UNDP/GEF PROJECT ENTITLED "REDUCING ENVIRONMENTAL STRESS IN THE YELLOW SEA LARGE MARINE ECOSYSTEM"

UNDP/GEF/YS/RWG-P.2/6 rev. 1
Date: 19 October 2005
English only

Second Meeting of the Regional Working Group for the Pollution Component
Busan, Republic of Korea, 7 – 10 November 2005

Regional Pollution Monitoring Guidelines – Progress Report

UNDP/GEF PROJECT ENTITLED "REDUCING ENVIRONMENTAL STRESS IN THE YELLOW SEA LARGE MARINE ECOSYSTEM"

First Progress Report on

Drafting Regional Pollution Monitoring Guidelines

Prepared by

Wen Quan

SOA Key Lab of Coastal Environment and Ecosystem Research
National Marine Environmental Monitoring Center
Dalian, P.R. China

Oct 10, 2005

Preface

Yellow Sea is located in northwest Pacific Ocean, a semi-enclosed sea, with an area of 380,000 km2, and an average depth of 44 m. The residence time of the Proper Water is about 5-6 years and particles reside for less than 2 months in the water column. About 117 billion m3 of river water enters into the sea per year. Yellow Sea is an important ecosystem and fishery region.

Many environmental problems are of a transboundary nature: industrial wastewater containing major pollutants from port cities; non-point source contaminants of agricultural origin (pesticides); oil discharged from vessels and ports; and oil and oily mixtures from oil exploration. Many marine resources are threatened by these sources of pollution as well as by loss of biomass and biodiversity and climate variability in the Yellow Sea Large Marine Ecosystem.

The fishing resource is threatened by both land and sea based sources of pollution and habitat loss resulting from extensive economic development in the coastal zone. There is significant international shipping traffic with associated threats from spills and collisions with marine mammals. GIWA characterizes the LME as severely impacted in terms of eutrophication, and loss and modification of ecotones. These impacts are increasing (see the GIWA web site).

To enhance the marine pollution monitoring activities in the region is very much helpful for the wise management and decision-making, which will promote the recovery and rehabilitation of YSLEM.

1. National and regional pollution monitoring programs in the region

1.1 Monitoring programs in China (mainland)

1.1.1 Background

The nation-wide marine environmental monitoring in China started in 1984. Based on the environmental investigation on coastal seas in 1959-1960 and the pollution investigation in 1970's, the first marine pollution monitoring network has established in 1978 for Bohai Sea and Yellow Sea. After issuing the first Law of Marine Environmental Protection in 1983, the nation-wide marine environmental monitoring network was established in early 1984 and implemented marine environmental pollution monitoring in waters along the mainland of the coast.

From 1984, the national marine environmental monitoring plan was implemented, but the parameters and the media were adjusted in order to meet the requirements in different period. And now the nation-wide marine environmental monitoring plan is designed as follows.

The purposes of plan are to serve the marine economy, the social development, the administration and management, the safety and the people's health.

The plan includes 6 programs, involving the Status and Trends Monitoring Program, the Marine Function Zones Monitoring Program, the Ecozones Monitoring Program, the Red-tide Monitoring Program, the EIA Areas Tracking Monitoring Program, and the Pollution-accident Monitoring Program, etc.

1.1.2 Status and Trends Monitoring Program

In general the Status and Trends Monitoring Program is the key program for marine environmental quality assessment, which includes:

(1) Seawater quality monitoring

Seawater quality monitoring involves near-shore waters and off-shore waters. The monitoring parameters/pollutants are:

- water temperature, water colour, water depth, transparency, waves, etc.
- pH, Salinity, DO, etc.
- COD, nutrients, oil
- Chlorophyll-a

(2) Mussel watch

The bivalves are used to monitor the situations and trends of coastal waters, which include mussels, oysters, and clams etc. The monitoring parameters are: oil, tHg, Cd, Pb, Cu, As, DDT, and PCB, etc.

(3) Benthic environmental monitoring

Benthic environmental monitoring involves benthic monitoring and sediment quality monitoring. The parameters include: tHg, Cu, Cd, Pb, As, Oil, DDT, PCB, Sulfides, etc.

(4) Atmospheric monitoring

The atmospheric monitoring includes the monitoring in Dalian, Qingdao, Shanghai and Guangzhou, etc. The parameters involve: total SS, Cu, Pb, Cd, and pH in precipitation, etc.

(5) Total-quantity monitoring for pollutants entering from rivers

15 rivers along the coastal are monitored to keep the record of pollutants discharged from the rivers annually. The monitoring parameters are oil, COD, NH4-N, P, Cu, Pb, As, Zn, Cd, and Hg, etc.

