, China, www.china.org.cn/english/environment/173729.htm

the crops, much of the fertilizer runs off or evaporates, resulting in water, soil and air pollution. Around 9 million tonnes of nitrogen fertilizer is washed away every year and becomes pollutants in the environment.[40]

China uses more than 1.2 million tonnes of chemical pesticides annually. This has contaminated 7% of its arable land and continues to wreak havoc on the biodiversity of the ecosystems involved. The pesticides' residue may also poison humans and livestock. In addition, with surface water polluted and scarce, there is a high demand for groundwater. However, the demand far exceeds the rate of replenishment.

Foreign trade may be a powerful vehicle for instilling changes in agricultural practice. For example, many farm exports have already been blocked for failing to meet international standards in fertilizer and pesticide use. This has resulted in millions of dollars of losses, and Chinese agriculture would be well placed to try and comply with these standards.

Moreover, China's World Trade Organisation (WTO) commitments will play a definite role in defining the contours of its agricultural policy. The Chinese government has recently listed increasing farmers' incomes as one of its key priorities. As a consequence, China has instituted a number of agricultural subsidies, including direct payment to farmers, price subsidies on farm machinery, seeds, fertilizer, electricity, fuel and irrigation, as well as support for minimum prices. All of China's subsidies have been notified as falling within the so called Green Box of non-trade distorting subsidies.[41]

Higher standards of quality control are still needed, and some MEAs may push China towards achieving this. One MEA that may potentially be used to curb the environmental damage caused by the agricultural industry is the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, which Switzerland and China ratified in 2002 and 2005 respectively. Known simply as the Rotterdam Convention, the treaty aims to compel exporters to use proper labelling and to notify purchasers of any hazardous chemicals used in the product that may be restricted or banned, including pesticides. All signatory nations are obliged to ensure that producers within their jurisdiction comply with the rules, though it is up to the importing country to decide whether or not to allow the importation.

Likewise, the Cartagena Protocol on Biosafety, which Switzerland ratified in 2002 and China in 2005, has implications for Sino-Swiss trade. The Protocol seeks to regulate, *inter alia*, the use of recombinant DNA technology in food. Genetically-modified food has the potential to enhance food security, particularly in a country as populous as China, but must also be used responsibly, as genetic modification may have unforeseen effects on biodiversity and human health. The proposed FTA could enhance cooperation between the two countries as regards food safety and DNA technology in a way that does not harm biological diversity and the health of humans and the ecosystem.

In addition, both countries are party to the 2001 Convention on Persistent Organic Pollutants (POPs), commonly known as the Stockholm Convention, which entered into force in 2004. POPs were often used as pesticides. They are not easily degraded and may remain in the environment for a long time, capable of being transported to different geographical areas and accumulating in human and animal tissue. Owing to their toxicity, these substances pose a threat to human health and the environment. Exposure to POPs usually occurs through consumption of animal fats, which, if accumulated in the human body, may lead to a disruption of the endocrine, reproductive and immune systems, cancer and possibly death. The Stockholm Convention aims to minimize and ultimately completely eliminate the unintentional production of POPs, as well as ensure that POP stockpiles are properly treated and disposed of.

More efficient and greener agricultural machinery and practices are essential to the sustainability of the agricultural industry in China. At present, Switzerland exports more agricultural products to China than China does to Switzerland. This could change with the implementation of the FTA. To ensure that the development and modernisation of the Chinese agricultural industry does not further infringe upon environmental integrity, the FTA could encourage knowledge partnerships between the two states and support the transfer of technology and expertise.

[40] Ibid.
[41] See China's notification to the WTO, G/AG/N/CHN/21, available on http://docsonline.wto.org

4. The role of trade in the dissemination of environmentally sound technology, goods and services

Environmental Technology Exchange

China's speed and scale of development combined with its severe resource scarcity provides an exceptional opportunity for increased international exchange of sustainable solutions.[42] Evenly distributed, the vast Chinese population has access to only 0.1 hectare arable land (45 percent of the world average) and only 2,200 m3 water per person (25 percent of world average). If China is to reach its ambitious goals for economic development, the country must find ways to power the achievement of those goals that are both environmentally and socially sustainable.[43] This challenge presents an opportunity for domestic and international companies alike. Ideally, an FTA would enhance mutual environmental technology exchange between Switzerland and China and provide new opportunities for Swiss firms wishing to expand operations in, or exports to China. China has also become an important exporter of environmental goods, especially in the area of renewable energy.

This section highlights the development of a Chinese market for environmental goods and services. It focuses on opportunities linked to the liberalisation of EGS under a potential Sino-Swiss FTA. In addition, it aims to clarify if an FTA would benefit some of the Swiss environmental technology firms presently active in China, based on interviews conducted with companies operating in this area.[44] It also aims to understand which barriers they perceive stand in the way for increased technology exchange.

The Development of the Chinese Market for Environmental Technology

The Chinese market for environmental technology has developed rapidly over the past decades. A steep demand increase stems from the heightened focus placed on environmental preservation by the Chinese central government and enhanced financial resources.

China's current use of energy is as pollution intensive as it is inefficient. Powering the extraordinary Chinese economic development since 1978 has been coal. In the Twelfth Five Year Plan, published in March 2011, the Chinese government has set itself a binding target to decrease CO2 emissions by 17% per unit of GDP. This has been combined with the binding aim of increasing consumption of non-fossil fuel usage in primary energy consumption over the next five years by 3.1%, to 11.4% of total primary energy consumption. This policy direction signals a possible market expansion in environmental technology to meet the Chinese government's targets over the next five years.[45] In this search for new sources of energy, the Chinese demand for natural gas is expected to double from 100 million m3 in 2010 to 150 million m3 before 2020.[46]

[42] Reinvang, Rasmus; Peters, Glen; January, 2008; *Norwegian Consumption, Chinese Pollution - An example of how OECD imports generate CO2 emissions in developing countries*; IndEcol Report no.1/2008; World Wildlife Foundation, Beijing, China, www.wwfchina.org/wwfpress/publication/climate/NorwC08.pdf

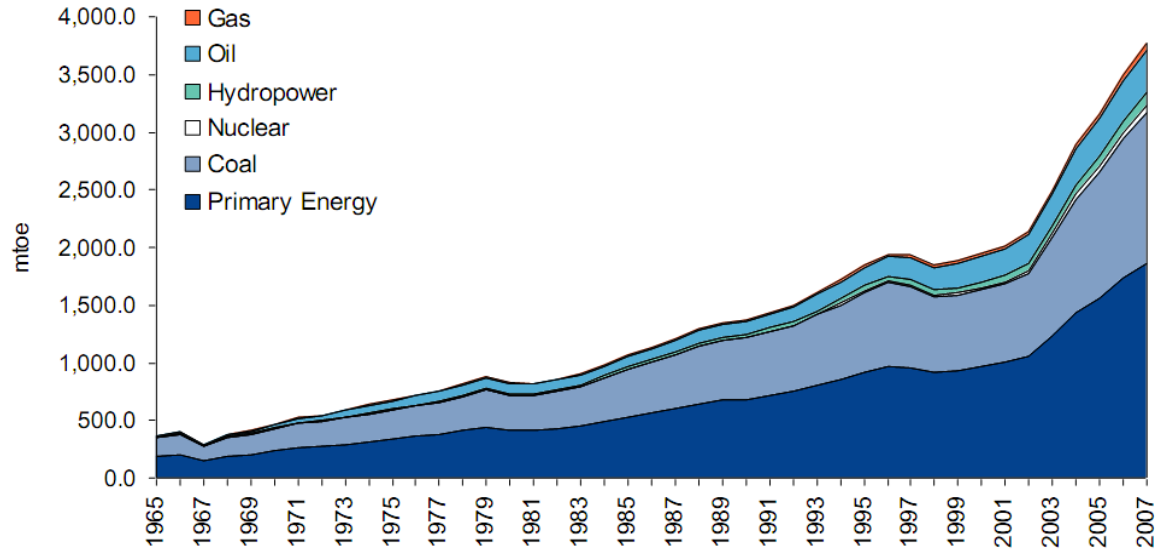
[43] Zhou, Dadi; Levine, Mark; Dai, Yande; Yu, Cong; October, 2003; *China's sustainable energy future: Scenarios of energy and carbon emissions*; LBNL-54067; Lawrence Berkeley National Laboratory; University of California, Berkley, USA, china.lbl.gov/sites/china.lbl.gov/files/LBNL_54067._Chinas_Sustainable_Energy_Future.Oct2003.pdf

[44] The analysis focuses primarily on the potential for Swiss environmental technology firms and do not place ample focus on the implication for increased Chinese technology transfers to Switzerland. Although important, this is outside the scope of the analysis.

[45] *Twelfth Five Year Plan: 2011-16*; March, 2011; Communist Party of China Central Committee, Beijing, China: p.4

[46] Statoil Hydro, www.statoil.com/en/Pages/default.aspx

Figure 2: Energy Consumption in China 1965-2007



Source: BP (2008)

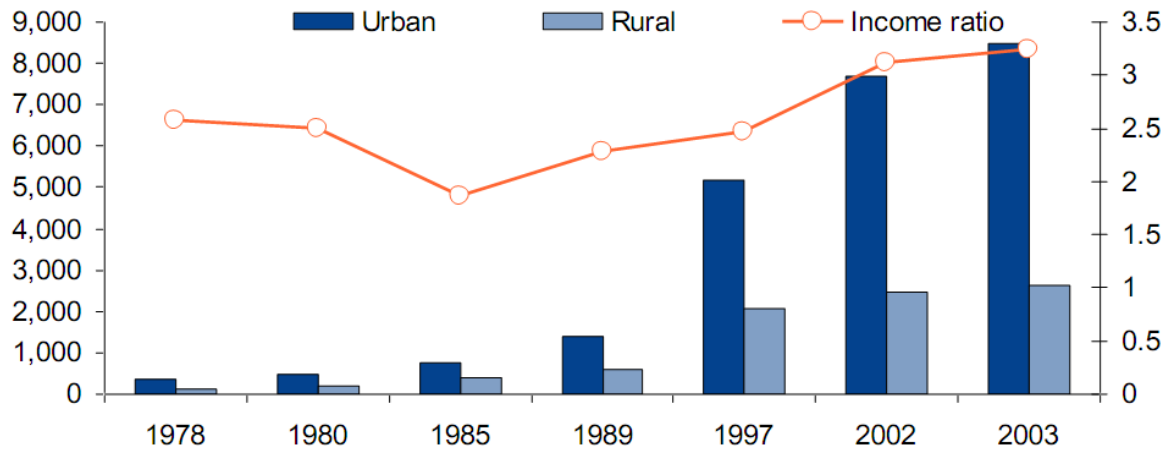
In the same plan, the Chinese central administration has been encouraging the promotion of environmental goods and services beyond that of energy production. Indeed, desalination technology was mentioned a number of times in the plan. Water safety remains an important environmental and social issue in China; as such, a number of key areas of environmental projects were listed: 1, the construction of waste treatment facilities; 2, restoring environmental health to rivers and lakes; 3, preventing soil pollution from hazardous waste and; 4, controlling and preventing heavy metal pollution.[47] All these initiatives follow on the back of the Eleventh Five Year Plan which set aside 70bn RMB for water treatment. This investment has jumped to 260bn RMB under the new Twelfth Five Year Plan, with 113.9bn RMB coming directly from the Chinese central administration's budget.[48] This increase in investment has been coupled with an increased regulatory oversight mechanism as the State Administration of Environment was upgraded to Ministry level in March 2008 as well as the strengthening of the Ministry of Water Resources.

