

# Policy options

**This section aims to identify feasible policy options that target key components identified in the Causal chain analysis in order to minimise future impacts on the transboundary aquatic environment. Recommended policy options were identified through a pragmatic process that evaluated a wide range of potential policy options proposed by regional experts and key political actors according to a number of criteria that were appropriate for the institutional context, such as political and social acceptability, costs and benefits and capacity for implementation. The policy options presented in the report require additional detailed analysis that is beyond the scope of the GIWA and, as a consequence, they are not formal recommendations to governments but rather contributions to broader policy processes in the region.**

## Overexploitation of living resources in the East China Sea

### Background

China has a five-year-long vessel-scraping program, begun in 2002 and funded with 33 million USD per year. The program aims at delicensing and scrapping a total of 30 000 ships, or 6 000 vessels each year, thus reducing the overall capacity of China's 440 000-ship fishing fleet by about 7%. In 2002, China scrapped and withdrew the licenses of 5 000 ships. A related regulation mandates that new fishing vessels cannot be built unless the new unit will replace and inherit the license of an existing vessel. Other recent agreements with Japan and Korea have reduced China's offshore fishing grounds. The scrapping program is aimed in part at creating nearshore opportunities for fishermen currently working offshore. Because the increase of fishing effort plays an important role in the decline of the fisheries resources in the East

China Sea, the reduction of fishing effort is significant, particularly in its effects on fishers' daily lives and futures.

### Identification of potential policy options

#### Fish farming as an alternative

Overemployment in the fisheries sector, however, requires China to face overall unemployment and underemployment problems, which are particularly acute for fishermen and semi-skilled workers. The increasing mobility of China's labor force also contributes directly to the oversupply of fishermen and consequent overfishing. It is necessary to deter poor farmers from becoming fishermen. Back-of-the boat labour is almost impossible to control because the average income for a fisherman (500-800 USD per year) is still as much as double what a farmer might earn. As long as that gap exists, there will be demand for work in the fishing industry. To avoid this situation, China has invested money and effort in promoting aquaculture as an alternative. Aquaculture can effectively promote economic development and social progress, through creating significant employment opportunities, absorbing and using surplus fishing labourers, increasing fishers' income and assisting in poverty alleviation. Aquaculture also should be developed as an economic activity that can provide significant export earnings.

#### Fishing ban

The Chinese government has promulgated many policies, such as forbidding the use of fishing lines, closing fishing periods and zones, licensing, setting minimum mesh sizes and minimum landing sizes. Among these, the fishing ban was the most successful. An annual three-month fishing ban for commercial fishing in the East China Sea from June 15 to September 14 was first issued in 1995. To mitigate pressures from overfishing, 100 000 fishing boats must stay in port during the ban. Patrol ships and planes are dispatched to the marine areas to enforce the ban. The campaign aims to reduce illegal activities in the fishing grounds such as fishing during the ban and marine contamination. There is also

currently a two-month freshwater fishing ban (February-March) in the middle and lower reaches of the Yangtze River. The Bureau of Fisheries expanded this in 2003 to include a further two-month (April- May) ban in the upper reaches of the river. There are no plans to lift or relax any of these moratoria. These measures have effectively protected juvenile fish so that the overall catch and quality could be increased and improved.

Up until the present the fishing ban has proven effective in protecting fishing resources and marine life. Catches of *Larimichthys polyactis* have increased from none in 1975 to 450 000 tonnes in 2000 (FAO 2004). This species is now the second most sought-after fish by the Chinese fishery. To further protect juvenile populations of *Larimichthys croceus*, *Larimichthys polyactis*, *Trichiurus lepturus* and other economic species, it is necessary to expand the fishing ban from the hatching areas such as Lvsu and the Zhousan Islands to the areas where young fish mature in the north of the East China Sea at the beginning of spring.

### Enforcing fishery management

Other actions for the management of China's marine fisheries resource should include:

- Efforts to improve the existing legal system to better cope with overfishing.
- An improved fishing license system, with a quota system and strengthened management of the fishing industry.
- Support for monitoring of fisheries resources, which is fundamental for the conservation and rational use of the resource, and is also an essential prerequisite for any quota system.

## Immediate policy options

### Knowledge

Because of insufficient knowledge regarding the limits of the fisheries resource, along with a lack of systematic monitoring and surveys of the fishery stocks, the dynamics of the resource and the maximum sustainable catch are not well understood. As a consequence, marine fisheries in the East China Sea have been managed without regard for sustainable yields. Many fishers and fishing businesses continue to believe that the fisheries resource is unlimited, and that the more fishing vessels are used, the more fish will be caught. It is essential that national scientific funding agencies support the study of the dynamics of fish stocks in the East China Sea.

