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WORLD MARITIME UNIVERSITY

Malmö, Sweden

**TOWARDS COOPERATION AND CAPACITY-
BUILDING: AN INTEGRATED COASTAL ZONE
MANAGEMENT APPROACH FOR THE
YANGTZE RIVER DELTA, THE PEOPLE'S
REPUBLIC OF CHINA**

By

Zhao Yinglei

The People's Republic of China

A dissertation submitted to the World Maritime University in partial
fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

In

MARITIME AFFAIRS

(INTEGRATED COASTAL AND OCEAN MANAGEMENT)

2006

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature).....

(Date)

Supervised by: Olof Linden
Professor
World Maritime University

Assessor: Bill Richie
Professor
World Maritime University

Co-assessor: Chua Thia-Eng
Regional Programme Director
Regional Programme on Partnerships in Environmental
Management for the Seas of East Asia (PEMSEA)

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ABSTRACT

Title of dissertation: **Towards cooperation and capacity-building: an integrated coastal zone management approach for the Yangtze River Delta, the People's Republic of China**

Degree: MSc

This dissertation presents an account of the concept of integrated coastal zone management (ICZM) and illustrates how it can be utilized to mitigate the use conflicts and enhance the coastal resilience in the Yangtze River Delta (YRD) coastal zone.

A brief review is made to examine the definition of integration, particularly its concept and justification in the marine policy context.

A snapshot of YRD coastal profiles is presented, along with the current situation of coastal resources utilization and various economic activities to illustrate the importance of coastal resources to the local and regional economic development. Use conflicts particularly in their spatial, functional and temporal forms in the YRD coastal zone are explored and their imminent threats on economic development and social integrity are analyzed.

The institutional framework of the YRD coastal zone, together with the inherent common property nature of coastal resource, as the root causes of use conflicts, is critically analyzed. The loopholes within the framework, which fail to address coastal resource management and conflicts resolution, are examined and summarized.

Subsequently, the concept and historical development of ICZM is introduced and its principal management methods and approaches are presented. Xiamen ICM, a pilot project under the auspices of IMO/GEF/UNDP, due to its natural resemblance and significant success, is selected as a case study to draw upon lessons and experiences for the YRD coastal zone management.

The concluding chapters of the dissertation examine the need and viability to develop an ICZM framework as such in the YRD coastal zone. Two proposals are made as the mitigation measures. One is to establish an ICZM framework, including coordination mechanism, legal framework and capacity building to serve as the basis for integration. The other focuses on the priority issues and gives potential solutions.

KEYWORDS: Cooperation, Capacity Building, Integrated, Coastal, Management.

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LIST OF ABBREVIATIONS

BHC	Biogenic Hydrocarbon
CPUE	Catch Per Unit Effort
CZMA	Coastal Zone Management Act
ECS	East China Sea
ECSLME	East China Sea Large Marine Ecosystem
EIA	Environmental Impact Assessment
EIAL	Environmental Impact Assessment Law of the People's Republic of China
EPB	Environmental Protection Bureau
FTZ	Free Trade Zone
GEF	Global Environmental Facility
ICZM	Integrated Coastal Zone Management
IMO	International Maritime Organization
ISPS	International Ship and Port Facility Security Code
LRA	Land and Resource Administration
MEPL	Marine Environmental Protection Law of the People's Republic of China
MLR	Ministry of Land and Resources
MMCC	Marine Management and Coordination Committee
MMT	Million Metric Tons
MPAs	Marine Protected Areas
NPC	National People's Congress
PEMSEA	Regional Programme on Partnerships in Environmental Management for the Seas of East Asia
SAUL	Sea Areas Use Law of the People's Republic of China
SEMP	Strategic Environmental Management Plan
SEPA	State Environmental Protection Administration
SOA	State Oceanic Administration
UNDP	United Nations Development Programme

WPPC	Law of the People's Republic of China on Prevention and Control of Water Pollution
YRCC	Yangtze River Conservancy Commission
YRD	Yangtze River Delta
YRDICMC	Yangtze River Delta Integrated Coastal Management Council

CHAPTER 1

1 INTRODUCTION

There are increasing calls for greater policy integration from a number of areas, one of the most prominent being environmental policy-making where integration is frequently recognised as being crucial for sustainable development (Meijers, 2004, p. 1). However, the concept of integration itself has not been exhaustively elaborated on or clarified in the policy-making community but remains a rather elusive principle open for divergent interpretations (Persson, 2004, p. 10). Be that as it may, we shall first review a selection of academic literature in order to identify the key elements of integration.

1.1 Literature review

1.1.1 Perspectives on integration

The word ‘integration’ derives from *integer*, meaning one, complete, or whole. Therefore, one view is that “integration means far more than interdependence—it is the act of combining separate albeit related units into a single whole” (Daly et al., 2003, p. 317). Those who subscribe to the above notions will distinguish integration from co-ordination or co-operation, which aims at adjusting different units in order to make them mutually enforcing and consistent. In light of this, it can be extrapolated that integration is more far-reaching than co-ordination as regards output and type of objective.

However, others conceive ‘integration’ as a flexible concept rather than a stationary status. Hooper et al. (1999, p. 753) provide an overview of integration in

their paper and suggest that various measures are available to achieve integration and that they fall along a continuum with an increasing amount of intervention. Thus, at one end of the continuum, we have a minimal approach to integration, with voluntary actions such as goodwill, trust, respect and willingness to cooperate as the means of integrating interests. In the middle, integration consists of cooperative action where agencies and individuals follow prescribed goals and specified planning processes. Then, at the other end of the continuum, coercive action is taken in order to get individuals and agencies to cooperate. A new lead agency is formed to prescribe integration procedures and ensure cooperation amongst stakeholders. The distinction between integration and co-ordination, according to this, is thus artificial and anomalous.

Apart from these efforts which try to characterize integration from outputs and objectives, some scholars choose to explore its rational and define integration through the whole process. Underdal (1980, p. 159) formulated three requirements that should be satisfied in order for a policy to qualify as integrated, i.e. comprehensiveness, aggregation and consistency. The three requirements refer to three consecutive stages of the policy-making process: “comprehensiveness to the input stage; aggregation to the processing of inputs; and consistency to outputs”.

Comprehensiveness can be pursued along four dimensions in terms of inclusiveness of time, space, actors and issues. Aggregation means policy alternatives are evaluated from an ‘overall’ perspective rather than from the perspective of each actor, sector, etc. Consistency implies that all the components of the policy are in agreement. Thus, an integrated policy is one where “all significant consequences of policy decisions are recognized as decision premises, where policy options are evaluated on the basis of their effects on some aggregate measure of utility, and where the different policy elements are in accord with each other” (Underdal, 1980, p. 162).

Nonetheless, integration is not always a necessity, and some problems can be managed without integrating a wide range of interests or stakeholders. It can be a costly process that may not bring the appropriate benefits for the solution of a problem. So another question is under what circumstances integration is justified and can achieve more ideal results. In other words, why do we need integration?

Ewert stated “an integrated approach is best used where there are complex problems and a need can be established amongst stakeholders that there is value in coordinating interests (2005, p. 74).” This kind of proposition would imply two preconditions for integration. First of all, “complex problems” indicate the situation involving more than one party, which have competing interests or conflict needs. Secondly, the situation of parties involved would be better-off if collective action can be taken. However, some important questions have to be answered to make this criterion operational. First, the market economy approach, through its ‘invisible hand’, enable the accomplishment of the objective of optimizing scarce resource distribution and maximizing social welfare in a perfect competing market. In other words, succinctly stated, the market provides a venue for effectively resolving competing or conflicting interests. Then why we still need policy integration which, to a large extent, has to resort to governmental intervention? Another question posed concerns how to delimitate the boundary of integration. Apparently, without exploring the economic principles and inherent nature of integration, one can not address the issue in a proper manner.

Underdal, in comparison, tries to answer these questions from the very economic essence of ‘integration’. As he (1980, p. 163) quite rightly states:

The most general purpose of policy integration is to improve outcomes, and the key to this improvement is ‘internalization of externalities’. Fragmented decisions often produce externalities... Policies having significant

externalities can be ‘bad’ from an efficiency as well as from a distributional perspective.

He then illustrates two situations the results of which are undesirable and render the need for integration. One is characterized by collective inefficiency, i.e., “a situation where relationships among members of a group are such that group gain falls short of its potential.” Another is distinguished by an asymmetrical relationship, where “one party ‘deprives’ another of something the latter claims to have a right to enjoy.” After that, he continues to discuss criteria determining the scope of integration and notes (1980, p. 164):

...the case for policy integration rests on the assumption that the elements to be integrated are somehow interdependent or linked... From this perspective, issue–areas requiring policy integration would have to be determined on the basis of what empirically constitute distinct ‘interaction systems’ – internally interconnected, externally relatively independent... From a cost–benefit perspective policy integration should be pursued up to the point where marginal cost of integration effort equals marginal gain from policy improvement.

1.1.2 Coastal zone: a focal point for integration

The growing published literature, conferences, and funding suggests considerable interest and faith in integrated coastal zone management (ICZM) (Christie, 2005, p. 208). Such fevers on the coastal zone raise interesting points. What are the distinctive features of a coastal zone? Why do coastal areas as such render the need for integration?

A coastal area, or coastal zone, is defined as the interface or transition zone, specifically “that part of the land affected by its proximity to the sea and that part of the ocean affected by its proximity to the land... an area in which processes depending on the interaction between land and sea are most intense (Sorenson et al., 1990, p. 194).” “Uniqueness” is a common terminology to describe its features by various scholars. According to them, the coastal zone can be characterized by:

- Containing habitats and ecosystems (such as estuaries, coral reefs, sea grass beds) that provide goods and services to coastal communities, while various uses of land and sea resources and spaces are featured by competition, often resulting in conflicts and destruction of the functional integrity (Scura et al, 1992, p. 17).
- The impacts of ocean and coastal uses, as well as activities farther upland, can have on the ocean and coastal environments; also, the effects of uses as such can have on one another (Cicin-Sain, 1998, p. 18).
- Seawards from the tidal limit, the coastal water and its resources are “common” and have been for millennia. The government, by its nature and mandates, often acts as the trustee on these common properties (Clark, 1996, p. 2).

Therefore, the coastal zone system can be perceived by being composed of different elements from various facets. Basically, three premises relating to the composition of a coastal zone can be identified according to the prevailing literature. These are: i) a system of land and sea, ii) a system of economic, environmental and socio-cultural dimension and iii) a combination of resources and their users. Each is featured by their intrinsic nature of being highly interrelated and their interaction among the elements. Take the economic, environmental and socio-cultural elements for example. The way human beings interpret and exploit the resources provided by coastal ecosystems (economic component) is determined by the socio-cultural features of the societies which condition the manner coastal areas and resources are utilized. The economic components, on the other hand, affect the environmental

features which include biological, chemical, and physical aspects of coastal areas and ecosystem, that, in turn, further impact on both the economic and socio-cultural components (Salomons et al., 1999, p. 42). Such complex components interaction serving the first precondition for integrated management.

The common property regime of scarce resources seaward of the coastal zone further exacerbates the situation. Such property regime, in most cases is characterized by 'open access', often leading to the result of a 'tragedy of the commons' (Cole, 1999, p. 106). In other cases, adverse consequences (externalities) of action or utilization by one group on the environment and resources are not adequately taken into account because of their 'common' nature. These adverse consequences would, in turn, exert negative impacts on other user groups and trigger conflicts.

Traditionally, the coastal resources would usually be managed by sectorally oriented resource agencies, such as forestry, fisheries, wildlife, and water pollution. These agencies do, however, recognize the economic activities which seek to maximize the returns from specific resources through single purpose activities (Salomons et al., 1999, p. 40). Reliance on sectoral approaches creates a series of problems, such as development plans which are generally based upon exclusive, single purpose development; inter and intra-sectoral conflicts arise which detract from the effectiveness of development initiatives and investment. The conventional approaches, evidently, have not adequately recognized the distinctive attributes of coastal zone and its resources. The inherent nature of coastal resources, interactions and links within the coastal zone system and traditional sectoral management, therefore, justify the need for integrated approaches.

1.1.3 The YRD coastal zone

The Yangtze River Delta (YRD), formed during thousands of years through the sedimentation and erosion processes, provides us with a unique venue to explore the

issue. Economically, it is one of the most dynamic and booming regions in China; ecologically, the various wetlands, Yangtze River basin and East China Sea (ECS) nurture one of the most diversified terrestrial and marine ecosystems in the world. The area is generally of great value to local people for the services and goods it provides.

However, in recent decades, with the increasing recognition of value provided by coastal resources, various users and populations compete over the finite YRD coastal space. The interconnection and interaction nature of coastal resources and their uses produce externalities and eventually tend to exclude other users from exploiting or enjoying their assets. The increasing population and urbanization along the Yangtze River basin inflict ever-increasing pressures on the coastal environment. These factors generate various spatial, temporal and functional conflicts which beset the whole YRD coastal zone, posing an imminent threat on economic development, ecological resilience and social stability. Despite the efforts made by the central and local governments to restore the coastal zone, little improvement has been achieved. Scholars both from at home and abroad have tried to address the issue from different perspectives.

The PEMSEA (2003) projects described the development of national coastal and marine policy in China. Essential elements of an integrated coastal and marine policy were identified and the major environmental problems and management issues in the coastal zone domain were characterized. Lau (2005) took a theoretical political science approach to explain the Chinese political structure and further analyzes its constrain on the integrated coastal zone management. Yu (1994) offered a national overview of some typical examples of adverse impacts and consequences by irrational coastal uses. Some others, on the other hand, based their researches at the local level. Shi C. et al. (2001) proposed an integrated coastal zone management framework for Shanghai in the awakening of the current pressures and management problems. Chua et al. (1997) present the success in ICZM institutional development

in Xiamen, particularly the establishment of decision-making mechanisms based on consensus building among major stakeholders, and inputs from science and technology.

Specific issues relating to YRD ICZM were also discussed. Li et al. (2004) made an in-depth research for ocean pollution from land-based sources in the East China Sea (ECS). Lin et al. (2001) further explored the spatial distribution of heavy metals and organic carbon in the ECS continental shelf sediments influenced by the Yangtze River and its grain size. Chen et al. (1997) discussed the impacts of construction of three large engineering works on the sediment supply into the Yangtze deltaic coastal system and coastal erosion. Chen et al. (1999) analyzed the Changes in the Biomass of the East China Sea Ecosystem due to anthropogenic reasons.

However, there are still missing links for a holistic solution to the YRD coastal issues. Considering the fact that the administrative boundary does not correspond to the YRD natural setting, any partial considerations will inevitably result in fruitlessness. In light of this, the YRD coastal zone should be considered as a whole. Secondly, various conflicts, as the main reason why integration is required, are rarely mentioned. Last but not least, key institutional arrangements, as the major cause of conflicts and foundation of integration, are neglected in most of the literature.

1.2 Research goal and objectives

The goal of the study is to assess and analyse the current coastal zone management situation in the YRD region, in respect to the institutional framework in managing various user conflicts, to examine the effectiveness and compatibility of the framework, to introduce the concept of ICZM and to discuss the future orientations of the ICZM practices in the YRD.

In order to achieve this goal, the following objectives were established for the study:

- To evaluate the contribution of coastal resources to the regional economy and manifest the value and importance of coasts
- To identify and assess the priority conflicts in the YRD coastal zone in relation to their spatial, functional and inter-generational dimensions
- To examine the current institutional framework in the context of coastal resource management and conflicts resolution and explore its loopholes and deficiencies
- To review the history of ICZM and assess experiences from successful coastal management programmes
- To develop a recommended ICZM framework for implementation by the YRD coastal zone

1.3 Research methodology

The initial literature research concentrated on identifying the data and materials with regard to the history and current environmental profile and coastal utilizations in the YRD coastal zone. In particular, selected resources were focused on a number of major areas of change including the rapid growth of ports and the shipping industry, expansion of mariculture, degradation of coastal water by various sources, depletion of fishery resources and coastal erosion with a particular emphasis on various conflicts instigated by such changes.

Quantitative analysis is divided into two parts. In Chapter 2, an analysis has been conducted to evaluate the coastal and marine industries whose activities heavily rely on coastal resources and their contributions to the regional and local economy. The importance of coastal resources is thus self-evident. Chapter 3 further examines various user conflicts in the YRD coastal zone. Data and material collected from official statistics reports, non-governmental organizations, research institutions and literature were synthesized and analysed to identify the priority issues, detect triggering factors and stress the severity of the problems in the YRD coastal zone.

Institutional analysis is harnessed to examine the coastal management framework in respect to the priority issues identified in Chapter 3. The legal framework, mandated governmental agencies, strategy of management, overall decision-making process in terms of public participation and inter-agency coordination and law enforcement are explored and assessed. Major deficiencies and loopholes hamper the successful and effective management of the coastal zone are identified as the output of the analysis.

Several projects under the auspices of international organizations have provided a solid foundation for presenting the ICZM concept and framework in addressing the user conflicts and management problems. Reports and other publications prepared by PEMSEA under the GEF/UNDP/IMO Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas have been drawn upon to summarize the lessons and experiences in regard to the principles and practices of integration. During the field study in PEMSEA, interviews were conducted and questions were raised to further explore the management mechanisms, detailed process as well as the sustainability of the projects to ensure the dissertation remains up-to-date.

