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Environmental Emergencies
环境应急

10

MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

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Editorial

Tian Weiyong, Chief of the Emergency Office and Director General of the Center for Environmental Emergency and Accident Investigation, Ministry of Environmental Protection

The overall trend of ever-increasing pollution is now under control; however, with its rapid economic growth and accelerating industrialization and urbanization, environmental protection in China still faces huge challenges. The environmental problems, which appeared in developed countries over more than one hundred years, have only been encountered in China in the last 20 years. At present, emissions of major pollutants exceed the carrying capacity of the environment; multi-regional, multi-faceted and multi-forms environmental risks together increase the number of environmental accidents. The environmental emergency management system is in its initial stage and not yet proficient at emergency response. Tasks such as strengthening China's environmental emergency management, developing approaches for disaster prevention and control, and effectively and scientifically handling emergency issues are on top of the governmental agenda.

The Chinese Government has attached great importance to emergency issues. It has strengthened its emergency response system and organization, and has issued a *National Plan for Environmental Emergencies*, and *the Emergency Response Law*. The Ministry of Environmental Protection (MEP) set up the Center for Environmental Emergency and Accident Investigation and six regional environmental supervision centers. All of these played important roles in dealing with the disasters of low temperatures, rain and snow early in 2008, the Wenchuan earthquake, as well as the environmental protection of the Beijing Olympic Games.

International communications and corporations need to be strengthened in dealing with environmental issues. Italy has attained both practical experience and research achievements in production management, chemical management and environmental emergency management. There's a famous saying in China: "Stones from other hills may serve to polish jade". We believe that the Sino-Italian Cooperation Program for Environmental Protection will provide help in improving the emergency response abilities of the environmental management departments and communities. It will also further promote the concept of environmental safety and scientific development.

This newsletter focuses on environmental emergency issues, and will give a brief review of the relevant cooperation programs that are carried out under the framework of the Sino-Italian Cooperation Program for Environmental Protection. It is hoped that further cooperation between the two countries, particularly in building up China's environmental emergency response abilities, will be strengthened.

Environment G8: Urgent Action to Address Climate Change

Italy hosted the Environment G8 2009, chaired by the Italian Environment Minister, Ms Stefania Prestigiacomo, in Maniace Castle (Syracuse), on April 22-24, 2009.
The meeting was attended by environment ministers from the G8 countries (Canada, France, Germany, Italy, Japan, Russia, the United Kingdom and the United States), together with the same level representatives from China, India, Brazil, Mexico, South Africa, Australia, the Czech Republic, Egypt, Indonesia, the Republic of Korea, and Sweden. A number of relevant stakeholders such as international organizations and representatives from NGOs also attended the meeting.
During the three-day meeting the main issues discussed concerned combating climate change and the protection of biodiversity, in view of this December's Copenhagen Convention on Climate Change, which will look to define a global strategy for the post-Kyoto era. The forum also focused on the relationship between the environment and health issues, in particular with regard to children.
Climate talks emphasized the importance of the national emission-cutting plan and the commitment to keep the temperature increase (due to global warming) within the 2 degree limit. The leadership role that the industrialized countries have to take on was also highlighted. The major role of technology in addressing climate

change was recognized, as well as the need for effective financing mechanisms, the investment in the production and more efficient use of energy, the stepping up of joint public and private investment in research and ensuring electricity supplies to the poorest populations.
Ms Prestigiacomo called for "convergence among the industrialized countries and the emerging economies on a joint agreement" to address climate change and CO_2 emissions.
Among the main outcomes of the meeting, the Syracuse Biodiversity Chart (twenty-four initiatives and five proposals) signed by the Environment G8 Ministries, set the guiding principles for safeguarding biodiversity from four main points of view: the climate, the economy, ecosystem services and science and research.
The chart's measures also include the "development of synergetic political lines" in favor of biodiversity, not least in view of the contribution they make to the adaption and mitigation of climate change at local, national and global levels. It goes on to discuss the preservation and sustainable use of biodiversity with a view to improving the management of water resources, forests, agriculture and the coastal and marine areas and the development of infrastructure, including the use of advanced technologies with guarantees of adequate transfer. Clamping down on illegal deforestation and capturing and storing CO_2 emissions were also covered.
The "Health and Children" chapter, opened by the head of the Environmental Protection Agency, Ms Lisa Jackson (United States) and the Japanese minister, Mr Testo Saito, stressed the importance of children's rights of "being born into and growing up

and enjoying development and prosperity in an environment offering clean air and water, safe food and minimum exposure to harmful chemicals". Several appropriate initiatives were identified: banning lead completely from paints and petrol; working together on surveys and studies on children's health, including the impact of chemical agents, heavy metals and climate change; enhancing knowledge and building the professional skills involved in children's health issues.

Methodological Framework Established to Evaluate GHG Emissions in Biofuel's Lifecycle

The Global Bioenergy Partnership (GBEP) has completed a common methodological framework for lifecycle analysis (LCA) of GHG emissions associated with biofuel production, conversion and use.
GBEP is an international forum, presently led by Italy, where the governments of major developed and developing countries gather, along with leading institutions, to reach a consensus on delicate topics related to bioenergy such as emission reductions and sustainability.
Climate change is a global phenomenon and efforts to reduce emissions locally – and to measure such efforts – need to be harmonized so that comparisons can be made. Biofuels have great potential to reduce GHG emissions but their effectiveness depends on how they are produced, transported and used and how land use, for example, is managed.
The GBEP Task Force, tackling this question, has succeeded in defining all the factors to be taken into consideration when assessing GHG emissions as compared with the use of fossil fuels, dividing them into 10 areas or check boxes.
The methodological framework is intended to be a practical product for the end user, providing a transparent template for LCA which can be applied to a wide range of bioenergy systems. The goal of the framework is to ensure that countries and

organizations can evaluate GHG emissions associated with bioenergy in a consistent manner, using methods appropriate to their circumstances, conditions and systems of production.
A report on the work of the task force will be prepared and be part of the input to the GBEP report to the G8 Summit 2009. It will include good practical guidance to help anyone interested in using the framework. Information about the GBEP and the methodological framework for lifecycle analysis (LCA) of GHG emissions is available at www.globalbioenergy.org.

EU Speeds Up on Climate Change and Energy Policy

The Council of the European Union adopted last April the climate-energy legislative package containing measures to fight climate change and promote renewable energy. This package is composed of six measures and is designed to achieve the EU's overall environmental target of a 20% reduction in greenhouse gases and a 20% share of renewable energy in the EU's total energy consumption by 2020.
To achieve these objectives, the directive, for the first time, sets for each member state a mandatory national target for the overall share of energy from renewable sources in the gross final consumption of energy, taking account of countries' different starting points. The main purpose of mandatory national targets is to provide certainty for investors and to encourage technological development, allowing for energy production from all types of renewable sources.
The climate-energy legislative package also includes a revised EU Emissions Trading System (ETS) for GHGs in order to achieve greater emission reduction in energy-intensive sectors. From 2013 onwards, heavy industry will contribute significantly to the EU's overall target of cutting greenhouse gas emissions. In particular,

power producers will have to buy all their emissions allowances at auction to correct the deficiencies of the previous scheme, in which free allocations resulted in massive windfall profits.
For the sectors not subject to the EU's Emissions Trading System, such as transport, agriculture and housing, the package contains the so-called "effort-sharing" decision, which sets out binding emission-reduction targets for EU member states, in line with their ability to pay, in order to reach an overall cut of 10% by 2020.
The package also establishes a regulatory framework for the capture and underground storage of CO_2 to help

support this new technology, which could help to mitigate climate change, before it becomes commercially viable.
The two remaining measures set CO_2 emission limits for new passenger cars and environmental standards for fuel quality.
The widespread blending of biofuels into petrol and diesel will be facilitated and ambitious environmental and social sustainability criteria for biofuels have been set.

China Issues First White Paper on Disaster Relief

On May 11, 2009 the Chinese Government published a white paper on the country's actions for disaster prevention and reduction to mark the first anniversary of the devastating Wenchuan earthquake.
The paper, released by the State Council Information Office, was also written to mark China's first "Disaster Prevention and Reduction Day", which falls on May 12 in memory of the Wenchuan quake.
The document, consisting of over 16,000 Chinese characters, shed light on the endeavors the Chinese Government and people have made in disaster prevention and reduction. "China is one of the countries in the world that suffers the most natural disasters", the report said. Except for modern volcanic activity, China has suffered most types of natural disasters.
Along with global climate changes, the country's economic takeoff and progress in urbanization, China faces increasing pressure on resources, environment and ecology. The situation of preventing and responding to natural disasters has become "more serious and complicated", the report said.
Given that many kinds of wide-ranging disasters frequently hit China and caused huge losses, China's main tasks were to strengthen its ability to manage potential risks for natural disasters, to monitor, forecast and prevent natural disasters, and to conduct rescue and relief work, the report said.
"Based on the lessons we learned and problems found in rescue and relief work for winter storms in south China in early 2008 and the May 12 earthquake, we have made efforts to improve the country's disaster management system", Zou Ming, director of the Disaster Relief Department under the Ministry of Civil Affairs, told the press conference. The country had amended its state-level contingency plan for natural disaster relief and ordered local governments, rural and urban communities to make corresponding plans.
A draft governmental al regulation on disaster relief has been released for public comment for about a month. The country will adopt a new system to calculate damages and loss in disasters from June 1 and train local officials in charge of collecting such data, he said.
Pilot training programs have been held in 13 provinces so far this year and training will be offered to 30,000 to 50,000 officials in total this year. Zhou expected about 300,000 officials would be trained in the next three years. China also planned to increase the number of state-level storage facilities for relief materials from 10 to 24, he said.
The country attaches great importance to institutionalizing disaster control work, such as issuing relevant laws and regulations, and it has developed a disaster control and response system in line with China's realities, the report said.
The system included leadership from the State Council and central government departments as well as disaster control departments at different levels, while local governments bore the main responsibilities.

The climate dilemma

Antonio Navarra, National Institute of Geophysics and Volcanology

Science progresses as a sort of collective temporary skepticism. At a certain point an agreement is reached based on the available evidence at the time, but the sudden appearance of new and improved results may change our view. Somebody may come up with a very smart and exotic explanation of how temperatures can rise without referring to carbon dioxide and in a manner consistent with our observations. In the meantime, signs of change abound. The Arctic has been warming steadily since the 1950_s. There is currently 40% less ice in volume in the Arctic than in the 1950_s. It is conceivable that very soon we will have an ice-free Arctic in the northern hemisphere summer. This event would imply changes in the shipping routes between Europe and the Far East and it would open the Arctic to exploitation of mineral and biological resources. This may compound the problem of climate change if we find that there are extensive reserves of fossil fuels in the Arctic Ocean.

The absence of an international agreement with regard to the exploitation of the Arctic will create a complex geopolitical situation and there is urgent need of an international treaty to define a shared way of operating within and protecting the Arctic. The warming of the northern Polar Region is also creating some considerable concern about Greenland. In recent years Greenland glaciers have been melting at an increased pace. The disappearance of the Arctic sea-ice is of little consequence to the global sea level because floating ice does not increase the volume of the oceans when it melts, but the land-locked Greenland glaciers are another story. Greenland is a big reservoir of water and the complete melting of its glaciers could result in up to a 7 m increase in the world ocean sea level. Nobody expects Greenland to just disappear so rapidly, but there is a degree of concern because we know very little of the dynamics of the ice rivers in Greenland. We know very little of the mechanisms that can accelerate or slow down their processes and we do not understand very well the mechanism of accumulation of ice over land. This is something that is now being monitored very closely and there's a lot of interest in this sector.

Once you have accepted the extreme complexity of the climate system you find yourself in a logical corner. If the system is so complicated how can we understand it? How can we make science out of it? The difficulty lies in the sense that science is relying heavily on the possibility of performing crucial experiments that enable you to distinguish between different competing theories. Consider, for instance, the famous experiment of Michelson and Morley that proved the existence of the electromagnetic aether. The experiment opened the road to special relativity and the entire experimental apparatus was sitting on a table in a basement.