One country, two markets

Viable technology solutions in China must be cost efficient, especially if solutions are to be financed by local administrative levels in the more rural parts of China. Although the country has experienced unprecedented economic growth and has lifted millions out of poverty, large parts of China are still poor. Over 20 percent of the Chinese population still lives under $2 per day and the average rural income is less than a third of average urban income.[49]

[47] *Twelfth Five Year Plan: 2011-16*; op. cit.: p.32
[48] Yong, Jiao; October, 2011; *Press Conference: Water Conservation and the 5-Year Plan*; Ministry of Water Resources, Beijing, China, english.cri.cn/7146/2011/10/11/2702s662142.htm
[49] Chen, S.; Ravallion, M.; May, 2008; *China is Poorer than we thought but no less successful in the fight against poverty*; World Bank Policy Research Working Paper 4621; World Bank, Washington DC, USA, www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2008/05/19/000158349_20080519094812/Rendered/PDF/wps4621.pdf

Figure 3: Income development 1978-2003



Source: World Bank China (2008). Left axis: Yuan per year

An equivalent gap exists between urban and rural regions for infrastructure development, education, foreign direct investment (FDI) and capital accumulation. Therefore, there are in effect two separate markets for environmental technology: One reasonably modern and well off; the other traditional and poor. Although the terminology distinguishes between the urban and poor, some urban areas actually belong in the traditional and poor category.

The development gap between the urban and rural markets contributes to a well-known discrepancy in priorities between central authorities and rural, poorer administrations. This complicates the implementation of centrally coordinated environmental projects at lower administrative levels. Although there is an increasing central political will to implement environmentally efficient technologies, it is evident that environment concerns are still second to economic development at lower administrative levels.

Swiss companies that wish to increase exports of environmental goods and services must therefore chose strategically depending on which market they wish to target. For example, there is huge demand for water cleansing technologies in China. Only six of the twenty-seven largest cities supply drinking water that meets government standards and over 400 million people in rural areas drink water that is at least partially polluted.[50] Both are problems of water quality, but they require different solutions.

In the rural areas, there is little available financing and low awareness of what causes pollution. There is also limited human capital available to implement new technology and provide regular maintenance. Viable solutions must therefore be cost efficient and relatively uncomplicated. As Swiss certifications often require high technology solutions, the final product is often too sophisticated and too expensive for the rural Chinese market.

Only in the larger cities, where there is good access to financing, can more expensive Swiss technologies be sold. In these areas the competition is fierce, however. To distinguish themselves from the competitors, Swiss firms have to find avenues to differentiate their products and services.

The Role of Tariffs on Environmental Goods

Clearly, a market exists for environmental goods and services in China. The traditional barriers to trade – ie tariffs – still exist for environmental goods. Under the WTO Doha Round negotiations, countries have sought to bring down, and eventually phase out tariffs on environmental goods. However, the Doha Round as a whole is stalled, and even within the EGS negotiations specifically, negotiators faced multiple challenges to progress. These were due to difficulties to agree on what constitutes an environmental good, the potential dual use of environmental goods, the evolving nature

[50] *China Environment Forum*; 2008; Woodrow Wilson International Center for Scholars, Washington DC, USA, www.wilsoncenter.org

of best available technologies, as well as countries' desire to develop and protect their own infant industries in this area.

Due to these complexities, FTAs such as the planned one between China and Switzerland provide major opportunities for liberalising trade in environmental goods and services, as such promoting the rapid diffusion of technologies necessary for environmental protection.

Table 6 below demonstrates that while Switzerland applies zero tariffs to a number of environmental goods used in the renewable energy sector, China still has bound and applied tariffs in this area ranging from 8-15%. Table 7, composed by ICTSD[51], shows the market size of a number of 'single-use' climate-friendly goods (goods with a predominantly 'climate-friendly' use). , The table shows that developing countries both produce and export more than half of these single-use goods in terms of total value. China makes up for a major part of the developing countries' production and exports of these climate-friendly goods.

Table 6: Bound and applied tariffs on some climate-friendly goods in Switzerland and China

HS code	Description	China: applied tariff	China: bound tariff	Switzerland: applied tariff	Switzerland: bound tariff
841011	Hydraulic turbines< 1 MW	10%	10%	0%	0%
730820	Lattice masts	8,4%	8,4%	0%	0%
850231	Wind turbines	8%	8%	0%	0%
854140	PV devices	0%	0%	0%	0%
841861	Heat pumps	10%	10%	0%	0%
841869	Heat pumps: parts	10%	15%	0%	0%
850720	Lead-acid accumulators	10%	10%	0%	0%

Source: WTO Tariff Download Facility, accessed 27 October 2011

[51] http://ictsd.org/i/publications/84489/

Table 7: Exports of selected climate-friendly goods

HS code	Climate-related single-use EG included in the 6-digit HS code	World		Developing countries		
		Value ($m)	Structure (%)	Value ($m)	Structure (%)	Share in world exports (%)
2207	Fuel ethanol	4318	8.5	3687	12.3	85.4
680610	Slag wool, rock wool	908	1.8	268	0.9	29.6
680690	Mineral insulating materials	822	1.6	68	0.2	8.3
700800	Multiple walled insulating units	593	1.2	213	0.7	36.0
701939	Glass-fibre insulation products	1213	2.4	375	1.3	30.9
	Subtotal insulation materials	3536	6.9	925	3.1	26.1
841011	Hydraulic turbines < 1 MW	50	0.1	8	0.0	16.7
841012	Hydraulic turbines 1-10 MW	58	0.1	27	0.1	46.9
	Subtotal hydraulic turbines	109	0.2	36	0.1	63.7
841861	Heat pumps	1916	3.8	358	1.2	18.7
841919	Non-electrical water heaters	969	1.9	504	1.7	52.0
850231	Wind-powered generating sets	3335	6.5	1010	3.4	30.3
853931	Compact fluorescent lamps	3625	7.1	3091	10.4	85.3
854140	PV devices	30513	59.8	19460	65.2	63.8
870390	Electric vehicles	1137	2.2	70	0.2	6.2
903210	Thermostats	1528	3.0	721	2.4	47.2
	Total	**50986**	**100**	**29861**	**100**	**58.6**

Source: COMTRADE

Environmental services

Trade in environmental services plays as critical a role in sustainable and environmental investment and trade as equipment and goods do. Environmental projects often involve the use of both goods and services as inputs. Sustainable energy projects - as a prime example - involve not only the trade of equipment and goods but also the construction, operation, maintenance, and financing of such projects.

The relevant services are most often rendered by a diverse number of firms, all of whom specialise in providing specific services. Given comparative advantages, many of these services can be provided more efficiently or at a lower cost by firms based abroad. Such firms might, however, face obstacles in accessing foreign markets. These barriers to entry are of a very different nature than the ones facing the trade of goods.

Unlike goods that have to physically cross a border to reach consumers, trade in services takes place through four modes of supply. The first is *Mode 1-Cross-border supply*, where services are supplied across borders without dislocation of the service supplier or consumer. For example, a software programmer based in China delivers a service to a client in Switzerland via the internet. The second, *Mode 2-Consumption abroad,* involves movement of consumers across borders to consume a service. For instance, when Chinese travel to Switzerland for medical treatment in Swiss hospitals, Switzerland is exporting medical services to China. Third, *Mode 3-Commercial presence* involves the establishment of a service provider in the domestic territory of a country to deliver a service. For example, when UBS establishes branches in China, Switzerland is exporting banking services to China via Mode 3. Lastly, *Mode 4-Movement of Natural Persons* is where services are delivered by individuals that temporarily relocate to the country from abroad to provide a service, such as when technical repair personnel from Suntech– a solar energy firm in China - travel to Switzerland to fix a technical problem at their solar power plant in Switzerland.

Under WTO rules, trade in goods is subject to different rules than trade in services. The former is governed by the General Agreement on Tariffs and Trade (GATT) and the latter by the General Agreement on Trade in Services (GATS). FTAs also govern trade in goods and in services under separate chapters.

Within the WTO, the negotiations on environmental services are facing the challenge of updating the current GATS classification, as the agreement does not reflect the evolving structure of the industry. The WTO Services Sectoral Classification list (W/120) is based on the UN Central Product Classification (CPC). In particular, the current classification (W/120) of environmental services largely focuses on infrastructural services, despite “non-infrastructural” services such as air pollution control or environmental consulting emerging as important activities in recent years, primarily due to increasingly demanding environmental regulations.

One challenge is that certain environmental services overlap increasingly with services classified within other services sectors –so called dual use services. The environmental industry is changing and developing beyond traditional end-of-pipe/pollution control/remediation/cleanup towards integrated pollution prevention and control, cleaner technology and resources and risk management. The EU has proposed an alternative classification comprising ‘core’ services which can undisputedly be classified as “purely” environmental and where the services are classified according to the environmental media (i.e. air, water, solid and hazardous waste, noise, etc.). In addition, the EU has also proposed a ‘cluster’ approach whereby conceptual services such as design, engineering, R&D and consulting services which have an environmental ‘end-use’ would be subject to a special ‘cluster’ or ‘checklist’. The checklist would be used as an aide memoir during the other sectoral negotiations.

Given the lack of movement on services liberalisation at the WTO, the services chapter of the Sino-Swiss FTA could include commitments in relation to environmental services, to complement liberalisation of environmental goods under the goods chapter. Commitments for environmental ‘end-uses’ could be scheduled in the Switzerland – China FTA within relevant categories, other than the environment, in addition to traditional environmental services. Both China and Switzerland could make deeper commitments in particularly mode 3 and in energy- and environment-related activities, such as construction, consulting, business, communications, financial services, and engineering. Alternatively, the environmental goods and services could be addressed together under a separate environment chapter under the FTA.