1.1.3 Marine Function Zones Monitoring Program

The Marine Function Zones Monitoring Program involves seawater recreation zone monitoring, aquaculture zone monitoring, natural reserves and marine protected area monitoring, dumping site monitoring, and oil & gas exploration zone monitoring, etc.

For aquaculture zone monitoring, the parameters are very complicated, which involve water quality parameters, sediment quality parameters and organism(cultured) quality parameters, as follows:

- Water quality: coliform, transparency, water temperature, DO, Salinity, nutrients, Chl-a, etc.

- Sediment quality: tHg, Pb, As, Sulfides, Org-S, coliform, TN, TP, etc.

- Cultured organism quality: oil, tHg, Cd, Pb, As, Cu, DDT, PCB, coliform, DSP, PSP, etc.

1.1.4 Ecozone Monitoring Program

The Ecozone Monitoring Program started in 2004, which focused on the problems of ecosystem and environment in ecologically-important zones. 17 ecozones in coastal waters are monitored, and two in the Yellow Sea, the area in coastal water of Qingdao and the one in coastal water of Jiangsu Province. Different monitoring plan is designed for different ecozone. The parameters include not only the ones for environmental quality assessment, but also the ones related to ecosystem variation and habitat change.

1.2 Monitoring programs in Korea

Unlike the situation in China, the marine environmental monitoring in Korea has no unified plan, and different area has its monitoring program. In general, the nation-wide marine environmental monitoring started in early 1980's, based on the nation-wide investigation on marine environment at that time. The parameters for marine pollution monitoring are listed as heavy metals (Cu, Zn, Pb, Cd, etc.), nutrients, POPs and other physical/chemical/biological parameters in different media (most in water, some in sediment or biota). The monitoring programs are designed for specific requirements and with the aims of marine environmental protection and management.

1.2.1 Designation of Environmental Management Zones, MOMAF

The program is to promote the effective and systemic improvement of marine environment through reasonable management corresponded with areas characteristics. The major implementation measures are: periodic pollution sources and status survey, and preparation of measures on the environment improvement and establishment of environment preservation zone and special management zone.

Master-plan for Integrated Coastal Zone Management included a 5-Year (2001-2005) master-plan for the marine environment protection, which focused on the problems on aquaculture, urban development, chemical industry and water management. The parameters involve the sewage, oils (hydrocarbons), Persistent Organic Pollutants, nutrients, heavy metals, and litter, etc.

1.2.2 Expansion of Environment Fundamental Facilities in Coastal Areas

The program is to enhance the treatment rates on sewage and human faeces, expansion of industrial waste treatment plant and live stock waste treatment plant, and incinerator, which is concerned of the problems in urban development, chemical industry and water management. Sewage and nutrients are involved as the major parameters.

It is planned to decrease the pollution load from non-point sources into sea and to promote the periodic monitoring of emission standard, discharge and treatment rate.

1.2.3 Shihwa Environmental Management Programme

It is a national/ municipal program, concerning the problems in agriculture, urban development, chemical industry, and water management in Shihwa Lake. The major target pollutants and problems are sewage, Persistent Organic Pollutants, nutrients, heavy metals, litter and physical alterations and destruction of habitat.

It is hoped to protect and sustainably use the Shihwa coastal areas. The aims and objectives of the program are:

- Restoring Shihwa ecosystem
- Controlling the land-based pollution loads
- Physical environment integrity
- Development of a coordinating mechanism of managing Shihwa Lake
- Enhancement of local capacity

This program is an output of partnership among central government, local governments, citizens, NGOs, academics, and an international organization, PEMSEA (Partnership in Environmental Management for the Seas of East Asia). This kind of partnership is unique in Korea.

The environmental parameters are: water quality, pollution sources habitat and biological ones. The physical environment integrity involves quantity and quality of wetlands, quality and quantity of incoming water to Shihwa Lake, land use, etc. And the program is implemented in long-term integrated monitoring by academics and researchers, and volunteer monitoring by NGOs and municipal inhabitants. For recreational resources, such as coastal recreation and fishing, the monitoring will be by number of tourists and fishermen.

1.2.4 Monitoring for Implementation of Prevention of Marine Pollution Act

The general purposes of Prevention of Marine Pollution Act is to protect the health and property of the people by preserving the marine environment through the regulation of oil, harmful liquid substances and wastes discharged into the sea from ships, marine installations, etc. and removal of it.

It is to establish the reasonable and scientific environmental management policy and precautionary approach toward sustainability of marine and marine ecosystems. It is concerned of problems in aquaculture, urban development, chemical industry, water management, harbours and ports, and mining, etc.