Now I would very much like to conduct experiments myself. I would like to close Gibraltar Strait, for instance, so that I could check if the Mediterranean Sea is actually drying up at about a meter per year as our estimate indicates. It is, however, difficult to find the funding and the environmental permission to conduct such an experiment. Hence our issue is: How can you create science if you can't perform experiments? How can you have a rational understanding of an area where no experiments are possible and where everything is so complex?

The development of climatology as a quantitative science has been crippled by this problem and it basically evolved as a descriptive science in the 19^{th} century and the early part of the 20^{th} century. The situation changed when we had the opportunity to conduct experiments. This is possible because we know very well how the climate system works. We are able to write down the equations that regulate its behavior but we are unable to solve them because of their extreme mathematical

complexity. The solutions to these equations are possible only through a tradeoff – we traded the mathematical complexity of the equations with a large number of elementary operations, using numerical methods and getting approximate solutions. This is what we call a numerical model, a mathematical representation of the functioning of the earth's climate system.
Present models are very advanced. They include not only the physical part of the atmosphere, the ocean, but also the biosphere, the biosystem, the chemistry and the ice – basically everything that is susceptible of a mathematical formulation, we can model. In the virtual world of the model we can conduct experiments because we can take out mountains, we can take out the Alps or, without being stingy, we can take out all the mountains and see what the climate of the earth would be. The models are to us what telescopes are to astronomers – large and sophisticated instruments that allow us to see deeper and deeper into the workings of the climate system. Every new model generation allows us to be more accurate, more detailed and more reliable.
The next-generation model that we are building at the Euromediterranean Center for Climate Change (CMCC) will be able to access climate details that will be useful to the evaluation of climate change impact for a variety of applications that really need localized data. The issue will be, of course, how precise is the simulation data? What are the uncertainties? What level of accuracy can we reach? There is a lot of work to be done, but you need to learn to walk before you start running. The main effect of climate change will be a shift in the overall precipitation. Precipitation may increase in some regions and decrease in others. In the Mediterranean, for instance, the winter precipitation is going to decrease quite a bit, indicating a potentially serious issue for the following decades in a region that is already under water stress.
So the question is – what can we do? We have discussed mitigation and adaptation as possible options. They are a "Wunderwaffen" and there are limitations that indicate that we will have to include both in our strategy. The reason we need adaptation is that there is a delay in the increase of carbon dioxide in the climate system and in the actual increase in temperature. If by some magic we are able to stop the accumulation of carbon dioxide at the present level, the earth would still warm up by 1.5 degrees in the coming few decades. The warming potential of the carbon dioxide that is already in the atmosphere has not completely expressed

itself yet. Adaptation will be needed because, even in this miraculous case, we would still have some global warming. But adaptation also has limitations. There is a limit to the adaptation capacity of cultures and economies, so mitigation strategies that cut down the greenhouse gas emissions are also needed.
There are a lot of international efforts going on to evaluate these strategies and the coming climate changes. For instance, there is a European project called CIRCE (www.circeproject.eu) whose goal is to make a regional assessment of climate change and its impact in the Mediterranean. It is very interesting since it is one of the first regional assessments of climate change on the international scene. CIRCE launches a new approach for these studies. One would usually start with climate drivers. Some scenarios will show how much the temperature or precipitation is going to change, other people will come up with the changes that will occur in agriculture, and the economists will make the calculations and attribute a dollar (or euro) figure to the scenario changes.
However, in the middle there is policy. The same set of climate drivers with a certain policy will give a certain dollar impact, but if the policy changes then there will be another impact and obviously a different cost. This means that we have to include the hypotheses of policy in our assessment of climate change and in our evaluation of climate change impact; otherwise we won't be able to make an evaluation of our options.
It is a very challenging problem and, of course, this is the reason why things are really difficult.
Drastic reductions in emissions are needed to stabilize the concentrations. They will be far more effective than the 3% reduction that can be achieved under the Kyoto protocol. The post-Kyoto climate regime agreement must be *effective*, as it must be capable of realizing significant emission reduction. It should be *empowering*, because it must allow emerging countries to continue their chosen developing paths. It will have to be *fair*, because it must recognize the historical responsibility of mature economies that have caused the bulk of the problem. It must be *shared*, because without consensus, both international and domestic, we will never be able to achieve the 70 or 80% reductions that are needed. It is crucial that we have a coalition, both internationally and domestically, because without a very wide consensus, it will not be possible to implement the policies that are needed. In a recent general social survey (2007) in the USA, a sample group of people was asked if they were satisfied with their jobs, if they were satisfied with their income, and so on. The results showed that 75% were happy with their income and jobs and 62% expected their position to improve over the next two years. However, only 25% believed that the country was on the "right track"; 80% thought that the Congress had accomplished nothing; 60% expected that the next generation would be worse off. This is a very interesting result because it shows that there is a happiness gap. People are basically satisfied with their lives, but they are not satisfied by what the government is doing to counteract these really large forces that are outside of their control: climate change, terrorism, the credit crisis, and they doubt the capacity of the government to handle these problems effectively. It is clear then, the challenge we are facing: a policy needs to be drafted that is actually tackling these large issues, without touching the personal sphere of satisfaction of the individual. Here is the entire climate change dilemma in a nutshell. This is why it is so controversial to define a policy about climate change, but it is a challenge we have to take if we want to shape a better future for all of us.

Stand-up From Great Love

Li Heyi, Sichuan Environmental Protection Bureau

The earth-shattering Wenchuan earthquake measuring 8.0 Richter scale hit Mt. Longmen fracture zone in Sichuan Province at 14:28 on May 12, 2008. At that moment, the earth trembled and cracked up, the mountains swayed and collapsed; highways, bridges and communication in the disaster areas were broken down. Factories were destroyed. Houses collapsed. Over 60,000 fellow people died and over 10,000 disappeared. Houses, instruments, vehicles, monitoring stations, pollution control equipments, monitoring systems etc of Sichuan Environmental Protection System were damaged severely as well. 9521 environmental protection instruments, 199 vehicles, 135 automatic monitoring stations, 659 urban pollution control facilities, 361 pollution source automatic monitoring systems were lost. Wenchuan earthquake devastated life and property, economic and social development in the disaster areas, making environmental safety endangered. After the serious earthquake occurred, Sichuan Environmental Protection Bureau set up earthquake relief headquarters rapidly and initiated the emergency plan immediately. All staff entered into a kind of war-state. The first task for the headquarter was to formulate the *Environmental Emergency Monitoring Scheme*, transferred 22 emergency monitoring vehicles and 70 professional monitoring personnel from different places of the province, composed of twelve environmental emergency monitoring groups with 190 persons from the provincial environmental monitoring central station. Despite the aftershock danger, they overcame the difficulties of dangerous roads, lack of materials, went to seriously-hit areas such as Chengdu, Deyang, Mianyang, Guangyuan, Dujiangyan, Pengzhou, Shifang, Mianzhu, Jiangyou, Anxian, Qingchuan and Beichuan county, reported their emergency monitoring situation in different places successively, starting from the night of the 12th on; monitored 63 fixed monitoring points and 16 temporary monitoring points for air quality in the disaster areas according to the emergency monitoring scheme. In addition to the routine monitoring parameters, hydrogen and sulfide etc, water quality of centralized drinking water sources in the disaster areas, indexes related with volatile organic compounds and semi-volatile organic compounds etc were monitored in more concentrated sequence. Key surface water were monitored in Minjiang River, Tuojiang River, Fujiang River, Jialingjiang River basin of the disaster areas while carrying out key special monitoring for water quality of barrier lake, Zipingpu reservoir area and the downstream. On the basis of centralized monitoring on urban and some rural drinking water sources, we carried out general survey on centralized town and township drinking water sources in the disaster areas, and realized two "full coverings" of "monitoring areas" and "monitoring indexes". With respect to the situation that earthquake might destroy enterprises and cause secondary environmental pollution, we transferred more than 30 persons from environment supervision branches of Zigong, Luzhou etc ten cities and prefectures to comprise ten environmental safety troubleshooting groups with Sichuan Environment Supervision and Enforcement General Brigade, strengthened emergency disposal, carried out comprehensive environmental safety troubleshooting for state-controlled and province-controlled enterprises, drinking water sources, dangerous reservoirs, enterprises on down-stream of barrier lakes in the disaster areas. Sichuan Environmental Protection Bureau cooperated closely with municipal and county environmental protection bureaus in the disaster areas, organized emergency disposal of dangerous conditions caused by solid wastes, timely collected and stored hazardous waste in Dujiangyan earthquake region collectively and

carried out risk assessment for the troubleshot risk sources one by one, formulated preventive measures. More than 30,000 environment supervision person-times, nearly 5,000 enforcement vehicle-times were mobilized in the whole province, checked over 19,000 enterprises to try to find environmental safety risks in the troubleshooting.

As of May 23, 2008, 8,920 environment supervision and enforcement person-times were mobilized in the whole province and 10,687 enterprises were checked. Among them, 236 key enterprises were checked in the disaster areas. At the same time, we collected and stored radioactive sources in severely afflicted areas, checked source units in the disaster areas one by one, collected and stored radioactive source safely. After several days of efforts, all radioactive sources in the disaster areas were well controlled and managed. In the earthquake relief, environmental protection system monitoring personnel strengthened environmental emergency monitoring, closely checking any changes of the water quality so as to ensure clean water provision for disaster areas and downstream districts. 1,325 persons participated in emergency monitoring, accounting for above 60% of total monitoring technical personnel in the whole province. More than 600 instruments, 5,960 vehicle-times were mobilized and more than 300,000 monitoring data were obtained.

The Ministry of Environmental Protection attached great importance to the disaster, setting up MEP environmental emergency instruction center, started National Emergency Plan for Outburst Environmental Events timely and established MEP Front Line Work

Group. Under the leadership of Vice Minister, Li Ganjie, the Group went to Sichuan for front commanding on the morning of May 13. At the critical moment of earthquake relief, on May 16, the Minister Zhou Shengxian went to command the work in Sichuan disaster areas. With the danger of intense aftershock, he traveled 3,000 km in 5 days and checked relevant works specifically. On June 3, Vice Minister Wu Xiaoqing led post-disaster ecological restoration assessment expert group to Sichuan disaster areas, surveyed ecological environmental disruption and post-disaster reconstruction on site. At the critical moment of earthquake relief, with respect to actual difficulties in provincial earthquake relief work, the Ministry of Environmental Protection provided the emergency monitoring equipment to Sichuan timely, transferred emergency monitoring technical professional and emergency monitoring vehicles from 21 provinces (cities, districts) to front line of the disaster areas for emergency monitoring of drinking water sources, urban atmosphere and key pollution sources rapidly. The earthquake disaster aroused the attention and care of the world. In earthquake relief, many countries sympathized the disaster areas, and provided aid to the disaster areas. Overseas and international environmental protection organizations and friendly enterprises and persons, donated environmental emergency monitoring and supervision equipment, drinking water disposal facilities, medical waste treatment facilities, mobile houses etc to the disaster areas. Among all these support, the Italian Ministry for Environment, Land and Sea (IMELS) expressed their consolation and willingness of assistance to China. IMELS initiated a program for post-earthquake environmental protection capability building.
The Program is divided into two stages. At the first stage, about environmental protection monitoring supervision, equipment of 1 million Euros was provided to Sichuan, which was urgently needed after Sichuan earthquake, mainly including 14 off-road vehicles (5 Leopard, 9 Iveco) and environmental protection monitoring equipments. At the second stage, when conditions were ready, investigation and fact finding missions were sent to the fields to develop more specific support project needed in the disaster areas, including drinking water safety, harmful waste treatment, remote sensing monitoring etc. At the same time, support is to be provided in the construction of environmental monitoring center after the reconstruction of Beichuan. Sichuan Environmental Protection Bureau delivered the vehicles and monitoring equipments to severely afflicted environmental protection bureaus timely and successfully, disaster aid environmental monitoring instruments such as gas chromatograph/ mass spectrum + syringe, atmospheric Fourier infrared analyzer, computer, portable air sampling instrument, portable water sampler, portable air sampler, multi-parameter water probe were aided to environmental monitoring stations in Sichuan disaster areas, such as Deyang City, Guangyuan City, Mianyang City, Aba Prefecture, Chengdu City Dujiangyan City, Deyang City, Shifang City. In earthquake relief, these vehicles and instruments played active roles in protecting environmental safety. People in the disaster areas appreciated very much the friendship that the Italian people provided to them. They thanked from the bottom of their hearts the care and aid of Italian government and people with reconstruction of their homestead. At present, post-disaster reconstruction is being carried on in Sichuan disaster areas. According to *General Planning of Post-Wenchuan Earthquake Rehabilitation and Reconstruction*, the rehabilitation task will be completed in three years. With the care and support from the whole world, we will complete post-disaster reconstruction tasks soundly and fast, enhance self-development capability of the disaster areas and construct Sichuan into a more beautiful place.