CHAPTER 2

2 THE YANGTZE RIVER DELTA AND ITS COASTAL ZONE RESOURCES

2.1 Profile of the Yangtze River Delta

2.1.1 Geographic location

Being one of the largest rivers in the world, the Yangtze River extends about 6,300 km from the Qinghai-Tibet Plateau and discharges into the East China Sea (ESC). The YRD is located on the central east coast of China, and its drainage area covers about 51,800 km², built mostly by the fluvial sediments from the Yangtze River basin since the post-glacial sea-level rise. The delta generally comprises the triangular-shaped territory of Shanghai, southern Jiangsu province and northern Zhejiang province (Figure 1).

2.1.2 Ecological profile

The YRD is an intrinsic constituent of the East China Sea Large Marine Ecosystem (ECSLME). The Ecosystem is influenced by the warm Tsushima Current, which originates within this ECSLME, and by the Kuroshio Current, of higher temperature and salinity, in the south. It is a monsoonal system, boasted by high productivity, with shallow coastal waters providing spawning and nursery grounds for numerous valuable living resources (Chen et al., 1999, p. 221).

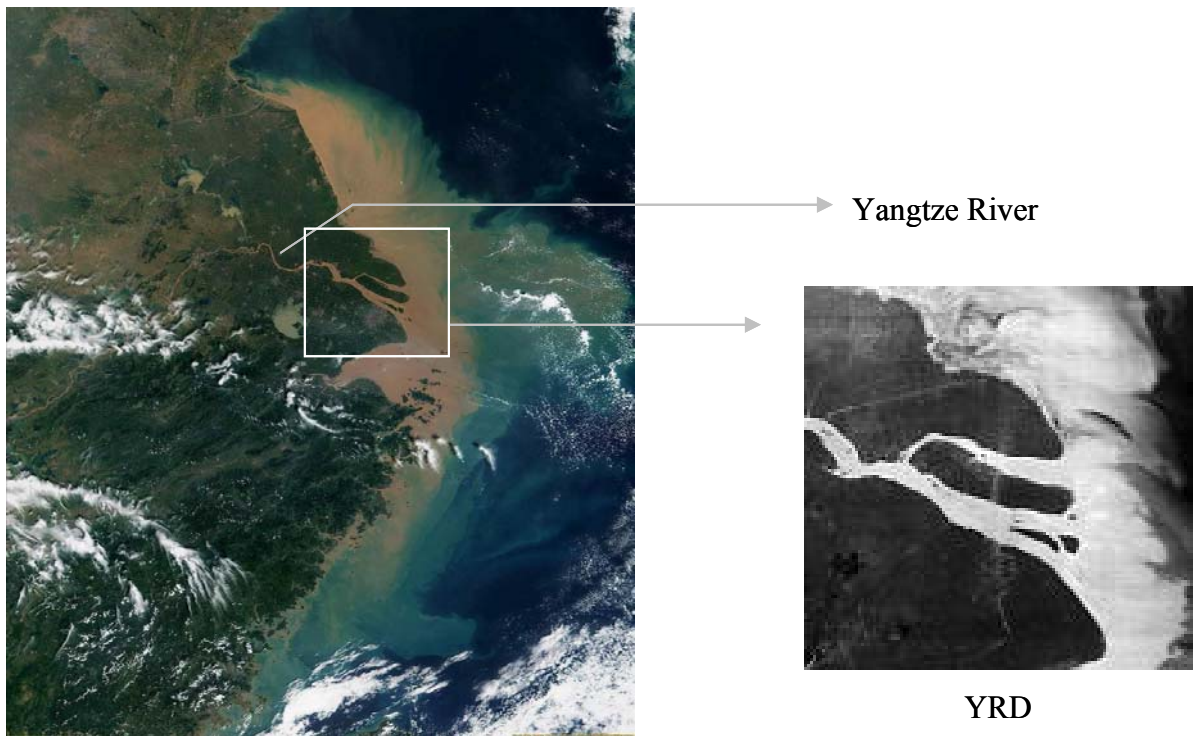


Figure 1 – Geographic location of Yangtze River and its delta

2.1.2.1 Seagrass bed

Seagrass beds are found throughout the region, Of the 12 genus of seagrasses, eight are present, they are, *Zostera*, *Phyllospadix*, *Halodule*, *Cymodocea*, *Syringodium*, *Enhalus*, *Thalassia* and *Halophila* (Simard, 2003, p. 110). Seagrasses provide shelter and feeding grounds for a variety of organisms. As they provide shelter and food during the early life stages of animals when individuals are susceptible to predation, seagrasses are also important nursery grounds, especially for fish. Seagrasses are, therefore, important habitats for fisheries. Seagrass beds generally support more fish than bare substrata. Significantly greater abundance of fishes were also collected from artificial seagrass beds than from bare sand (Fong, 2000, p. 251).

2.1.2.2 Wetlands

The length of the coastline of the Yangtze Estuary is approximately 170 km, with littoral wetlands distributed along the coastline, which cover an area of 40470 ha (Chen et al., 1986). It can be further categorized by supertidal fresh water marshes, intertidal wetland (above sea level, about 14650 ha) and subtidal wetland (at an elevation of -5 m to 0 m, about 25820 ha) (Yuan et al., 2002, p. 312). Most of the natural wetlands are concentrated along the south bank of the Yangtze Estuary, accounting for about 90 percent of the littoral wetlands. Among them, Chongming Dongtan Nature Reserve, due to its extraordinary resources and scenic qualities, was developed into a centre for environmental education and training and listed as a Ramsar site.¹

2.1.2.3 Beaches, Dunes and Cliffs

Sandy beaches, rocky shores and cliffs are found throughout the region. Rocky shores and dunes are found in the south of the YRD. There are also a good variety of sandy beaches from white to black sands and from fine sand to large pebbles (Simard, 2003, p. 111).

2.1.2.4 Species Diversity

Data obtained during a scientific survey from August 1984 to May 1985 confirmed the ECSLME as a Class I, highly productive ecosystem, with a mean value of primary production reaching just over 600 mgCm⁻²d⁻¹ (Chen et al., 1999, p. 227). The productivity is influenced by the runoff from the Yangtze River. It delivers nutrients that affect the composition, distribution and dynamics of the phytoplankton population. Over 200 species of pelagic phytoplankton and about 600 species of zooplankton have been identified. A total of 694 fishery species have been found in the ecosystem. Of these about 200 species are commercially harvested (Chen et al., 1999, p. 227). The key fish species are hairtail, large yellow croaker, small yellow

¹ For detailed information, see http://www.ramsar.org/profile/profiles_china.htm.

croaker, filefish, mackerel, scad, pomfret, Chinese herring, cuttlefish, jellyfish, shrimp and crab.

2.1.3 Socio-economic development

With its abundant natural resources and unique geographic position, the Yangtze River Delta stands an important economic status. Since the introduction of the country's reforming and open policy to outside world, the economy in the delta has developed rapidly. The establishment of Pudong Development Zone in 1992, in particular, promoted the development of Yangtze delta to a higher platform. High-tech industry in the region begins to grow in scales. Harbor and land transportation also experience a significant expansion. In all these fields, the Yangtze River Delta reveals its importance in the country (She, 2003, p. 297). The region only accounts for 0.54% of the total land area of China, but it has 6.2% of the total population and contributes 18.7% to the GDP (National, 2006).

2.2 The multiple use of coastal resources

The coastal resource in the region provides numerous livelihood opportunities for a significant number of the YRD population. Generally speaking, 4 sectors rely heavily on resources and space of coastal zone, namely, fisheries, aquaculture, ports and shipping and waterfront industry.

2.2.1 Fisheries

The broad distribution of seagrass beds and wetlands support important food resources and an ecological niche for diverse organisms, provide good nursery and fishing grounds and embrace three most important fishing grounds, namely, Lusi, Yangtze River Estuary and Zhoushan fishing ground (Table 1). These grounds are

known to be very productive, supplying a large portion of the protein to the populations in the region and surrounding areas².

Table 1 - Some information on the main fishing grounds in the YRD region.

Name	Location	Size (km ²)	Main commercially important fish species
Lusi fishing ground	32°-34°N, 122°-123°30' E	9,060.5	Yellow croaker, pomfret, Chinese herring, eel.
Yangtze River Estuary fishing ground	30°30'-32°N, 122°-125°E	19,202.75	Yellow croaker, Chinese herring, pomfret, hairtail.
Zhoushan fishing ground	28°-30°30'N, 122°-125°E	28,362.88	Hairtail, sea beam, yellow croaker, crab, edible jellyfish, shark, eel.

Source: China Natural Resources Database. (2006). *Fishing grounds in Bohai Sea, Yellow Sea, East China Sea and South China Sea*.

2.2.2 Aquaculture

The Marine aquaculture in the YRD region is mostly operated in shallow seas, shoals and bays. Cultured species extend to fish, shellfish, molluscs and sea weed, such as shrimp, oyster, mussel, scallop, clam, blood clam, razor clam, abalone, red porgy, black porgy, Tilapia, grouper, crab, kelp and laver³. The production of marine aquaculture include floating raft culture, semi-floating raft culture, net cage culture, sea ground sowing, vertical culture, stone adhesion culture and pond culture (NOAA, 2006). The seedlings for aquaculture are obtained from artificial breeding, semi-artificial breeding and collection of larvae from the wild.

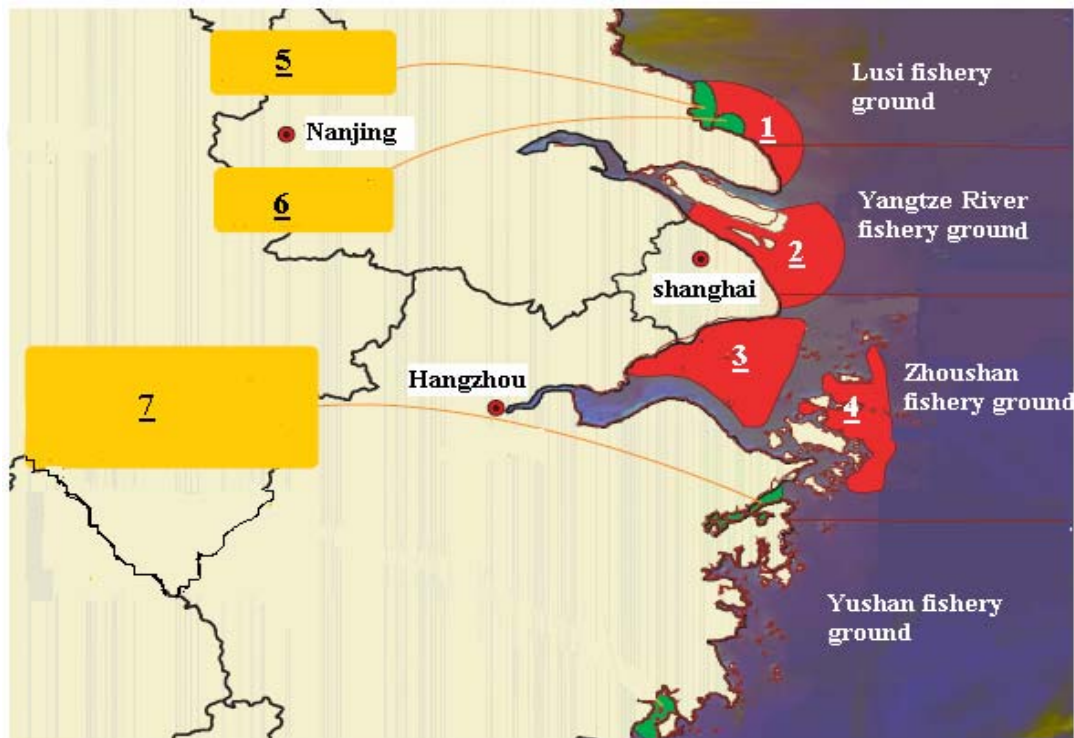
² The China Natural Resources Database web site gives further information on statistics (<http://www.naturalresources.csdb.cn/zrzy/ntBK62.asp?Page=2>) (in Chinese).

³ The China Fishery Statistics Database web site gives further information on statistics (<http://www.cafs.ac.cn/page/cafs/yuyetongji/main.asp>) (in Chinese)

Aquaculture in the region is one of the fastest growing sectors of the coastal zone economy. Socially, the production is seen as an important supplement to local diets and as a valuable source of protein. Financially, it is considered a fast profit earner. Although the volume of total output of mariculture in the YRD region is not available, the booming of the industry can still be perceived from the figure of fishery output in Shanghai, Jiangsu and Zhejiang province from 1997-2001 (Figure 3). The location of important mariculture ground can be seen from Figure 2.

2.2.3 Ports and shipping

With its fast growing economy, China has established its status as the world's largest importer of raw materials. Moreover, as it evolves into the global manufacturing centre, China is also becoming the largest exporter country for products. Amidst the rapid progresses gained by China's economy and its shipping sector, the YRD, the most prosperous economic region in China, are attracting the attention from the world shipping industries. Its unique geographic location and the ample cargo flow resulting from the integration of the ports and the hinterland's economy render the YRD one of the most developed shipping areas in China. The major ports in that region (including the ports of Shanghai, Ningbo, Zhoushan, Zhangjiagang, Nantong and others) achieved cargo turnover of 910 million tons in 2005, or 30.23% of the total in China, and formed the country's single biggest group of coastal ports (Wang, 2006).



1. Lusi offshore fish spawning ground for some commercially important fish species, such as yellow croaker, mackerel, Chinese herring.

2. Important nursery ground for eel, crab, etc. in the Yangtze River Estuary.

3. Hangzhou Bay fish spawning ground for some commercially important fish species, like pomfret, Chinese herring.

4. Zhoushan offshore fish spawning ground for some commercially important fish species, such as hairtail, pomfret, yellow croaker, Chinese herring, etc.

5. Algal farming ground in Rudong, Jiangsu Province.

6. Shellfish aquaculture ground in Qidong, Jiangsu Province.

7. Integrated polyculture ground for fish, prawn and shellfish in Xiangshan, Zhejiang Province.

Figure 2 - Important fishery and aquaculture grounds in the YRD region.

Source: Ministry of Agriculture & State Environmental Protection Agency. (2003). Report on the state of the fishery eco-environment in china. Beijing, China: CFSRI. (in Chinese)

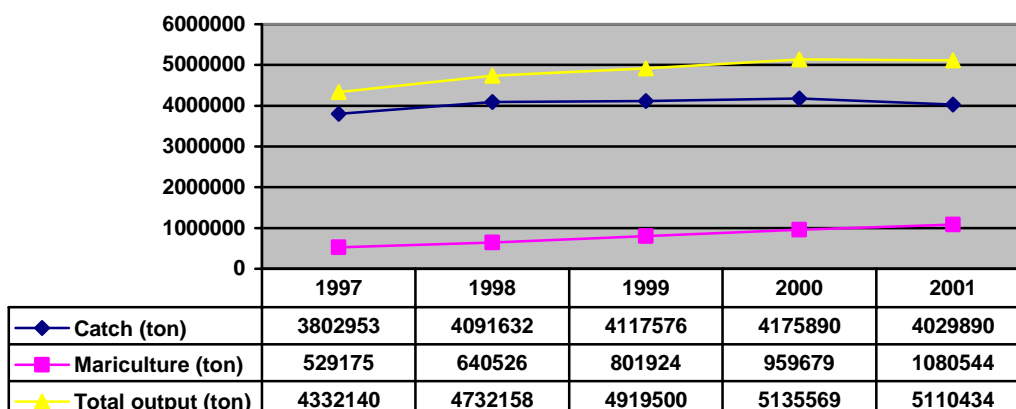


Figure 3 - Output of marine fish landing by catch and mariculture in Shanghai, Zhejiang and Jiangsu province from 1997-2001

Source: China Fishery Statistics Database, (<http://www.cafs.ac.cn/page/cafs/yuyetongji/main.asp>)

2.2.4 Waterfront industry

The development of ports and shipping industry also attracts a considerable number of waterfront industries to the coastal zone of YRD region, especially near the major ports such as Shanghai and Ningbo. There they can benefit from access to low-cost marine and inland transportation systems. Also, most industries, for instance, oil refineries and steel plants, need seawater for processing, cooling purposes or for waste disposal. Some industries have to be located near the shoreline because they draw directly on the marine environment for raw material such as salt plants. Industries are also attracted by labour availability in coastal population centres in the YRD.

Being aware of the mutual benefits between the shipping industry and waterfront industries, the State Council established 15 Free Trade Zones (FTZ) in the coastal zone of major ports back in 1990. Amongst them, 3 (Shanghai Waigaoqiao FTZ, Jiangsu Zhangjiagang FTZ and Zhejiang Beilun FTZ) are located in the YRD and cover a land area of about 16 km² (Tang, 2005). Because the FTZs adopted favourable policies including exemption of taxes and customs surveillance, great

amount of enterprises were attracted. Take Shanghai Waigaoqiao FTZ for an example, from 1990 to 2004, 131 of the world 500 largest enterprises have invested in the Zone (Tang, 2005).

2.2.5 Other ocean industries

The Yangtze River Delta is also known as the "golden triangle" in China's tourism industry as well. Among the first batch of China's excellent tourism cities, 25 percent are located in this area with 48 of them being classified as 4A scenic spots, almost taking up 50 percent of the total 4A scenic attractions in China. In 2003, the domestic and foreign tourists hosted in this area accounted for 30 and 25 percent of the total received in China respectively (Yangtze, 2003).

The offshore oil and gas industry has developed swiftly in recent years. The Pinghu Oil-Gas Field, situated on the continental shelf of the ECS, is the first combined oil gas field with natural gas being its main product. After being put into operation, the field has been providing natural gas of 1.2 million cubic meters per day.⁴ The Chunxiao gas field, located in the EEZ of ECS, has been newly developing since August, 2003 (Takahashi, 2004).