### Improved institutional capacity for fisheries management

Although China has taken measures to control fisheries, these measures have not fundamentally reversed the overfishing situation, partly owing to insufficient capability on the part of government agencies to administrate fishing programs. The development of an increased

fisheries capacity will require the development of institutional capacity to administrate fisheries programmes and regulations.

### Shifting employment away from exploitive fishing

Fishing bans pose severe economic challenges for those employed in the industry or on their own. Government aid is needed to help with the economic problems that result from fisheries management. The following programmes are necessary to achieve this goal.

- Encourage the growth of freshwater and coastal aquaculture, and encourage technology transfer to improve the breeding and supply of young fish.
- Encourage fishing activity in the open sea, with technology transfer and assistance.
- Strengthen education and the availability of information to improve public awareness regarding environmental protection.
- Strengthen information and education in the rural population regarding environmental protection.

## Recommended policy options

### International cooperation

The East China Sea is known to be a very productive fishing area. However, management of resources in the area has been complicated due to territorial claims made by Korea, Japan, and China. The three countries ratified the 1982 United Nations Convention on the Law of the Sea in 1996. To adjust to the new situation arising from overlapping claims, the countries need to alter their claims under the United Nations Convention. Thus far there has been a Japan-China Fisheries Agreement (1997), a Korea-Japan Fisheries Agreement (1998), and a Korea-China Fisheries Agreement (1998), which provide legal frameworks for a new fisheries regime. But these bilateral agreements are not enough to resolve complex legal issues relating to boundary problems. It is necessary for the three countries to cooperate on a new fisheries order in the Northeast Asian seas, especially in expanding seasonal fishing bans and structured bans.

### Legal and institutional frameworks

The importance of legal, procedural and institutional frameworks designed to facilitate sustainable fishing industry development must be emphasised in China. There are no universally applicable models. The nature of any improvements will depend on existing laws, traditions, and institutional structures. But law, traditions and institutional structures need to be modified or adapted to develop a system that is relevant enough to play a role in building a sustainable fishing industry.

The ideal framework would allow for vertically (national to regional) and horizontally (across sectors) integrated policy-making and planning with a

significant role for strategic, sectoral or regionally integrated environmental assessments as an input to the planning process. Such a framework should allow for adaptation in both directions, i.e. national policy should inform local planning; local planning and public involvement should inform the development or adaptation of policy at higher levels.

The adoption of the “Law of Fisheries of the People’s Republic of China” in 1986 was a very important step in the development of China’s fishery policy. From that time up until the present, laws and regulations under the umbrella of Chinese fisheries law have been established. The Law of Fisheries as a legal provision defined a fishery development policy suitable for the Chinese economy. It has shown significant importance in the adjustment of fisheries production relationships, in the standardisation of fisheries activities, and for the conservation and rational use of the fisheries resource. It is also necessary to take steps to control illegal, unregulated and unreported fishing by blacklisting bad actors and enacting strict regulations. A joint fisheries commission between the East China Sea littoral states should be established as a part of new international fisheries agreements.

## Eutrophication in the Yangtze River estuary and adjacent inner shelf

Eutrophication has been identified as one of major problems that affect the sustainability of East China Sea and its coastal water ecosystems. In particular, coastal eutrophication has been identified as a key cause in the deterioration of coastal environment, with subsequent socio-economic effects.

### Root causes for eutrophication in the East China Sea

In the Causal chain analysis section the primary root causes for coastal eutrophication in the East China Sea were identified as the following:

- **Demographics:** The development of coastal eutrophication is correlated with land-source nutrient inputs, which result from increased human activities (e.g. growth in population and agriculture). Moreover, the influence of domestic wastes can be seriously underestimated owing to the lack of sanitation systems in the watersheds.
- **Knowledge and education:** Rural populations have no understanding of cause and effect that can start with agricultural practices, both on land and coast, and end at marine food webs

that are seriously harmed by eutrophication. Failure to adequately treat sewage has the same effect.