Combating Eutrophication/Algae Bloom in Chaohu Lake

Annalisa Bortoluzzi, Fabrizio Fortran and **Andrea Panizza,** Progetti e Ambiente S.p.A.

The severe eutrophication of freshwater basins, with its likely development into algae bloom, deeply affects the safety of drinking water supplies in China and stands as one of the main environmental emergencies of the country. The Chaohu case analysis, developed within the framework of the Sino-Italian Cooperation Program for Environmental Protection, provides a thorough assessment of the water basin conditions and its eutrophication causes, with the objective of improving the water quality by strengthening lake monitoring and introducing an integrated lake management. The emergency plan of the Chaohu district will also be proposed.

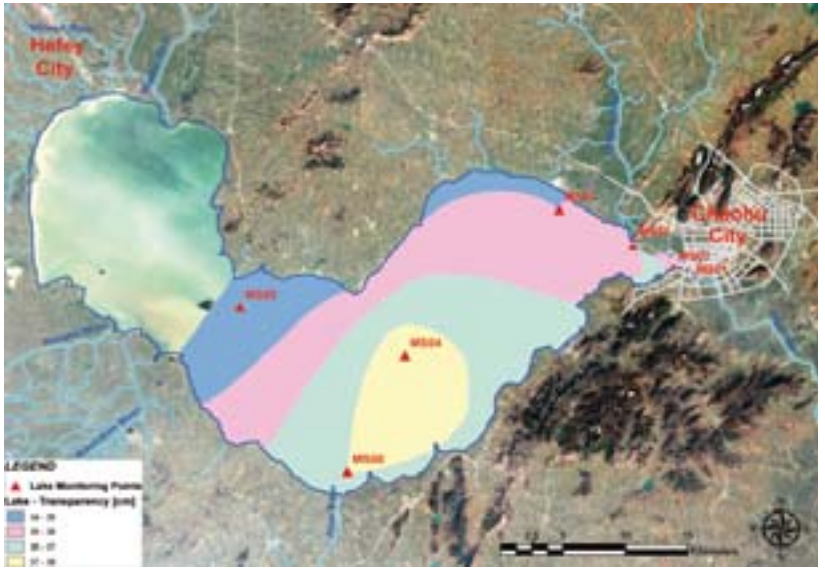
Eutrophication in Chaohu Lake

Chaohu Lake is located in the central area of Anhui Province on a tributary of the Yangtze River and is one of the five largest freshwater lakes in China, with a surface area of 770 km² and a watershed area of 9,925 km².
The following table reports some significant lake characteristics, considering an average elevation of the water level of 8.37 m above sea level.

Parameter	value
Surface	769.6 km²
Length	61.7 km
Width	12.5 km
Perimeter (lakeshore)	155.7 km
Annual medium depth	2.89 m
Annual medium storage volume	2070 x 10^6 m^3
Annual maximum storage volume	5610 x 10^6 m^3
Annual minimum storage volume	700 x 10^6 m^3
Water retention time:	3.2 months

Chaohu Lake belongs to a subtropical monsoon climate area, transiting from a subtropical to a warm temperate zone. Its climate is warm and rainy, and it has ample sunlight and heat.

The average annual rainfall in the last 6 years was between 1,062 mm and 1,213 mm (1,181 mm in 2008, 1,213 mm in 2007, and 1,147 mm in 2006) in the Chaohu district. The precipitation is centralized in summer, with maximum rain levels generally in July and August (in 2008: 442 mm in August, 108 mm in July and 146 mm in June; in 2007: 268 mm in August, 180 mm in July, 124 mm in June; in 2006: 103 mm in August, 315 mm in July, 39 mm in June).
The yearly mean water temperature is about 20°C (for more than 9 months it is higher than 10°C); average water temperature in summer (May to September) is about 28°C, while in winter (October to April) it is about 11°C.
Maximum water temperatures (about 33.5-34.5°C) are recorded in July and August, while minimum (2-3°C) are recorded in December and January.



Lake Chaohu (N 31°43'10"-31°25'35" - E 117°17'20"-117°51'05"): water transparency map from GIS

Both sunlight and temperature meet the demand of the photosynthesis of algae. Being a shallow and flat lake in the temperate zone, as defined by limnology, Chaohu Lake is typically subjected to eutrophication.
From available data in the period from 1998 to 2008, the maximum water level in the lake has been about 4 m, given the existing artificial regulation by the Chaohu water gate at the only outlet.
The wind direction is east in February and March, southeast from April to July, northeast from August to October, northwest from November to January, and the wind speed is greater from April to July and from November to January (for example, the average wind speed was 2.9 m/s from 1957-2003; the greatest wind speed was 13.8 m/s on land and 18 m/s on the lake surface).
The lake provides multiple functions including flood control, water supply for humans, industrial and agricultural uses, transportation, fishery and tourism; its drainage area is famous for its pleasant weather and abundant products.
For thousands of years the lake has been a special and brilliant part of Chinese history, being regarded as a bright pearl of the Jianghuai Plain (the plain between the Changjiang (Yangtze) and the Huaihe rivers).
This area in the middle and lower reaches of the Yangtze River is one of the most concentrated areas of shallow lakes in the world; there are 651 lakes with an area of over 1 km^2, and 18 lakes with an area of over 100 km^2.
As a result of serious water pollution and intensive human activities, most of these lakes are nowadays eutrophic. Lakes and estuaries accumulating large amounts of plant nutrients are called “eutrophic” (from the Greek words *eu* meaning “well” and *trophe* meaning “nourishment”).
Eutrophication can be defined as the sum of the effects of an excessive growth of phytoplankton leading to imbalanced primary and secondary productivity, and of a quicker transition from the initial to the higher stages. This is caused by nutrient enrichment through runoffs carrying overused fertilizers from agro-ecosystems and/or discharged human waste from settlements.
Generally speaking, water eutrophication is caused by the autotrophy algae blooming in water, which develops its bioplasm by sunlight energy and inorganic substances through photosynthesis.
The process of eutrophication can be described as follows:

$$106CO_2 + 16NO_3^- + HPO_4^{2-} + 122H_2O + 18H^+ \text{ (Energy + microelements)} \rightarrow C_{106}H_{263}O_{110}N_{16}P \text{ (bioplasm of algae)} + 138O_2$$

According to the above equation, it can be concluded that inorganic nitrogen and phosphorus are the major control factors for the propagation of algae, especially phosphorus.
In China, the parameters for assessing the environmental quality of surface water have been increased to over 30 (CNEPA, 2002) and, accordingly to different thresholds, five classes of surface water quality have been set up.
The calculation of the total nutrient status index is an equation where *TNI* is the sum of the indexes of all nutrient parameters, *TNIj* is the TNI of *j* parameter, *Wj* is the proportion of *j* parameter in the TNI, and *rij* is the relation of chlorophyll a (Chla) to other parameters.
The available parameters concerned include total nitrogen (TN), total phosphorus (TP), Chla, dissolved oxygen (DO), chemical oxygen demand by K_2MnO_4 oxidation method (CODMn), biological oxygen demand (BOD5), etc, and TN, TP and Chla are selected for calculating the TNI.
Although there are many different assessment parameters, the concentrations of total nitrogen and phosphorus are the two basic ones.
N and P input and enrichment in water are the most primary factors to induce water eutrophication and P especially is the main limiting factor to control the growth of algae in water. It was reported that 80% of lake and reservoir eutrophication is restricted by phosphorus, about 10% of lake and reservoir eutrophication is relative to nitrogen, and the remaining 10% of lake and reservoir eutrophication is relative to other factors. The ratio of N:P in the water body (referred to as the “Redfield ratio”) is an important indicator of which nutrient is limiting eutrophication.
The results indicate that available N is the limiting nutrient for the growth of phytoplankton in water bodies with high P. In phosphate-deficient water bodies or those having reasonably good growth of blue-green algae, which fix enough of the atmospheric nitrogen, phosphorus becomes the limiting element, because a portion of P is used to counterbalance high nitrate content. Such circumstances show that no paroxysmal algal boom may break out in heavily eutrophicated water bodies with both high N and P.

Chaohu Lake is a eutrophic shallow lake. It has an average total phosphorus concentration of 0.142 mg/l and a total nitrogen concentration of 1.63 mg/l.
The water is turbid with an average transparency (Secchi Disk depth) of 0.25 meters.
According to the experiment, the algal growth is limited by phosphorus only at the SRP (soluble reactive phosphorous) concentration below 0.019 mg/l in Chaohu Lake. Above this critical value, there is no further response. The experiment yields a saturation. This value is important in the management of the lake since the in-lake phosphorus has to be below this value to create a phosphorus limiting process.
Chaohu Lake water has an annual soluble phosphorus concentration of 0.049 mg/l and SRP concentration of 0.026 mg/l. Both of them are higher than the phosphorus threshold of 0.019 mg/l. It can be considered that in the present stage of the lake, the algal biomass is not limited by the nutrient phosphorus but by other factors. Only below the point of 0.019 mg/l the biomass will respond correspondingly with the reduction of phosphorus concentration in the lake.
However, nutrient enrichment is only one necessary (but not sufficient) condition for algal bloom. Other factors inducing, controlling and influencing water eutrophication include: (1) temperature and salinity (algae blooms always occur at temperatures between 23 °C and 28 °C), (2) slow current velocity and wind velocities, (3) carbon dioxide, light, pH and dissolved oxygen (for example, the change in pH is directly related to the availability and absorption of nutrients from the solution), and (4) microbial activity and biodiversity. Water eutrophication may occur rapidly when all of these conditions are favourable.
In China, water eutrophication has occurred in 67 lakes (51.2% of the total lakes). Some prediction ecological stress models (Jin *et al*. 2005), starting with the pollution water treatment rate (60% in 2030), reported that by 2030, all urban lakes and most medium-sized lakes in urban-rural fringe areas in China may be eutrophicated or hypertrophicated.
The Chaohu Lake area has a population of 2.3 million and more than 3,000 factories in its basin.
Hefei City, located on the northwest shore of the lake, is the capital of Anhui Province and discharges large amounts of sewage into the lake (the discharge from city wastewater contains 18,368 tons of total nitrogen (TN) and 1,050 tons of total phosphorus (TP) every year (Min, *et al*. 2009)).
In 2007, in Juchao district – where Chaohu city is located – the total yearly industrial discharge was 11,107 tons including domestic: 33,906 tons, total P: 143 tons, and total N: 1,950 tons.
The quality of water is known to be the worst in the lake's western part and it gradually gets better from west to east.
Since the 1990_s, eutrophication has become one of the most serious problems of the lake. It is one of the most eutrophic freshwater lakes in China.
Since the build-up of the Chaohu Water Gate in 1964 and the Yuxi Gate in 1969, Chaohu Lake has become an artificially controlled, semi-closed lake with considerable changes to the lake ecosystem. Eutrophication has progressed in past decades.