A variety of domestic laws, regulatory measures, and administrative rules could also affect trade in environmental goods and services. In particular, regulations concerning government procurement could have a significant impact on trade in these services given that the public sector is the largest client in this area.

Swiss Environmental Technology Firms in China

Several Swiss environmental technology firms have been active in China since the country opened up to trade in the late 1970s. Most of them exited after the Tiananmen Square incident in 1989 and re-entered in the mid 1990s.

The scope of services provided by Swiss firms range from high technology products and services such as Carbon Capture and Storage (CCS) techniques to less advanced products aimed at handling key challenges at hand such as water and air pollution. In our interviews for this analysis, we have contacted Swiss Cleantech and the following companies:

- Geberit
- Jansen
- Oerlikon Solar
- Keller Technologies
- Bang & Clean
- SIS SA
- Georg Fischer Piping Systems
- Endress Hauser
- Jakob Stiefel GmbH
- ELEX AG
- Straub

The companies included in the study were chosen in collaboration with Swiss Cleantech in Beijing.

According to the companies surveyed for this study, one adequate way of positioning Swiss technology is to emphasize the Swiss awareness of environmental management and experience in applying environmental management and safety standards. Another possibility is *innovation*. Although Chinese firms are efficient and good at developing existent technologies, they are often less prominent in Research and Development. New, innovative solutions to China's problems will therefore be more likely to succeed than refinements of previous technologies.

Could a FTA help increase environmental technology exchange?

The firms included in this study emphasize that a FTA between Switzerland and China would have greater political use than commercially benefit their businesses. The current challenges for providers of environmental technology firms in China, as described by the firms interviewed in this study, are primarily linked to insufficient awareness, to establishing relationships and to the irregular institutional framework. A FTA is however seen as a positive political signal that can be combined with other efforts to enhance exports of Swiss environmental technology to China.

It should be mentioned that beside the technology itself, Swiss technological goods, services and investments applying under the present WTO commitments are de facto still subject to trade barriers. As an example, the imported Swiss equipment for the Three Gorges dam project was eligible for tariffs and there are still human capital barriers since engineers require visas and professional certificates to install the equipments. Such barriers to trade in environmental services should ideally be overcome after the FTA.

Thus trade-related barriers in China are diverse and may range from tariffs on environmental equipment and domestic support measures to export restrictions of critical raw materials[52] and various modes of services supply. Local content requirements and subsidies are some policies that China until recently used to create domestic jobs in sustainable energy manufacturing, specifically encouraging the use of locally-made components or technologies in wind energy projects.[53] China also linked incentives, cheap loans or subsidies to power producers to the use of local equipment. Similar measures have already triggered controversy at the WTO[54] and, if their use spreads, may generate further trade frictions in the future, and could thus be tackled through multilateral, plurilateral and bilateral negotiations.

Other trade and market barriers could be sparked by Chinese domestic laws and measures linked to investment, government procurement, competition policy and trade facilitation, or possibly by their absence. A great diversity of product-related standards or, on the contrary, an absence of standards could also `hamper trade and diffusion of renewable energy equipment between Switzerland and

[52] http://ictsd.org/i/news/bridgesweekly/114203/
[53] http://ictsd.org/i/news/biores/108435/
[54] http://ictsd.org/i/news/biores/85469/

China, as well as diffusion of energy efficient products. While the issue of 'transfer' or 'diffusion' of environmental technologies is heavily debated in many policy arenas, these discussions often seem to neglect the fact that most technology in the end is held by private enterprises, and that thus the private sector will have to determine the level of cooperation on environmental technologies.

What could be done from an official level?

The Swiss firms brought forward mainly two areas where official actions could complement the introduction of a FTA in order to endorse environmental technology exchange from Switzerland to China:

I. Firstly, Swiss officials could help the Swiss firms with marketing and with establishing the essential contacts, both institutional and with other firms. Official representation is often needed to develop corporate networks and to establish necessary governmental contacts. It is however crucial that these official networking attempts are planned in accordance with Chinese corporate culture and properly followed through.

II. Swiss official representatives could during the FTA negotiations also stress the problems caused by the Chinese irregular institutional framework and promote more stringent routines for controls of standards and regulations. This relates to promoting awareness of environmental concerns and capacity building on how to manage them. Rather than lack of financing or lack of technical expertise, awareness and management capacity is often what is missing in the Chinese context. While Chinese firms are already experts within many traditional fields of Swiss expertise such as hydropower, they often have inadequate routines for managing environmental and social concerns.[55]

III. One way for Switzerland to provide support for environmental technology development is the 'fast-tracking' for the patenting of such technologies. The United States, the United Kingdom, Australia, Japan, Canada and South Korea have expedited examination for patent applications for green (environmental) technologies in place. Such initiatives can support the development of a clean energy economy in particular as it is very technology intensive. In Canada for example, if a patent application is accepted into the fast track programme for green technology, the Patent Office will issue a substantive office action (examiner's report) within 2 months of the request. It usually takes 1-3 years for a substantive office action to be issued for an application under routine examination.

5. Horizontal issues

This section focuses on cross-cutting issues, including embedded resources, competitiveness concerns that environmental measures may trigger, as well as export restrictions with regard to raw materials and rare earths. In addition, it addresses trade-related rules and instruments that affect environmental impact and performance, such as standards, labels and intellectual property rights.

Carbon and Embedded Resources

In terms of embedded resources, a large fraction of China's greenhouse gas emissions are incurred in order to satisfy final demand of consumers in other countries. In effect, carbon emissions are embedded in China's exports. It is necessary to bear in mind the economic context and policy implications of carbon embedded in trade with China for the environmental dimension of a possible Swiss-China FTA. On the consumption side, the discussion focuses on so-called 'embodied carbon,'

[55] As an example, China is the largest producer of hydropower in the world and has the technical capacity to manage hydropower plants of larger scale than will ever be developed in Switzerland. The Three Gorges Hydropower Station in Hubei Province is one example. The station will encompass 26 large generator groups with an expected annual 84.7 Twh electricity supply (www.ctgpc.com). The development of the Three Gorges Hydropower Station has however been surrounded by inadequate handling of large resettlements of people and environmental consequences such as erosion and landslides. Awareness of the management of such concerns is, to a great extent, still insufficient in China.

which refers to the carbon content of imported goods.[56] For example, Switzerland's official per capita carbon emissions would be much higher if emissions associated with goods produced in and imported from China, and then consumed in Switzerland, were accounted for as Swiss, rather than Chinese emissions.

Table 8: Carbon intensities of exports, imports and total production measured relative to each other for selected countries.

Carbon intensity of Coutry or Region	Exports (kg/ $)	Imports (kg/ $)	Production (kg/ $)	Exports/Production	Imports/Exports
Singapore	0.14	0.36	0.48	0.28	2.66
Iran	0.93	1.24	2.66	0.35	1.33
Paraguay	0.2	0.85	0.49	0.42	4.16
Vietnam	0.96	0.86	2.28	0.42	0.9
Malaysia	0.66	0.32	1.51	0.44	0.48
Ecuador	0.47	0.9	0.99	0.48	1.91
Thailand	0.96	0.49	1.65	0.58	0.52
Morocco	0.48	0.67	0.8	0.6	1.39
Nigeria	0.86	0.83	1.42	0.61	0.97
Mauritius	0.33	0.82	0.54	0.61	2.48
Switzerland	**0.07**	**0.42**	**0.11**	**0.61**	**6.09**
Hong Kong, China	0.15	0.78	0.24	0.61	5.3
Costa Rica	0.23	0.47	0.36	0.63	2.07
Taiwan	0.55	0.38	0.85	0.65	0.69
Korea	0.48	0.62	0.73	0.65	1.3
Sweden	0.1	0.46	0.16	0.66	4.45
Pakistan	0.91	1.16	1.37	0.66	1.28
China	**2.13**	**0.49**	**3.05**	**0.7**	**0.23**
Mexico	0.43	0.57	0.6	0.72	1.32
Indonesia	0.91	0.75	1.26	0.72	0.83
Tunisia	0.58	0.53	0.8	0.73	0.92
Bolivia	0.77	0.79	1.03	0.74	1.03
European Union	0.25	0.49	0.32	0.78	1.98
Peru	0.41	0.85	0.48	0.85	2.09
Turkey	0.65	0.79	0.77	0.85	1.21
Egypt	1.73	0.88	1.99	0.87	0.51
Russian Federation	2.43	0.85	2.63	0.92	0.35
World	0.61	0.61	0.66	0.93	1
India	2.06	0.88	2.12	0.97	0.43
United States	0.49	0.77	0.5	0.99	1.56
Canada	0.57	0.52	0.57	1.01	0.92
Japan	0.3	0.91	0.28	1.06	3.05
New Zealand	0.36	0.68	0.32	1.12	1.89
Argentina	1.2	0.58	1.04	1.16	0.49
Brazil	0.78	0.78	0.55	1.41	1
South Africa	2.8	0.6	1.94	1.44	0.22
Norway	0.32	0.55	0.2	1.6	1.74
Australia	0.93	0.78	0.53	1.74	0.84

Source: Jakob, Michael; Marschinski, Robert; & Hubler, Michael (2011)

On the production and exports side, China is far more carbon intensive than Switzerland. Table 8, above, reports some calculation of carbon intensities for a set of selected countries and regions and shows that China's exports and production of manufactured goods are far more carbon-intensive than Switzerland's services-based economy.[57] In table 8, the first three columns show the carbon emissions embodied in exports, imports and total production. The fourth column shows the ratio of the carbon intensity of exports to the carbon intensity of total production. A value greater than one thus indicates a higher carbon intensity in exports than in total production, and since total production

[56] See, for example, "The emissions omitted: The usual figures ignore the role of trade in the world's carbon economy."; April, 2011; *The Economist*.

[57] While the services sectors contributes more than 70 percent towards Switserland's GDP, China's GDP is for almost 50 percent dependent on the industrial sector – almost twice Switzerland's rate (CIA factbook 2011)

consists of exports and the non-export sector also a higher carbon intensity in the export than in the non-export sector. Similarly, the last column shows the ratio of the carbon intensities of imports versus exports.[58]

Although China is a net exporter of embedded carbon, China's success in trade is based on labour costs, not carbon emissions. The Stockholm Environment Institute's paper, *Carbon Embedded in China's Trade* finds that there is little correlation between direct carbon intensity and revealed comparative advantage within the Chinese economy today.[59] While China has higher carbon emissions per dollar of output when compared to developed countries, much of this embedded carbon can be attributed to China's heavy reliance on coal and lack of energy efficient infrastructure. The most carbon-intensive sectors of the Chinese economy are the energy and agriculture sectors. These two sectors combined only account for one percent of China's exports. Additionally, the complex supply chains associated with manufactured goods assembled in China often incorporate component parts made elsewhere. The components originate in countries with differing carbon intensities and carbon prices. Any increase in trade will impact on the use of natural resources both embedded and manifest; the important thing is the efficient and sustainable management of such resources. In terms of equity, the question is in how far the responsibility for a transition towards both low-carbon production and consumption can be shared between a developing country producer and exporter of carbon-intensive goods, and the developed country which imports and consumes these goods.