Along with the rapid development of the shipping and port industries in the YRD, the shipbuilding industry is advancing in parallel. In 2003, the shipbuilding output in Shanghai municipality, Jiangsu Province and Zhejiang Province attained 3.74 million DWT, 58.4% of the total shipbuilding output in China. This was a remarkable 71.2% increase against 2002 (Overview, 2005). At present, Shanghai, Jiangsu Province and Zhejiang Province are taking active measures to further improve their shipbuilding and ship repairing infrastructure. The shipbuilding base in Shanghai's Changxing island will be the largest in the world. By 2015, the YRD will be the world's shipbuilding centre.

2.3 The contribution of marine industries to the national and regional economies

In 2002, the total output value of China's national marine industries reached 905.029 billion Yuan, with an annual increase of 9.2%, accounting for 8.84% of the country's GDP (10239.8 billion Yuan) (State Oceanic, 2003). The contribution of the marine industries sectors to the national economy is illustrated in Table 2 and Figure 4.

Table 2 - The output value of marine industries by sectors in China, 2002

No.	Marine Industries	Output Value (Billion Yuan)	Increase Compare with Previous Year
1	Marine fishing	137.645	↓ 0.5%
2	Mariculture	116.458	↑ 7.2%
3	Ports and shipping	134.200	↑ 27.1%
4	Offshore oil and natural gas	36.053	↑ 11.6%
5	Coastal shipbuilding	39.591	↑ 30.6%
6	Coastal tourism	287.486	↑ 14.9%
7	Sea salt making	9.004	↓ 1.1%
8	Beach placer	0.464	↑ 46.3%
9	marine chemical industry	10.375	↑ 36.0%
10	marine biological pharmaceutical and health products	4.743	↑ 127.3%
11	marine electric power and seawater desalination	50.754	↑ 20.5%
12	marine engineering architecture	10.6	↑ nearly six times
13	Other industries	67.656	↑ 57.9%
Total		905.029	↑ 9.2%

Source: State Oceanic Administration. (2003). China's Marine Economic Development in 2002.

⁴ The China Gate web site gives further information on courses (<http://www.chinagate.com.cn/english/208.htm>)

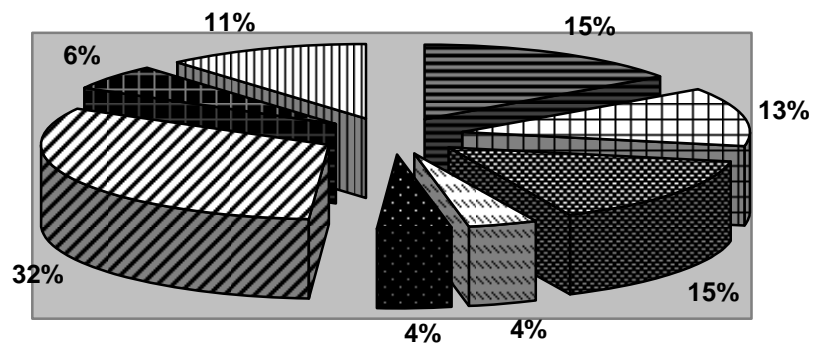
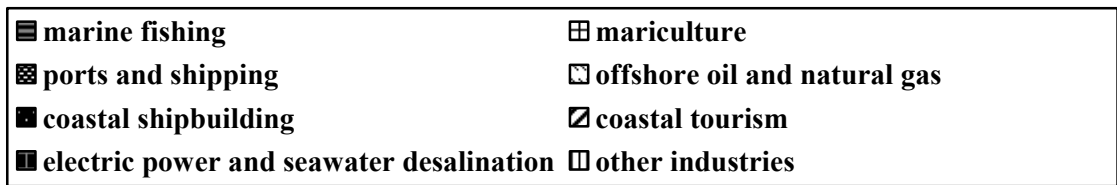


Figure 4 - The composition of major marine industries by value in the PRC, 2002

Source: State Oceanic Administration. (2003). *China's Marine Economic Development in 2002*.

The output of marine industries in the YRD region reached 586 billion Yuan in 2005, account for 34.5% of total yield of national marine industry. Fishery, ports and shipping and coastal tourism are the three leading industries which make up 74.3% of the total output value (China Ocean, 2006). Although there is no direct statistics for marine industries' contribution to the YRD region, the importance of the industries is self evident by its contribution to the local GDP of Shanghai, Zhejiang and Jiangsu Province (see Figure 5).

Apart from these conspicuous contributions to the national and local economy, YRD coastal zone also delivers a number of other services to the inhabitants of the YRD. The assimilative capability of ocean digests most of the urban sewages; unique coastal landscape provides people with perceptions of leisure and amenity; the coastal topography serves significant protection from typhoons and storms. Hence, the YRD coast is an asset of incalculable value.

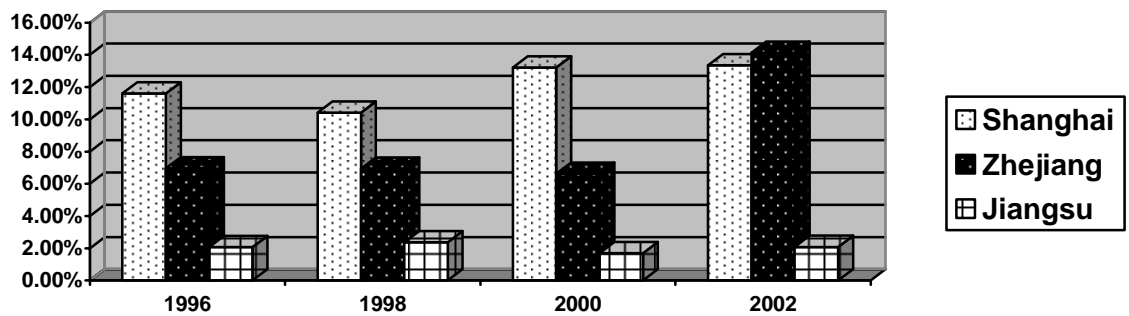


Figure 5 - The contribution of marine industries to the GDP in Shanghai, Zhejiang and Jiangsu Provinces, 1996-2002.

Source: China Ocean Press. (2006). *China Marine Economic statistics yearbook 2005*. Beijing. (in Chinese)

With the increasing awareness and recognition of the value of coastal resources, more players want to participate in the coastal development and resources utilization. Nonetheless, not all the multiple uses can be compatible in the same sea area. A number of negative effects from the large numbers of ocean and coastal uses can be clearly observed today. Several of these activities take place in the hinterland far from the coastal ecosystem. Such effects have a direct impact on the present users of the marine resources. In addition, with the rapid development of the various marine industries of the YRD, the impacts will lead to increasing conflicts between the different industrial sectors. We will discuss different dimensions of these conflicts in Chapter 3.

CHAPTER 3

3 USE CONFLICTS IN THE YRD COASTAL ZONE

Given the diversity of the functions and users of coastal resources, utilization can become mired in conflict and disagreement. These conflicts may arise from competing over limited marine and coastal spaces. Conflicts could also occur where activities on the coast or upland affect the functional utilization of the coastal zone. Furthermore, the excessive exploration and exploitation of resources may deprive the use of these resources from the next generation, giving rise to future conflicts. Therefore, the conflicts in the YRD coastal areas can be categorized by *spatial conflicts*, *functional conflicts* and *conflict of interests between today's and future generations*.

3.1 Spatial conflicts

3.1.1 Conflicts between mariculture and the shipping industry

As stated earlier, shipping and ports in the YRD are one of the most prosperous and fast growing sectors among the marine industry sectors. In 2005, total turnover of seaports in the YRD region reached 1.387 billion tons, increased by 2.94 times compare with 351.99 million tons in 1997. The container turnover in the region attained 26.7 million TEU in 2005, with an annual increase of 29.1% from 2001 to 2005 (Wang et al., 2006).

Skyrocketing trading volumes greatly increases the demand for port capacity and navigational infrastructure. As the major ports along the YRD coastline are suffering from congestion, a new phase of port construction is underway. Shanghai has already

expanded its Waigaoqiao Phase I container terminal. Waigaoqiao Phases II to V and Yangshan Phase I have just been constructed and started its operations. Ningbo Port, the main rival of Shanghai in the YRD, has also expanded and developed Phases II and III of the Beilun container terminals. More port development projects are yet to come: the total budget for the Yangshan Island container terminal project could reach as much as \$16-18 billion, including 52 berth container terminals, a 32 km bridge connecting the islands to the closest on-shore point and a shore based terminal to accommodate auxiliary facilities (Port Technology, 2006). Ningbo Port has also signed the contract with Hong Kong and Taiwan investors to develop its container terminals and facilities.

Mariculture, paralleling the rapid development of shipping and ports, has also seen a tremendous progress. The total area devoted to mariculture increased from 183,013 ha in 1983 to 1,532,152 ha by 2003, more than an eight-fold rise.⁵ Mariculture in Shanghai, Zhejiang and Jiangsu Province occupy 274,852 ha, accounting for 17.9% of the total mariculture area (Table 3).

Table 3 - Aquaculture statistics by species in selected provinces, 2003

Name of Provinces (Municipality)	Fish	Crustacean	Mollusks	Algae	Others	Total mariculture area
Shanghai	9	457	--	--	--	466
Jiangsu	4,005	20,772	119,564	11,177	1,429	156,947
Zhejiang	6,319	37,907	65,388	7,223	571	117,408
China	75,941	306,270	963,698	80,699	105,544	1,532,152

Source: Ministry of Agriculture. (2005). *China Mariculture statistics*. Retrieved June 13, 2006 from the World Wide Web: <http://www.agri.gov.cn/sjzl/2003/211.htm>

⁵ China Agricultural Statistics web site gives further information at <http://www.china.org.cn/chinese/zhuanti/tjbg/709757.htm> (in Chinese)

The fast growth of shipping and mariculture sectors, nevertheless, leads to competition over limited space and eventually generates conflicts. The development of port and navigational facilities can physically exclude other sectors out of the coastal and sea area. The port and its facilities can be broadly divided into infrastructures such as jetties, terminals; and areas designated for navigational use like anchorages, roadsteads and waterways. Port infrastructures are spatially exclusive when issues of safety and security are concerned particularly after the entry into force of the International Ship and Port Facility Security (ISPS) Code. Designation of anchorage and others can also occupy significant areas and push other sectors away.

Similarly, mariculture is also featured by exclusivity in terms of spatial occupation (Clark, 1996, p. 355). For a number of reasons the sector is particularly dependent on the coastal area. Shrimp farming, for example, can occupy valuable intertidal areas which may otherwise be developed as port constructions. Fish aquaculture, also, usually use cages or pens and involves placing a mesh or wire cage in a near shore, open water system, can also impede the navigation and mooring of ships. The fast development of these two sectors inevitably leads to clashes of interest when land and sea spaces are concerned.

The rapid rise in turnover of cargo in Ningbo Port has greatly increased the demand for the clearance of waterways and anchorage. However, these waterways and anchorage, more often than not, are encroached by mariculture rafts (China Waterway, 2005). Dozens of vessels calling at Ningbo reported that the rudders were entangled by mariculture rafts or nets. Painstaking efforts were made to clear the rafts from marked anchoring areas after consulting with the fishermen. The Port also suffered economic loss due to increases in Port congestion and the number of ships' berthing days because of diminishing anchorage. Fishermen, on the other hand, complained of increasing cage damage and fish mortality due to ships' navigation

and anchoring. Such conflicts were also reported elsewhere in the YRD and cause considerable losses.

3.1.2 Conflicts between wetland reclamation and resource uses

The natural wetlands in the Yangtze Estuary are important in China for their biodiversity and various ecological functions. The region is of important ecological and socio-economic value due to its great biodiversity and the presence of key habitats. It is also significant for the development of resources and protection of the ecological environment related to the YRD (Figure 6). While the multiple values of a wetland ecosystem in coastal land cultivation, protection against erosion, resource enhancement for fisheries, foods, medicines, chemical and timber industries, tourist sites, purification of water quality, and mitigating adverse effects of greenhouse gases, etc., have been widely recognized by the international community, they have been neglected by government and local communities.

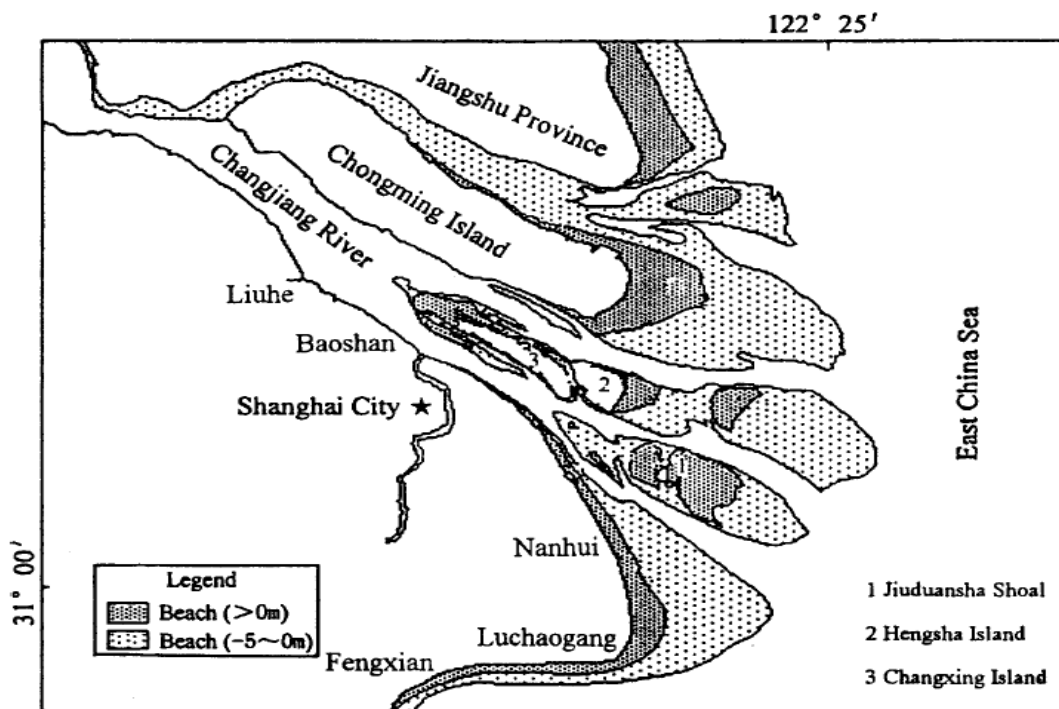


Figure 6 - The distribution of wetlands in the Yangtze Estuary, China

Source: Yuan, Z., Liu, H. and Lu, J. (2002). The ecological and environmental characteristics and conservation of the wetlands in the Yangtze Estuary. *The Environmentalist*, 22, 311–318.

During 1950-1985, nearly 1.19 million ha of tidal lands in China were reclaimed for agriculture, salt making fields, shrimp farming, ship berths and other uses. In the early 1990s, already over one-third of the country's tidal lands were lost, with a rate of decrease at 340 km² per annum (Yu, 1994, p. 169). The phenomenon is especially pronouncing in the YRD region where population increase and economic activities exert great pressure on land spaces. Since the 1950s, tidal flat wetlands of the estuarine area have been reclaimed by 76700 ha, which amounts to 33 percent of today's natural wetlands and is equal almost to the wetland area above sea level. For example, the wetlands of Chongming Island that have been reclaimed amounts to 49000 ha. Coastlines from Baoshan to Nanhui have been almost fully developed by human exploitation (Yuan et al., 2002, p. 312).

Negative impacts of reclamation and tidal flats losses are inevitable. Tidal flats serve as nurseries for innumerable organisms of the sea and coastal zone, as well as the habitats for plants and animals. Reclamation disrupts the local ecosystem through providing a means for anthropogenic inputs to find ways into the environment. Tidal land reclamation contributes significantly to the loss of wetland fauna and flora in the YRD. The interests of local fishermen whose livelihoods are heavily dependent on the wetland resources could be severely impaired. The access to the fishing ground may also be cut off by newly claimed land which may serve exclusive use. The loss of subsistence could give rise to serious disputes and conflicts over the protection and reclamation of tidal lands.

3.2 Functional conflicts

3.2.1 Conflicts arising from transjurisdictional water pollution

The unique geographical location of the YRD determines the region's environment and ecosystem and is susceptible to the anthropogenic activities not only along the coastal line, but also through the Yangtze River drainage basin. Point and non-point pollutions discharged in the upstream of the River and its tributaries

can severely affect the economic function of marine industries in the downstream and the river mouth.

3.2.1.1 Nutrients and coastal eutrophication

With a runoff of $9.25 \times 10^{11} \text{ m}^3$ annually, The river is by far the largest source of sewage and effluents from land-based activities that are discharged into the YRD coastal seas (Figure 7) (Yangtze River, 2004). The Yangtze River basin receives 45% of the total industrial effluent of China and 37.5% of the municipal sewage of China. Annual sewage discharge from the 21 cities along the main stream of the Yangtze River is 6.3 billion tons, which still keeps growing at the annual rate of 3.3%. 70% of the cities do not comply with the national discharge standard, and directly lead the sewage into the river with little treatment (Li et al., 2004, p. 110).