The implementation of the Act depended on many measures, such as periodic survey, control of terrestrial and marine pollution loads, and improvement of the deteriorated environment, specially for sewage, oils (hydrocarbons), Persistent Organic Pollutants, nutrients, heavy metals, and litter, etc.

The Government will strengthen standards for effluent discharged into rivers and will expand the number of hazardous substances subject to control for the protection of public health. BOD was 30 mg/l and number of substances subject to control (items) was 20 in 1995. BOD will be 10 mg/l, total N will be 30 mg/l, total P will be 4 mg/l and number of substances subject to control will be 30 in 2001. Basic environmental facilities such as sewage treatment plants will be built to raise the treatment ratio to the level of developed countries. So sewage treatment ratio will be increased from 42% in 1994 to 65% in 2001. And it will be increased to 80% in 2005

Ministry of Environment's Regional Environmental Management Offices each have a Water Systems Management Division responsible for establishing water quality preservation plans for the basins in each region and for licensing water treatment installations at industrial complexes. For each of the four main water systems, Environmental Management Committees, comprising business and local government representatives as well as experts, deliberate upon and co-ordinate matters regarding priority projects to be carried out under the basin's plan for water quality conservation. Each of the 11 sub-basins also has an Environmental Management Committee, which advises on the water quality plans in its jurisdiction and works to reconcile conflicting interests among water users, citizens and local bodies.

The amount of wastes into the oceans, such as trash, debris, etc. is rapidly increased in accordance with the industrialization and urbanization. Most of the wastes in oceans are originated from land area, usually when there is flood or heavy rainfalls.

Such wastes cause the destruction of marine biodiversity, ghost fishing and threat in the marine shipping safety. So, the proper disposal and blockade of various wastes at the source is really important thing in implementing the GPA and promoting the Sustainability of marine ecosystem.

Coastal environmental monitoring is implemented by National Fisheries Research & Development Institute(NFRDI) annually to check the result of measures addressed in that act, concerning water quality. Intensive and systematic environmental survey is designed at 296 stations in Korean coastal areas, to measure broad characteristics related to the marine environment. General parameters include such as WT, pH, COD, DO and nutrient etc., and toxic micro pollutants such as PCBs, TBT, PAHs and dioxins etc. in seawaters, sediments and organisms

KORDI is also involved in coastal environmental monitoring, concerning water quality and coastal development. Much work is on establishment of measures on the improvement of environment by the estimation of carrying capacity in the aquaculture areas, simulation of water quality and control of terrestrial inputs through application of modelling in the coastal areas, and so on.

1.2.5 Monitoring of POPs in the coastal environment of Korea

This program covers whole coastal area of Korea, especially where severe pollution is expected, and coastal environment management area. The program is the first comprehensive POPs monitoring project of coastal areas of Korea. Some semi-enclosed bays which are vulnerable to land-based pollutants are also intensively monitored. The pollutants covers dioxins/furans, PCBs, organochlorine pesticides, and PAHs in surface sediments and bivalves. It also covers PAHs in surface seawater.

The purposes of the program are

- To understand the status and trend of POPs pollution in the coastal area
- To provide POPs data for the proper management of coastal areas by government
- To provide environmental quality standards for the protection and management of coastal area

1.2.6 Korean maritime pollution monitoring

When pollutant harms the marine ecosystem beyond its self-purification, it is called as that as the maritime pollution. The influx of pollutants created as a result of human activities into the ocean that harms living organism resource by damaging the quality of sea water, which becomes an obstacle to maritime activity including fisheries and deteriorates the comfortableness of maritime environment.

Causes of maritime pollution are very extensive and various. Among those pollutants, some of them have a fast noxiousness effect to marine living organisms. But, like environmental hormone will have a critical influence to ecosystem after long period of time. Thus, in order to prevent maritime pollution, establishment and expansion of wastewater treatment facility is a priority and implementation of continuous inspection of noxiousness of incoming materials. Administrative control of manufacturer, trader and end user is necessary. Promote a countermeasure of special management in high polluted area.

A strict component test for maritime discharge waste is conducted for oil content, cyanide compound, Zn and its compound, Cd or its compound, hydrargyrum or its compound, organic phosphorus compound, As or its compound, Pb or its compound, Cr6+, Fluorine compound, PCB, and phenol, etc.

The status of environment pollution level for the discharging area is examined regularly, and checked how it has an effect on the maritime environment. This data are used as a basic information for the control of maritime waste discharge policy.