Another embedded resource discussed is that of water. Virtual water refers to the amount of water used – both surface water, and water needed to dilute pollutants – to produce agricultural goods or manufactured goods from jeans to cars. When these goods are traded, the water embodied within them is also traded across borders. As such, the concept has proven of particular interest in terms of guiding water use in water-scarce and drought-stricken areas. Data of adequate resolution for assessing the impacts on trade between Switzerland and China does not exist as such, but could be generated.

The Global Footprint Network (GFN) specialises in calculating the footprints of individual nation's economic activities. While the ecological footprint provides an interesting metric based on demand and supply of biocapacity (the combined regenerative and sequestratative capacity of the biosphere), it has not yet been adapted directly to trade, especially not at the disaggregated level looking at bilateral trade between two countries. However, provided with the relevant data, this analysis could be carried out, if desired, in the preparatory process for the Swiss-Sino FTA.

Competitiveness concerns

Historically, countries that have been forerunners with regard to legislation to control pollution have expressed concern that their industries risk losing their competitive advantage against industries in countries without such policies in place. They have feared the creation of so-called 'pollution havens,' with low-cost production in countries with low environmental standards and massive industrial relocation. Research has, however, found only weak indications of such a link.[60] Instead, companies' decisions with regard to location are only marginally affected by potential costs for pollution control. Indeed, strict environmental legislation has often lead companies to innovate and become the leaders in new green markets, and foreign investment in 'dirty' industries in developing countries can lead to an increase in environmental standards.[61]

[58] Jakob, Michael; Marschinski, Robert; Hubler, Michael; 2011; *Between a Rock and a Hard Place: A Trade-Theory Analysis of Leakage under Production- and Consumption-Based Policies;* Potsdam Institute for Climate Impact Research, Potsdam, Germany, http://www.pik-potsdam.de/members/jakob/publications/leakage-bta-paper

[59] Ackerman, Frank; 2009; *Carbon Embedded in China's Trade*; Stockholm Environment Institute, Stockholm, Sweden, http://sei-us.org/Publications_PDF/SEI-WorkingProgressUS-0906.pdf

[60] See, for example, Cole, Matthew A.; 2004; "Trade, the pollution haven hypothesis and the environmental Kuznets curve: examining the linkages."; *Ecological Economics* 48.1: pp 71-81.

[61] Eskeland, Gunnar S; Harrison, Ann E.; 1997; *Moving to greener pastures: multinationals and the pollution-haven hypothesis*; Policy Research Working Paper Series 1744; The World Bank, Washington DC, USA, www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2000/02/24/000009265_3971110141248/Rendered/PDF/multi_page.pdf

Today, concerns regarding competitiveness and leakage focus mainly on carbon. As the prospects for a comprehensive global agreement on climate change remain remote, countries' different approaches to regulating carbon give rise to different cost structures.

In terms of policy, countries with stringent measures to regulate carbon are concerned that carbon-intensive industries could migrate to carbon-tax-free locations (thus promoting unsustainable practices), so that some part of the expected reduction in emissions would be lost through "leakage" out of the countries with carbon prices. It has been suggested that a border tax could be utilised to address the carbon embedded in a country's imports, so as to bring the price of the embedded carbon up to the importing country's standard. The intention would be to eliminate any unfair advantage from low carbon prices, at least within the importing country's own economy. An attempt to implement such a border tax in an equitable manner which directly promoted environmental protection and sustainable development would be extremely complex.

In terms of competitiveness, countries with high carbon costs are concerned that their energy-intensive industries, in sectors such as steel, chemicals, fertilizer and cement, lose market share to producers in other countries.[62] In this regard, countries taking on stringent carbon reduction measures, such as the European Union - as well as the US, in draft climate change legislation which has not passed so far - are contemplating so called border carbon adjustments (BCAs). These BCAs would serve to protect their industries by imposing an additional carbon cost on imports from countries where the industries face lower costs due to lack of climate change legislation. Even when this is applied to perhaps one of China's most carbon intensive sector; that of steel production, which has seen a dramatic rise since 2000 when China produced 15.1 percent of global production, now accounts for 44.3 percent. While the numbers are impressive, for 2009 in terms of net exports (exports – imports) only accounted for 0.28 percent of China's annual steel production. While China's economy is carbon intensive, its comparative advantage is not. A border tax adjustment on carbon-intensive goods would do little harm to China's exports, and would bring little benefit for developed countries.

A globally harmonized carbon price, often assumed to be crucial to successful climate policies, is not strictly necessary in theory, and may not be introduced for some time in practice. When and if it occurs, a harmonized carbon price will raise costs for China's carbon-intensive industries, but will also create an opportunity for China to "leapfrog" beyond the technologies developed in high-income countries and take the lead in creating the technological basis for a sustainable future. Already, China is a world leader in certain areas of renewable energy technologies, such as PV, which has brought down prices on the global market.

Switzerland has imposed legislation to curb climate change, as an Annex I country under the Kyoto Protocol of the UN Framework Convention on Climate Change (UNFCCC). Under the CO2 Act, Switzerland is, like the EU, required to reduce emissions by eight percent as compared to 1990 levels in the 2008-2012 period. As such, Switzerland has imposed a CO2 regulatory tax on fossil fuels since 2008. China, which is a developing country and does not fall into Annex I, is not under such an obligation. This classification of emerging economies is one of the many obstacles to progress under the UNFCCC and will likely lead to a situation in which there are no multilateral rules on climate change, and countries take unilateral measures to restrict carbon emissions. Switzerland could chose to impose BCAs on its trading partners, such as China. A recent study looking at impacts on developing country imports of potential BCAs in the EU shows that Chinese exports of organic chemicals and iron and steel would, potentially, be affected.[63] On the other hand, China is also increasingly undertaking domestic measures to address climate change by decreasing the carbon intensity of its production.

So far, BCAs are potential instruments that have not yet been put into use. The issue of BCAs has never been contemplated nor discussed in FTAs – however, for a new-generation of FTAs, this could potentially be addressed with countries looking for greater parity in their measures to address carbon.

[62] *Trade, Climate Change and Global Competitiveness: Opportunities and Challenges for Sustainable Development in China and Beyond*; March, 2008; ICTSD Trade and Sustainable Energy Series; International Centre for Trade and Sustainable Development, Geneva, Switzerland, www.ictsd.org/i/publications/22257/

[63] Derksen, Samantha; April, 2011; *Developing Countries' Trade Vulnerabilities to EU Climate Policies*. ICTSD, Transition to a Low Carbon Future Series; Issue Paper 19; International Centre for Trade and Sustainable Development, Geneva, Switzerland, www.ictsd.org/i/publications/112589/

Countries could both boost their technical cooperation with regard to emissions-limiting and clean energy technology, and ensure that the carbon intensity of their production processes begin to converge. This could be discussed either in an open-ended information-sharing process, such as under the NAFTA CEC, or in a specific side agreement on environment and cooperation in the area of climate change.

Export restrictions on raw materials, including rare earths

The constantly growing use of raw materials globally – as well as rising price trends – has led countries to look more closely at supply and trade issues. European countries, including Switzerland, are highly dependent on imports.[64] China, on the other hand, is a major producer, exporter and consumer of raw materials. Over the last few years, China has tightened its export regime, implementing export quotas and taxes.

China's export restrictions with regard to a number of raw materials - bauxite, coke, fluorspar, magnesium, manganese, silicon carbide, silicon metal, yellow phosphorus, and zinc – have been challenged at the WTO by the US, EU and Mexico. These countries claimed that China was out of compliance with regard to the conditions stated in its accession agreement. While the GATT only prohibits quantitative restrictions on exports, most recently acceded Members have committed to also refraining from the use of export duties. In the case of China, the accession protocol clearly requires the elimination of export duties on most raw materials and most other goods, except for a closed list of products in its annex. China defended its export restrictions mainly on environmental grounds. While the panel ruled against China in July 2011, China has appealed and an Appellate Body ruling is expected, at the earliest after six months, though possibly after up to two years.

This ruling is being closely watched, as it signals the way forward regarding countries' possibilities to restrict raw material exports. The ruling also scrutinized when a country can restrict exports on environmental grounds. In the case, the policies China has taken did not qualify as such, as there was no apparent critical shortage of the materials, nor were the domestic policies in place seen as consistent with the stated conservation objectives. In addition, the panel concluded that the relevant GATT Article XX exception on the conservation of natural resources could not be applied to commitments in China's accession agreement.

Rare earths constitute another important category of minerals, used in particular for high-tech products and green technologies. Rare earth elements or rare earth metals are a set of seventeen chemical elements in the periodic table. Despite their name, "rare earths" are actually not scarce in the earth's crust, but known deposits have been dormant or undeveloped for years because China has been willing and able to meet global demand. The extraction of rare earth is highly complicated and polluting - one reason why most Western countries closed down their extraction plants in the nineties when China increased its production. However, China has recently closed several mines, started stockpiling the elements and instituted export quotas. This has lead to rapidly rising prices on the global market and concerns among importers. No dispute has thus far been initiated at the WTO, although this remains a strong possibility. The US, EU and Japan have held talks to discuss possible strategies to ensure future supplies of rare earth minerals.[65]

Switzerland currently only produces and exports a limited range of raw materials yet has strong vested interests in the import of rare earth minerals for its previously discussed high-tech manufacturing sector.

While the disciplines on export restrictions included under the GATT are relatively weaker than those on imports, recent FTAs and RTAs have been designed to fill this gap.[66] Especially in the area of raw materials, import-dependent countries – such as the EU or Japan – have actively sought to secure access through their FTAs. This may be an option to consider in a potential FTA between Switzerland

[64] Brown, T.J.; Idoine, N.E.; Bide, T.; Mills, A.J.; Hobbs, S.F.; 2011; *European Mineral Statistics 2005-2009*; British Geological Society Survey, Nottingham, UK, www.bgs.ac.uk/downloads/start.cfm?id=1389

[65] See, for example, "China Restrictions on Rare Earths Prompt EU, US, Japan Gathering."; September, 2011; *BRIDGES Weekly*; Volume 15 Issue 31; International Centre for Trade and Sustainable Development, Geneva, Switzerland, www.ictsd.org/i/news/bridgesweekly/114203/

[66] The Economic Impact of Export Restrictions on Raw Materials. OECD Trade Policy Series (2010). Paris, France.

and China. However, while China now is a major exporter of rare earths, according to some estimates China will need to import these metals as early as 2015, in which case there would be no clear-cut importer-exporter relationship, but rather the two parties would have similar interests.