The situation along the coastal line of the YRD region is also discouraging. According to a report on ocean environment in China by State Oceanic Administration (SOA), 84% of the sewage discharge pipelines under monitoring exceeded the discharging standards in 2005. The main pollutants flowing into the ocean through those pipelines include inorganic nutrients, coliform bacteria. In Shanghai, Jiangsu and Zhejiang, 89.6% of the pipelines (95 out of 106) discharged the sewage higher than the national standards (State Oceanic, 2006).



Figure 7 - The Yangtze River drainage basin and the anoxic areas in the ECS

Source: Li, D. & Daler, D. (2004). Ocean pollution from land-based sources: East China Sea, China. *AMBIO: A Journal of the Human Environment*, 33 (1), 107–113.

Non-point pollutants leaching from farmland and forests or through deposition of airborne nitrogen and phosphorus compounds constitute another important source of nutrients. As the population in the Yangtze River basin had doubled in the past 40 years (Huang et al., 2006, P. 129), increasingly agricultural and industrial activities have inevitably enhanced the loads of nitrogen and phosphorus to the air, soils, rivers and lakes, thus greatly boosting the possibility of leaching out or carrying by the air and eventually deposit into the sea.

As a result, in the past two decades, nutrient pollution has exacerbated and the polluted areas are expanding continuously. The average concentration of inorganic nutrients in the Yangtze estuary was higher than Class I of State Water Quality Standards in 1985, and by 1991 the concentration exceeded the Standard by more than 9-fold. In 1994, the situation worsened and inorganic nutrients rose up to 14-fold more than the Standard (Li et al., 2004, p. 111). The sewages and nutrients primarily origin from the Yangtze River produced the most polluted sea area in China (Figure 8).

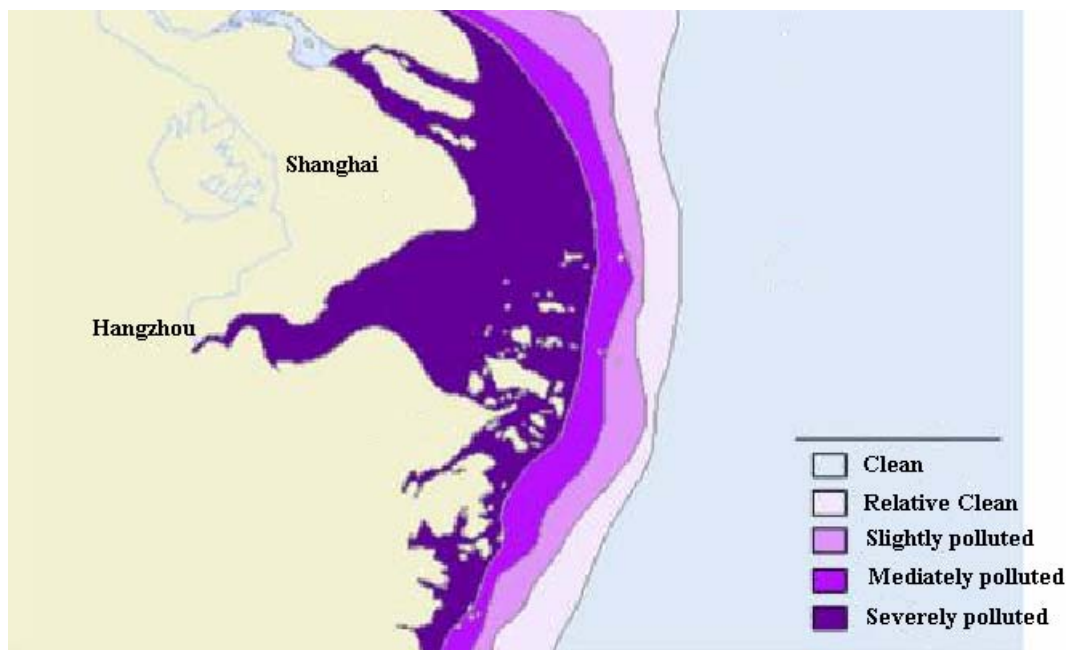


Figure 8 - Marine environment status of the YRD

Source: report on ocean environment in China, 2005

Large quantities of nutrients introduced from the Yangtze River basin and coastal cities have broken the balanced system of marine nutrient cycle. Eutrophication of the coastal ocean and estuarine area very often stimulate the occurrence of red tides. Parallel with the deterioration of marine and blackish water quality, both the scale and frequency of red tides in the YRD coastal area have seen a dramatic rise since 1980s. The occurrence of red tides added up to 46 through 1980s in the whole ECS, while in 2004 alone, the Yangtze River estuary and sea areas witnessed 44 red tides, with a coverage exceeding 17,660 km² (State Oceanic, 2006) (Table 4).

Oxygen depletion and death in the benthic zone can be the direct consequences of red tides. Even worse, the decomposition process of dead algae by bacteria in the anoxic layer produces hydrogen sulphide that makes deoxygenated areas of the seabed almost totally unfit for animal life. Such changes would have severely

deleterious impacts on the large marine ecosystem and cause huge losses to the fisheries, mariculture and tourism industries.

Table 4 - Comparison of red tides in the YRD coastal sea, 2003-2004

Coastal areas	Occurrences		Affected area (km ²)		Major species inducing red tides	
	2003	2004	2003	2004	2003	2004
Jiangsu	0	2	0	100	--	<i>Gonyaulax polygramma</i> , <i>Noctiluca scintillans</i>
Shanghai	8	4	2280	1100	<i>Skeletonema coastatum</i>	<i>Skeletonema coastatum</i> , <i>Prorocentrum triestinum</i>
Zhejiang	49	38	8970	16460	<i>Prorocentrum triestinum</i>	<i>Prorocentrum triestinum</i>

Source: State Oceanic Administration. (2006). *China marine Environmental Report 2000-2005*. Beijing: China Ocean Press. (in Chinese)

A significant harmful algae bloom occurred at the Zhoushan area of the YRD in May, 2005. The outbreak extended to an area of 7,000 km² and killed numerous marine animals. Fishery and mariculture were heavily smitten—not only those who suffered from fish mortality, but also fishermen in the vicinity of the area—the market refusing to purchase the fish from the red tide region. Coastal tourism industry, which primarily depends on the integrity and cleanliness of littoral vista, also bore great loss. The total loss from this single damage amounted to 19.7 million Yuan (State Oceanic, 2006). The situation of fishermen was made even more miserable when they were unable to claim the loss against any entities due to the reason that it is impossible to attribute the cause of red tide to any individual.

Another source of anxiety is the fact that algae, such as certain species of dinoflagellates, often appear to produce toxins. These toxins are of three main types, namely PSP (paralytic shellfish poisoning), DSP (diarrhoetic shellfish poisoning) and NSP (neurotoxic shellfish poisoning). They can be accumulated in bivalve molluscs and cause illness in human beings and sea birds that eat bivalves. Although there are no statistics for the impacts of toxic algae bloom on human health in the YRD region, we still can extrapolate the severity of situation by learning shellfish poisoning affected more than 1,800 people and 31 people died from the 1960s to 2000 in China (Zhou et al., 1999, p. 334). Needless to say, a great number of conflicts can be generated between the victims and polluters.

3.2.1.2 Heavy metals and persistent organic compounds

The special deposition of heavy metals (mainly copper, lead and cadmium) in sediments of the YRD has shown clear historical changes, especially during the past two decades. The highest concentrations of heavy metals were found at the surface, the concentrations decreased rapidly with increasing depth. Similarly, higher concentrations of heavy metal were observed in sediments near the Delta than those away from the Delta, which indicated that anthropogenic sources are becoming an important factor controlling heavy metal concentrations in the ECS inner shelf sediments especially during the past decade (Lin et al., 2002, P. 390).

The extent of this increasing trend is quite alarming since the entire inner shelf is most likely at risk from the Yangtze River. There was about 28000 tons of heavy metal discharge from the Yangtze River Basin into the ECS in 2005 alone (State Oceanic, 2006). Most of heavy metal was the contribution of the dense industries along the River basin, which was transported through the atmosphere or directly discharged into water. The heavy metals are readily absorbed and accumulated by animals and human beings. Cadmium is taken up by plants, such as cereals, fodder crops, and is thus passed on to human beings. It has also been found that, in fish, cadmium can disturb reproduction, inhibit growth, reduce the formation of white

blood cells and impair oxygen uptake. Osmoregulation and blood enzyme balance may also be disturbed in fish, these in turn leading to skeletal deformities. Lead, in high concentrations, can even damage the blood-forming organs, nervous system and kidneys of human beings. Such a high concentration of heavy metals out of the YRD poses an imminent threat on the public health. The possible outbreak of heavy metal related diseases can result in significant conflicts between local on-site residents and off-site pollutant discharging industries.

On the other hand, the information regarding persistent organic compounds is less disheartening. According to the monitoring data of variations of biogenic hydrocarbon (BHC) and DDT contents in the surface sediments of the Yangtze River estuary over the last decades, it can be seen that BHC and DDT contents have decreased rapidly after the use of organochlorinated pesticides was banned by the Chinese Government in 1983 (Table 5) (Li et al., 2004, p. 110). Although remaining pesticides can still affect the marine environment and marine organism for decades to come, the concentrations of organochlorinated pesticides in the ECS are much lower than the State Water Quality Standards.

Table 5 - Variations of BHC and DDT contents in surface sediments in the Yangtze Estuary since the 1980s (ng g⁻¹)

Time	BHC	DDT
Aug. 1981	3.26	12.38
Jan. 1992	-	0.94
Oct. 1997	0.38	0.17

Source: Li, D. & Daler, D. (2004). Ocean pollution from land-based sources: East China Sea, China. *AMBIO: A Journal of the Human Environment*, 33 (1), 107–113.

3.2.2 Functional conflicts among coastal users

Coastal users, during their utilization of coastal resources, can deprive others of the right to enjoy or exploit. The shipping sector, for instance, can bring great loss to

other sectors through affecting the environment and coastal resources. Port construction and maintenance dredging can change the sediments, degrade sensitive habitats and water quality, which will eventually influence tourism, aquaculture and fishery. The introduction of alien invasive species through pumping of ballast water from ships is a major environmental concern since those species have virtually destroyed the endemic fauna, reduced the biodiversity and altered the whole ecosystems. The invasion of *Rapana venosa* in the YRD, probably through the vector of ships, has been recognized as an imminent threat on local marine ecosystem. *Rapana venosa* is a predatory gastropod with a characteristic deep orange aperture and columella, characterised by a strong ecological fitness due to high fertility, fast growth and tolerance to low salinity, water pollution and oxygen deficiency. Moreover, the long distance dispersal of *Rapana* larvae is assisted by a planktonic phase lasting from a minimum of 14 to a maximum of 80 days allowing accidental transfer throughout the oceans within ship ballast waters.⁶ *R. venosa* has caused significant changes in the ecology of bottom-dwelling organisms and has the potential to damage native bay species. All these factors make the ‘Rapa whelk’ one of the most unwelcome invaders in the ECS and YRD.

Apart from playing the role as a vector, the ship can also become a perpetrator in damaging the coastal and marine environment. Tributyl tin, as anti-fouling coatings which was widely used on ships, can harm the endocrine systems of a wide range of wildlife species and severely affect the integrity of marine ecosystem. CO₂, SO_x emission and oily discharges from ships are widely recognized as hazards to the public health and social amenities. Accidental spills releasing toxic oil and chemicals can even instigate public panic and cause the collapse of tourism, fisheries and aquaculture.

⁶ The ISSG Global Invasive Species Database web site gives further information at <http://www.issg.org/database/welcome/>

Coastal waterfront industries particularly heavy industries pose a variety of threats that go well beyond the plant sites. The construction of factories may require the dredging of a deep-water channel or put increased pressure on infrastructure – waste disposal, water and electricity supply, land and air transportation links – each with its own potential for ecological disruption. Also, the wastewaters from coastal industries can seriously jeopardize coastal ecosystems. These impacts range from relatively minor disturbances (such as temporary, localized turbidity increase) to major disruptions (e.g., water pollution caused by discharge of toxic chemicals). Fisheries and mariculture will be heavily affected due to such impacts.

Mariculture, on the other hand, can also be detrimental to other marine industries. Aquaculture may be either a polluter or a petitioner for a clean environment. That is, success in aquaculture requires a clean water supply from the environment and intensive aquaculture practices themselves may pollute coastal waters and reduce biodiversity. Conflicts can be also generated when marine farming attracts predators and causes extra losses to fisheries. Furthermore, mariculture practices can introduce alien invasive species when the raised species escape from the cages or offspring of those species migrate to other areas. Thus, more conflicts can be triggered even between aquaculture and fishery.

3.3 Conflicts on resource use between this generation and the next

3.3.1 Coastal erosion and sea level rise

Massive engineering works can change the hydrological and sedimentation process of the river and enhance coastal erosions which, in the long run, will cripple vast on-site waterfront industries and cause huge losses. As mentioned previously in this study, the YRD has been formed mostly by the fluvial sediments from the Yangtze River basin since the post-glacial sea-level rise. The intricate balance between the accretion and erosion of the Delta is determined by sediment supply from the basin. Studies indicate that the changes in sediment input into the coastal system are dependent on the two factors: (1) the sediment output from the Yangtze

River basin to the estuary; and (2) from the river estuary to the south coast system (Chen et al., 1998, P. 736). The sediment output from the drainage basin is further decided by the sediment source available and the hydrological processes on which human activities have exerted an increasing impact. It was also proposed that the deltaic growth tendency can be held back or dramatically reduced in accretion rate if the sediment output from the river decreases by more than 10-20%, and consequently coastal erosion can become intensified in both spatial extent and intensity, because the fine-grained sediments are easily eroded and transported out of the coastal system by tidal and currents (Chen et al., 1998, P. 735).

It was anticipated, nevertheless, that the sediment supply would decrease significantly due to the large construction and engineering projects related to the Yangtze River. Three key projects will have the most significant impacts, namely, the three-gorge dam, water diversion schemes and channel dredging and sediment transport routes within the estuary.

The three-gorge dam is the largest hydroelectric dam in the world. Because of its potential adverse impacts on the environment in the lower reaches and the estuarine area, it is also one of the most controversial constructions. According to the Water Conservancy and Hydro-electric Academy of Sciences, the proportion of suspended sediments trapped by the reservoir will be as high as 57.9-69.4% during the first 48 years after the completion of the dam construction. This means a reduction of 281-337 million tons of suspended sediment supply, 60-70% of the total annual sediment discharge from the catchment to the estuarine-coastal system (Chen et al., 1998, p. 738).

The water diversion schemes are aiming at transferring water resources to North China where water shortage is besetting the area. Currently being planned and under construction, three large-scale south-to-north water diversion schemes have already start their first phase and will be functioning from 2010. According to the initial plan,

the total amount of water to be transferred to North China from the Yangtze River basin is up to 80,000-90,000 million m³ by the year 2020, about 10% of the Yangtze's total runoff discharge into the sea (Chen et al., 1996, p. 260). The reduction of runoff, however, can incur reduction of sediment supply in the lower reaches of the river.

The third construction pertains to a development plan approved by the central and local government in which the navigation channel through the North Passage of the Yangtze River will be dredged downwards to allow 50,000 DWT vessels entering and exiting Shanghai harbour during all stages of tide. The impact of such dredging seem to encourage more sediments to be transported through the North Passage into the sea, resulting in less sediments being deposited on the shoals along the passages and the south coast of the deltaic plain (Chen et al., 1998, p. 741).

Given the fact that the shoreline of the YRD is highly susceptible to the changes in sediment runoff from the river basin to its estuary, the aforementioned three projects can cause a reduction of sediment discharge and subsequently result in serious shore erosion. The report on the Yangtze River sediment has already confirmed the remarkable reduction of sediment output from the statistics of four major hydrological stations (Pingshan, Yichang, Hankou and Datong) along the Yangtze River.

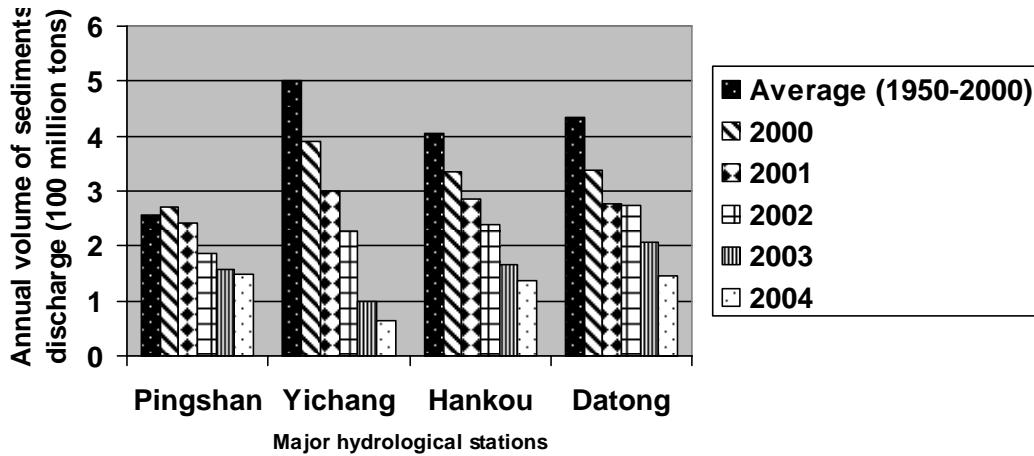


Figure 9 - Annual observed volume of sediments by four stations from 2000-2004

Sources: Yangtze River Hydrology Bureau. (2005). *Yangtze River Sediment Report 2000-2004*. Retrieved June 16, 2006 from the World Wide Web: <http://www.cjh.com.cn/doc%5Cda/04-10-20-10850930492462/uploadfile.htm> (in Chinese)

With such a dramatic reduction of sediments discharge, it can be envisaged that general delta recession will replace accretion and cause severe coastal erosion in the coming years. Nature has already show signs of warning. The shoreline in the south coast of YRD adjacent to Hangzhou Bay has retreated severely in recent years (Chen et al., 1998, p. 734). On the other hand, the sea level is rising at a significant rate under the influence of global warming. The SOA released the Bulletin on Sea Levels in 2003 and announced the sea level of Chinese coastal regions has consistently risen for decades. By 2003, the sea level of coastal regions has risen 60 mm at an annual rate of 2.5 mm over the past five decades (China Oceanic, 2004). Even worse, some parts of the YRD coastal zone have already sunk due to the over-exploitation of underground water (Shi et al., 2001, p. 416). The YRD, due to its distinct sediment strata and deltaic topography, is especially susceptible to these multi-impacts, which can lead to the loss of coastal lands, a substantial change in the ecosystem, saltwater intrusion and a further encroachment on the habitat of rare species. Drainage systems in coastal cities could also be hampered, posing a direct endangerment to coastal city

inhabitants. Ports, waterfront industries and tourism will firstly be influenced in that they stand at the forefront of the shoreline. Fisheries and mariculture will also be affected because changes in the sediment and shoreline will modify the habitats in which marine organisms live. Although these changes will be long-term and attract less attention from the public, they will definitely have deleterious implications on the next generation. The future generation, who are deprived of their rights of using coastal resources under the combined impacts of coastal erosion and sea level rise caused by this generation, will surely blame such irresponsible activities on the actions of their predecessors.