1.3 Monitoring programs in the region

1.4 Differences in monitoring programmes

1.4.1 Requirements of the relevant laws

(1)The Law of Marine Environmental Protection of PRC

The purpose of this law is to protect and improve the marine environment, protect marine resources, prevent and control pollution damage, safeguard ecological balance, protect public health, and advance sustainable economic and social development.

The law focuses on marine ecosystem conservation, the prevention of pollution and damage from land-based sources, coastal engineering, marine and ocean engineering, waste dumping, and ships and related activities

The principals are involved, such as sustainable development, coordination of exploration and development of marine environment and ecosystem, function zonation controlling, total-quantity-control, target management, science and technology support, integration and coordination, equal stress on responsibility and obligation, etc.

(2) Prevention of Marine Pollution Act of Korea

The purpose of this Act is to protect the health and property of the people by preserving the marine environment through the regulation of oil, harmful liquid substances and wastes discharged into the sea from ships, marine installations, etc. and removal of marine pollutants.

The Act focuses on discharge of oil and harmful liquid substances or wastes from ships and marine installations, inspection of marine pollution prevention equipment for ships, prevention, removal and cleaning business, marine pollution response corporation, etc.

The principals are involved such as sustainable development, integration and coordination, equal stress on responsibility and obligation, compensation by polluter, total quantity control, etc.

(3) Monitoring requirements

From the Law of Marine Environmental Protection of PRC, it can be seen that many kinds of monitoring programs are required for implementation of the law, specially for conservation of marine ecosystem, which needs a wide series of monitoring program, involving habitat, species, population, ecosystem and other impact factors.

From the Prevention of Marine Pollution Act of Korea, it can be seen that the Act focuses on the discharge of oil and harmful liquid substances or wastes from ships and marine installations. The monitoring activities will depend on the environmental protection actions or measures, but the pollutants are concerned of nutrients, oil and POPs, and heavy metals from effluents.

1.4.2 Differences in monitoring programs

Based on the recent references and reports, it can be seen that there are some differences in monitoring programs between China and Korea, such as:

- China has a unified marine environmental monitoring plan, which includes a wide range of monitoring programs. Korea has the general objectives according to the Act and the monitoring programs depend on the environmental protection actions and projects.
- In China's monitoring programs, the parameters of nutrients, heavy metals and oils are concerned and POPs is becoming the monitoring parameters. In Korea's monitoring programs, POPs are of concern in recent years with other pollutants such as nutrients and heavy metals.

2. Analysis of parameters to detect pollution problems of Yellow Sea

2.1 Parameters monitored in China and Korea

The parameters occurred in monitoring programs in China and Korea are selected as follows:

- physical characteristics: salinity, temperature, pH, transparency, circulation;

- water quality characteristics: NO2-N, NO3-N, ammonium-N, DO, total dissolved P, silicates, chlorophyll a, total particulate C, coliform, COD, SS, Cd, Cr, Cu, Pb, Hg, Zn, As, organotin, phenolic Compounds, oil;

- biota: Cd, Cr, Cu, Pb, Hg, Zn, As, Organotin, PCBs, Dioxins and Furans, OCPs (Aldrin, chlordane, DDT & metabolites, dieldrin, endrin, heptachlor, hexachlorbenzene, hexachlorocyclohexanes, mirex), PAHs (Naphthalene, acenaphthylene, acenaphthene, fluorine, phenanthrene, anthracene, pyrene, bezo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k)fluoranthene, benzo[a] pyrene, indeno[1,2,3-cd]anthracene, benzo[ghi]perylene], PBDE, PBB, Phenolic Compounds

- sediment: Cd, Cr, Cu, Pb, Hg, Zn, As, Organotin, PCBs, Dioxins and Furans, OCPs (Aldrin, chlordane, DDT & metabolites, dieldrin, endrin, heptachlor, hexachlorbenzene, hexachlorocyclohexanes, mirex) ,PAHs (Naphthalene, acenaphthylene, acenaphthene, fluorine, phenanthrene, anthracene, pyrene, bezo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k)fluoranthene, benzo[a] pyrene, indeno[1,2,3-cd]anthracene, benzo[ghi]perylene], PBDE, PBB, Phenolic Compounds, TPH, organic C, grain size, sulphide,etc.