SPS and TBT requirements

As tariff barriers come down, standards are increasingly important for trade, and are regulated under the WTO Agreement on Sanitary and Phytosanitary Standards (SPS Agreement) and the Agreement on Technical Barriers to Trade (TBT Agreement). A chapter on this topic will likely also be included in the new Switzerland-China FTA, affirming adherence to the WTO SPS and TBT Agreements and possibly going beyond them. While countries can set their own standards to enforce public policy goals, their international trade agreements' chapters in this area seek to ensure that standards are not used as disguised barriers to trade.

Sanitary and Phytosanitary standards are particularly relevant with regard to trade in agricultural and food products, since they cover food safety and animal and plant health measures. The three international standard-setting bodies recognised under the SPS Agreement are the Codex Alimentarius, the International Plant Protection Convention (IPPC), and the World Organization for Animal Health (OIE). Standards on pesticide residues, toxics etc. are set and adhered to, meaning the trading partners can trust the products they import from one another. In case of disease outbreaks, countries can halt imports until a country/region can prove it again is disease-free, and the risk of contagion is contained. High-profile cases have included halting exports of meat from countries with cases of BSE or foot-and-mouth disease, or agricultural products exposed to radiation following the Fukushima accident in March 2011 in Japan. Traceability is also an important element, especially regarding genetically modified products, which are treated differently in different markets. As the climate continues to change, new diseases and pests are more likely to emerge. SPS standards will need to be developed and adapted accordingly. Issues beyond the SPS Agreement could also be discussed/included in the new Switzerland-China FTA, such as animal welfare.

When it comes to technical regulations and standards, these are very important to ensure conformity between different countries in order to facilitate trade. For example, many countries, including Switzerland and China, have set mandatory energy efficiency standards – minimum energy performance standards (MEPS) – for a wide range of electrical appliances.[67] Here, ensuring that products from one country conform with requirements in the other is important. The testing and certification need not be cumbersome or carried out twice or more, ensuring the smooth flow of trade, market access, and maximising uptake of the most efficient products. The TBT Agreement includes a Code of Good Conduct – which both public and private standard-setting bodies are encouraged to adhere with – for how to prepare, adopt and apply standards.

Since WTO SPS and TBT Agreements also seek to ensure that these standards are not used as disguised barriers to trade, both agreements state that where possible, national standards should be based on international standards. Both require transparency and information-sharing.

Under a bilateral treaty between Switzerland and China, concerns about possible disguised trade restrictions, as well as discussion around new and emerging threats and how to handle them through SPS and TBT measures, could be handled in a pre-emptive manner, rather than after the fact. As such, damage either to the environment/human health or trade flows could be minimised. The two countries could agree to work together to improve adherence with existing and emerging standards,[68] and create a standing committee to deal with issues in this area, including technical cooperation.

[67] Janssen, Rod; 2010; *Harmonising Energy Efficiency Requirements — Building Foundations for Cooperative Action*; ICTSD Environmental Goods and Services Series; Issue Paper 14; International Centre for Trade and Sustainable Development, Geneva, Switzerland, http://ictsd.org/i/environment/84837/

[68] For example, Article 906.1 of NAFTA states that "Recognizing the crucial role of standards-related measures in achieving legitimate objectives, the Parties shall, in accordance with this Chapter, work jointly to enhance the level of safety and of protection of human, animal and plant life and health, the environment and consumers."

Private standards, labelling and PPM

While government-set standards need to conform with the SPS and TBT agreements, private sector standards and burgeoning labelling schemes do not.[69] The number of environment-related standards and labelling initiatives is rapidly growing, spanning areas such as carbon content, water and pesticide use (organic agriculture), sustainable forestry and fisheries as well as fair trade initiatives. Advances in this area are led by the private sector, which is developing standards affecting both sourcing decisions and decision-making within supply chains.
With regard to carbon, the standards allow producers to measure and monitor their embedded carbon, and therefore identify measures to reduce emissions. In addition, a growing number of consumer-facing labels are now in use. Such carbon labelling schemes provide consumers with the option of decreasing their personal carbon footprints[70]. Examples of early movers include supermarket chains, with companies such as Tesco providing an increasing number of products with carbon labels. Migros in Switzerland has also taken action in this regard, although it does not provide the carbon footprint for specific products. Biofuels is another area where Switzerland has set stringent standards both with regard to carbon footprint and other sustainability aspects. Measuring greenhouse gas emissions is complex, however, and as of yet an evolving science where practicality and environmental integrity have to be balanced. Currently, more sophisticated carbon labelling schemes based on life cycle analysis are being set up. The products targeted have mainly been agricultural goods, since they tend to be less processed than industrial goods and thus simpler to analyze. Since such a wide range of carbon standards and methodologies exist, the International Standards Organization (ISO) is launching a carbon footprint standard, ISO 14067, towards the end of 2011.

Private sector standards and labels have often been controversial in trade circles. They are seen by a number of developing countries as constituting a new generation of non-tariff barriers and disguised barriers to trade. Standards based on so-called Process and Production Methods (PPMs) have been particularly divisive. This is due to the fact that no features in the finished product can distinguish the environmentally friendly product from one that is not (non product-related PPMs), and non-discrimination of like products constitutes a pillar of the WTO Agreement. For example, shrimp caught with gear that excludes turtles as by-catch cannot be distinguished from shrimp that is not caught with such gear, and an organically grown apple cannot necessarily be visually distinguished from one produced using pesticides. Many countries argue that such distinctions are too opaque and discriminatory, and also that each country should have the right to make its own choices in managing its environment and natural resources.

The WTO does provide a source of transparency, as Members are required to notify official standards. The Committee on Sanitary and Phytosanitary Measures has seen a lively debate on voluntary standards, with presentations and engagement on the part of the private sector over the last years. Given the issues already outlined above with regards to the contamination of certain products with POPs and other toxins due to insufficient manufacturing capabilities, there is the possibility for the Swiss-China FTA to promote a constructive approach to this problem. Instead of simply banning the import of certain products under SPS measures, there is the possibility to facilitate the transfer of the necessary environmental technology to ensure that such issues do not reoccur - benefiting both nations.

Under an FTA, Switzerland and China could set up a framework under which their respective private sector entities could work more closely together to ensure that labels are developed in a transparent and collaborative manner. Workshops gathering representatives of producers and consumers could help develop mutual understanding at an early stage, paving the way for efficient, fair and realistic environmental standards and labels with maximum uptake in both Switzerland and China, as well as mutual learning. At the government level, Switzerland and China could exchange information on

[69] Private sector standards and possible government intervention/regulation are still the subject of inconclusive debate at the WTO SPS Committee. See, for example, Mbengue, Makane; April, 2011; "Private standards and WTO law."; *Bridges Trade BioRes Review*; Volume 5, No. 1; International Centre for Trade and Sustainable Development, Geneva, Switzerland, www.ictsd.org/i/news/bioresreview/103540/

[70] McGregor, James; May, 2010 *Carbon Concerns: How Standards and Labelling Initiatives Must Not Limit Agricultural Trade From Developing Countries*; ICTSD-IPC Platform on Climate Change, Agriculture and Trade; Issue Brief 4; International Centre for Trade and Sustainable Development, Geneva, Switzerland, www.ictsd.org/i/publications/77531/

initiatives underway at an early stage, and also cooperate in relevant international fora outside the trade realm, such as the ISO.

Intellectual property

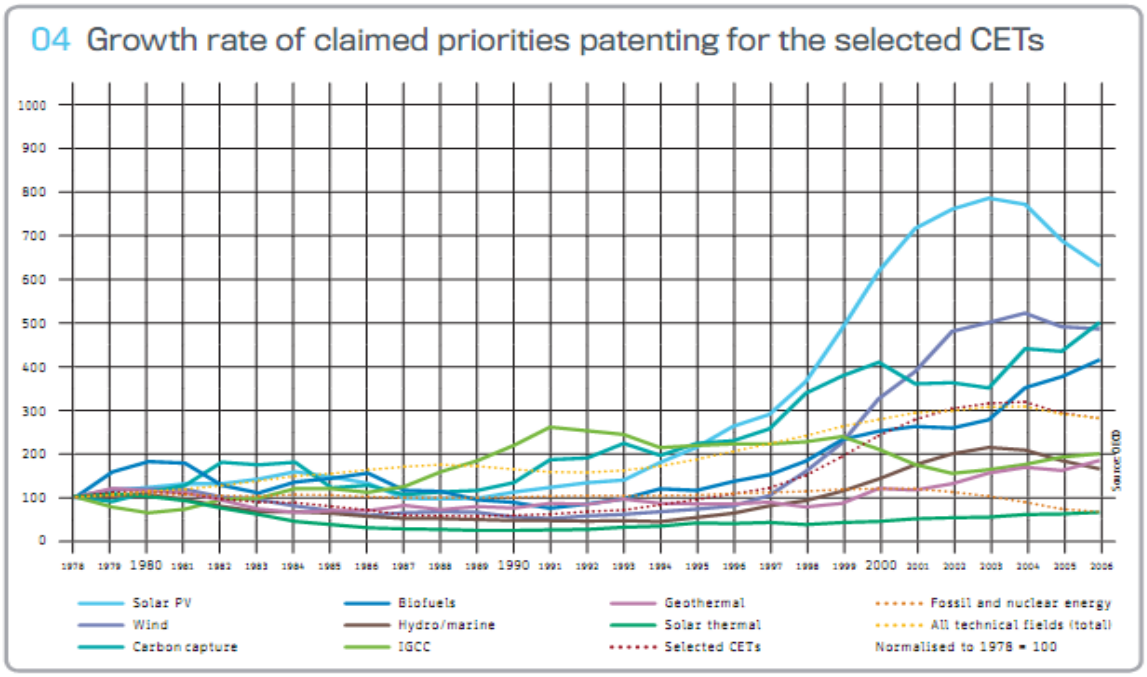
The prospective FTA between Switzerland and China is likely to contain a comprehensive, high-standard chapter on intellectual property. This will be negotiated primarily between the Swiss Patent Office and its Chinese counterpart, focusing on creating a framework conducive to collaboration and enforcement.