Algae bloom situation at Hefei Yicheng on June 5th, 2007

Algae bloom situation close to the water intake of one of the Chaohu treatment plants on May 13th, 2007

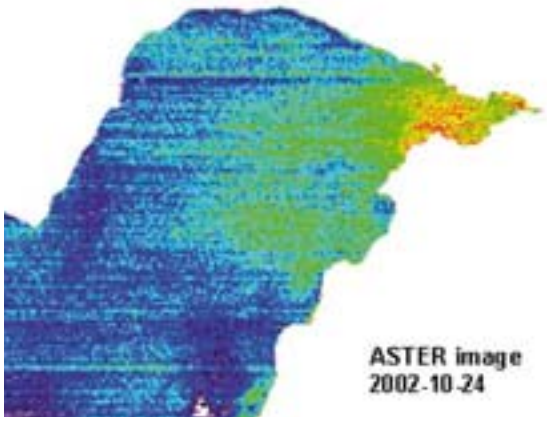
Lake pollution by anthropogenic sources has become increasingly serious due to the rapid growth of the economy, the large population in the basin and the artificial regulation of the water flow. Therefore, nutritive matters such as nitrogen and phosphorous have increasingly accumulated in Chaohu Lake.
Cyanobacterial blooms first appeared at the beginning of the 1950_s, but they were still absent in the pelagic and southern zones of the lake in 1961, while in the 1980_s, they occurred from May to November each year throughout the lake.
There is no published data on the phytoplankton community in Lake Chaohu before the 1980_s. In the 1980_s, cyanobacteria was predominant (in terms of density or biomass) in summer (August) and autumn (November).
About 190 phytoplankton species have recently been recorded in Chaohu Lake; among them chlorophytes, cyanophytes and bacillariophytes are predominant.
In summer, a high abundance of cyanobacteria occurs, whose dominant species are *Anabaena spiroides*, *A. flosaquae*, *Microcystis aeruginosa*, *M. flosaquae*, and *M. wesenbergii*, among which *A. spiroides* ranks the first and *M. aeruginosa* second in terms of biomass.
In winter and spring *Aphanizpe non flos-aquae* grows predominantly.
Water quality in the lake has deteriorated and eutrophication is badly affecting industrial and agricultural development, tourism and other activities, but especially the safety of the drinking water supply for Hefei and Chaohu City.

The MITIC project

Progetti e Ambiente S.p.A. is currently implementing the MITIC (*Monitoring Improvement and Treatment Improvement of Chaohu Lake*) project together with Chinese partners, Anhui and Chaohu Environmental Protection Bureaus, focusing the action on Chaohu City that looks like the most disadvantaged area at the moment.
The project falls fully within the area of joint initiatives of the Sino-Italian Cooperation Program for Environmental Protection relating to Integrated Management of Water Resources in China.
It is a feasibility study mainly aimed at suggesting feasible solutions for the main specific problems related to safe and sustainable lake water exploitation for Chaohu City (with 160,000 inhabitants in the central urban area, but, considering the rapidly increasing population, there is the possibility of extending the action to neighboring areas):
a) the management of algae blooms: a deep knowledge of the algae phenomenon in terms of scientific characterization, surveys, collection and cleaning is missing locally at the moment;
b) the management of water quality and data monitoring: water quality is, of course, analyzed at different stages of the whole process (lake stations, treatment plants, points in the distribution network) but the institutions in charge are different and the

Map of Chaohu Lake basin with monitoring stations, treatment plants and gate in Chaohu city.

巢湖流域图：
包括监测站、处理厂和巢湖水闸。



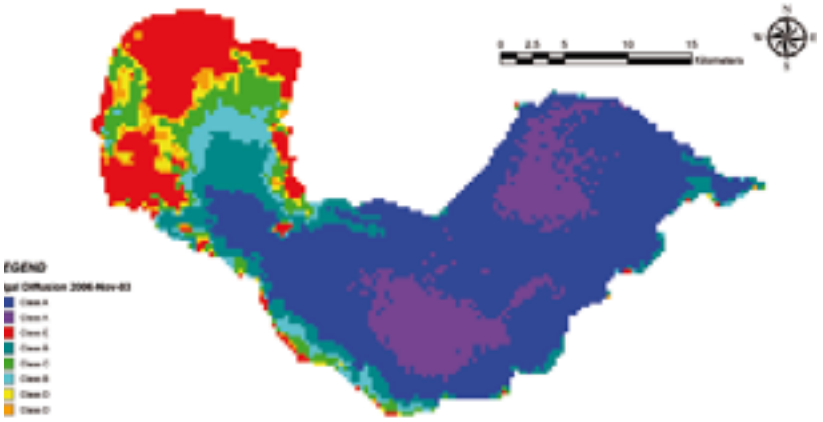
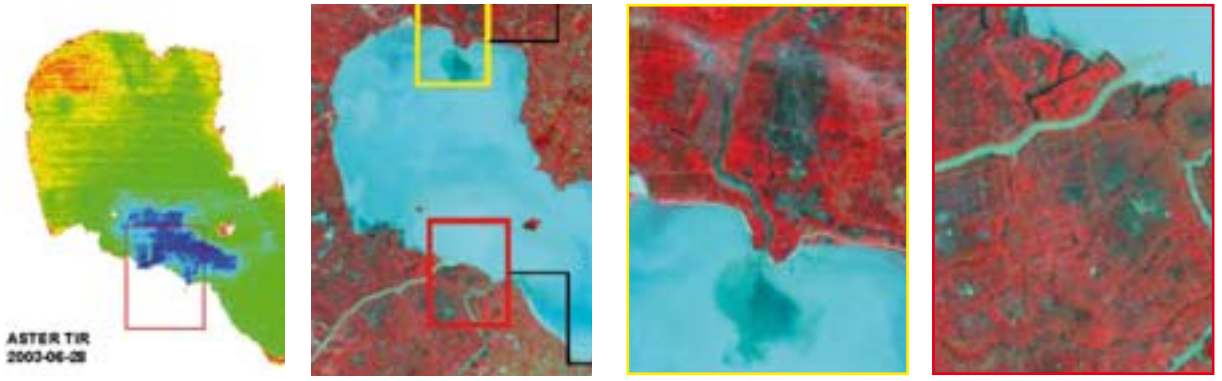


Figure depicts the thermal image of the Chaohu basin where water temperature increases close to the outlet. In contrast, by MODIS, ASTER TIR data was able to capture the LST patterns within the lake. On the left the thermal image (temperature increase from blue to red) derived from ASTER TIR data acquired in October 2002. The false-color image shows the land use close to the outlet in the Chaohu basin.

MERIS-derived algal products (2006-11-03): the colour represents the defined water type, Chla concentration increases from purple to red.
取出的藻类产品MERIS影像

coordination in terms of time, procedures and data quality needs to be better analyzed, as well as the synthesis, study and report of collected data;
c) the management of answers to water needs: a specific knowledge of water needs, in terms of season demand (l/per person/day) needs to be developed further in order to plan the best answer in terms of time and method;
d) the quality control of process management: some standard and emergency procedures do exist within any institution involved, however, at the moment a proper quality control management of performances in different situations has to be designed and developed.
Started in January 2009, the project is going to achieve its expected results in July 2009:
_ upgrading of the existing monitoring system at lake and water treatment plant levels by designing an automatic smart SCADA (*Supervisory Control And Data Acquisition*) system to acquire and continuously process data which can guide optimisation of the treatment process in real time and support prompt and effective management of emergency situations;
_ upgrading of the water collection and treatment technologies, in close relation to the SCADA system set up, including management of water intakes;
_ improving the emergency management plan, integrated with the data acquisition network, the data processing center and the operating centers of the treatment plants through the SCADA system;
_ reducing lake trophic conditions by pinpointing critical loads and pursuing the overall improvement of lake health in an integrated watershed view.
The project methodology strongly relies on valuing



In Hefei basin, the colder waters from the southern river inlet are evident, while two rivers entering the lake's northern and western parts do not produce any anomaly. On the left, the thermal image (temperature increase from blue to red) is derived from ASTER TIR data acquired in June 2003. The false-color images show the land use close to the rivers entering into the Hefei basin.

the big efforts that Chaohu Municipality and EPB have put in in recent years into enhancing the quality and frequency of the monitoring process at the lake, intakes and treatment plants and the coordination among different stakeholders, especially in facing algae bloom emergencies.

A significant part of the project sees an updated and cross-checked application of remote sensing techniques to Chaohu Lake, assessing water quality parameters (especially chlorophyll-a concentration) from MERIS and MODIS images.
Remote sensing techniques may provide useful information to study large water systems, such as the Chaohu Lake, whose extension may hamper in situ measurements with necessary temporal and spatial resolution (nevertheless, optical remote sensing becomes useless in the presence of cloud coverage).
A first classification of water types was made according to their optical properties and subsequently to the chlorophyll-a concentration and hence to the trophic status (the derived Chla concentrations were grouped into five classes, according to the increasing level of trophic status and therefore poorer water quality conditions). Initial results are encouraging: they show the worst water quality conditions were always observed in the Hefei west part of the lake, while good water status was observed with higher frequency in the central lake and the Chaohu east part. Initial results seem to also indicate a seasonality of algae blooms, since the worst cases occurred in summer-late summer, while a significant decrease was observed in the first part of the year.
A subset of five MERIS-derived products in the season May-June was also analyzed with respect to the spatial distribution of water types: graphs confim that from the western to the eastern part the water quality status improves.
Finally, an investigation of water types in the areas closer to the water intakes in the western basin was performed. At these stations the water conditions were always of a better status; in the area closer to the Chaohu city water intakes, the status of worst water quality was not applicable.
However, it is now evident that Chaohu Lake is affected by algae all year round and not only during the considered bloom periods. Therefore an adapted and complex overall monitoring system is needed.
An option under investigation is to complement the existing lake monitoring system with the installation of probes (3-4 sensors at different water levels on small platforms) able to measure chlorophyll-a and algae toxins, together with buoys for meteorological measures.
Looking at the existing treatment plants that serve industrial and private uses in Chaohu city, the in-depth analysis of existing processes and their monitoring during normal and emergency situation is ongoing.
There are two treatment plants serving the Chaohu district and they are managed by Water Group Ltd. A total of about 160,000 people are served by the two treatment plants that both cater to domestic and industrial uses. Treatment plant 1 was built in 1971, while the second was built in 1993. They present similar processes and functional schemes but have different capacities and applied technologies.
Initial results show no proper measure is currently employed to reduce the risk of algae and algae toxins within the plants. Improvement of water intake technologies as well as that of filter functioning is

needed. It is likely that a different position on the kind of intakes used will be proposed, on the basis of the results of remote sensing study and overall monitoring data analysis.
Different feasible options for technical improvements to the existing water treatment plants will be suggested and compared in terms of cost/benefit and sustainability, aiming to have them properly respond to specific algae and toxins present in the lake throughout the year, and to the increasing demand of the population.

Conclusions

Project outputs by this stage were an in-depth analysis of available data and information and a GIS on Arcgis 9.2 that will be, step-by–step, updated and finally delivered to local environmental protection bureaus. The idea to possibly develop a spatial data infrastructure for Chaohu Lake is under examination, given the considerable advantages this sharable output could give to local public institutions and the private sector.
It is evident that the priority in facing algae bloom emergencies and combating eutrophication in Chaohu Lake is enhancing monitoring, research and integrated watershed management. The lake's environment can be basically preserved with comprehensive environmental programs and the development of plans for the whole watershed. This will require the continual improvement in coordination among different local and government public institutions and private stakeholders and, therefore, will make proper and updated data and information management infrastructures accessible.
The ongoing MITIC project operates from two synergic views: giving feasible and easily applicable solutions to water supply managers and lake and treatment plant monitoring technicians in Chaohu city, in the short term; and giving sustainable and comprehensive suggestions to public institutions to improve the sustainable management of the watershed and eventually the lake health (with particular attention to the management of the Chaohu water gate), in the medium and long terms.