3.3.2 Fishery depletion

As an indispensable constituent of the ECS large marine ecosystem, the variation of fishery resources in the YRD sea area can be directly reflected by changes in the biomass of the ECS. According to the surveys by Chinese and Japanese scientific groups, about 5.50 to 6.00 million metric tons (MMT) of fisheries resources exist in the ECS, of which about 2.75 to 2.90 MMT could be caught. China, Japan, North and South Korea have caught 4.00 MMT per year to date, resulting in the overexploitation of these fisheries resources (Chen et al, 1999, p. 237). In general, species structure and population abundance have reduced dramatically. The harvest of individual species is moving towards a lower age, smaller size and earlier sexual maturity.

As stated earlier, about 200 out of 694 species in the ESC are commercially harvested (Chen et al, 1999, p. 231). Total landings in the ECS have increased by over 300% (Table 6), from 988,459 t in 1950 to 4,760,953 in 2003. The marine fish catch reached its peak in 1999, with a staggering landing of 5,661,966 t.⁷ After that, the fish catch saw a pronounced shrinkage. There is still no sign of recovery so far, indicating most fish species have been overexploited or depleted.

⁷ The Sea Around Us Project web site gives further information at <http://www.searoundus.org/lme/SummaryInfo.aspx?LME=47>

Table 6 - Mean catch for the ECS, by decade

Decade	Mean catch (1,000 t)	Increasing rate
1950s	1,716,211	--
1960s	2,602,922	+51.67%
1970s	3,207,005	+23.21%
1980s	3,862,979	+20.45%
1990s	4,961,051	+28.43%
2000s (2000-2003)	4,940,881	-0.41%

Source: The Sea around Us Project web site statistics information at <http://www.searoundus.org/lme/SummaryInfo.aspx?LME=47>

Despite the increasing fish yield, the catch per unit effort (CPUE) is declining. The CPUE of motorized fishing boats in the ESC was about 1.5 t during 1957 – 1967. The figure decreased to about 1.0 t during 1968 – 1978. After 1970, it continued to decline to 0.70–0.44 t and reduced to only a third of the catch obtained before 1967 (Chen et al, 1999, p. 235).

About 25 are generally considered as commercially important species and the annual catch of them exceeds 10,000 metric tons in the ECS. Before the 1980s, the key dominant species in the ECS were the largehead hairtail (*Trichiurus lepturus*), large yellow croaker (*Larimichthys croceus*), butterfish (*Stromateidae*), chub mackerel (*Scomber japonicus*) and pilchard (*Sardinops sagax*). After 1980, the species composition changed gradually due to the stocks of these dominant species decreasing sharply. The catch of some traditional low – valued stocks such as small yellow croaker and crustacean, however, has increased rapidly (Figures 10 and 11).

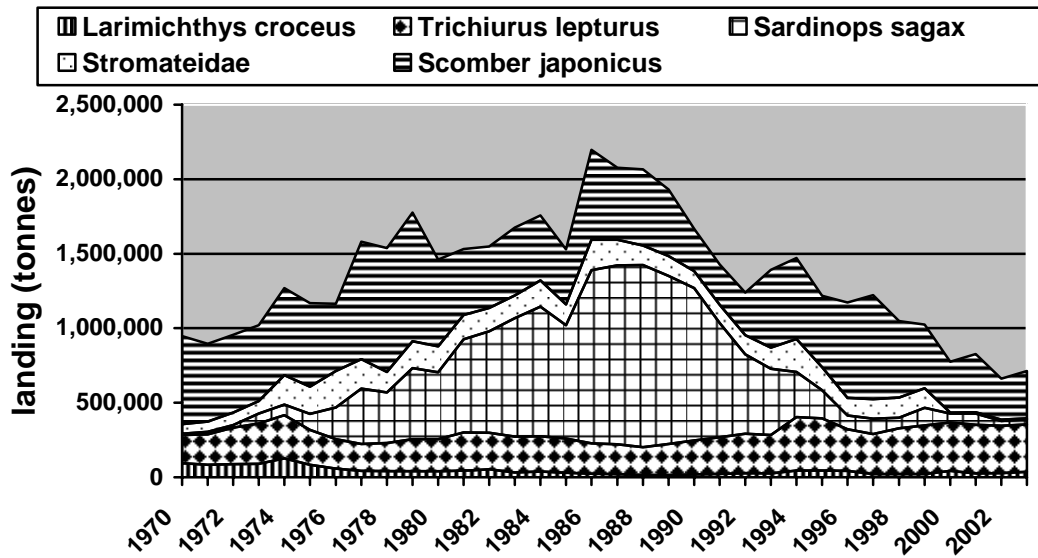


Figure 10 - Declining landings of old dominant species, illustrating change over time by species from 1970-2003

Source: the sea around us web site provides statistics information at <http://www.searoundus.org/lme/SummaryInfo.aspx?LME=47>

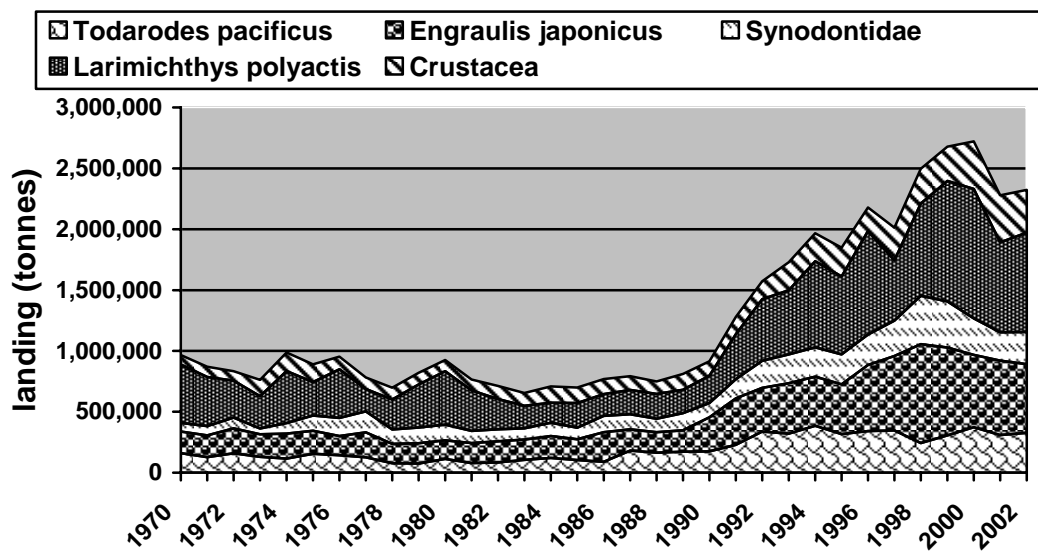


Figure 11 - Increasing landings of new dominant species, illustrating changing over time by species from 1970-2003

Source: the sea around us web site provides statistics information at <http://www.searoundus.org/lme/SummaryInfo.aspx?LME=47>

In addition to composition changes, biological characteristics have also changed. The small yellow croaker now grows quickly and reaches sexual maturity early. In 1959, the length at maturity was 140 – 160 mm, the percentage of sexually mature fish at age 1 was less than 5%. In comparison, the length at maturity reduced to 120 – 140 mm and the percentage of sexually mature fish increased to 40% in 1981 (Chen et al., 1999, p. 236).

Clear evidence has shown that the large marine ecosystem in the ECS is severely jeopardised and exacerbated. Old dominant commercial fish resources are below the endangered threshold level and will not be viable for future generations if no further actions are adopted. Even newly exploited fish can be depleted if current catching efforts are maintained. In addition, the loss of wetland and intertidal zones due to land reclamation and coastal erosion, heavy pollution from excessive sewage and heavy metal discharge in the Yangtze River basin and coastal cities pose a great threat on the sustainability of fishery resources. If the current trend continues, future generations will be deprived of fundamental rights of fishery resource utilization, either for animal protein intake or pharmaceutical research. Perceived conflicts can be envisaged between this generation and the next.

Increased demand for coastal zone or coastal resource use raises the possibility of conflicts. They can emerge as a result of competing over scarce ocean and coastal space, or by adverse effects of one use on another use both in spatial and in inter-generational contexts. These conflicts threaten the resilience of the marine ecosystem; jeopardize sustainability of resources utilization, deprive local stakeholders of their subsistence and even contribute to the accumulation of hostility among the users and localities. Two intriguing questions arise from the discussion of this chapter. First, what is the intrinsic nature of coastal resources, does such nature contribute to various conflicts? Second, why such conflicts still exist or even exacerbate despite the management efforts by the government? We will explore these issues in the next chapter.

CHAPTER 4

4 INSTITUTIONAL ANALYSIS OF THE YRD COASTAL MANAGEMENT FRAMEWORK

4.1 Central role of property rights in coastal conflicts

Apparently, conflicts in the coastal areas often involve issues of resource allocation. Traditionally, there is widespread opinion that markets are the most effective and efficient institutions to allocate scarce resources (Löfgren, 2000, p. 3). So, we may ask, why the YRD has already espoused the market approach, the economic activity is still entrenched in undesirable environmental consequences? To answer this question, we have to explore the very essence of coastal resources. As Glavovic et al. (1997, p. 270) stated, ‘At its deepest level, environmental conflict is the division that arises over competing demands for individual and collective rights . . .’ Where major differences occur regarding how resources should be allocated, an understanding of the property right and its distributing mechanism is essential.

Property rights can be understood as characteristics that define the rights and duties in using a particular asset or resource. Perfect property rights have specific characteristics: specificability, exclusivity, transferability, and enforceability (Ma, 2006). Specificability means that the resource is privately owned and that what the owner may do with the resource is properly defined. Exclusivity means that the costs/benefits of ownership must belong solely to the owner of the property. That these rights are subject to voluntary exchange between the owner and another party is referred to as transferability; and enforceability refers to the protection the rights

have under law. According to Bromley (1989, p. 11), natural resources can be utilized under any of the following property rights regimes:

1. Under a *state property* regime the ownership and utilization of the resource is controlled by the state. Individuals may be allowed to use the resource, but only according to the rules imposed by the state.
2. Under a *private property* regime, the right to utilize the resource and to buy or sell it is controlled by individuals.
3. In a *common property* regime a group of owners can control the use of the resource and prevent others from using the resource. The members of the group have specified rights and duties.
4. Under an *open – or free – access* regime, each potential user of the resource has complete autonomy to utilize the resource since no one has the legal right to prevent anyone from using it. One cannot speak of property since there are no property rights.

The majority of coastal environmental areas and resources in the YRD region, more often than not, are under state or free–access regimes. This is mainly due to the following reasons:

- (1) It is impossible to allocate the property rights to specific individuals due to their inherent nature which prevent the specificability or enforceability of their rights. In other words, the property of the resource can not be defined or current technology prevents enforcing such rights. Resources such as air, seawater and fish stocks are under this category.
- (2) States deliberately establish the state property regime to ensure the public have open access to those resources or to preserve the environment. Examples are public beaches and marine protected areas.
- (3) States are empowered by the nationals to act as the ‘trustee’ of the resources in that they are “the common heritage of mankind”. Most minerals, petroleum and natural gas are among this category.

(4) National legislation provides that certain resources should be subject to the governance of the State. Coastal land and freshwater resources come under this category.

It is obvious why property rights, along with their distribution, contribute so much to the generation of coastal conflicts. First of all, open access to the finite resources will eventually lead to the “tragedy of the commons”. For a particular resource, owner who can be sure that the situation will continue in the future (as in the case of private or common property regimes), it is in the interest of utilizers to manage and harvest the resource in a sustainable way. Under the free-access regime, the situation is completely different. There is no resource-owner and those who utilize the resource have no incentive to pursue careful management or the conservation of the natural asset, thus eventually results in the resource deplete.

Also, conflicts can be instigated when the uses of one group have negative externalities on the utilization of another group. Coase suggested free market system can solve such externalities through bargaining between the affected parties (Coase, 1960, p. 1). However, the theory was based on some key assumptions including zero transactions costs and well-defined property rights. None of those requirements can be satisfied under the regime of coastal resources. As aforementioned, resources such as air, seawater and fishes cannot be assigned property rights due to their inherent nature. So when the economic activity of one party affects these natural resources, externality will still exist because no individual has the *locus standi* to claim the loss. On the other hand, the externality in the current context is frequently characterized by involving a large number of actors. Coastal pollution and erosion, for example, would have impacts on numerous users and residents. Needless to say, the transaction costs involved will be huge. Therefore, malfunctioning of markets, induced by inherent nature of coastal resources, fail to allocate resources in a socially desirable manner.

Property rights characteristics of a coastal resource thus render particular challenges for the governance. Governance in this context refers to the framework of social and economic systems and legal and political structures through which the coast is managed (Brown et al., 2002, P. 23). The institution constitutes the very essence of governance, by which the sets of rules structure human behaviour and regulate the allocation and utilization of coastal resources. Institutions are thus made up of formal constraints (rules, laws, constitution), informal constraints (norms of behaviour, conventions and self-imposed codes of conduct) and their enforcement characteristics. This study focuses on the formal institutional arrangement including structure of government organizations and legal framework in the context of coastal management, the objective of which is to identify the effectiveness of those instruments in conflicts resolution and resource management.

4.2 Institutional framework for coastal management in the YRD region

4.2.1 An overview of the institutional system

4.2.1.1 Governmental structures

China has a multilevel political system which embraces five hierarchies; they are: the centre, provinces and ministries, prefectures, cities and townships. Every governmental office has a bureaucratic rank assigned to it. In addition, one territorial level of government contains within its organs several bureaucratic ranks (Lieberthal, 1997, p. 3). Ministries, for example, have the same bureaucratic rank as provincial governments. These ranks play an important role in regard to the distribution of authority, that is, one specific level of government can only issue binding orders to the government that are one step down.

Apart from ranks, the authority is also channeled by function. Each ministry represents the top of a functionally defined hierarchy of governmental units that exist as each territorial level of government (Lieberthal, 1997, p. 3). The Ministry of Land and Resources, for instance, has its subordinate units at, respectively, the provincial,

prefecture, city and township level. Typically, each of these specialized units has at least two superiors: the government at each unit's own territorial level and the office in the same functional hierarchy which is one level up (see Figure 12).

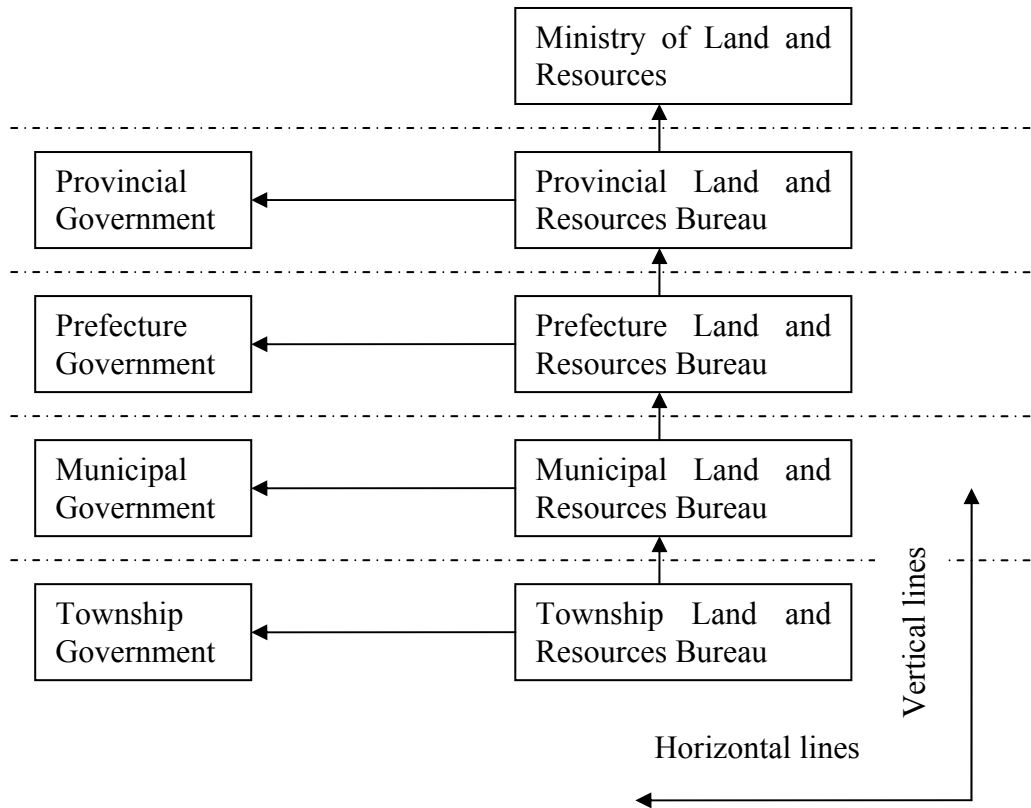


Figure 12 - The vertical and horizontal structure of the Land and Resource Bureau

Within each territorial government, moreover, there is one top person and several deputy heads. Each of these heads has formal responsibility for a specific array of functional offices, and a deputy head is not allowed to interfere in others' affairs of functional offices. These unique governmental structures would have following implications:

(1) A potential dispute would arise when two superiors of the same unit have different objectives or opinions. In fact, such disputes frequently occur in the environmental arena where the protecting functions of the “vertical lines” are in contradiction with the economic aims of the “horizontal lines”. This phenomenon

can be an obstacle in implementing the policies formulated by the central government at localities.

