

## **Potential Environmental Related Projects in China**

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There are increasing environmental challenges in China due to strong economic growth and dependence on fossil fuels as the main energy source. In addition there is little tradition for cleaning industrial waste and a lack of clean, convenient and cheap environmental friendly technology. Coal is the main energy source in China, supplying 75 % of the countries energy production. Such an extensive use of fossil fuel leads to enormous emissions of CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub> and other pollutants. The emissions are expected to increase, and by 2010 China could have higher level of CO<sub>2</sub> emissions than the USA and thereby become world's largest source of CO<sub>2</sub> emissions.

According to the IPCC, global CO<sub>2</sub> emission must be reduced by 50 to 80 percent by 2050 in order to keep global warming below 2 °C compared to pre-industrial times. In order to achieve this target it is essential that China also takes its share of reducing their CO<sub>2</sub> emissions. Large emission reduction in China is only possible if the rich part of the world allocate resources and funding into solving Chinese environmental challenges. CO<sub>2</sub> reductions in China must not impede its economic development

Norway has developed its prosperity on export of fossil fuels that leads to enormous CO<sub>2</sub> emissions. Therefore, Norway has a moral responsibility to contribute to solving global environmental challenges. Norway has also a strong industrial and technological position in several fields. This puts Norway in a unique position to cooperate with China and help China to solve their environmental problems in an economically sustainable manner. Below is a list of environmental issues that Norway and China could cooperate on..

### **1. Extinguish Coal Fires**

There is a large number of coal fires in China leading to enormous CO<sub>2</sub> emission and economic loss due to lost coal reserves. It is difficult to quantify the extent of the coal fires, but several sources indicate that coal fires in China is responsible for 2 - 3 percent of global CO<sub>2</sub> emissions<sup>2</sup>. Coal fires can be extinct by covering the burning coal with large volumes of CO<sub>2</sub>. The Norwegian company Sargas has a technology for CO<sub>2</sub> capture that can be further developed to extinguish coal fires. The Sargas technology has the

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<sup>2</sup> Source: International Institute for Geo-Information Science and Earth Observation, [http://www.itc.nl/personal/coalfire/problem/china\\_coalfire.html](http://www.itc.nl/personal/coalfire/problem/china_coalfire.html)

potential for establishing a new project aiming at distinguish the coal fires. Such a project can also be a starting point for collaboration on introducing CCS technology in China.

## **2. Carbon Capture and Storage (CCS)**

The European Commission established the *European Technology Platform on Zero Emission Fossil Fuel Power Plants (ZEP)* in 2005. ZEP is comprised of approximately 250 experts on CO<sub>2</sub> capture and storage (CCS) technology from all over Europe. The purpose of ZEP is to identify and remove the barriers to creating highly efficient fossil fuelled power plants with zero emissions, which would drastically reduce the environmental impact of fossil fuel use. One of the main recommendations from ZEP is to build 10-12 demonstration plants for CCS. Furthermore, ZEP is involved in facilitating the construction of a CCS demonstration plant in China. Such a plant can be the starting point for wide deployment of CCS in China. Norway could also take part in the financing of this plant and as such pave way for development and deployment of Norwegian CCS technology in China.

## **3. Enhanced Oil Recovery (EOR)**

There is a huge potential for EOR in the South China Sea. Establishing EOR projects will not only result in increased oil production, but also lead to development of more cost effective CCS technology. As a result, faster deployment of CCS from coal power plants in China can be ensured. Norwegian companies have long experience in offshore oil and gas business, and, therefore, a Norwegian-Chinese collaboration project on deployment and operation of EOR projects in the South China Sea should be established.

## **4. Enhanced Coal Bed Methane Recovery (ECBM)**

Injection of CO<sub>2</sub> in deep unmineable coal beds can release methane from the coal reservoir, and China has a large potential for ECBM. By combining ECBM and CCS it is possible to capture CO<sub>2</sub> from the flue gas from coal power plants and inject this CO<sub>2</sub> into coal mines. The methane production will be enhanced, but CO<sub>2</sub> will also be captured and safely stored underground.

## **5. Reduce Emissions of SO<sub>2</sub>, NO<sub>x</sub>, Ash, Particles and Other Pollutants from Coal Power Plants, Petrochemical Plants, and the Metallurgical Industry**

Emissions of SO<sub>2</sub>, NO<sub>x</sub>, ash, articles and other pollutants from coal power plants, metallurgical plants, and petrochemical plants lead to local environmental problems. The emission can easily be reduced by available technologies, but such technology is not installed in many Chinese plants. As such, there is a significant potential for emission reductions. The aluminium industry in Norway has run a program on emission reduction for some years with very good results. A cooperation project between Norway and China on transfer of experiences and technology has the potential to reduce emissions from Chinese plants considerably.

Beijing will host the Summer Olympic Games in 2008, and expose Beijing as an environmental friendly city. This could be a starting point for collaboration with Norwegian actors on emission reducing strategies. As an example, the Norwegian cement industry has identified a large potential in adding ash to cement to increase its strength. By installing filtration technology in Chinese coal power plants, not only emission reduction will be achieved, but the ash can also become a valuable product.

## **6. Production of Microsilika**

Elkem produces microsilika which is a bi-product from silicon production. Microsilika has turned out to be a valuable product that can be used as an additive in cement, enhancing the physical properties of the cement. Microsilica can be produced from the waste streams from many power plants and metallurgical plants in China. There are several other products that can be produced by converting waste into valuable resources. A study should be performed to identify the potential for producing valuable products from waste.

## **7. Electrical cars**

The market for cars in China are growing fast and as a result local environment problems are becoming more serious. Introducing electrical cars is therefore an important strategy to reduce the environmental problems. As such, there is a potential for bilateral cooperation on establishing electrical car production in China. Norwegian companies like Think have demonstrated their technology for electrical cars in Norway, and their technology could be the starting point of a collaboration project on electrical cars.

## **8. Small Water Power Plants**

China has a large potential for small water power plants, and such plants can play an important role for energy supply in China in the future. Norwegian actors are highly skilled on this subject, and transfer of experience and technology is a potential bilateral project.

## **9. Aquaculture**

China is the largest nations on aquaculture business and Norwegian and Chinese actors can learn a lot from each other. Norwegian actors have high competence on developing vaccines for fish diseases, and transfer of Norwegian knowledge on this subject can lead to reduced antibiotic consumption in Chinese aquaculture.

## **10. Clean Water**

Clean water supply is a limited resource in China, and securing clean water supply will be a huge challenge in the years to come. Several Norwegian actors have high competence on this issue, and cooperation between Norway and China can contribute to ensuring clean water supply in China.

## **11. Increase the Competence on Environmental Issues in China**

Increasing the competence on environmental issues among civilians, companies and governmental organisations is a challenge in China. It is important to communicate that such competence can lead to improved economy as well as more environmental friendly solutions. Norwegian environmental NGOs can contribute with high level competence on environmental issues in Norwegian-Chinese collaboration projects.

## **12. Understanding EU policies on energy and environment**

EU policy initiatives often set international standards for emissions of air pollutants, technology norms and waste practices. An understanding of the functioning of the EU policy machinery and decision making bodies is therefore essential. Bellona is a leading Norwegian actor in shaping EU policies and encompasses vast experience in this field. Knowledge sharing in this area could also be of benefit to Chinese authorities.