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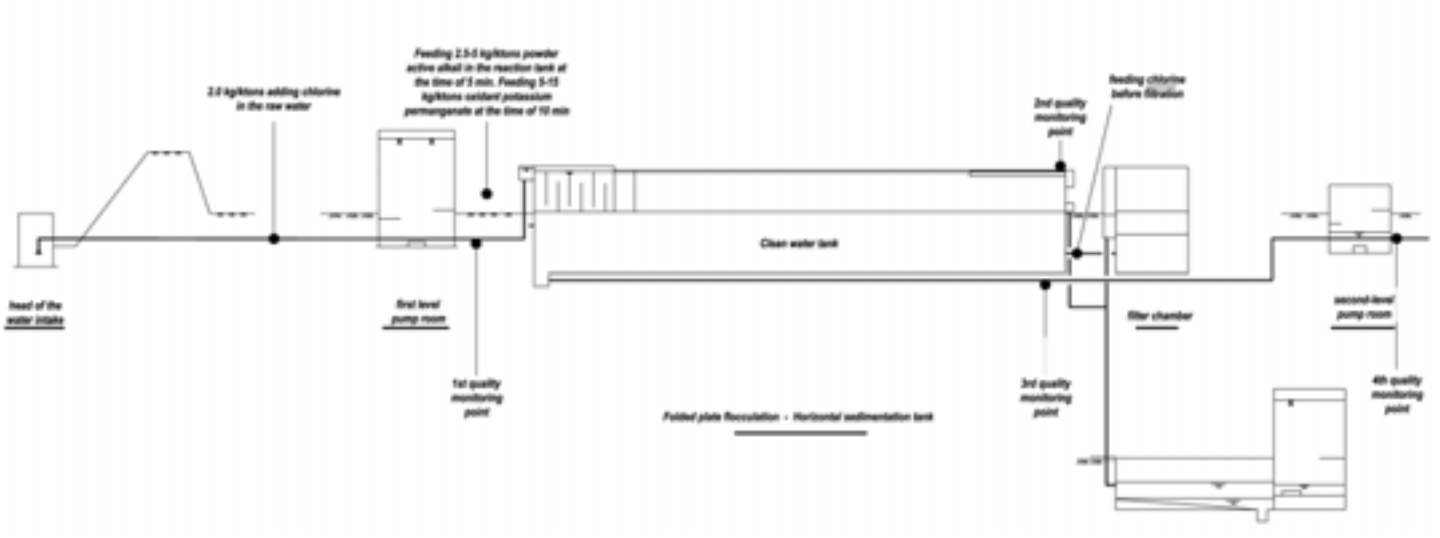

Scheme of existing processes during algae bloom in treatment plant 1 in Chaohu city

Flooding in Venice: emergency response and rehabilitation

Giovanni Cecconi, Consorzio Venezia Nuova

This paper presents the erosion and flooding problems of the Venice Lagoon, the adopted solutions for the protection against the erosion of the littoral, the lagoon tidal flat and salt marshes, and the flood protection of the city using local defences and the MOSE mobile barriers. The environmental restoration activities conducted in the last 20 years, together with the mobile barriers, will protect Venice from a maximum sea level of 50-60 cm over the next century.

1. The Lagoon Territory

The lagoon ecosystem is made of three territorial units: the lagoon itself, the drainage basin and the northern Adriatic Sea.
The Lagoon, with its 550 km² of surface area, is the largest wetland in the Mediterranean. It is divided from the sea by a strip of barrier islands, the littoral that runs for about 60 km from the mouth of the Adige River to the mouth of the Piave River, interrupted by the lagoon inlets of Lido, Malamocco and Chioggia. Inside the lagoon basin are Venice, Chioggia and more than 50 islands, among them Murano, Burano and Torcello; about 35 km² of salt marsh (low-lying areas which are covered with halophytic vegetation); and a 1,580 km network of canals that ensures the propagation of the tidal currents up to the boundary with the mainland. In the northern and south-central lagoon, the lagoon boundary is defined by fish farms (areas that take up a surface area of about 90 km², are separated from the living lagoon and are equipped for fish farming).
The average depth of the lagoon is 1.2 m.
The drainage basin is the part of the mainland that channels fluvial waters and rainwater into the lagoon. It has a surface area of 1,880 km² that is crossed by a hydraulic network of over 2,500 km that pours into the lagoon - in 27 different places - about 2.8 million m³ of water a day and only 30,000 m³ of sediment per year. Just over 60% of the area is used for agriculture.
The area of the drainage basin is subdivided among 98 communities that make up the provinces of Venice, Padova and Treviso, including a total of nearly 1.5 million inhabitants.
The northern Adriatic Sea governs the lagoon ecosystem with its tides that enter and exit the lagoon twice a day through the lagoon inlets, reaching two maximums and two minimums (semidiurnal tides).
It has been calculated that the volume of water exchanged daily between the sea and the lagoon is about 400 million m³.
The average astronomical tidal range in the lagoon is about 60 cm, and 110 cm at spring tide; nevertheless, the water level is subject to the storm surge set-up of 30-200 cm due to meteorological conditions: cyclones producing low atmospheric pressure in Venice and strong winds and seiching along the Adriatic Sea. When there is flooding of the historic centre the “acqua alta” is said to occur; the worst flooding in history occurred on the 4th of November 1966, reaching a level of 194 cm above the mean sea level of 1895.

2. The Problems

Over the last few centuries, a series of natural phenomena and factors due to human intervention have profoundly altered the lagoon environment.
Over the course of time, the sea level rise and subsidence have drastically modified the relationship between land and water, with a total loss of land elevation of more than 23 cm just in the last 100 years. Although just a few centimetres, this is actually quite a lot for a city that rests on the surface of the water, just 30 cm above the mean high tide level: for this reason Venice is a significant example of the impact and possible responses to rising sea levels.

The deviation of the rivers out of the lagoon, from the 14 - 19th centuries, carried out to avoid sedimentation of the navigation canals, almost completely eliminated the input of sediment. Additionally, the construction of the breakwaters at the lagoon inlets, which occurred between 1800 and 1900 with the aim of ensuring the passage of modern ships, reduced the input of sandy sediment by the sea. Over the course of the 20th century, the creation of the petrochemical centre of Porto Marghera and the excavation of deep navigation canals have caused the emission into the ecosystem of pollutants from industrial activity (to which agricultural and civil pollutants are added) and erosion of the tidal flat.
Rising sea levels, pollution and erosion due to waves and currents have caused a general crisis: the frequency and intensity of the floods have become progressively worse and the risk of a dramatic event, such as the one of November 4, 1966, in which Venice, Chioggia and the other historic centers were submerged by a meter of water, has increased from a return period of 200 years to 100 years at present, and could reach 40 years in the case of a mere 20 cm of sea level rise (Fig. 1).
The beaches of the littoral have drastically reduced in width or have even disappeared, leaving the coastal areas ever more exposed to the violence of sea storms.
The ecosystem has undergone a progressive impoverishment and deterioration with the reduction of the surface area of the salt marshes and tidal flats and the deterioration of water quality.

3. The Solutions

The Venice Water Authority - Ministry of Infrastructures and Transport, through the Consorzio Venezia Nuova, began activities aimed at the physical and environmental safeguarding of Venice and the lagoon 20 years ago with a "General Plan of Interventions" that ties the protection of Venice and the lagoon ecosystem from high tides together with environmental restoration.
The activities already completed and currently underway constitute the most important program of protection, restoration and management of the environment that the Italian state has ever constructed in Italy.

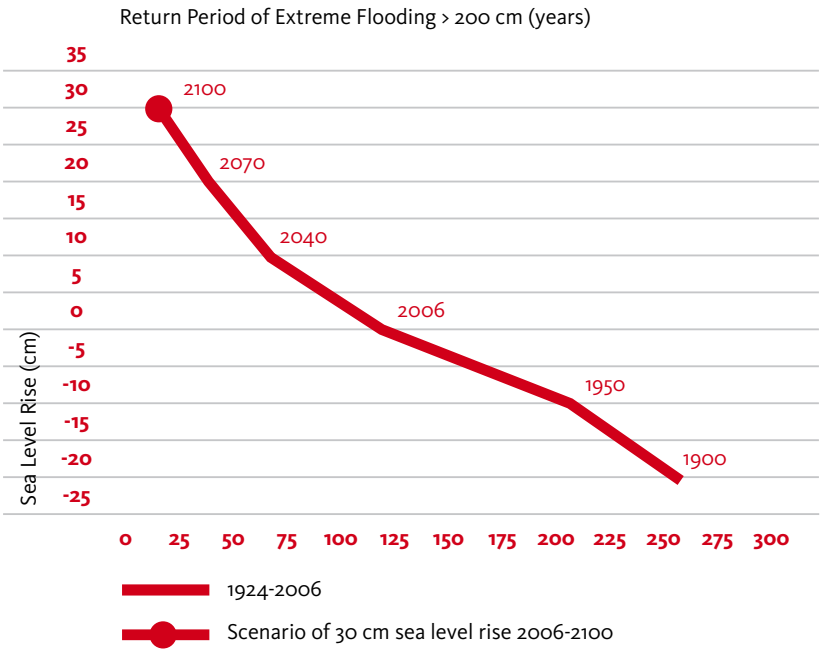

Fig. 1: Increase of the risk of extreme flooding >200 cm for a sea level rise of 30 cm in the next century.

3.1 Defence from Flooding

The MOSE system

For the complete defence of Venice and the inhabited areas of the lagoon from high tides of every level, including extreme events, the "MOSE system" was created. The system includes *mobile flood barriers* at the lagoon inlets in order to isolate the lagoon from the sea in the case of tides higher than 110 cm and the *local defences*, carried out by "raising up" the lagoon banks in the areas that lie the lowest in the water.
Since the works are limited by the urban, architectural and monumental context of the individual areas, raising areas in Venice can occur, on average, in limited amounts - up to 20 cm - reaching a level of 110 cm above the historical mean sea level of 1895.
The integration between the mobile barriers and the raising of the banks and pavements in the lowest-lying urban areas defines a system of defence that is extremely efficient and functional and that not only guarantees the total defence from high waters, but also guarantees port activity, water quality by means of tidal flushing, and the safeguarding of lagoon morphology.
The MOSE system has a technical life of one century and can be operated for a maximum sea level rise of 60 cm.

3.2 Coastal Protection

Protection of the littoral and inlet breakwaters

The program of interventions is almost complete, with the formation of beaches implementing the new techniques of *protected beach nourishment* and dune fields, recreating a self-protecting habitat with the plant species *Ammophila littoralis*. Also, the inlet breakwaters that define the lagoon entrances, constructed between the 1800_s and 1900_s, have been reinforced.

3.3 Environmental Protection

3.3.1 Protection and restoration of the lagoon habitats of tidal flats and salt marshes

The objective of the interventions is the safeguarding of the habitats of the salt marshes, tidal flats and shallows, and the restoration of the self-protecting ecological and hydrodynamic functions that these fulfil, cooperating with nature for the sustainable use of the lagoon environment. A well-defined series of interventions for recovery, protection and maintenance have been put in place, re-using about 15 million m^3 of sediment from maintenance dredging in 95 constructed inter-tidal habitats.

3.3.2 The Securing of Polluted Sites, Improvement of the Water and Sediment Quality

The interventions are aimed at blocking the dispersion of contaminants from the dumps used in the past (at times for the drainage of slag from industrial production) and at cleaning the canals of the industrial Port of Marghera of the residue from manufacturing that has accumulated over time.
The activities also include interventions to reduce the pollutant load transported into the lagoon from the drainage basin, recreating the transitional wetlands between the mainland and the lagoon that are capable of filtering and absorbing the pollutants, and subtracting them from the body of water (phytobiopurification). The project, aimed at cutting-off the lagoon from oil-tanker traffic, is in the course of development with an oil terminal at sea.

4. The MOSE system

4.1 Safeguarding Venice and its Lagoon

The Italian Republic has defined the problem of safeguarding Venice and its lagoon as one of "primary national importance" (Law 171 - 1973).
Contributing to safeguarding the lagoon are: the Italian state, responsible for defending Venice, Chioggia and other urban areas from flooding (high waters), protecting coastal areas from sea storms and restoring the environmental balance of the ecosystem; the Veneto Region, responsible for pollution abatement; and the local authorities of Venice and Chioggia, responsible for the socio-economic development, maintenance and restoration of the architectural and built fabric.
The system of safeguarding measures is directed, coordinated and controlled by a committee (set up by Law 798 - 1984) chaired by the President of the Council of Ministers and consists of representatives of local and national authorities and institutions.
The project for the "MOSE system" to protect Venice and the lagoon from high waters, drawn up by the Ministry of Infrastructure and Transport - Venice Water Authority through the Consorzio Venezia Nuova, is described here. Implementation of the project has reached 50% and completion is expected by the year 2014.