- **Economics:** Traditional agricultural practices result in increased fertiliser use and soil and water losses. In some regions burning before cultivation is quite common in watersheds, as is the exchange of wastewater from marine culture ponds with clean seawater, which is the most typical and cheapest method for coastal aquaculture. Coastal mariculture has become one of the most important economic forces following fishery production agreements between neighbouring countries in the East China Sea. Sustainability of aquacultural practices in the coastal region may not be a high priority among the population, because of problems of land and property tenure. There is little provision for controls or monitoring of waste discharges because of attempts to cut costs.
- **Governance:** The reduction of eutrophication will only come through a sound environmental management by legislation and protection. A combined effort on regional agreements and actions will help solve eutrophication problems.

### Identification of policy options

The cross-link of causes listed above corresponds to numerous possible policy options in dealing with the problems associated with coastal eutrophication.

#### Demographic issue

It is necessary that each country reduce nutrient inputs from land-based sources. Coastal activities should also be carefully designed and managed to reduce direct waste discharges.

#### Knowledge

Awareness on the part of the public about the detrimental consequences of coastal eutrophication needs to be improved. This issue should be incorporated into the national education curricula. While short-term targets are important to convince the population to improve farming methods and in aquaculture, technological innovations can also contribute to reducing nutrient input into marine waters. Such information and knowledge should be freely accessible through the education of farmers and fishermen about the appropriate use of fertiliser in agriculture and feedstocks in aquaculture as well as the relationship between inappropriate cultural activities and the eutrophication of coastal waters. Technological improvements should also be adopted to increase the capacity of water purification systems.

#### Economic issues

Financial constraints constitute one of important causes of these problems, but the corresponding policy options should go beyond

improving water quality frameworks. Economics at the provincial level, as well as trade barriers and protectionism by industrialised countries and differences in trade policies for agricultural and fisheries products must be addressed, because these issues limit the ability of the region to advance economically.

### **Cultural issues**

Cultural differences are an important constraint in the sound management of the coastal environment. However, overcoming these problems will result from cultural evolution, in which different traditions are progressively and naturally blended, particularly in coastal areas, where education and economics are on average already mostly developed.

### **Governance and Legislation**

Coastal waters should be managed as sustainable ecosystems, and the authorities, through their governance of water policy both on land and in marine environment, should work towards this goal. Integrated management of water systems within the context of whole East China Sea is required, through the efforts of land and marine authorities in neighbouring countries. This approach is already a part of the fisheries agreements among the countries of the East China Sea. An East China Protection organisation should be established, first by creating an advisory body, which can gradually be expanded to consultation, technical management, and the evaluation of financial allocations for water quality improvements.

### **Immediate policy option: Establishment of a regional monitoring system for water pollution and coastal eutrophication.**

The recommended policy options to combat coastal eutrophication in the East China Sea must address the root causes identified above and should be based on the ongoing national and regional programs with efforts at the institutional and/or organisational level. Existing facilities and databases should be taken into account in designing frameworks and projects. Therefore, the recommended policy option is the implementation of a regional monitoring system for coastal eutrophication in East China Sea, which is critical to the:

- Establishment of an agreement between neighbouring countries (Japan, Korea and China), which should be based on the free exchange of opinions from provincial governments, industry and local communities.
- Registration and monitoring of pollution sources, which should be taken into account during the early stages of the formulation of economic and social development programmes.
- Environmental assessment of pollution impacts and selection of indicator species for marine water quality. Such an assessment

should include water profiles, sediment sampling and evaluation of living organisms.

- Organisation of an institutional network in the field of marine water quality, which will provide an assessment of eutrophication-related issues, e.g. effects on ecosystems and biodiversity.
- Establishment of a network for the systematic observation of coastal waters and the definition of an observation frequency and measurement parameters.
- Definition of a financial mechanism for monitoring activities, which allows inter-comparison of monitoring results from neighbouring countries, compilation of monitoring results, and an assessment of changes in eutrophication-related issues.
- Establishment of a joint consultation board, composed of representative of countries in the East China Sea. National representatives should include experts, policymakers, people from industry and local communities in coastal areas.
- Other related recommendations for policy options can be outlined at this stage, and can be defined in more detail later or altered, based on the progress of existing organisations, such as:
  - Improvement of technological methodologies used in agriculture or/and marine fisheries (such as aquaculture);
  - Prohibition of economically harmful techniques (traditional marine culture techniques) through legislation and education;
  - Introduction of environmental friendly and non-polluting industries in coastal areas and the replacement of traditional fisheries with of new techniques;
  - Reinforcement of mechanisms such as taxes or penalties to discourage certain practices that may cause coastal pollution;
  - Promotion of the spread of the knowledge and regulation of environmental protection through training and education;
  - Creation of a communication network between countries to exchange information regarding pollution issues and to inform coastal populations;
  - The IMO regulations for ballast water need to be more strongly enforced by the East China Sea countries.