The role of intellectual property rights (IPRs) in the transfer of environmental technologies has been particularly contentious in the negotiations under the UNFCCC. One of the key findings of ICTSD's research on IPRs is that the differences in conditions across countries and sectors require flexibility in both domestic and international policies that are put in place to promote international technology transfer. The effectiveness of IPRs in promoting both the development and deployment of environmental technologies in global markets depends on both industrialized and developing countries, including how well innovation policies function in industrialized countries, the institutions in place in developing countries to facilitate the absorption of new technologies, and ensuring an appropriate balance in both domestic and multilateral IPR systems, in both originating and recipient countries.

UNEP, EPO and ICTSD undertook a joint study on the relationship between patents and the development and transfer of clean-energy technologies.[71] The study has yielded important insights, evidence and data which could lead to better-informed policy-making on this important subject. It includes the findings from a comprehensive mapping of clean energy technologies, a patent landscape for clean energy generation technologies and the first global survey of clean energy licensing practices.

A major insight from the study is the influence that international environmental policy has on innovation in the field of clean energy technologies. As figure 4 below shows, the negotiation and conclusion of the Kyoto protocol (signed in 1997) was paired with a surge in clean energy technology (CET) patenting.

Figure 4: Growth rate of claimed priorities patenting for the selected CETs



Source: UNEP, EPO & ICTSD (2010)

[71] Available at http://ictsd.org/i/publications/85887/

Another aspect of intellectual property is the link between intellectual property rights and biodiversity that could be incorporated into the potential Swiss-China FTA. The inclusion of provisions on biodiversity in an FTA is one manner by which it is possible to recognise and secure the economic value of biological resources and traditional knowledge. Taking into consideration the previously discussed Swiss pharmaceutical industry as well as keeping in mind the future potential and strength of the Chinese traditional medicine market, the merits of such a provision should be further examined. There has been an increasing trend in Latin America to treat biodiversity issues as an offensive interest by including such provisions into bilateral and regional trade agreements. Taking the recent EU FTAs with Colombia and Peru as examples, both contain sections on the "protection of biodiversity and traditional knowledge". It must be noted that these provisions are only best endeavour in nature.

The trade agreement signed by EFTA with Colombia includes, in the text, several concrete measures backed by a degree of enforcement. The later agreement between EFTA and Peru used this as its basis. Both trade agreements entered into force on 1 July 2011.[72] Considering that both China and Switzerland are signatories of the Convention on Biological Diversity - and the current standstill in the TRIPS Agreement discussion at the WTO on biodiversity - there is a possibility to use EFTA-Colombia/Peru as a basis for the Swiss-China FTA negotiation process to ensure protection of intellectual property rights in the area of biodiversity.

6. Conclusion and the way forward: options to address trade and environmental concerns in the framework of a possible FTA

When considering options for how to address trade and environment issues in the framework of a possible FTA between Switzerland and China, several different or complementary options could be used. They range from simple exceptions clauses to allow both countries to undertake their own environmental protection, to proactive technical cooperation, to a full environmental chapter with substantive provisions subject to dispute settlement.

Typically, commitments with regard to the overall goals of sustainable development and environmental protection are written into the chapeau of an FTA. The chapeau would usually make clear that trade and environment objectives should and must be mutually supportive.

Certain FTAs, such as that between EFTA and Hong Kong, China, has also integrated the exceptions clauses under GATT Article XX, exactly as they stand. As such, it has secured the right of both parties to take measures that do impinge on trade under special circumstances, when deemed necessary in order to, among other, conserve exhaustible natural resources and protect human and animal health and the environment.

Integrating environment into the FTA chapters

Such general commitments could be significantly strengthened and complemented by more specific articles in the various chapters.

A specific area where progress could be made is in the liberalization of environmental goods and services, which could be explicitly written into the agreement, either under the chapters on goods and on services, or in a chapter on environment.EGS are increasingly being integrated into FTAs – with movement in the WTO Doha Round at a standstill. Among recent developments, Asia-Pacific Economic Cooperation (APEC) leaders have pledged to develop a list of environmental goods and services in 2012, on which APEC members will reduce tariffs to five percent or less. In addition, they have pledged to remove non-tariff barriers such as local content requirements.

The chapter on intellectual property could include biodiversity-related provisions. For example, the FTAs between EFTA and Colombia and Peru include specific language relating to the protection of biodiversity and traditional knowledge, and the requirement for prior informed consent (PIC) according

[72] Vivas-Eugui, David; and Oliva, Maria Julia; September, 2010; *Biodiversity Related Intellectual Property Provisions in Free Trade Agreements*; ICTSD Project on Genetic Resources; Natural Resources Programme; Issue Paper 4; International Centre for Trade and Sustainable Development, Geneva, Switzerland: pp. 22-24

to national legislation. The parties recognise their rights and obligations as established by the Convention on Biological Diversity with respect to access to genetic resources, and to the fair and equitable sharing of benefits arising out of the utilisation of these genetic resources. For the protection of plant varieties, the FTA recognises both patents and relevant sui generis systems, or any combination thereof.

The EU-Korea FTA provides an example of a new-generation FTA that includes environmental as well as labour provisions that go beyond those at the WTO. The EU-Korea FTA establishes a framework for cooperation on trade and sustainable development. Both parties make commitments to abide by certain environmental and labour standards, effectively implementing all multilateral environmental agreements to which they are party. They recognise each other's right to regulate, and there is a process in place for civil society to monitor implementation. In case of dissatisfaction, differences can be settled through a panel of experts.

The EU-Korea FTA also includes a commitment to liberalising trade in environmental goods and services in order to promote sustainable development through green technologies. Within the first three years, almost all EGS will have duty free access to the markets of the two trading partners. The FTA also includes far reaching commitments beyond the WTO General Agreement on Trade in Services (GATS) in the environmental sector.

The Swiss-Sino FTA could include similar provisions in different areas, ie on EGS, biodiversity, SPS and TBT, or other topics of interest.

Environment chapter

The most comprehensive option would be to conclude an environmental side agreement or chapter under the proposed Sino-Swiss FTA. The first FTA with a fully developed framework to address environmental issues was the North American Free Trade Agreement (NAFTA) between the US, Mexico and Canada, which came into force in 1994. NAFTA contains an environmental side agreement, the North American Agreement on Environmental Cooperation (NAAEC), and at the institutional level, it established a Committee on Environmental Cooperation. When the NAFTA was agreed, it included a mandate to assess its environmental impact.

Such an environmental side agreement, or chapter, goes beyond less comprehensive arrangements or best-endeavour language by including substantive provisions that are subject to dispute settlement under the FTA (unless the contrary is explicitly stated, as in the EFTA-Hong Kong, China agreement).

Monitoring the implementation of MEAs and strengthening technical cooperation

Since MEAs do not necessarily include strong enforcement mechanisms, some FTAs include provisions to strengthen enforcement. Under these, countries are basically required to implement and enforce their own domestic environmental laws. If not, citizens and civil society have access to a process under the FTA to address their concerns.

In order to operationalize such an option, a special body would be needed under the FTA to deal with the complaints/concerns. This body could be tasked with investigating the issue and coming up with concrete proposals for remedies. It could also have further tasks related to technical cooperation in the area of environment (see Box 1 below).

Box 1: Environmental technical cooperation priorities under CAFTA-DR[73]

a) Strengthening each Party's environmental management systems, including, reinforcing institutional and legal frameworks and the capacity to develop, implement, administer, and enforce environmental laws, regulations, standards, and policies;

b) developing and promoting incentives and other flexible and voluntary mechanisms in order to encourage environmental protection, including the development of market-based initiatives and economic incentives for environmental management;

c) fostering partnerships to address current or emerging conservation and management issues, including personnel training and capacity building;

d) conserving and managing shared, migratory, and endangered species in international trade and management of marine parks and other protected areas;

e) exchanging information on domestic implementation of multilateral environmental agreements that all the Parties have ratified;

f) promoting best practices leading to sustainable management of the environment;

g) facilitating technology development and transfer and training to promote the use, proper operation, and maintenance of clean production technologies;

h) developing and promoting environmentally beneficial goods and services;

i) building capacity to promote public participation in the process of environmental decision-making;

j) exchanging information and experiences between Parties wishing to perform environmental reviews, including reviews of trade agreements, at the national level; and

k) other areas for environmental cooperation on which the Parties may agree.

In terms of potential issues to discuss and include - and where to house them within an FTA – the following section provides some options (see table 9 below). It considers a number of trade policy topics and instruments, and their linkages with environmental objectives. For each issue, current governance gaps both on the environment and trade side are highlighted, as these gaps provide the drivers for possibly including the issues in an FTA. Finally, options for where to address the issue in a Sino-Swiss FTA are provided.

[73] *Central America Free Trade Agreement – Dominican Republic*; August, 2004; Office of the United States Trade Representative, Washington DC, USA, www.ustr.gov/trade-agreements/free-trade-agreements/cafta-dr-dominican-republic-central-america-fta/final-text: Annex 17.9 on Environmental Cooperation.

Table 9: Possible options for the Switzerland-China FTA

Trade Policy Topics and Instruments	Linkage with environmental objectives?					Where to address in a Swiss-China FTA
	Transfer and diffusion of environmental technologies.	**Biodiversity conservation.**	**Carbon intensity/ footprint/ leakage.**	**Conservation of exhaustible resources (e.g. rare earths).**		
	No global agreement on the diffusion of EGS.	Convention on Biological Diversity. Both CH/China signatories.	Many uncoordinated private labelling schemes.	No comprehensive international agreement on conservation of resources.	Governance gap (environmental policy) / Governance gap (trade policy)	
Tariff Measures	Identification of environmentally-friendly goods. Scheduling of commitments.		BCAs		Negotiations on liberalization of EGS stalled in Doha.	*Under Goods or in separate environment chapter together with environmental services.*
Standards/ TBT (including private standards and PPMs)	Mutual recognition of standards/ testing procedures. Transparency of standards and information sharing. Designated points of contact, conflict resolution/complaint process. Support for international standard-setting.	SPS standards for pesticides and disease outbreaks, including potential invasive species.	How to address the numerous private labelling schemes.		Lack of harmonisation/mutual recognition of a number of standards on environmental equipment and biofuels. Private standards not regulated.	*Include under SPS/TBT provisions.*
Export restrictions				Dual pricing Quotas Licensing Export taxes	Weak disciplines under GATT on export restrictions.	*In Goods article on export restrictions or separate annex on export restrictions that reaffirms China's commitments from its WTO accession protocol.*
Government procurement	Procurement of environmentally preferable products. Policy space for both parties to procure EPPs in order to help develop market. Transparency; environmental criteria; local content/sourcing.				Applies only to GPA members. Transparency discussions dropped from 'Doha' round.	*Under government procurement.*
Services	Identification of environmentally-friendly services. Scheduling of commitments.				Unresolved classification of environmental services and domestic regulation issues.	*Under services or in separate environment chapter together with environmental goods.*
Investment	Performance requirements & right of establishment. Local content requirements. Investor-state disputes.				No multilateral framework beyond TRIMS. Mostly dealt with in bilateral negotiations. Issue dropped from Doha Round.	*Investment or environment chapter.*
Intellectual Property Rights	Speed of granting for green patents. Licensing arrangements. Tech-transfer and cooperation.	Disclosure requirements. ABS Traditional knowledge.			Ongoing discussions in TRIPS Council, WIPO, UNFCCC & CBD.	*Possibility to follow the example of the EFTA-Colombia/Peru agreement as a model for biological diversity IPR.* *Could expand the provisions of the CBD technology categories.* *EU-CARIFORUM EPA as basis for provisions for tech-transfer.* *Chapter/Annex on IP.*

Source: Compiled by ICTSD

Tariff measures: Tariff measures currently form a barrier to the optimal diffusion of environmental goods. Negotiations within the Doha round are stalled, and there is no agreement within the realm of environmental law; provisions for the diffusion of environmental technology are not included under the UNFCCC, for example. At the same time, there are ongoing discussions among countries with stringent climate policies on the potential to make use of border carbon adjustments. Both of these

topics could be addressed under an FTA. Tariff reductions on EGS could be scheduled under the goods chapter, or alternatively under a special chapter on environment. Under such an environment chapter, environmental goods and services – which often are provided in conjunction with one another – could be comprehensively dealt with together.