4.2 Why

Since the beginning of the 1900_s, high waters have become more frequent and intense. The lagoon area floods ever more frequently because of the relative sea level rise of 23 cm: a rise in the sea level of 11 cm and a subsidence of 12 cm. As a result, urban centres in the lagoon are today 23 cm lower in relation to the sea level than they were at the beginning of the 20^{th} century.
The problems caused by flooding for the inhabitants, architecture and buildings are becoming more serious and reach an ever greater area as water levels increase.
There is also the high risk of a catastrophic event such as the flood of November 4, 1966 when Venice, Chioggia and other urban centres in the lagoon were completely submerged by a meter of water. In the future, the problem of high waters could worsen due to the predicted rise in the sea level produced by the greenhouse effect (Fig.1).

4.3 Where

The MOSE system is under construction at the three lagoon inlets: Lido, Malamocco and Chioggia, 800 m, 400 m and 380 m wide respectively. The inlets are delineated by long breakwaters built between 1800 and 1900. These have been reinforced and thus serve as supports to the high water defence system.

4.4 How

The MOSE system consists of mobile barriers to isolate the lagoon from the Adriatic during tides exceeding the established level of 110 cm.
Integration between the mobile barriers and the raising of quaysides and paving in the lowest lying urban areas reduces the number of times the inlets need to be closed to a minimum: three times per year with the current sea level for a duration of 5 hours. The MOSE system is thus able to guarantee water quality, safeguard the morphology and landscape and maintain port activity while protecting the city from flooding.
The *mobile barriers* are the heart of the system and consist of rows of gates installed in the inlet channels. When not in operation, the gates are full of water and rest in caissons on the bed. When a tide higher than 110 cm is forecast, compressed air is introduced into the gates, expelling the water. As the water is expelled from the gates, they rotate around the axis of the hinges until they emerge and block the tidal flow entering the lagoon. The mobile barriers remain in position for the duration of the high water only. (Fig.2)

5. Concluding Remarks

The main result of the MOSE system will be to safeguard Venice's world heritage value: apart from a reduction in the damage to the economy, the main benefit is the conservation of the physical and cultural structure of the city so that it will age safely, preserving its fragile nature together with its open physical and social boundaries.
In a time of world economic downturn this construction, financed by the state, plays a leading role in the regional economic recovery, with more than 3,000 workers involved.
Considering that the closure of the gates will be limited and the port activities are independently operated by navigation locks, the city will be protected against flooding without any ecological or economical impact.
The MOSE solution can be transferred to many other coastal areas where rigid local protection or retreat is not a sustainable solution from an economical and environmental point of view, due to the loss of integration with natural processes and the use of the renewable resources of the sun, the tide and hydro-morphological processes.

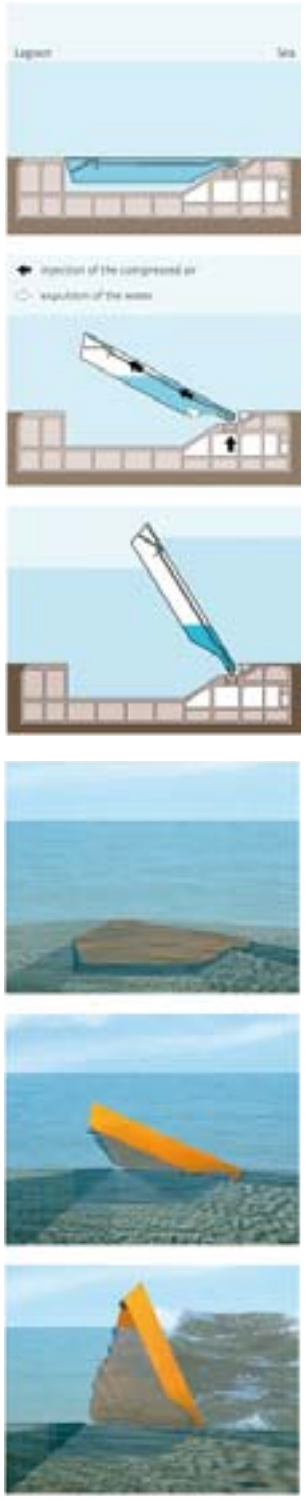

Fig. 2: The operation of the Mose buoyant flap gates.

VIU training program echo from participants

This section is written by the Chinese participants in the trainings in Italy.
We hope hereby to provide the Newsletter readers with an authentic flavour of the training experience.

Tianjin Science and Technology Committee
Sustainable Development in Urban and Industrial Areas
Italy, 7-20 December 2008
22 participants

With its most advanced experience on environmental administration, especially on Venice's sustainable development, Italy offered training courses to our supervisors on environmental and municipal services to assist China with its sustainable development of both the environment and the economy.
Each course was carried out with a specific subject, including clean development mechanism, water and air pollution, waste and water management, energy efficiency technologies and renewable resources, urban sustainable development and eco-buildings, rural development and the protection of natural resources, as well as environmental education. With these subjects, the content of the courses covered energy, environmental management, sustainable development, water resources management, waste, air quality, green industry, capacity building of clean development mechanism, urban sustainable development and eco-building, environmental education, etc.
Tianjin development zone in which I am now working has been paying close attention to ecological industry and district development. The Sino-Japan Seminar on Circular Economy and Zero Draining was held in 2001 and brought in the concept of a circular economy. We became a part of the pilot project of China's environmental management of an industrial park in 2002, and set up the developing direction of the ecological industrial park. We finished planning the ecological industrial park in 2003, and were authorized by the State Environmental Protection Administration to construct a model ecological industrial park in 2004. After four years' construction, the project obtained the approval of the assessment team, composed of the State Environmental Protection Administration, the Ministry of Commerce and the Ministry of Science and Technology in March 2008, and became one of the earliest approved model ecological industrial parks in China.
Tianjin Development Zone has been attaching great importance to environmental protection, and has combined the concept of ecology and humanity in the construction of the park.
By 2010, Tianjin Development Zone will further improve the operating mechanism and framework of the ecological industrial park. We will develop the leading industries, including electronic information, biological medicine, automobile manufacturing and food and beverage industries to optimal levels, and try to improve the ecological efficiency to an advanced international standard. By drawing on Italy's environmental management and sustainable development experience, we will construct the development zone into a production base of hi-tech products with the characteristics of industry co-existence,

circular resources, as well as high and new technology within 10 to 15 years.
The development area will also serve as an ecological and producing base for the manufacturing center to be constructed in northern China, technology incubator and international modern harbor.

Han Yugang, Tianjin Science and Technology Development Agency of Development Zone

During the training in Italy, we were given a total of 16 lectures by experts and professors from the National Research Council, air pollution institutes, Venice International University, Italian research institutes and environmental protection organizations and enterprises of model industrial areas. The content of these lectures referred to monitoring technologies of air and water pollution in coastal areas, management technologies of solid waste, the evolution of Venice, the problems of sustainable development in Italy and solutions, the Italian economy and industrial ecology, model sustainable development cases from Italian enterprises and industrial areas, as well as land recycling. Site visits to VEGA Science Park, Veritas water and organic waste management factory, ASJA.BIZ Company and IVECO Company really impressed me a lot. Combining this with my own profession, I would like to share what I've learned:
1. The key to a sustainable development strategy in Italy is the saving of resources and energy and a change in consumption patterns. Whether in government, business, research institutes or the lives of common people, you can feel that the concept of sustainable development is deeply rooted in people's minds. China's environmental problems have originated from people's incorrect development concepts, which identify economic growth with development. We reckon that as long as the economy grows, we can get enough materials to deal with all the political, social and environmental problems at present or in the future. However, the reality is that we have paid too high a price for our economic growth. Therefore, the only way for China to go is to adopt a sustainable development strategy;
2. The basis for legislating environmental protection laws and regulations is scientific environmental protection monitoring technologies and assessment methods. Developed countries are early starters in this field, as they possess more mature technologies, whereas China is relatively weak in this field and we have not attached enough importance to environmental protection. We can, therefore, draw lessons from developed countries to avoid unnecessary environmental pollution and create a better environment for self-development. In doing so, we can also contribute to worldwide environmental protection;
3. The garbage classification and waste recycling in Italy is worth studying. Italy also has integrated and differential management systems for the classification, collection and disposal of domestic and commercial waste. China consumes enormous quantities of raw materials and it must recycle the waste to protect the environment and to save raw materials. However, it is reported that the waste being classified in China is less than 20% and the recycling is inefficient; to make it worse, our investment cost on facilities is very high. All of the above call for financial support, policies and laws from the government;
4. What impressed me most is the leading role of the government in the course of environmental protection, managing public resources and maintaining public interests. Enterprises and people have to balance environmental protection with financial benefits. The government should make public management departments more responsible and lead and control them by means of laws, policies and finances. Consequently, the government, as an advocate and participant in environmental protection, will enable enterprises and people to benefit from it.

The training combines theories with practices and explains histories, present situations and advanced experiences in sustainable development in Italian cities and industrial areas. The site visits to scientific parks and enterprises has deepened my understanding of the training material. What's more, it has broadened my horizon, increased my knowledge and made me understand the differences between eastern and western cultures.
I am very grateful to the leaders and experts for their efforts to promote the communication between China and Italy.

Li Lirong, Tianjin Environment Monitoring Center

Taking ecological construction, environment protection and city construction management as the theme, the training course in Italy is very impressive. It was arranged that I pay a visit to Rome and Venice to experience Italy's well-developed economy, long history, cities with special features and harmonious society, through which I have broadened my outlook, emancipated my thoughts and enlarged my scope of knowledge. After the course, I have systematically grasped the idea of sustainable development and meanwhile understood that the idea of sustainable development must work its way from theory to practice. China is now facing a severe condition. The large population hinders the development of the country, the shortage of resources makes people feel worried and the environmental crisis becomes more and more serious; therefore, it is imperative for China to adopt the idea of sustainable development.
The visit to several Italian cities helped to enhance my understanding of what I have learned in the course.
1. Great importance must be attached to environmental protection. Italy has formulated an integrated legal system with effective enforcement and monitoring means through which waste management and environmental protection have achieved great results;
2. It's essential to prevent the man-made sabotage of the ecological balance. In Italy people have excellent living conditions thanks to the government's efforts to protect the ecological balance;
3. Water is a basic need in people's lives. It goes without saying that water plays a prominent role in the overall economic development and in improving people's health. In this case, the city's water-supply system must be highly regarded and the best water source should be reserved for human beings.

Xu Yuhan, Tianjin Municipal Water Holdings Limited

During the training in Rome, Venice and Turin, I had the strong feeling that the training course possessed features such as clear-cut themes, abundant contents and excellent teaching methods, combining talks with on-the-spot visits. Apart from its own professors, VIU also invited senior people with substantial experience of urban sustainable development as well as specialists, professional and management personnel from local environment protection authorities and enterprises to speak on the subjects of energy saving and regenerative resources, atmosphere and seawater monitoring, ecological architecture and urban sustainable development, comprehensive management of the waste and separation of electronic waste, energy saving architecture, intelligent traffic, water pollution, as well as reclamation and reutilization of soil. Together with the above, we also visited the Thetis Company, a power plant and the Regional Agency for the

Environmental Prevention and Protection (ARPAV).
While in Italy, I noticed Italy's advanced theories and technologies with regard to sustainable development, and also its lessons in this field. These lessons will provide the guidance for me to fulfill my duty of protecting Tianjin's environment.
The harmony in Italy between humans and nature, and humans and society was very impressive to me. This kind of harmony was reflected in both urban planning and construction and various service facilities. Therefore, we need to adhere to the idea of being people-oriented and taking people's wishes and needs into account when formulating a city's constructive planning. We should also integrate improving people's living conditions with city planning and make people really benefit from the reform and development.
Visiting the waste management plant and ARPAV in Italy has offered me an intimate understanding of the fact that the city's development ought to follow the principle of a circular economy. Tianjin is a metropolis with advanced industry, a large population and a serious shortage of natural resources. In this case, it is imperative for this city to actively pursue clean production; develop ecological agriculture; eliminate and improve manufacturing processes, equipment and enterprises which are using out-dated technology, seriously wasting natural resources and contaminating the environment; strictly enforce the regulations of controlling waste emissions; meanwhile, making every effort to cut down on per unit resource consumption and waste emission by legal and economic means.