(2) Within the territorial governments, the management of different functional units would, to a large extent, still remains fragmented. This is because there are few formal mechanisms to coordinate various units subjected to different governmental heads.

4.2.1.2 Legal framework for coastal management

China's legal framework for coastal management has been developing rapidly, particularly in the last two decades. Take coastal environmental management for example, the whole set of legislations includes approximately 20 national statutes, 40 regulations, some 500 standards, and more than 600 other legal "norm-creating" documents, which address environmental aspects of consumer products, production process, etc, (Ferris et al., 2003, p. 579). More than 1000 additional measures at provincial and municipal levels are believed to be introduced.

The National People's Congress (NPC) is the supreme law-making body in the legislative hierarchy. The laws enacted and promulgated under the NPC are principal legislations in terms of binding force and coverage. Nevertheless, ministries always play an active role in the legislative proposal and drafting process. This is partially due to the reason that the NPC often lacks the human and technical resources to fulfill the drafting responsibility. On the other hand, ministries are more conversant with the issue particularly when the topic falls within their own authorities and responsibilities. This peculiar phenomenon inevitably leads to the situations that ministries are self-authorized and self-empowered through participating in the law-formulating process. Thus gives rise to overlaps of the mandates and, even worse, such self-empowered activities contribute to the departmentalism which constrains the ministries and their departments from communicating with their peers. This also reflects the traditional top-down approach to the exercise of authority in China.

Given the complexity of coastal resource and actors, a wide range of government and state agencies are involved in managing the coast. The formal institutional arrangements for coastal area management comprise a set of government department, which include: marine living and non-living resource, land and sea use planning, shipping and port, pollution prevention, health and environment. Each of agencies takes responsibility for managing separate elements of the coastal area, i.e., one or a few aspects of management. Thus, these agencies tend to be organized along sectoral lines (Table 7).

Table 7 - The mandates and responsibilities of national agencies related to coastal management.

Agency	Management Role and Function	Regulated Laws and Regulations
Ministry of Land and Resources	<ul style="list-style-type: none"> • Mineral, land and sea resources mapping 	<ul style="list-style-type: none"> • Land Administrative Law • Mineral Resources Law • Mapping Law
State Oceanic Administration	<ul style="list-style-type: none"> • Ocean and coastal zone surveys • Monitoring • Research and information services 	<ul style="list-style-type: none"> • Sea Area Use Administration Law • Marine Environment Protection Law • Ocean Dumping Regulations • Offshore Source Pollution Regulations • Submarine Cables and Pipelines Regulations
Ministry of Communication	<ul style="list-style-type: none"> • Shipping and ports • Maritime Safety • Search and rescue • Ship source pollution 	<ul style="list-style-type: none"> • Maritime Traffic Safety Law • Ship Source Pollution Regulation • Port Law
Ministry of Agriculture	<ul style="list-style-type: none"> • Fisheries Capture and aquaculture • Aquatic resources 	<ul style="list-style-type: none"> • Fisheries Law • Regulations for the Protection of Aquatic Wildlife

Agency	Management Role and Function	Regulated Laws and Regulations
State Environmental Protection Administration	<ul style="list-style-type: none"> • National environmental policy • Pollution from land-based sources • National natural resources 	<ul style="list-style-type: none"> • Environmental Protection Law • Water Pollution Protection and Control Law • Land-Based Sources Pollution Regulations • Coastal Engineering Pollution Regulations
Customs	<ul style="list-style-type: none"> • Anti-smuggling 	<ul style="list-style-type: none"> • Customs Law
Ministry of Water Resource	<ul style="list-style-type: none"> • Water resources • Water conservation projects 	<ul style="list-style-type: none"> • Water Law
Ministry of Public Security	<ul style="list-style-type: none"> • Public safety at sea 	<ul style="list-style-type: none"> • Various laws and regulations for public safety and social security
Ministry of Health	<ul style="list-style-type: none"> • Quarantine (including animals and plants) • Food security 	<ul style="list-style-type: none"> • Entry and Exit of Animal and Plant Quarantine Law • Quarantine regulations
State Administration of Cultural Heritage	<ul style="list-style-type: none"> • Cultural relics 	<ul style="list-style-type: none"> • Underwater cultural relics regulation
State Planning Commission	<ul style="list-style-type: none"> • Coordination in national economic and social development planning, including marine development programmes 	
State Economic and Trade Commission	<ul style="list-style-type: none"> • Coastal industries and commerce 	<ul style="list-style-type: none"> • Salt mining Regulations
State Tourism Administration	<ul style="list-style-type: none"> • Coastal and marine tourism sites and activities 	
People's Liberation Army	<ul style="list-style-type: none"> • National defense and security • Naval affairs 	

Source: Adapted from PEMSEA. (2003). *The development of national coastal and marine policies in the People's Republic of China: a case study*. Quezon City, Philippines: PEMSEA.

It is, however, impossible to address all these legislations and instruments within the scope of this paper. Considering, also, the priority issues identified in the previous chapter, the author confines his focus on some principal legislations that are essential for coastal resource management and disputes resolution. Therefore, four aspects of YRD coastal management and their institutional arrangements will be

focused on, namely, land and sea area planning and use, coastal pollution prevention, environmental impact assessment (EIA) for constructions and fishery management,.

4.2.2 Institutional analysis for land and sea planning and use

There are various categories of planning concern multiply aspects of conservation, development and resource allocation at the local, regional and central levels. Amongst them, four planning and zoning schemes fall within the land and sea use planning spectrum, namely, overall plans for land utilization, city plan, overall port plan and marine function zoning plan. These plans are stipulated by following laws and legislations.

4.2.2.1 Laws stipulating land and sea planning and utilization

1. Land Administration Law of the People's Republic of China

This Law is a general law with the principal purpose of strengthening land administration, maintaining the public ownership of land, preserving and developing land resources especially cultivated land and promoting sustainable development of the society and the economy. Two property right regimes of land are prescribed by the Law, i.e., state ownership and common ownership. To control and strengthen rational use of land, the Law confers the Ministry of Land and Resource (MLR) the authorities for unified administration of and supervision over the land throughout the country, which include land policy formulation, land allocation and acquisition, monitoring of land development, comprehensive land-use plans, and implementation of relevant laws.

Governments at all levels (national, provincial, prefecture, city/county and township) are responsible for drawing up overall plans for land utilization, such responsibilities are frequently further vested to Land and Resource Administration (LRA) directly under it. The plan, normally refer to a long-term strategic plan, is aim to specify and designate the use of land for different purposes and in different areas. The plan drawn up at a lower level shall be in conformity with the plan at a higher

level. Furthermore, land zoning and the purposes of its use shall be defined in the plans at and under the county level, both of which shall be informed to the general public.

Land use (normally under the tenure or leasehold system) should be in accordance with the overall plans for land utilization. Such rights should be granted by the government after being examined by the LRA. Users of land areas shall pay fees in accordance with the regulations of the State Council.

2. City Planning Law of the People's Republic of China

The City Planning Law is formulated to determine the size of a city, define the orientation of its development, map out its plan and carry out its construction on a rational and sustainable basis. City plans applies to whole territory of municipality, including inner suburban area, but generally do not extend to the sea. The municipal and town governments are responsible for compiling the city plans.

The city plan should be worked out in two stages, i.e. comprehensive planning and detailed planning. The comprehensive plan should cover, among others, the designated function of the city, the distribution of land used for various construction purposes, the functions of different zones and the comprehensive urban transportation system. The detailed plan should, on the basis of comprehensive one, define the scope for the use of land for each construction project within the planned plot and provide the control indexes for building density and height. The city plans shall be in conformity with the overall plan for land utilization.

3. Port Law of the People's Republic of China

Port Law has been formulated for the purposes of strengthening port administration, maintaining port security and operation orders and promoting port construction and development. One important element of the Port Law is the requirements for port planning and construction. According to the Law, the Port

Authority is obliged to compile the overall port planning which should be further subject to the approval of local government.

The overall port plan should consist of the geographic layout of the port, division of the port area, nature and functions of the port, function zoning of the water and land areas and use of the coastal lines, etc. The plan should be in line with the overall plans for land utilization and city plan. It is also stipulated by the law that no port facilities should be constructed in violation of the port planning. The use rights of land and sea should be granted according to the Land Administration Law and Use of Sea Areas Law. However, the use of deep-water coastal lines should be permitted by Ministry of Communication, while use of other coastal lines should be subjected to the approval of the port authority.

4. Law of the People's Republic of China on the Administration of the Use of Sea Areas

Sea Areas Use Law (SAUL) establishes the rights and obligations for utilizing the marine resources in the sea areas which refer to sea surface, water column, seabed and subsoil of the inland waters and Territory Sea. SOA, as empowered by the Law, is responsible for supervision over the use of sea areas and working out the local marine function zoning plans.

The marine function zoning plans should be defined and demarcated in accordance with their geographical, ecological and natural attributes. Detailed arrangements for the use of sea areas among various related sectors should be manifested in the plans. In other words, zoning of sea areas for aquaculture, salt industry, shipping, tourism and other industries should be involved and specified in the plans. The law also addressed that the marine function zoning plan should be in line with overall plans for land utilization, city plan and overall port plans.

The rights to the use of sea areas should be granted by the local government after being examined by the Oceanic Administration Units. Such rights may also be obtained through bidding or auction if two or more parties compete for the same sea areas. The use of sea areas should be in conformity with the marine function zoning plans. Changes of purposes of use of the sea areas should be authorized by the local government and in line with the plans.

4.2.2.2 Critiques on the institutional arrangement for coastal planning and uses

1. It is evident that individual institutions take responsibility for managing and formulating separate elements of the coastal zone planning and uses. As a result, different planning covers separate territory of land and sea (Figure 13) formulated by various government agencies. Although the Laws governing the coastal planning stipulate that plans should be drawn up in a harmonized way, no substantive and procedural arrangement for the coordination and cooperation within the agencies has been prescribed.

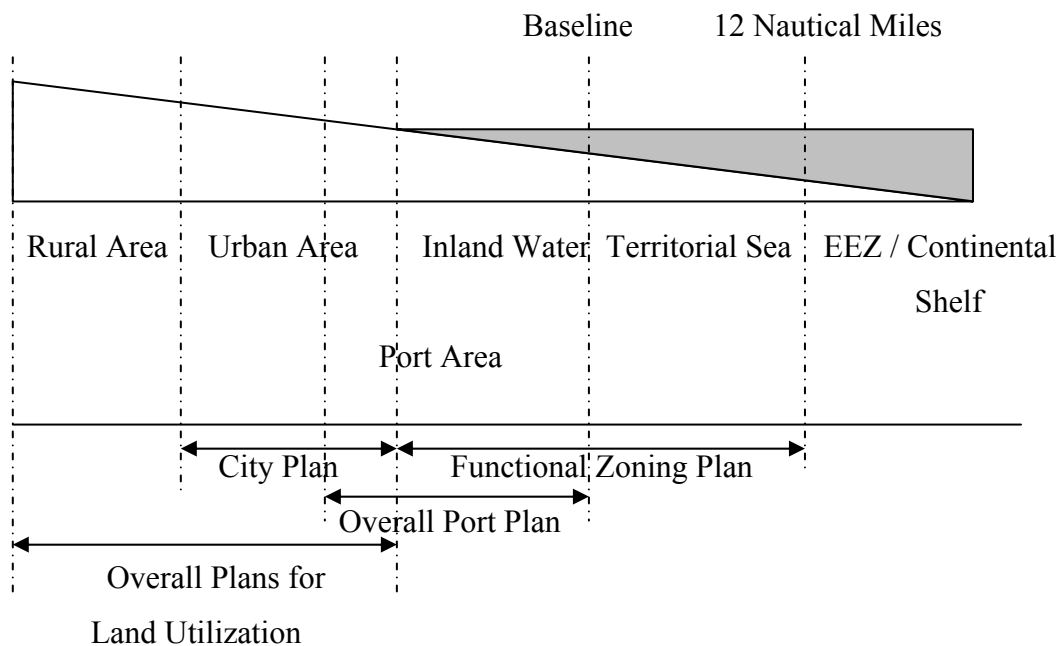


Figure 13 - Coverage of various planning in the coastal zone

As a result, various plans are often found incompatible or even contradict with each other. For instance, certain areas can be designated by port authority as exclusive navigational use such as navigational aids or anchorage; while the same areas can be specified by oceanic administration for aquaculture use. Also, plans tend to separate land from sea, only port plans provide an exception. However, port plans are limited as comparing with the coastal zone concept, both in spatial and in contents. Therefore, the planning, zoning and subsequent utilization at sea may not always be in line with the terrestrial arrangement. Such sectoral approach will inevitably mire in conflicts among the users.

2. Few horizontal and vertical coordination mechanisms are established in government agencies. The traditional top-down model excludes the local government from being involved in the high-level decision making process such as strategic land use plan or deep-water shoreline use, thus deprive the participating rights of local government in critical planning issues. As stated earlier, there is no dedicated authority has influence on a wide range of agencies. Therefore, individual agencies often find helpless when it requires coordinated multi-governmental policy decisions and conflicts resolution.

3. Except requiring that the approved plans should be publicized, the laws rarely mention public participation in planning. In reality, due to traditional top-down rational and departmentalism, few chances of inclusion have been offered to the public. Even for the approved plans, the government agencies may refuse to publicize it due to “security reasons”. Such lack of transparent and inclusion atmosphere severely affects the effectiveness of decisions and its implementation. As mentioned by Brown:

A lack of participation by all important stakeholders in decision – making processes is widely recognized as an important factor in generating additional

conflict between those included in and those excluded from the decision – making process. Where important stakeholders are excluded, decisions are likely to reach stalemate or to fail in implementation.

(Brown et al., 2003, p. 55)

4.2.3 Institutional analysis for coastal pollution prevention

Two major sources of pollution can be identified according to previous analysis, i.e., transjurisdictional pollutant carried by the Yangtze River and discharges in the coastal area. To address the coastal pollution and its subsequent instigated functional conflicts, three principal legislations fall within the analytical framework.

4.2.3.1 Laws governing marine environment protection and transjurisdictional water pollution

1. Marine Environment Protection Law of the People's Republic of China (MEPL)

The purposes of MEPL are to protect the marine environment and resources, prevent pollution damage, maintain ecological balance, protect people's health and promote marine understandings. It covers five sources of pollution in general: land-based pollutants, coastal construction projects, offshore construction projects, dumping of wastes and shipping activities. In order to implement this law effectively, a series of regulations were later laid down to govern the various sources of marine pollution.

MEPL applies within China's internal waters, territorial sea, contiguous zone, exclusive economic zone, continental shelf and all other sea areas under China's jurisdiction. Thus it covers all the sea areas, which fall within China's jurisdiction and jurisdictional rights. Implementing power was granted to relevant government agencies, including the State Environmental Protection Administration (SEPA), the

SOA, the Maritime Safety Administration, Fishery Administration, environmental protection department of the armed forces, and environmental protection departments of the coastal provinces.

MEPL provides three kinds of liabilities, i.e. administrative liability, civil liability, and criminal liability. In the first case, the relevant supervising departments have the right to order a violator to remedy the damages caused and to impose a fine upon him or her. In the second case, all violators will be held strictly liable for any damage incurred to the Chinese marine environment, except those caused by act of war, act of God or negligence or other wrongful act or omission of government departments responsible for the maintenance of lighthouses or other navigational aids in exercising their functions. Strict liability has become a principle in China's environmental legal system.

2. Law of the People's Republic of China on Prevention and Control of Water Pollution (WPPC)

The WPPC is enacted for the purposes of preventing and controlling water pollution, protecting and improving the environment, safeguarding human health, ensuring the effective utilization of water resources. The Law applies to surface and ground water bodies such as rivers, lakes, canals, irrigation channels and reservoirs in the Chinese territory other than the marine area.

The SEPA is empowered to exercise unified supervision and management over the prevention and control of water pollution as well as to establish national standards for water environment quality. The SEPA is also responsible for formulating prevention and control of water pollution plans for key river basins. Other agencies concerned such as the water resources administration, the people's governments of relevant provinces, autonomous regions and municipalities directly under the Central Government should involve in the planning process.