Standards: Despite their increasing use, environmental standards are not comprehensively dealt with under environmental agreements (such as UNFCCC). The TBT and SPS Agreements under the GATT do provide guidance. However, as standards – including private sector ones – proliferate, dealing with them becomes challenging. Harmonization and mutual recognition tends to lag behind standard-setting. Issues to discuss in the context of an FTA, and possibly address in the TBT/SPS provisions, include: mutual recognition of standards and testing procedures; transparency and information-sharing; designating contact points and setting up processes for conflict resolution and a complaint process; and ways of supporting international standard-setting processes. The issue of how to address the numerous private labelling schemes that deal with carbon could also be discussed. In terms of biodiversity-relevant standards, issues to discuss include SPS standards on pesticides and pathogens, as well as potential invasive species.

Export restrictions: As natural and mineral resources become scarcer, countries are more inclined to impose export restrictions. The GATT disciplines for governments are relatively weak, although China made additional, GATT-plus commitments in its accession to the WTO. Export restrictions, and many natural resources more generally, are usually not subject to environmental governance regimes, although some specialised treaties and instruments do exists (such as the Forest Principles). Some private sector initiatives seek to enhance the environmental viability of the extractive industries. An FTA could include provision on the use of export restrictions either under the goods chapter or in a separate annex. These could deal with issues such as dual pricing, quotas, licensing requirements and export taxes. They could also specify exceptions on environmental or natural resources conservation grounds.

Government procurement: Under WTO rules, only those countries that are members of the plurilateral agreement on government procurement are bound by disciplines. Governments are often important players in market development for environmental goods, services and environmentally-preferable products. Their procurement policies can shape future product landscapes. Issues to discuss and possibly codify in an FTA include how to deal with transparency, environmental criteria and local content or sourcing requirements under within government procurement. What policy space the two parties may need in this regard could also be debated.

Investment: Currently, there is no multilateral investment framework beyond TRIMS. In fact, this is a contributing factor behind the drive for FTAs, which often have strong investment disciplines. Certain issues with possible environmental implications, such as performance requirements and right to establishment; local content requirements; and investor-state disputes, could be housed in either the investment or an environment chapter.

Intellectual property rights: IPRs are the subject of ongoing and inconclusive discussions at the WTO TRIPS Council, WIPO, UNFCCC and CBD. A number of topics could be considered for inclusion in an FTA. On the clean technology side, topics to discuss include the speed of granting green patents; licensing arrangements; and tech transfer and cooperation. On the biodiversity side, the option of including disclosure requirements, provisions for access and benefit-sharing (ABS) and for safeguarding traditional knowledge exists. These topics could be address in the chapter or annex on IP, depending on the format of the FTA.

This paper has sought to provide background information on the trade between China and Switzerland, as well as on their environmental situations and commitments in the form of MEAs that currently exist. An FTA would be accompanied by a diverse set of implications for the environment, through different impact routes – these possibilities range from increasing trade volumes to possible changes in the composition of production and trade. The paper has focused on the environmental challenges and opportunities that are particularly affected by trade. By doing so it has outlined the various possibilities available to address these issues in the development of an FTA between Switzerland and China.

7. Appendix I

The role of trade in the dissemination of environmentally sound technology, goods and services: technology assessments in MEAs

This section provides an overview to determine the role of trade in the dissemination of environmental good and services that are essential for the implementation of various Multilateral Environmental Agreements (MEAs) that Switzerland and China are involved in.

Switzerland and China are both global top 10 exporters of low-carbon goods (such as solar panels and wind turbines) and therefore, this analysis will be of particular value as it will determine the best areas for these nations to cooperate on with the goal of implementing MEAs.

As is shown with the following table, Switzerland and China are both actively involved in a number of important MEAs. Therefore, they are bound by these agreements and the study of the different technologies involved will be beneficial to both these nations.

Table 1: List of MEAs common to Switzerland and China

Agreement	Country	
	Switzerland	China
Basel Convention	*Ratified*	*Ratified*
Convention on Biological diversity	*Ratified*	*Ratified*
CITES	*Ratified*	*Accession*
Montreal Protocol	*Ratified*	*Accession*
Rotterdam Convention	*Ratified*	*Ratified*
Stockholm Convention	*Ratified*	*Ratified*
UNFCC/Kyoto Protocol	*Ratified*	*Ratified*

Due to the vast range of different sectors covered by these six MEAs, a large and varied number of technologies, goods and services are affected. The various technologies and goods in each MEA are examined below:

Basel Convention

The goal of the Basel Convention is to protect human health and the environment against adverse effects resulting from the generation, transboundary movement and improper management of hazardous wastes. To achieve this goal, the Convention establishes a system of prior notification for the export of hazardous wastes and other wastes, and a requirement that Parties provide written consent (referred to as “prior informed consent” or “PIC”) before shipments of such wastes can transit or be imported into the areas under their national jurisdiction. The use of appropriate technologies is an essential element in achieving these goals.

According to the Basel Convention, Parties shall cooperate “in the development and implementation of new environmentally sound low-waste technologies and the improvement of existing technologies with a view to eliminating […] hazardous wastes […] and achieving more effective and efficient methods of ensuring their management in an environmentally sound manner . . .” Parties to the Basel Convention are required to actively cooperate in technology transfer related to the environmentally sound management of wastes and the development of technical capacity among Parties.

Technology identification

A vital area of technology is the disposal of hazardous wastes, as some countries have little or no capacity for their storage or disposal. Switzerland is a leader in the development of safe and climate friendly disposal technologies and its aim, under its revised Environmental Protection Law, is

to become self-sufficient in its waste management. In the mid 1990's Switzerland opened two new hazardous waste incinerators (1994 in Dottikon, Aargau and 1995 in Basel) in order to move forward with their aim of self sufficiency in waste management. These plants use the energy gained from the incineration of waste to produce electricity.

Convention on Biological Diversity (CBD):

The objective of the CBD includes the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising from the use of genetic resources. Parties to the CBD are required to develop national strategies, plans or programs for the conservation and sustainable use of biological diversity, and to integrate the conservation and sustainable use of biological diversity into relevant policies and programs.

The CBD recognizes that both access to and technology transfer among Parties is essential to the achievement of its objectives. Given this, the Convention requires Parties to provide, facilitate access to, and transfer to other Parties technologies that are relevant to the conservation and sustainable use of biological diversity or make use of genetic resources. The Convention also establishes that access to and transfer of technology "shall be provided and/or facilitated under fair and most favourable terms, including on concessional and preferential terms where mutually agreed," and in a way "consistent with the adequate and effective protection of intellectual property rights."

Technology identification

The CBD has identified several general categories of technologies that are recognized as key drivers of implementation: techniques for in-situ conservation (e.g., integrated pest management), technology for ex-situ conservation (e.g., preservation and storage technologies), and technologies related to the sustainable management of biodiversity resources (e.g., forest management). In addition, many monitoring technologies, such as remote sensing, are essential for the generation of updated and accurate biodiversity information.

CITES:

The aim of CITES is to ensure that international trade in specimens of wild animals and plants does not threaten their survival by according more than 30,000 species of animals and plants varying degrees of protection. To accomplish this objective, CITES requires Parties to adopt a permit system for international trade in these species, which are listed in three Appendices according to the level of protection required: Appendix I includes species threatened with extinction; Appendix II includes species that are not currently threatened with extinction but may become so unless trade is strictly regulated; and Appendix III includes species subject to regulation within the jurisdiction of a Party who requests cooperation of other Parties in the control of trade.

There is no explicit reference to technology transfer in the Convention. However, as Parties, the Secretariat and other entities have carried out work on implementation, certain types of technologies have been identified as useful in achieving the CITES objectives.

Technology identification

Among the technologies that have been recognized as useful for the purpose of CITES are: software for computerized permit issuance/reporting, security stamps and security paper (measures that ensure that documents are difficult or impossible to alter), systems or methodologies for propagating animals or plants in a way that contributes to their survival in the wild (e.g. ranching, captive breeding, aquaculture, artificial propagation) and forensic techniques or materials for the identification of specimens.

A Resolution on coded-microchip implants for marking live animals in trade is one example of a technology related resolution adopted by the CITES COP. The experience of technology transfer within CITES is indicative of how particular technologies can be critical to achieving environmental goals. While under CITES technology transfer efforts have tended to focus on several specific technologies, this transfer has been accompanied by the spread of management techniques, standardization of procedures, and general know-how.

Montreal Protocol:

The objective of the Montreal Protocol, which is a Protocol to the Vienna Convention for the Protection of the Ozone Layer, is to protect human health and the environment against adverse effects resulting from human activities that modify the ozone layer. The Protocol focuses on the control and elimination of CFCs and other ozone depleting substances.

The Protocol explicitly recognizes the importance of "promoting international cooperation in the research, development and transfer of alternative technologies . . ." Article 9 of the Montreal Protocol states that Parties shall cooperate "in promoting, directly or through competent international bodies, research, development and exchange of information on: (a) best technologies for improving the containment, recovery, recycling, or destruction of controlled substances or otherwise reducing their emissions; (b) possible alternatives to controlled substances, to products containing such substances, and to products manufactured with them; and (c) costs and benefits of relevant control strategies."