Zhao Shujun, Tianjin Economy Committee, CPPCC

Chinese Academy of Social Sciences
Sustainable Development
Beijing, 23-27 March 2009

The 2009 Sino-Italian E-learning Training on Sustainable Development was closed on March 27. However, as far as I am concerned, it marks a new beginning. Each special lecture of this training session focused on modern environmental hot spots; both Chinese and Italian experts introduced theories and analyzed cases centering on sustainable development. Thanks to the training, it is clear that scientific research should be established based on actual needs, rather than castles in the air.
The Xiangjiang River in Hunan Province has been severely polluted. Hunan Province adopts a method of integrating comprehensive treatment and stage-by-stage pollution control. This distance learning session emphasized "the polluters pay policy". By analyzing the case of the Rhine River basin pollution control, the experts stressed that ecosystem restoration and biodiversity conservation should be focused on during river basin treatment. In my opinion, we should learn from the experience of the Rhine River basin pollution control, expand "Xiangjiang River pollution control" to "Xiangjiang River basin pollution control", and regard it as a long-term systematic project, rather than "ineffective short-term conduct".
This year's remote training was well–organized. The network test and tutor training before lectures, as well as the teaching process, were all orderly. The only fly in the ointment was that as distance learning is subject to network bandwidth, the video display was not synchronized with the sound, and there was interruption of network communications, which impacted on the learning to some extent. I hope the training technology supplier improves the network communication technology to ensure the smooth communication between the teaching and learning.
I am engaged in chemical engineering research. In terms of curriculum design, based on the fact that environmental science is closely linked with a wide range of environmental engineering technologies, I suggest that some Italian experts, dealing with environmental engineering research will be invited to introduce some advanced technologies from Italy or the EU in environmental improvement to the trainees. Meanwhile, in order to improve the relevance, usefulness and effectiveness of the distance learning, I advise the organizer to select some hot spots of concern to the trainees before the next training, and invite Italian and Chinese experts in relevant fields to give lectures accordingly and help trainees solve practical problems. In addition, it is suggested that the organizer arranges for trainees to visit and investigate the locations of the Sino-Italian Cooperation Program for Environmental Protection with the purpose of consolidating what we have learned.
Some meaningful activities, such as soliciting articles on environmental protection investigation, holding photographic exhibitions on the theme of sustainable development, and compiling selected cases about both international and domestic sustainable development, could be organized after the training. These activities can be regarded as platforms which will facilitate the cooperation between training places and Venice International University and cement the training results.

Yu Liping, Associate Professor, College of Chemistry and Chemical Engineering, Hunan Normal University

Shanghai Environmental Protection Bureau
Environmental Impact Assessment
Shanghai, 27 March 2009

To implement the strategy of sustainable development, in accordance with the Chinese Environmental Impact Assessment Law, the national government has announced that it will push forward the Strategic Environmental Impact Assessment (SEA) in China. The government of Shanghai has actively engaged in the initiation of SEA in Shanghai and has listed it into the fourth round of the three-year Environmental Action Plan for 2009-2011. However, SEA is a new topic for the local practitioners and their experience and knowledge on this topic are quite limited. In response to this, the Shanghai Environmental Protection Bureau has requested this topic to be included in the Sino-Italian training program for 2009.
With support from the Italian Ministry of Environment, Land and Sea and Venice International University, the Sino-Italian Training Program on Advanced Environmental Impact Assessment was held on March 27, 2009 in Shanghai. More than 100 participants from the Shanghai Environmental Protection Bureau, the Shanghai Academy of Environmental Sciences, as well as those from other research institutes and universities in Shanghai attended this training.
We feel the training program was arranged just close to the needs of promoting Strategy Impact Assessment in Shanghai. The lecturers invited had rich experience, so we thought the Advanced Training Program on Environmental Impact Assessment was a success. Through this program we have a better understanding of the current situation of EIA and SEA in Europe as well as the practices on remediation and reuse of urban soil in Italy. We also learned some new thoughts and techniques.
1. In the EIA/SEA lecture, Professor Chiellino introduced a DIVAS standard method, DPSIR mode, index and alternatives for SEA, which made the process of SEA much clearer and understandable and very useful for us to undertake SEA in Shanghai. Through the introduction of BREF (Best REFerence document for available technique), she taught us the function of BREF and how to use it in EIA, especially in the evaluation of cleaner production;
2. Through the lecture given by Professor Turvani, we learnt of the importance of evaluation of urban soil pollution as well as the practices of soil remediation and reuse. Through the introduction of the cost/benefit analysis, we learnt that it is an important basis for decision makers, but this is not well implemented in China. We had a clearer understanding of the field of urban soil remediation and reuse after the introduction of the project of San Greenock Park. During the training program, quite a number of questions were raised and the answers were satisfactory. We all found that this training program had just the right approach. Though the time was limited and deep discussion was impossible, we hope that close cooperation can be extended either through more training programs or scholar exchanges. The following areas were proposed in the next phase:
1. Strategic Environmental Impact Assessment case study: more details on the practices of SEA, for instance, how the DPSIR model operates, how to select the index and how to make the alternatives etc;
2. The techniques and cases of risk analysis: especially the evaluation of the impact on human health, the prediction method of soil risk (chemical leakage), and the method of cost/benefit analysis.

Bao Xianhua, Director of Environmental Impact Assessment Institute,
Shanghai Academy of Environmental Sciences

Capacity Building on Climate Change, NDRC
Italy, March 8-21, 2009
20 participants

The advanced training course held in Italy in March was the first organized in cooperation with the National Development and Reform Commission (NDRC), the new partner of the Advanced Training Program on Sustainable Development and Environmental Management.
As China tries to pursue a development able to take care of the environment, climate change represents one of the key topics that need to be addressed by the government. In this regard, national development strategies are required to take into account the issues deriving from this global problem. Administrations at all levels are therefore establishing relevant departments or divisions specifically dealing with climate change, or adding the task of addressing climate change into already existing divisions.
This is the case with the NDRC which has recently decided to raise its division on climate change to the status of department and is mainly responsible for comprehensively analyzing the impact of climate change on the socio-economic development of China. Consequently, capacity building on climate change became strategic in the restructuring of the NDRC itself, particularly for the newly-developed department.
It is from this perspective that the NDRC joined the VIU Advanced Training Program and decided to devote the two courses planned for 2009 to Capacity Building on Climate Change, and to address them to directors general of the NDRC departments of climate change at provincial levels. Since the delegates are mainly decision-makers, the management of climate change and the tools for policy-makers, from the point of view of legislation and technology, were central to the training agenda. Lectures and site visits scheduled in Rome, Siena, Venice and Turin were designed to provide the delegation with a wide overview of the scientific basis of climate change, including its current status, policy analyses and relevant experiences on mitigation and adaptation in Italy and Europe. One important example is that of Venice, a city that is facing serious risks because of the rising sea level partly due to climate change. It is trying to develop technologically-advanced solutions and the right policies to tackle this problem and, at the same time, preserve the particular and very fragile ecosystem of its lagoon. Other adaptation case studies included water resources protection in Spain and sustainable agricultural practices in Australia.
Following the priorities identified in China's National Climate Change Program with regard to mitigation, energy efficiency and the use of renewable energy were thoroughly discussed using examples of promoting policies adopted by the European Union and the case studies of Padua Municipality's energy plan and Turin Province's district heating systems.

Given its important role in the climate change debate, the Kyoto Protocol was also introduced, particularly the Clean Development Mechanism, as it represents a tool which developing countries can commit to in reducing greenhouse gas emissions without having any binding objectives.

E-Learning Program for Sustainable Development, CASS
March 23 – 27, 2009, Beijing, Changsha, Hohhot, Lingzhi, Sanya, Taiyuan, Urumqi, Xining

If it is true that environmental sustainability is a global challenge for the economic system, then China plays a key role in determining the winning odds. Can China's fast economic growth comply with the principles of sustainable development?
The lectures held within the framework of the E-Learning Program for Sustainable Development, sponsored by the Italian Ministry for the Environment, Land and Sea and the Graduate School of the Chinese Academy of Social Sciences, and organized by Venice International University (VIU), Monserrate and Beijing M&D Strategy Consultancy Ltd in cooperation with local partners, helped to outline the possible answers.
Each day of the training offered the participants (hosted in 8 classrooms in Beijing, Changsha, Hohhot, Lingzhi, Sanya, Taiyuan, Urumqi and Xining) insights on a different side of the issue. A general introduction on the first day on the role of economics within the framework of sustainable development and on the complex interaction between China's economic growth and environmental policies was followed by a focus on industrial ecology; on the second day the lectures illustrated the crucial role of sustainable agriculture and forestry in the fight against desertification and the preservation of one of the most valuable natural resources: the soil.
In the following days the lectures ranged from urban ecology (sustainable urban planning, urban waste management) to contaminated site remediation, to water pollution and sustainable energy, thus providing the attendants not only with a broad overview of the main issues on the environmental agenda, but also with some interesting case studies based on the projects carried out within the Sino-Italian Cooperation Program.

Sustainable Development for "Eco-Cities": Overview and General Principles, TSTC
March 24-27, 2009 – Nankai University, Tianjin
and
Environmental Impact Assessment, SEPB
March 27, 2009, Shanghai Academy of Environmental Sciences, Shanghai

Urban Ecology tries to apply the principles of environmental sustainability to the most compromised (due to human activities) of all the ecosystems: modern cities.
Tianjin and Shanghai, as two of China's and the world's largest cities, relying on a thriving, fast-growing economy, must face serious threats to their environment and to the health of their inhabitants.
The participants to the seminar held in Nankai University, Tianjin, were given the opportunity to attend lectures on the different topics that comprise the broad framework of urban ecology, with a focus on the most urgent issues at local, national and global levels, including air pollution, reclamation of polluted soils, circular economy, industrial ecology and reduction of energy consumption and CO_2 emissions through energy efficient buildings.

Shanghai is experiencing a major urban transformation, towards the 2010 Expo and within the framework of the 11th five-year plan; in this context, the Environmental Impact Assessment seemed to be the most appropriate choice as the subject of the advanced training program held at the Shanghai Academy of Environmental Sciences. Together with the students of the academy, officers from the Shanghai Environmental Protection Bureau had the opportunity to learn how this tool is implemented in Italy in order to evaluate major infrastructure and building plans and choose the best possible option for the environment and human health.

Solid Waste Management, BMEPB
Italy, March 21-April 4, 2009
15 participants

The economic growth of China in the past decade has caused a huge increase in the production of solid waste, including electrical and electronic waste, construction and demolition waste and, obviously, municipal waste. This has greatly contributed to make China one of the biggest waste generators in the world and it is expected to produce at least 480 million tonnes of municipal solid waste by 2030.
From another point of view, waste can be a source of secondary material if adequately treated. China, by improving its recycling technology, could reduce the use of primary and non-renewable sources and preserve the advantages of its economic growth.
The Beijing Municipal Environmental Protection Bureau and Venice International University, conscious of the importance of managing solid waste effectively, decided to start the fifth year of their collaboration with a training course devoted to solid waste management.
The course was arranged in such a way as to tackle the core problems linked to the management of waste, namely waste production, collection, disposal and, hence, waste recycling and remediation.
The first part of the course involved experts from the Ministry for the Environment, Land and Sea explaining Italian national laws, regulations, strategies and technical guidelines to the trainees.
To make the training more effective, VIU chose to organize more site visits than lectures in order to allow participants to personally experience the management of different kinds of waste. In particular, VIU, keen to spread the idea that waste is an opportunity for growth, organized a visit to the Sogliano Ambiente landfill and Consorzio Riciclo Vedelago. Sogliano landfill is managed in such an effective way that 80% of the municipal revenue comes from the landfill proceeds. Consorzio Riciclo Vedelago produces a secondary material derived from plastic waste.
This secondary material is so sought after that its demand is higher than its production. VIU, aware that China is experiencing a strong industrial expansion, decided to let participants experience the industrial waste management in Italy, both hazardous waste at the HERA plant, and the waste water at Depuraque S.p.A. In the same context, the training course provided examples of land remediation in industrial areas in order to illustrate the idea of recovery and reuse of degraded sites.