The plans for the prevention and controlling of water pollution shall be compiled by the river basin or by the region. Although such plans are served as the essential basis for the prevention and control of water pollution, its substantial matters are rarely mentioned by the Law. The WPPC also proscribes three kinds of liabilities, i.e. administrative liability, civil liability, and criminal liability in its penalties. Nevertheless, due to the complexity of polluters involved in pollution related activities, law enforcement is carried out by various government and its agencies, which including local government, environmental protection bureaus, navigation administrative office, agricultural administration and fishery administration.

3. Water Law of the People's Republic of China

The Water Law is formulated for the rational exploitation, sustainable utilization, preserving and protection of water resources, as well as the prevention and control of water disasters. The Law applies to surface and ground water bodies in the Chinese territory other than the marine area. State property regime was established by the Water Law and the exploitation and utilization of the resource are subjected to the permission of the State.

The Ministry of Water Resources is in charge of the unified administration and supervision of water resources throughout the country. The basin management agencies of designated major rivers and lakes exercise within their jurisdictions their water resource management and supervision responsibilities, which mainly refer to hydrologic planning and supervision of hydraulic works within the basin.

A set of planning systems was set up by the Law. The state shall formulate a strategic national water resources master plan based on basin and region boundaries. The plans are divided into river basin plans and regional plans. River basin plans include comprehensive plans for river basins and special plans for river basins. The "comprehensive plans" refers to the general plans prepared for the development, utilization, saving and protection of water resources and the prevention and control

of water disasters according to the needs of economic and social development and in the light of the water resource development and utilization conditions. On the other hand, the "special plans" mean plans for special purposes such as flood prevention, irrigation, navigation, water supply, hydropower generation, etc.

4.2.3.2 Critiques on the institutional arrangement for coastal pollution prevention

1. Lack of remedy and accountability mechanism in transjurisdictional pollution damages

The concept of the land-source pollution has been prescribed by the MEPL, but does not properly address the transjurisdictional pollution conundrum. Under the WPPC Law and administrative practice, each province is responsible for its own water quality management. Such responsibility is achieved through setting pollution indicators and standards by SEPA. Ambient water quality, nevertheless, consistently exceeds the prescribed standard (Ongley et al., 2004, p. 276). The main reason is that no legal requirements for operating within a basin framework or subsequent liability for exceeding water quality standards for ambient water or for causing harm to its downstream neighbours. That is, in reality, no accountability provided in the legal framework for inter-jurisdictional responsibility. As a result, one province can act in such a way that causes deleterious consequences downstream yet has no liabilities. This is the root cause why in the YRD so many disputes based on water pollution have been generated and have still not been resolved.

2. Cooperation and coordination within governmental agencies

Although Oceanic Administration, Environmental Protection Agencies and Water Resource Bureaus within any one jurisdiction report to the same government, they operate independently in most provinces with little or no coordination on a day-to-day operational basis (Ongley et al., 2004, p. 273). Hence, pollution is not managed through a holistic way in terms of planning, organizational structure and information sharing.

One of the major additions to the 1996 revision of the WPPC Law is basin-wide planning and interjurisdictional planning with the purpose for preventing and controlling the water pollution of basins of major rivers, designated as such by the State. It was also stipulated by the MEPL that the Environment Protection Bureaus (which operate from provincial level down to environmental protection offices at the lowest level of township governments, hereinafter refer to EPB) and the Water Resources Bureaus (same organizational structure as EPB, hereinafter refer to WRB) shall, in accordance with relevant laws on the prevention and control of water pollution, strengthen the control of rivers that enter into the sea to prevent pollution and ensure good quality of the water in the estuaries.

However, there is no requirement in the WPPC Law to involve other government agencies in the planning making process only that SEPA should consult with MWR and other relevant departments. Under such arrangements, it can be envisaged that important information such as carrying capacity of the sea will not be effectively transfer to the SEPA. Or even such information has been transferred, SEPA may not necessarily adopt those standards or recommendations. Also, as mentioned before, MWR is responsible for formulating comprehensive river basin plans, but it is not clear how the latter should be harmonized with the basin-level water pollution prevention and control plans, albeit it might be interpreted that the pollution plan should be in line with the latter. Obviously, SEPA does not see it this way and provides its plan directly to the State Council (Ongley et al., 2004, p. 278).

Another problem stems from the organizational structure and mandates. The Yangtze River Conservancy Commission (YRCC) is a subordinate organization of the MWR and, as such, is an entity established under the auspices of the Water Law (Article 12). YRCC have the primary responsibility for all hydrologic planning and management and hydraulic works within the basin. The MWR has sought to have overall authority on all aspects of water resources management, including pollution;

however the State Council has manifested the supremacy of SEPA in pollution prevention. Subsequently, the YRCC, which has no formal links to the EPB, have no responsibility for pollution planning or management. Therefore, the implement of river basin water pollution prevention and control plan has not been carried out in an integrated and holistic manner.

What's more, the issue of water quality monitoring is a vexatious problem in that both SEPA and MWR have claimed authorities under their respective laws for monitoring. This results in well known overlaps in monitoring. From the legal point of view, nothing has been provided in the laws for the standardization of data, nor is there a requirement for data collected by one jurisdiction to be valid in another. This peculiar phenomenon not only cause significant wastes of resources, but degrade the quality of environmental policy making of both agencies. The lack of information sharing mechanism is detrimental to the comprehensiveness of decision-making input stage, thus further affects the aggregation of processing phase and the eventual output (Underdal, 1980, p. 162).

3. Implementation of Laws by government agencies

The supreme authority to address the transjurisdictional environmental problems is empowered within the EPB using environmental management strategies for local concerns. Thus, the EPB are the frontiers in environmental protection in China and their role is critical. Nevertheless, the ability of EPB to enforce the law is diluted by their dependency on local government. Therefore, critiques and complaints arise for the inadequacy of pollution enforcement when it is not in the economic interests of the local government.

4.2.4 Institutional analysis for EIA

The Environmental Impact Assessment Law (EIAL) is the backbone of environmental legislation in China and has been complemented by 15 specific laws which address water, noise and air pollution control, management of solid wastes,

resource conservation, wildlife, land use control, and hazardous material disposal (Wang et al. 2003). These legislations, such as the Water Pollution Prevention and Control Law 1984, each contain provisions for EIA thus forming the legislative basis for EIA practice.

4.2.4.1 Law of the People's Republic of China on Environmental Impact Assessment

The purpose of the EIAL is to prevent and mitigate the adverse impact of development activity on the environment in order to achieve the goal of environmental protection. The Law applies to government planning and any constructions have impacts on environment in China, including both the land and sea.

The SEPA is conferred with authorities for overall EIA management and standards-setting in China, which include overseeing and coordinating EIA implementation nationwide, reviewing and making decisions on those EIA which require SEPA approval, providing EIA technical reviews and training for licensed EIA agencies. EPB are responsible for reviewing and permitting EIA for constructions within its jurisdiction.

Not all construction projects require a detailed environmental impact report, so three categories of project are now recognized: Category A—projects which are likely to cause a range of significant adverse environmental impacts need to produce an Environmental Impact Report; Category B—projects which are likely cause to a limited number of significant adverse environmental impacts need to fill in an Environmental Impact Form; Category C—projects not expected to cause significant adverse environmental impacts do not require EIA, but should fill in an Environmental Impact Registration Form.

4.2.4.2 Critiques on the institutional arrangement for EIA

1. Scope of EIA

EIA in China has been strongly influenced by the historical emphasis on pollution prevention and control (Wang et al., 2003, p. 548). Essentially, EIA was viewed from the outset as an instrument to deal with pollution generated by development projects, and the processes were designed to that end. The resulting system has focused on projects, rather than policies or programmes, and has tended to be more concerned with direct impacts, especially of pollution, on the main natural environmental systems: air, water and soil. Other impacts, such as social and ecological impacts, and indirect and cumulative impacts, have not generally been recognized. The three major constructions on the Yangtze River, as discussed earlier, pose a considerable threat on the coastal integrity but still were granted permission. Each of those constructions may not cause severe coastal erosion individually, but combined would induce deleterious erosion consequences.

2. Loopholes in consideration of alternatives

According to the EIAP, proposed construction projects go through a series of planning phases, with EIA starting in the second phase, the Project Feasibility Study. However, a major part of the first phase, the Project Proposal, is to determine where the project is to be built. Local EPB are required to conduct an on-site inspection and preliminary environmental evaluation, and then their comments are included in the Project Proposal before project registration by the local planning authority (MPCPEP, 1989). One result of such a process is that developers may have already signed land use contracts before an EIA has been carried out. Frequently, EIA is conducted after a site has been chosen, so removing the option of alternative sites. Although the “no-action” alternative is still available, it is usually seen as a decision-making option after an EIA has been completed rather than an alternative to be assessed during the EIA process.

3. Public participation

Effective public involvement is largely missing from the current EIA system in China, both in terms of statutory support and in practice. Developers are required to

consult relevant organizations and local people when producing the Environmental Impact Report, the purpose being to avoid public complaints and possible administrative litigation. For example, if a project was to be built close to a residential zone, the licensed impact assessment agency would conduct a questionnaire to get feedback about the perception of local people about the project and the possible environmental impacts, mainly as a way to avoid objection from the EPB. However, this is a rather narrow form of public involvement and there is no further legal provision for public participation in the EIA procedure. In particular, there is no statutory requirement for the full Environmental Impact Report to be made available to the public. Lo et al described the current situation of EIA as:

The EIA system in Guangzhou is dominated entirely by environmental agencies without any forum and provision for public participation or consultation. All decisions in the process are made solely by agency officials; [few] institutional channels exist for the general public and those who are affected by the proposed project to express their opinions and raise objections.

The EIA process as a whole lacks the transparency for agency accountability.

(Lo et al., 1997, p. 376)

The EIA originated in China very much as a top-down administrative instrument, in response to serious environmental deterioration and external pressure from international funding organizations. Therefore, unlike in western countries, there was no preconceived notion that the public should be involved in the EIA process.

4.2.5 Institutional analysis for fishery management

The Fisheries Law, as the principal legislation governing the fishing and aquaculture activities, seeks to enhance, inter alia, the production, increase, development and reasonable utilization of the nation's fishery resources. The Law is

supplemented by various subordinate rules and regulations promulgated by the State Council and Ministry of Agriculture, such as Regulation for the Implementation of the Fisheries Law, The Fishing Vessel Registration Charter and The Regulation on Making and Clearing Fishing Port. Here we will focus on the principal legislation.

4.2.5.1 Fisheries Law of the People's Republic of China

The Fisheries Law and the relevant regulations are formulated for the aim of enhancing the protection, increasing the development, and reasonable utilization of fishery resources, developing aquaculture, protecting fishery workers' rights and interests and increasing fishery production. All productive activities of fisheries, such as aquaculture and catching or harvesting of aquatic animals and plants in the inland waters, tidal flats and the territorial sea of China, or in other sea areas under the jurisdiction of China, must be conducted in accordance with the law and regulations concerned. The Bureau of Fisheries, falling under the Ministry of Agriculture, is the main administrative body governing the fisheries and aquaculture sector. The major functions assigned to the Bureau are to formulate plans, strategies, policies and programmes for fisheries development, to strengthen fisheries management so as to ensure proper utilization of fisheries and aquatic resources, to protect the fisheries environment, to support fisheries education and scientific research and to administer the fisheries processing industry.

The main body of the Fishery Law was divided into 4 parts, namely, aquaculture, fishing, enhance and protection of fishery resources and legal liability. In the context of marine fishery management, the Law adopted 6 major measures in protecting fishery resources. They are: fishing license; total allowable catch; upper limit of national fishing fleet horsepower; closures of areas and seasons; ban of certain fishing gears and methods and protection of specific species.

4.2.5.2 Critiques on the institutional arrangement for fishery management

1. Inter-provincial jurisdictional issues

The enforcement of the Fishery Law is primarily exacted through provincial mechanisms, with coordination by the central government. Historically, the divisions of the offshore jurisdictions between the central and provincial governments and between adjacent provinces have not been clearly defined (Hu, 1991, p. 30). The offshore fishery activities traditionally fall into local jurisdictions under the supervision of the superior governments. The lack of clarity in the jurisdiction facilitates fragmented management, overlapping and conflicting responsibilities, the occurrence of jurisdictional vacuums for which no one can be held responsible, and fosters sectoral interests. Discriminatory application of the regulations in dealing with violations in favour of local fishermen by local enforcement institutions causes serious problems to the enforcement of fishery laws. Some local enforcement teams only keep an eye on the violations by outside fishermen committed in their jurisdictions, they would be reluctant to cooperate with the enforcement teams of other localities. These problems also demonstrate the need for training of personnel in the local enforcement teams.

2. Ineffectiveness of enforcement

Although the Fisheries Law provides for conservation and protection of marine living resources, violations are still common. During the spring and summer seasons in 1989 there were about a 100 incidents of explosive fishing in the ECS (Xu, 1990, p. 2). The primary cause, contrary to the popular belief that there is a lack of policy, law or regulation, rather attributes to an irregular enforcement, insufficient personnel and lack of funds. In Zhoushan, the ratio between fishing boats and administrative officers is about 400:1. Therefore, it is not strange that during the first three years after the Fishery Law came into effect in the Zhoushan Fishing Ground alone, about 3,000 cases of violation occurred annually (Zou, 1997, p. 306).

3. Employment constraints

The dilemmas between fishery resource management and employment are among the major obstacles in regulating the offshore fishery in China. Controlling the

national fishing boat scale means shifting a substantial amount of the labour force from offshore fishery to other employment areas. Many families have engaged in the offshore fishery for generations, and, through the process expanding their teams significantly. Another factor is fishing activities provided only means of subsistence for many of them. To them, termination of the construction of new boats means end of the livelihoods. Moreover, the present Chinese society is not ready to accommodate a large transfer of labour from the offshore fisheries elsewhere, except for some of the emerging occupations related to fisheries, such as mariculture, fish product processing, distant water fishing. These new occupations, which heavily depend on new technology, have a fairly limited capacity to absorb the required transfer of labour.

4.3 Institutional framework: fail to preserve the coastal resources

As mentioned in the previous part of this chapter, disputes arise surrounding several sets of issues. The YRD coastal zone, due to its unique natural location, distinct property right regime and diversified uses, is particularly susceptible to disputes and conflicts. Thus, the importance of government in allocating and managing coastal resources and resolving conflicts is self-evident.

Nevertheless, as analyzed before, the institutional arrangement in the YRD is problematic and can not properly address the coastal conundrum. The loophole in the framework can be summarized as follows.

4.3.1 Lack of integration and cooperation amongst government agencies

The lack of integration and cooperation can be identified from 4 aspects, namely, integration between the land and sea, governmental agency cooperation, interjurisdictional coordination and vertical integration within the agencies.

Planning and allocation of land use is separated from that of the sea, as evident from the institutional analysis of sea and land use. The root cause of which is the

entity responsible for planning and allocation operates within its own mandates, and there is no formal arrangement for integration. However, the coastal zone is such a complex and interrelated system that putting too much emphasis on either one will lead to imbalance and incompatibility. The land, for instance, may be planned for the use of waterfront industries, while the sea adjacent to the land can be allocated as mariculture ground. The discharge of sewage and wastes from the industries will pose an imminent threat to the aquaculture and hostility can be generated among different users. Some users, such as the salt mining and tourism industry, may require both the sea and land area for development. In that case, the sectoral approach may not only inflict the unnecessary burden on the users by separate applications and permissions, but also create further problems like duration of user rights and dispute settlements.

Also, there are few formal arrangements for harmonization and cooperation among different government agencies. SEPA, for example, can formulate discharge standards for industries along the Yangtze River basin without undergoing any consultancy from SOA. As a result, industries may be well qualified in accordance with the standards but still cause great loss to the marine industries simply because the amounts of the pollutants exceed the carrying capacity of the sea. In addition to that, the phenomenon creates problems in inter-sector conflicts resolution. The function of agency as the mediator during the resolution process is greatly weakened by missing links in communication and negotiation channels.

The Transjurisdictional problem arises when one jurisdiction does not have to take responsibility for its operation, as is evident in the outbreak of red tides caused by nutrients carried through Yangtze River. This, again, concerns integration among the regions. Nothing in the legal framework provided clear accountability for the local government and its officials when they fail to meet the discharging standards and affect another region. Similarly, no mutual or multi-lateral agreement has been

reached to curb the pollution in the upper stream of the River. The externality⁸ of point and non-point source pollution, as a result, failed to be internalized through compensation or other mechanisms, thus creating conflicts between the different regions.

Even within one governmental agency, there may be discrepancies among the state, regional and local level. In the case of transjurisdictional pollution, another problem facing the SEPA is that although EPBs are subordinate to the Agency, it is also responsible for the local government. As the resource allocation such as staff, finance are, more often than not, controlled by the local government, the capacity of law enforcement is severely subjected to the discretion of government. While the local governments often concentrate on economic development, the SEPA may find the objectives of their units deviate from its set of goals. Thus, the implementation of policies and legislations at the local level would be problematic. It is especially prominent in the case of pollution discharge along the Yangtze River and YRD coastal area, where pollution industries contribute significantly to the local economy; the result of which is the functional conflicts between the on-site users and off-site polluters.