2. 2 Proposal of parameters and sites for regional monitoring

The proposed parameters for regional monitoring are selected as follows:

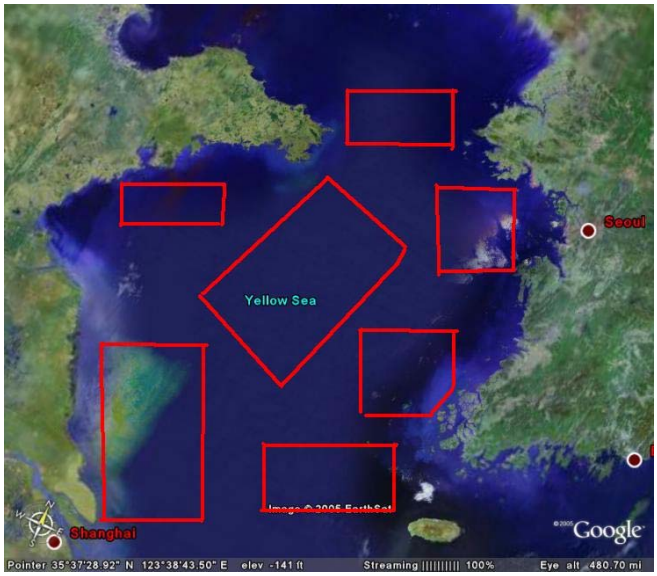
- physical characteristics: salinity, temperature, pH, transparency;

- water quality characteristics: NO2-N, NO3-N, ammonium-N, DO, total dissolved P, silicates, chlorophyll a, SS, Cd, Cr, Cu, Pb, Hg, Zn, As, oil;

- biota: Cd, Cr, Cu, Pb, Hg, Zn, As, Organotin, PCBs, Dioxins and Furans, OCPs (Aldrin, chlordane, DDT & metabolites, dieldrin, endrin, heptachlor, hexachlorbenzene, hexachlorocyclohexanes, mirex), PAHs (Naphthalene, acenaphthylene, acenaphthene, fluorine, phenanthrene, anthracene, pyrene, bezo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k)fluoranthene, benzo[a] pyrene, indeno[1,2,3-cd]anthracene, benzo[ghi]perylene], PBDE, PBB;

- sediment: Cd, Cr, Cu, Pb, Hg, Zn, As, Organotin, PCBs, Dioxins and Furans, OCPs (Aldrin, chlordane, DDT & metabolites, dieldrin, endrin, heptachlor, hexachlorbenzene, hexachlorocyclohexanes, mirex), PAHs (Naphthalene, acenaphthylene, acenaphthene, fluorine, phenanthrene, anthracene, pyrene, bezo[a]anthracene, chrysene, benzo[b]fluoranthene, benzo[k)fluoranthene, benzo[a] pyrene, indeno[1,2,3-cd]anthracene, benzo[ghi]perylene], PBDE, PBB, Phenolic Compounds, organic C, grain size, etc.

The proposed sites for regional monitoring are selected in the key zones (in red-line areas), showing in the following figure.



3. Persons/institutions visited or interviewed

In this research process, some experts and officers have been visited or consulted, whose points and comments are adopted in the report, such as:

Ms Yi Xiaolei, division chief, Division of Marine Monitoring and Forecasting, Department of Marine Environmental Protection, SOA, China.

Prof. Ding Dewen, Academician, Director, SOA Key Lab of Marine Eco-environmental Science and Engineering, China

Dr. Yang Jianqiang, Deputy Director, North-sea Environmental Monitoring Center, SOA, China.

Prof. Xu Ren, Director, Eastern China Sea Monitoring Center, SOA, China.

Prof. He Guangshun, Deputy Director, National Marine Data and Information Service, China.

Dr. Oh Jae Ryoung, South Sea Institute, KORDI, Korea.

Dr. Yang Dong Beom, KORDI, Korea.

4. Further activities

4.1 Activities

It is planned to integrate and review further all the information on monitoring programs. The parameters to monitor and the sites will be selected and the monitoring stations will be proposed. Finally the guidelines for sampling in different medium are determined.

The reporting procedures are also proposed.

4.2 Recommendations

In the final report, the recommendations and justifications regarding acceptable contaminant levels will be proposed. The actions and the use of networks in regional monitoring are recommended.

4.3 Finalizing regional guidelines for pollution monitoring

The final report will be finished according to the following content:

I. Background of assignment
II. Methods used to carry out assignment
III. National and regional pollution monitoring programmes in the region
    A. Review of programmes
    B. Assessment and summary of the differences in monitoring programmes

IV. Regional guidelines for pollution monitoring
    A. chemical, physical and biological parameters to monitor
    B. guidelines for sampling in different medium
    C. monitoring stations
    D. suggested reporting procedures to national and international agencies
    E. recommendations and justifications regarding acceptable contaminant levels
    F. recommendations for actions

V. Recommendations for use of networks in regional monitoring
VI. Persons / institutions visited or interviewed