Environmental Monitoring Management, MEP
Italy, April 18-May 2, 2009
24 participants

China is moving decisively towards the optimization of its environmental monitoring network in order to provide an effective tool to set up sound environmental protection policies.
To reach this goal, the efficient collection of environmental data is fundamental as it provides a reliable overview of the current environmental status in a given place and monitors the evolution of the system following the application of new rules.
For this reason the Chinese Ministry of Environmental Protection asked VIU to organize, for the year 2009, three training courses on environmental monitoring management.
The agenda of the first course was designed to explore environmental parameters like water, air and soil, and to couple the discussion on theoretical issues with a presentation of the practical experience of the Italian institutions involved in the monitoring activities.
The legislative framework was the natural starting point, providing an explanation of the implementation process of European directives into national law.
Another key issue was to explain to the participants the respective role of the several Italian institutions in applying regulations and carrying out monitoring activities. The competencies and fields of action of some of the most relevant Italian institutions like the High Institute for Environmental Protection and Research (ISPRA), the National Research Council (CNR) and the Regional Protection Agencies (ARPA) were presented through lectures and visits.
The importance of sharing information among the institutions potentially interested in environmental data was also stressed as a way of saving resources and accelerating interventions in case of need. A new project carried out by the Italian CNR and aimed at building an interoperative and interdepartmental network to facilitate environmental data sharing was presented as an example of how the existing databases containing environmental quality data can be adapted to international standards and also made more accessible to public administrations.

North China Plain Groundwater Management Plan Launched

The Italian Ministry for the Environment, Land and Sea (IMELS) and the Chinese Ministry of Water Resources (MWR) officially launched the North China Plain Groundwater Management Plan (NCPGMP) project during the project's kick-off meeting last March.
The NCPGMP is a five-year project which aims at producing a groundwater rehabilitation plan for the North China Plain (NCP), an area that includes Beijing, Tianjin, Hebei Province plain, and the plain in Shandong and Henan Provinces on the north side of the Yellow River.
The decline of groundwater tables in the NCP is one of China's more serious economic and environmental problems. In many parts of the NCP, groundwater levels are falling by one meter or more every year. In some areas, water supplies are so dependent on groundwater resources that limiting extraction will lead to dramatic water shortages.
First year project activities are focused mainly on three underground water recovery approaches. The first one aims to conduct a field pilot project to verify the effectiveness of implementing Managed Aquifer Recharge (MAR) technologies in representative areas already affected by severe underground water shortage around Shijiazhuang. Injection water wells will be utilized to pump water into the aquifer and a monitoring network will verify the impact on the underground table. This will provide

the knowledge to replicate MAR on a larger scale in other appropriate sites in the NCP. The second is a legislative approach and aims to mitigate the underground water exploitation in Handan. At a local, municipal and province level, data of underground water exploitation will be screened to understand the final quantity and uses of the extracted water in order to improve the cost effectiveness of extraction and the rational use of the underground water resources. The third and last approach concerns a comparison between European legislation on underground water preservation and Chinese legislation. This approach aims to provide suggestions at a ministerial level for policy review and update. All project activities will be supported by a Geographic Information System (GIS) and hydraulic and hydrologic mathematical models.

China-Italy Cooperation on Clean Coal Technologies

The Italian Ministry for the Environment, Land and Sea (IMELS), the Chinese Ministry of Science and Technology (MOST) and ENEL, the main Italian power company, in May 2008, signed a memorandum of understanding aimed at promoting the sharing of experiences and the transfer and development of technologies able to make energy from coal more sustainable. In this framework, a Chinese delegation led by MOST and including senior experts from businesses and academia visited Italy from 19th to 24th April 2009 to learn about the most successful Italian experiences.
The Chinese experts visited ENEL Torrevaldaliga Power Plant, Livorno, Sesta and Gioia del Colle pilot and experimental sites and Pisa Research Centre, where advanced technology for high-efficiency

coal burning, the capture of CO_2 and its sequestration are implemented or tested. Building on these experiences, Italy and China will define and carry out a joint work program on clean coal technologies.
Since in future decades fossil fuels will continue to represent the world's main energy resources, the development of technologies for reducing the GHGs emissions from fossil fuels, in view of possible zero emissions power plants where all the GHGs are captured and stored in underground or submarine reservoirs, could play a very important role in climate change mitigation and could have a tremendous impact on countries like China, where 70% of national energy consumption currently comes from coal-burning facilities.

Pollution Control in Shichahai Lake Project Concluded

The Italian Ministry for the Environment, Land and Sea (IMELS) and the Beijing EPB officially closed the works of the Pollution Control in Shichahai Lake project, in the presence of officials from BMEPB, Xicheng EPB, representatives from the SICP PMO and technical experts from Italy and China. The project has been highly commended by experts and officials for the results achieved.
The Shichahai area, renowned for its beautiful landscape, culture and long history, is one of the most visited areas of Beijing. Unfortunately in recent years, due to the increasing pollution of the Shichahai lakes, green and blue algae has grown and affected the lake's eco-system. After the project's first phase, which provided an insight into the pollution problems and identified the most appropriate measures to restore water quality, a pilot project was implemented, consisting of the setting up of a water treatment plant in the Houhai Lake, which is now active and working.
The tools developed throughout the project, including a mathematical model, a database and monitoring network, together with the training courses provided to the relevant local experts, ensure the correct and autonomous running of the treatment facilities, and clean and safe lake water for years to follow.

Italy at CIEPEC 2009

The Sino-Italian Cooperation Program for Environmental Protection presented the most advanced Italian technologies for environmental protection at the Italian Pavilion at CIEPEC 2009. Most of these technologies have been successfully implemented in China through the SICP projects and are tailored to the Chinese market.
The biennial China International Environmental Protection Exhibition and Conference (CIEPEC) is the largest, most influential event of its kind in China and has developed into one of the most prestigious and comprehensive environmental expos in the Asian-Pacific area. Its 270,000 sq ft of exhibit space is dedicated to the best sustainable technologies, products and services to ensure environmental safeguard.
Sponsored by the Chinese Ministry of Environmental Protection (MEP) and organized by the Chinese Association of Environmental Protection Industry (CAEPI), CIEPEC has reached its 10th edition.
The Italian Ministry for Environment, Land and Sea and the Italian Trade Commission have sponsored the participation of over 40 Italian companies, in a pavilion larger than 1,000 sq m, displaying the most advanced Italian technology for water and air treatment, waste management, energy saving and much more.

Italian Support of Reconstruction in the Earthquake-hit Regions

On the first anniversary of the May 12 earthquake, the Italian Ministry for the Environment, Land and Sea and the Chinese Ministry of Science and Technology launched a new reconstruction project in the Gansu Province. Project activities, to be kicked off in June, will focus on reconstruction interventions on the municipal landfill in the Wudu district, which will be upgraded to reach the higher international environment and seismic-safe standards.
Italian experts will support Chinese officers and experts in planning an integrated waste management system for the new settlement areas, based on differentiated waste collection, recycling, and energy production from landfill biogas. Project activities also include training of local technicians and an awareness and education campaign on sustainable waste management for its citizens.

E2-China Web Portal launched

The E2-China Web Portal, developed within the framework of the Sino-Italian Cooperation Program for Environmental Protection, was officially launched last April. The website is aimed at disseminating know-how on Energy Efficiency (EE) within the Chinese industrial sector. The necessity for a powerful dissemination tool came from the experience developed within the Energy Planning Project (ENP) for sustainable development in China, in which a Sino-Italian team elaborated and validated an innovative approach to assess EE improvement potentials in the industrial sector. The valuable experience, together with the knowledge gained during these activities led to the idea of implementing a comprehensive and interactive tool available on the web.

The E2-China Web Portal intends to stand as an easily-accessible platform for the promotion of the sustainable use of energy, where theoretical and practical experiences will be exchanged among experts and technicians involved in the Chinese industrial sector. Moreover, it aims to become the reference web-site for technological and scientific discussion, both on the concept of EE and the potential for improvement, and on CDM methodologies and procedures.

Through the use of a bottom-up approach, the E2-China Web Portal is aimed at disseminating the achieved results and experiences to a wider range of subjects. Several industrial sectors are considered: Thermal Power Generation, Cement Sector and Steel and Iron Sector.

www.e2-china.com

what's next

For the 2009 edition of the program, **VIU is holding 14 training courses** and **10 more courses** are scheduled after the summer break.
Thanks to the successful cooperation between our two countries, many other activities related to China are being developed within VIU and a network of experts and expertise on sustainable development continues to grow through a variety of different activities arranged on San Servolo's international campus. To disseminate their experiences and achievements, **VIU** exhibits, **at the CIEPEC 2009**, a stand presenting the Advanced Training Program, developed within the Sino-Italian Cooperation Program of the Italian Ministry for the Environment, Land and Sea, as a successful example of a capacity building project for sustainable development.
Seminar focus on "From Poverty to Development. Chinese Economic Growth in a Historical Perspective" is discussed on May 13, 2009 with Prof. Li Bozhong, Chairman of the Department of History, Tsinghua University; and Prof. Ignazio Musu, President of the TEN Center and Professor of Environmental Economics at Ca' Foscari University, as the co-chair persons. The recent trends in the Chinese economy and the social and environmental issues involved are at the center of the lecture-debate, which is part of the "VIU Lectures" series. The VIU Lectures project, inaugurated in 2006, consists of a series of open-to-the-public lectures to provide a platform for international and local researchers and experts to discuss key issues of our current era.
Eight VIU scholarships for research in China, at Tsinghua University, Tongji University and at the China-Italy Chamber of Commerce in Beijing, will be granted by VIU in October to the best students of the new VIU **Globalization Program** recently launched by the School of Humanities and Social Sciences at Venice International University. The Globalization Program offers to the students of the VIU network a set of advanced courses, research laboratories and seminars on the theme of globalization and its economic, social, cultural and environmental impact. In particular, the course "Globalization, Environment and Sustainable Development" presents different sessions on the environmental implications of globalization, including the Chinese challenge for sustainable development. PhD Ilda Mannino, Head of the Research Unit of the VIU-TEN Center, coordinates the course, in cooperation with Prof. Ignazio Musu.
"**A Gift to Marco Polo**" is the exhibition organized by VIU in cooperation with the MOCA-Museum of Contemporary Art in Shanghai and the Institution of Chinart. The works of nine Chinese contemporary artists (Zhang Xiaogang, Zhou Chunya, He Duoling, Wang Guangyi, Fang Lijun, Yue Minjun, Zhang Peili, Wu Shanzhuan and Ye Fang) are displayed on the island of San Servolo, June 2–November 22, 2009, as a side-event of the 53rd Biennale International Art Exhibition. It is entitled Fare Mondi/Making Worlds/ Bantine Duniyan.
Executive Session on Grand Challenges of the Sustainability Transition is convened on July 20-21, 2009 at VIU by the Sustainability Science Program at Harvard University's Center for International Development, in cooperation with Venice International University and the Italian Ministry for the Environment, Land and Sea. The focus of the session is on "**Water, Health and Development**", which brings together a small group of academics, policymakers and development practitioners for an intense, high-level series of discussions around the role of water in human well-being, including topics such as new paradigms for the water-health interface and new approaches to landscape-level decision-making challenges at the water-agriculture intersection.