Article 5 of the Montreal Protocol defines countries eligible to receive financial assistance from the Montreal Protocol's Multilateral Fund. Eligible countries are developing country whose annual calculated level of consumption of the controlled substances in Annex A is less than 0.3 kilograms per capita. Known as Article 5 countries, they are allowed to delay implementation of control measures. Currently 147 of the 196 parties to the Montreal Protocol meet this definition, and while China is an 'Article 5' country and thus eligible to receive financial assistance and is allowed to delay implementation of the Montreal Protocol, Switzerland is not.

Technology identification

As the process of technology development is dynamic, Parties are required to assess the control measures "on the basis of available scientific, environmental, technical and economic information." Substitutes for ozone depleting substances (ODS) and the products that incorporate them are predominantly privately-owned technologies. Widespread adoption of substitute technologies entails significant costs, including the purchase of access and the rights to use technology.

Rotterdam convention

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, more commonly known simply as the Rotterdam Convention, is a multilateral treaty to promote shared responsibilities in relation to importation of hazardous chemicals. The convention promotes open exchange of information and calls on exporters of hazardous chemicals to use proper labelling, include directions on safe handling, and inform purchasers of any known restrictions or bans. Signatory nations can decide whether to allow or ban the importation of chemicals listed in the treaty, and exporting countries are obliged make sure that producers within their jurisdiction comply.

Stockholm Convention:

The Stockholm Convention regulates the production, management and disposal of twenty two persistent organic pollutants (POPs), which are scientifically recognized as possessing toxic properties, resisting degradation, and bio-accumulating in living organisms. The objective of the Convention is to protect human health and the environment through measures that will reduce and/or eliminate emissions and discharges of POPs. The Convention covers the production, management and disposal of POPs, in order to prevent their adverse effect "at all stages of their life cycle." Parties are required to implement a number of measures to fulfil the Convention's objectives, in terms of technology, Parties are required to promote development in, and require the use of, substitute or modified materials, products and processes.

Technology identification

Article 11 provides that Parties must encourage "appropriate research, development, monitoring and cooperation pertaining to persistent organic pollutants and, where relevant, to their alternatives..."

Information on alternatives to POPs, including information on their risks and their economic and social costs, must be made available through exchange of information.

With respect to POPs released unintentionally, Parties are required to put in place “best available techniques and best environmental practices” to reduce such releases, and ultimately, eliminate them. The Convention defines “techniques” as including both the technology used and the way in which it is designed, built, maintained, operated and decommissioned.

Climate Change: the UNFCCC and the Kyoto Protocol

The United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty established in 1994 with the goal of beginning to consider what can be done to reduce global warming. The Kyoto Protocol was designed as the legally binding arm of the UNFCCC so as to ensure any pledged emissions reductions and global warming containment measures would be applied.

Established in 1997, the Kyoto Protocol was a landmark, (almost) worldwide agreement to reduce emissions. Organized through the UNFCCC, the Protocol sets binding emission targets for 37 industrialized countries that amount to an average reduction of 5% against 1990 levels over the five year period of 2008-2012. This agreement recognizes that developed countries are principally responsible for GHG emissions and therefore places a heavier burden upon them for emissions reductions.

Technology Identification

The Protocol calls for the reductions to be achieved primarily through national measures. It offers as a means of achieving these reductions through various market based measures including emissions trading, clean development mechanisms and joint implementation. These mechanisms require different forms of technology and knowledge.

Emissions trading employs and promotes various climate friendly technologies because of its financial incentives towards emission reductions. Clean development mechanisms and ‘joint implementation’ allow a developed country to offset some of its own emissions by implementing an emission reduction or emission limitation schemes in developing countries. This allows the transfer of emission reduction technologies while not burdening the economies of developing countries with the high cost of investment. The regulations imposed by Kyoto cover total emissions. Therefore, reductions can be found in any emission area and there are no specific technologies pertaining to Kyoto. Emissions trading through a free market system will inevitable find the most cost effective areas for reductions, ensuring that research and technological development are spent in the right areas.

China and Switzerland Clean Energy Connections

China has the largest existing capacity for renewable energy generation in the world. China is a leader in solar energy. It accounted for more than half of the global solar water heating capacity in operation in 2007. As costs have decreased for the production of photovoltaic power, China has become a large producer of photovoltaic cells and modules. Additionally, in the past few years, China increased its wind-turbine capacity by more than any other country. In 2010 as well as each of the four years preceding it, China has consistently doubled its capacity for wind energy. This form of renewable energy has been highlighted as a key economic growth area by the Chinese government in response to the financial crisis.

Chinese exports of renewable energy technologies have increased dramatically in recent years as costs have declined and demand increased. It is now the world largest exporter of photovoltaic cells and its export revenue from these products has climbed from $5.3 billion in 2007 to $17.7 billion in 2010. However, the correlation between increased renewable energy capacity and imports will weaken over time as any country with large increases in capacity will seek to grow their domestic industries so as to reduce trade deficits or gain a foothold in the market.

Investment in energy efficiency could create new markets for products and allow countries who invest early in such technologies to reap the benefits with little competition. ICTSD showed that the share of

CFL and HPS energy efficient lamps in worldwide trade increased between 2002 and 2008. China, with its investment in this industry, has become the world's largest exporter of CFL and has played an important role in the market creation. Nevertheless, Chinese growth in these sectors can, partly, be attributed to increased investment by multinational corporations in China. The primary markets of such companies are predominantly in developed nations who have stringent energy efficiency requirements.

Tariffs play an important role in the trade of climate friendly goods and services. Many climate friendly goods are traded with low or non-existent tariffs. 99.5% of the world's trade in solar panels enjoyed zero Most Favored Nation (MFN) applied rates. Import tariffs for wind turbines are also relatively low (5% or lower in most countries). However, there are other non-tariff, technological barriers, that appear. Infrastructure, or lack thereof, can be seen a major barrier as well as the infancy of the technology. The trade of electric cars is minimal in developed countries; this is partially due to the lack of electricity charging infrastructure and also to the inconvenience of a fully electric vehicle (low range, price and long charging times). Another example can be found in the implementation of solar energy. There can be initial reluctance to install solar panels because of their high cost (both to purchase and to maintain) and their geographically sensitive use. Major use of such technologies will only really be achieved when the technology is adequately advanced enough (e.g. fast charging car batteries or low light solar panels).

Trade in climate-friendly services

A vast range of services across multiple sectors appears to be related to implementing climate change policies. Any attempt to liberalise trade in environmental goods and services faces a number of challenges. The first lays in the identification of a reasonable set of climate change related services that could be subject to a negotiation on trade liberalization. This is a daunting task, since they are likely to be spreading around multiple sectors: infrastructural services, engineering services, construction services, waste collection and scientific and other technical services. Another challenge is posed by the disconnection between negotiations at the WTO on environmental goods and environmental services since certain climate friendly goods are indispensable for delivering the associated services and vice versa.

ICTSD has attempted to address these challenges by identifying services that are directly linked to climate change mitigation technologies [i] (hereafter 'complementary services of climate change mitigation technologies') and analyzing specific commitments made by the major trading countries of these services. Given that some of the key services required for mitigation options, ranging from energy efficiency projects to utility-scale wind power projects, are often unavailable in the host countries, liberalizing trade in these services could not only facilitate the diffusion of associated climate change mitigation technologies, but also enable countries to easily access to such services.

'Complementary services of climate change mitigation technologies' that cut across multiple key mitigation sectors identified by the Intergovernmental Panel on Climate Change (IPCC) (Energy supply, transport, buildings, industry, agriculture, forestry and waste) largely fall in the following Centralized Product Classification (CPC) groups: other professional, technical and business services; construction services; and sewage and waste collection treatment and disposal and other environmental protection services.

A review of major trading countries' specific commitments on these services shows that only a handful of the countries have made a full commitment. The principal Modes of supply for the complementary services of climate change mitigation technologies are 'commercial presence' (Mode 3) and 'movement of natural persons' (Mode 4). Yet, they appear to be largely limited, as the majority of countries concerned have put specific as well as horizontal limitations on these two principal Modes of supply. Members' commitments on 'Cross-border supply' (Mode 1) across all three CPC groups are increasingly being important to facilitate trade in these services, as the provision of services through Mode 1 is increasing together with new channels of electronic supply. Yet, the majority of trading countries concerned left this Mode of supply unbound as they considered it inapplicable particularly to construction services.

It should be born in mind that facilitating trade in 'complementary services of climate change mitigation technologies' goes beyond the boundary of the General Agreement on Trade in Services

(GATS) as it is not restrained to the issue of market access and national treatment. A variety of domestic law, regulatory measures and administrative rules could also affect trade in these services. In particular, regulations concerning government procurement could have a significant impact on trade in these services given the public sector being the largest client in this area. It is crucial, therefore, to address the issue of the liberalization of trade in complementary services of climate change mitigation technologies alongside a discussion on the plurilateral government procurement agreement (GPA) in the FTA negotiations between Switzerland and China.

Survey Swiss Ministry Environment/International Centre for Trade and Sustainable Development

1. *Do you think there is a tendency for the Chinese administration to focus on treating the symptoms of environmental challenges at hand instead of preventing the real roots of the problems?*

2. *In China, are environmental concerns still second to economic development at lower administrative levels?*

3. *Which products do you see as relating to the implementation of multilateral environmental agreements (MEAs) such as the UNFCCC and its Kyoto Protocol, the Basel Convention, the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Fauna and Flora (CITES), the Montreal Protocol and the Stockholm Convention*

4. *Swiss certifications often require high technology solutions. Do you think this makes the final product too sophisticated for the rural Chinese market?*

5. *Does emphasizing Swiss awareness of environmental management and experience in applying environmental management and safety standards help you to succeed in China?*

6. *Do you think new, innovative solutions are more likely to succeed in China than refinements of previous technologies? This is with an eye at Chinese firms being good at developing existent technologies but being less prominent in R&D.*

7. *Would a free trade agreement between Switzerland and China have greater political use than commercial benefit for the Swiss clean tech industry?*

8. *What are the biggest challenges for providers of clean tech in China?*

9. *Which trade barriers do you mostly run into (tariffs or non-tariff barriers such as subsidies, local regulations, local content requirements)?*

10. *What is your experience with regards to intellectual property rights in China? Which improvements would be possible in this regard?*
11. *In general, which opportunities do you see for Swiss clean tech companies in China and how can the Swiss government contribute to realizing these opportunities?*

12. *In which areas could official actions complement the introduction of a FTA in order to endorse environmental technology exchange from Switzerland to China? For example help with marketing, establish contacts, make Chinese authorities aware of irregular institutional frameworks and controls of standards and regulations?*

13. *Do you know other companies or organizations that we could approach with these questions?*

14. *Would you be interested in taking part in another survey on China, clean energy and global governance (yes/no)?*