### **Performance of the recommended policy options**

The recommended policy options can be implemented, as provisions exist for such options in existing regional frameworks agreed to by the countries of East China Sea, for example, under the umbrella of Northeast Asia Region-Global Ocean Observation Systems (NEAR-GOOS).

### **Efficiency**

The recommended policy options can be undertaken in different ways, such as by creating a forum where individuals from different organisations as well as different countries can identify problems, and

exchange information, ideas and knowledge. The recommendations for regional measurements can be adopted for eutrophication in relation to cultural practices in watersheds and coastal areas. The monitoring system must be carefully designed to be on the same scale as the problems to be addressed as well as to the financial resources available long-term to address them. Existing facilities should be used to their fullest capacity and should be elevated to a higher level. The system should enable the production of an annual report on eutrophication in the East China Sea. Follow-up programmes, and comparisons of indicators/parameters should allow the creation of an early warning system for authorities in case of serious and rapid coastal water quality deterioration. The system should also identify sources and impact areas to be dealt with, and actions to reduce pollution and to restore damaged ecosystems.

### **Equity and feasibility**

The proposed policy options are equitable as they aim to include, in equal numbers, governmental representatives, industry, research institutions and communities. With regards to implementation, the existing regional framework is designed to give priority to the actions planned by the governments of the East China Sea countries. Political feasibility will be guaranteed by strong cooperation between the countries of the East China Sea. Furthermore, links between industries and communities will provide balance and openness during the process.

### **Implementation capacity**

The countries of the East China Sea have sufficient human resources and facilities to carry out such a campaign; however, attention should be paid to the upgrading and standardisation of facilities. The existing technical organisations of participatory countries will be the local contact points for routine data collection and compilation.

## **Habitat and community modification**

### **Definition of problems**

Numerous factors make it difficult to control pollution of the East China Sea. Wastes may come from a sewage outfall, a population center or a canal. These kinds of point sources are relatively easy to locate and simple enough to control. But occurrence of marine pollution has often linked with complicated circumstances. It usually is affected by non-point pollution sources, which are much more difficult to treat. For example, the largest agricultural application of irrigation water occurs in the Yangtze River drainage basin, which is faced with serious pollution

from fertilisers and pesticides, resulting in aquifer contamination. There are also some other problems such as ineffective regulation, insufficient resources, the need for capacity building at all levels of government, and a lack of political will.

## **Identification of potential policy options**

### **Reforestation**

In recent decades, the primary goal has been broadened from solely increasing growth production to maintaining and enhancing various ecological functions such as preventing desertification and coastal erosion, and reducing run-off in river basins. Efforts to increase forest cover received a further boost after 1998 when a flood caused a heavy losses in China and widespread deforestation in the upper reaches of the Yangtze River was identified as one of the main contributing factors. Because of deforestation and loss of aquifers, a huge amount of nutrients generated by agriculture and aquaculture enters water bodies of the East China Sea in non-point run-off. Nutrients make up the second most important group of pollutants in the marine environment and are the main reason for eutrophication and harmful algal blooms. Reforestation is an efficient way to achieve the long-term goal of ecological reconstruction to protect the marine environment of the East China Sea.

### **Controlling use of fertilisers and pesticides**

Excessive use of fertilisers and pesticides (fungicides, herbicides and insecticides) has produced serious problems for the health of aquatic ecosystems. Traditional farming may lead to large quantities of soils entering stream channels and contribute to the sediment load in river discharges to the marine environment.

Detecting pesticide presence in aquatic environments and removing it requires expensive methods. Funding such activities will be difficult at the local level. The high concentration of chemicals from agriculture, especially fungicides, herbicides and insecticides, in the marine and related freshwater environments can result in the loss of biodiversity and reduction of productivity. There is a need to encourage farmers to employ environmentally friendly farm practices that minimise the use of fertilisers and biocides, and to enhance soil retention of fertilisers.

### **Wetland protection**

Reclamation of intertidal areas has been a national priority for many years. Massive reclamation projects have also been undertaken in the coastal areas of the East China Sea. It is believed that the substantial investments that have already been made in seawalls will continue to produce losses in wetland habitat.

Reclamation of wetlands was usually promoted by local governments for short-term economic benefits. Protecting wetlands will take years and will be difficult. Knowledge and institutions will be very important components, and legal frameworks for the Law of Wetland Protection are another. The law is the only hope of holding out against the pressures of economic demands for reclaiming wetlands.

### Reconnecting migratory links

Over the past decades, lakes in the Yangtze River Basin and in the East China Sea region have been artificially severed from rivers by hydroelectric and irrigation projects, and as a result, migratory fish can no longer move between lakes and sea, or to and from these via rivers. This has led to a sharp decline in species such as the Chinese sturgeon (*Acipenser sinensis*) and *Cyprinus*, for which both lake and river spawning grounds are essential. The construction of fishways is a good solution that can be enacted now. Any future construction of irrigation facilities should also consider effects on fishways.

### Reduction in land-based pollution

The major pollutants in the East China Sea are oil, inorganic phosphorus, inorganic nitrogen and heavy metals. Long-term monitoring in coastal waters from the East China Sea shows that seawater quality is steadily deteriorating. Wastes from domestic, agricultural, and industrial sources, along with sediments and solid wastes, are the major sources of pollutants that affect both freshwater and coastal systems in the Yangtze River and the East China Sea. Land-based sources play a major role in both inland and coastal pollution. Ship-based sources, such as split oil and ballast water, contribute relatively small amounts. There is a need to collect data on atmospheric inputs, which can also be considered a source of land-based pollution.

## Immediate policy options

### Public involvement

Substantial public involvement is a desirable and necessary part of any planning initiative with regard to the health of ecosystems. This involvement can take different forms, all of which are important:

- Communication of information between decision makers, planners or technical specialists to the public;
- Participation, shared responsibility and decision making with comprehensive public involvement should be increasingly emphasised in any assessment or planning;
- Planning that makes assessments about issues of widespread public concern, the quality of life, the value of resources, and the trade-offs between different resource uses;
- Requiring any assessments to be properly evaluated and/or validated through the widest possible consultation.

### Balancing economic and environmental goals

It is often difficult in policy-making to reconcile the conflicting objectives of economic development and social values associated with environmental conservation. Uncontrolled and unplanned industrial, commercial and residential development that does not include adequate provisions for potable water, management of solid waste, and collection and treatment of wastewater should no longer be allowed.

### Pollution penalties

A person, company, or agency responsible for environmental damage or actions that cause pollution in the marine environment should be made responsible for the cost for remedying the situation. This provision is not universally included in legislation, but has been adopted as a matter of policy. Compensation should include all the expenses actually incurred by the government service for the clean-up of pollution. Although the government has adopted the principle of compensation for damages and penalties for illegal activities it is often too expensive to stop the pollution. More strict laws or regulations should be adopted and carried out.

## Performance of the recommended policy options

### Legal frameworks

Since the 1980s, China has been taking steps to complement and then replace administrative measures with a legislative and regulatory framework as a foundation for economic and social behaviour. The legal system has yielded an impressive amount of laws, regulations, and standards in a way that has truly changed basic rules in Chinese society. But the system is still far from complete. Still, the work so far to create a legislative and regulatory framework should not ignore the fact that administrative measures play an important role as a tool for environmental actions. Legislation has often been accompanied by large-scale investment projects targeted with government funds. For example, the government will complement its the marine pollution bills by investing heavily in land-based pollution control, and by closing down many polluting enterprises.

### Integration and coordination

By definition, integrated coastal management implies a greater level of integration than is typical with conventional approaches. It implies a holistic analysis and synthesis of complex technical, social, economic and ecological information. It also implies correspondence between local initiatives and international-level policies. It is necessary to create improved cooperation between different sectors. Increased integration therefore implies increased complexity. Decision-making is likely to be slower and more difficult as the degree of integration increases. Key requirements are:

- High quality, well-presented and effectively communicated/exchanged information,
- Clearly and widely agreed upon decision criteria,
- Clear and transparent decision-making processes; and (if necessary),
- A clearly designated (and widely agreed upon) final authority and arbiter (whether individual or committee).

Where a single policy alone cannot guarantee the achievement of the desired impact, for instance, fishing quotas, the active involvement of the countries of the East China Sea region will be critical in the follow-up

to the GIWA endeavour. The assessment of perturbations and feedback mechanisms shows that anthropogenic activities have accelerated the environmental degradation of natural systems and resources, both on land and in the East China Sea. Increased land-source nutrient runoff, modification of habitats and overfishing are the predominant challenges to development in the region. The improper management of water resources, coastal eutrophication and an unsustainable fishery have been identified as the most severe issues, while other issues also merit attention. It should be recognised that most of the impacts discussed in this report are very much linked to human activities.