4.3.2 Lack of public participation

Due to the traditional top-down decision-making process, public participation in China is still in the preliminary stage. At present, public participation in China still concentrates on awareness raising and educational activities (Lau, 2005, p. 135). The general public, on the one hand, fail to recognize the importance of coastal resources and lack of the necessary information channel to learn the social, ecological and environmental situation, thus does not have enough incentives to actively involve in the public decision-making process. When the interests of main stakeholders are

⁸ Hereby defined as consequences which are not adequately incorporated as decision premises because they fall outside the scope of attention or because of poor aggregation.

concerned, for instance, the construction of the Three Gorge dam, will eventually have impacts on deltaic areas, their opinions and proposals are often regarded as “trouble maker’s voice” by the governmental agencies.

Governmental agencies, on the other hand, often lack the experiences and capacities to include stakeholders in the decision-making process. Furthermore, as the legal framework, usually the result of a few elite, does not stipulate the requirement for public involvement. Therefore, public participation is always missing in the decision making process such as policy-formulation, planning and construction. As the requirements and demands of important stakeholders are not considered by the government, the result of the decision-making could mire in prejudice and bias. The conflicts between the port and mariculture and disputes between the Three Gorges dam and delta erosion, reflect such deficiencies.

4.3.3 Inadequacy of capacity among governmental agencies

Lack of participatory process is partly attributed to lack of capability to raise the public interest. Raising awareness and building ownership for initiatives through an intensive participatory process requires expertise and knowledge. The stakeholders and community need to be convinced that it is worth for them engaging in consultative processes that may not always result in improvement in their conditions. Thus, capacities, e.g., awareness and skills to instigate the public interests and manage the participatory process are needed in most root-grass governmental agencies.

There is a lack of awareness of ongoing initiatives that aim to address some of the priority problems in many coastal communities. The municipality in Shanghai, for example, has not yet recognized sea-level rise as an immediate danger and instead emphasizes the successes achieved in stopping the city’s subsidence due to over extraction of groundwater (Lau, 2004, p. 122). Another problem facing the governmental agencies is channels of integration and cooperation. As the traditional

institutional arrangement does not provide for the communication channels among the agencies, it is incumbent for the officials to explore new ways to address coastal problems which can not be settled by the sectoral approach.

It is suggested that capable coastal and ocean managers are essential for a meaningful and effective coastal zone management. To promote better planning and management practices in the YRD region, two systematic approaches can be identified, i.e. university-based degree programs on ICM or closely related subjects, and specific ICM courses (generally short courses). Nevertheless, in China, only one university (Xiamen University) degree programme offering a specialization in integrated coastal management. Two other institutes teach short-term courses (Cicin-Sain et al., 2000, p. 11). Suffice to say here the YRD region does not have sufficiently trained human resources to carry out coastal and marine management tasks efficiently and effectively.

In summary, the distinctive nature of coastal resources induce the problem of externality and ‘tragedy of the commons’, while governmental agencies, which are supposed to fulfill their obligations as the trustees for these public properties, fail to manage the coastal resources and resolve the conflicts. An examination of the institutional framework exposes the root causes, which can be summarized as lack of cooperation and integration mechanisms, insufficiency of public participation and disparity of capacity. The findings of the analysis justify the necessity to adopt new approaches, including institutional arrangement and specific actions, to solve the coastal conflicts and conserve valuable resources.

CHAPTER 5

5 LESSONS AND EXPERIENCES OF THE INTEGRATED APPROACH FROM OTHER REGIONS

The institutional analysis emphasized the need to harmonize and integrate coastal resource management strategies, by moving from a sectoral to a comprehensive and holistic approach. At the international level, the notions of integrated coastal management and sustainable development have been espoused by the global community for decades.

5.1 International background for integrated coastal management

As early as 1972, the United Nations Conference on Human Environment in Stockholm highlighted the need to design and implement environmental protection strategies while promoting equitable economic development (El-Sabh et al., 1998, p. 3). The concepts embedded in the Stockholm Conference laid the bases for many subsequent events, and gained even greater momentum following the Rio Declaration. Those major events and initiatives can be summarized as in Table 8.

Table 8 - Major international coastal zone management events and initiatives

Year	Major Events	Main Focuses and achievements
1982	UN Convention on the Law of the Sea	facilitated international communication and promoted the peaceful use of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and

		preservation of the marine environment
1992	The Rio Declaration on Environment and development	Established 27 broad principles concerning the environment and sustainable development, includes the equitable right to development, eradicating poverty, etc.
1992	Agenda 21	Encompassed and stimulated a great boost to the concept of integrated management and sustainable development of maritime and coastal zones
1992	The UNCES Convention on Biological Diversity	Moved to a more proactive position that simultaneously seeks to meet people's needs from biological resources while ensuring the long-term sustainability of earth's biological capital.
1992	The Convention on Climate Change	The objective of which was the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system
1993	Noordwijk Declaration	Produced a set of guidelines for the integrated management of coastal zones, including institutional and general public roles and responsibilities in the coastal zone
1995	Global programme of action for the protection of the marine environment from land based activities	Formulated conceptual and practical guidance in devising and implementing sustained action to prevent, reduce, control and eliminate marine degradation due to land-based activities.
1995	The International Coral Reef Initiative	A partnership among nations and organizations seeking to implement Chapter 17 of Agenda 21

		and other instruments, for the benefit of coral reefs and associated seagrass and mangrove ecosystems.
1995	The Agreement on High Seas Fishing	Aimed to make the fishing industry more transparent and call for government to use the “precautionary principle” in devising conservation regimes.
1994	Cooperation in the coastal zone	Develop and implement the integrated coastal zone management through inclusive and cooperative approach.

Source: El-Sabh, M., Demers, S., & Lafontaine, D. (1998). Coastal management and sustainable development: From Stockholm to Rimouski. *Ocean & Coastal Management*, 39 (1-2), 1-24.

The growing international initiatives suggest considerable interest and faith in ICZM. ICZM takes many forms depending on the context, but principally it has focused on encouraging sustainable coastal resource use through an iterative process of regulation and policy development, institutional coordination, and education.

The following are two frequently cited definitions of ICZM:

ICZM is a process by which rational decisions are made concerning the conservation and sustainable use of coastal and ocean resources and space. The process is designed to overcome the fragmentation inherent in single-sector management approaches (fishing operations, oil and gas development, etc.), in the splits in jurisdiction among different levels of government, and in the land-water interface.

(Cicin-Sain et al., 1998, p. 39)

ICZM is a broad and dynamic process that . . . requires the active and sustained involvement of the interested public and many stakeholders with interests in how coastal resources are allocated and conflicts are mediated. The ICZM process provides a means by which concerns at local, regional and national levels are discussed and future directions are negotiated.

(GESAMP, 1996. p. 4)

These definitions emphasize the distinct features of the ICZM process—on the one hand, balancing development and conservation and ensuring multi-sectoral planning, and, on the other hand, participation and conflict mediation. A central purpose of ICZM is to create conditions for “a sustained effort whose fundamental goal is to reform the objectives, structure and processes of governance that control how coastal resources are allocated,” the rates in which coastal resources are used, and “how conflicts among user groups are resolved” (Olsen et al., 1998, p. 615).

ICZM employs a set of tools including marine protected areas (MPAs), land-use control, marine zoning and permit systems, conflict resolution, planning, and fisheries management (Christie, 2005, p. 209). These concepts and strategies have been adopted by governments, organizations and citizen groups that attempt to more effectively govern the world’s coastal and marine ecosystems. Some successful cases will enable us acquire some clues as how to manage the YRD coastal zone.

5.2 ICZM in Xiamen, a GEF/UNDP/IMO demonstration project

In 1994, the Regional Programme for the Prevention and Management of Marine Pollution in the East Asian Seas successfully initiated two ICZM demonstration projects in Batangas (Philippines) and Xiamen (China). These were executed by the International Maritime Organization (IMO), and supported by the Global Environmental Facility (GEF) and the United Nations Development Programme

(UNDP) (Yu et al., 2004, p. 3). The Xiamen project, particularly, have provided effective ICZM working models in terms of inter-agency collaboration, multi-sectoral partnerships, and systematic program development and implementation process.

The Xiamen demonstration project focuses on the application of an ICZM system to address marine pollution problems arising from economic development. The project takes advantage of the lessons learned from the development of ICZM in Southeast Asia (Chua, 1997, p. 235). Through a critical analysis of past experiences and lessons learned, and taking into consideration the local conditions, the project has adopted following strategies in its formulation of ICZM framework:

5.2.1 ICZM institutional arrangements

5.2.1.1 Establishment of the coordinating mechanism

From the very beginning, a paradigm shift was made to integrate the various marine and coastal resource planning and management agencies. The Marine Management and Coordination Committee (MMCC) were established directly under the municipal government, with the first deputy mayor chaired as director. Four vice-mayors in charge of agriculture, transportation, science and city construction were appointed as deputy directors. The committee, composed of representatives from 22 local government agencies, such as planning, finance, marine affairs, land use, environment, fisheries, port operations, and tourism, was to provide policy advice, review progress of activities, and provide recommendations arising from the ICZM project (Xue et al., 2004, p. 279). At the lower hierarchy, a Marine Management Office functioning directly under the Committee was created upon the existing staff and facilities of the current Oceanic Administration Division. The integrated Framework is illustrated in Figure 14. In order to strengthen integrated law enforcement, a supervisory force was formed within the marine management office, and relevant law-enforcements were organized into an integrated group to mediate use conflicts and crack-down illegal occupation of land and sea area.

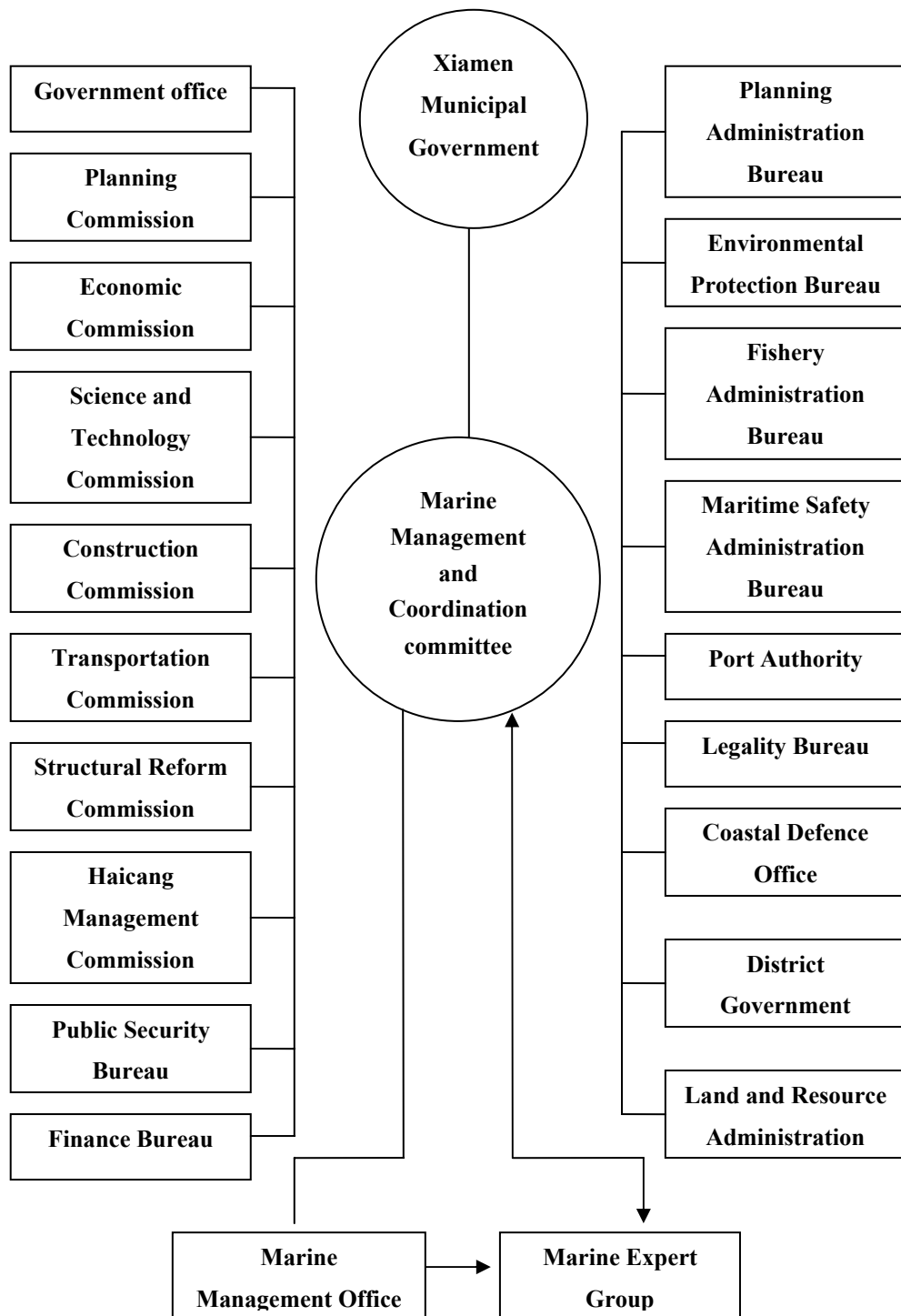


Figure 14 - Organizational Structure for ICZM in Xiamen

Source: Xue, X., Hong, H. & Charles, A. T. (2004). Cumulative environmental impacts and integrated coastal management: the case of Xiamen, China. *Journal of Environmental Management*, 71, 271-283.

5.2.1.2 Harmonization of legal framework

As stated earlier, the unique institutional arrangement in China contributes to the overlapping functional jurisdiction of central line agencies. The implementation of this legislation by corresponding central agencies at the local level often resulted in serious interagency conflicts. To solve the problem, a legal group was set up to review related existing national legislation and local secondary laws to draft local regulations that could harmonize or strengthen the implementation of national legislation (Chua et al., 1997, p. 244).

The legal group has successfully submitted new or modified rules and regulations, which have been promulgated by the municipal government. These legislations cover a broad spectrum concerning coastal planning, resource management, ecological environment protection and transportation management (Table 9).

5.2.2 Environmental profiling

The Coastal Environmental Profile of Xiamen presents relevant information on the socioeconomic, political, legal and environmental status of the city for the past 20 years. In addition to providing the basic ecological and socioeconomic information, the profile serves to (1) assess the status of the coastal and marine environment; (2) determine the severity of environmental stress; (3) evaluate institutional and management constraints; (4) identify information gaps and the national and local capacity to undertake ICZM programs, and (5) analyse potential benefits and cost for undertaking management interventions (Chua et al., 1997, p. 240).

Table 9 - ICZM related legislation in Xiamen

Coastal Planning	Regulations on land management
	Regulations on city planning
	Regulation on the use and management of sea areas
	Regulations on coastline planning and management
Resource management	Regulation on the management of sand, soil and stone
	Public notice on removal of households engaged in aquaculture from the location of the new shipyard
	Measures on management of charging sea area uses
	Regulation on aquaculture management in the shallow seas and intertidal zones
Ecological environment protection	Regulations on environmental protection
	Measures on the management of Yuandang lagoon region
	Regulations on the Management of Nature Protected Areas for Chinese White Dolphin
	Measures on the management of nature protected area for White Egret in Dayu Island
	Public notice on the reinforcement of management of sea eel fishing in the Sea areas around Xiamen
	Regulation on the protection and management of the marine environment measures on the management of Lancelet nature protected area
Transportation management	Regulation on the management of waterway transportation

Source: adopted from Xue, X., Hong, H. & Charles, A. T. (2004). Cumulative environmental impacts and integrated coastal management: the case of Xiamen, China. *Journal of Environmental Management*, 71, 271-283.

5.2.3 Strategic environmental management plan

A strategic environmental management plan (SEMP) was developed, based primarily on the information gathered from the environmental profile and was the product of consultations with various agencies and experts. The document contained an assessment of the causes and effects of identified environmental concerns and

their associated risks, evaluated and ranked possible management options for intervention (PEMSEA, 2006, p. 35). Much emphasis was put on developing essential coastal and marine policies and management strategies that could be carried out by the local government.

To facilitate the implementation of the strategic management objective, the following policy measures were included in the SEMP (PEMSEA, 2006, p. 35):

- (1) Adoption of integrated planning and management;
- (2) Undertaking resource valuation and environmental accounting;
- (3) Application of the principles of functional marine use and pollution damage compensation;
- (4) Adoption of the precautionary principle;
- (5) Encouraging public participation;
- (6) Application of economic instruments for environmental management.

5.2.4 Plans for the control of pollutant discharges in Xiamen

Two projects, namely, the Xiamen coastal waste management and pollution prevention and integrated management action plan for the control of pollutant discharge in Xiamen were undertaken to serve as inputs in the development of a waste management program for the municipality. The former collected and analyzed data on waste generation, collection, and prevailing disposal practices for both solid and liquid wastes, while the latter drew up a plan aimed at controlling pollution discharge in the coastal waters by 2020 (PEMSEA, 2006, p. 40).

5.2.5 Designation of functional zones

Clark states the management of zoning serves two main purposes in coastal conservation (1996, pp. 213-214):

- (1) Custodial-for nature reserves, to sub-divide them into particular use allocation zones; for instance, diving, nature study, fishing, etc., and

(2) Regulatory-for regulatory programmes and coastal land use planning, to designate certain areas for particular uses, such as aquaculture, navigation, greenbelt, etc.

The Xiamen's Marine Functional Zoning Scheme of sea areas straddles both dimensions. Based on the assessments of the cumulative effects of current and potential activities in the marine areas of Xiamen, the zoning defined use priorities in terms of dominant, compatible or restricted functions. The dominant function is assigned to uses considered high priority, while a compatible function is for those considered to have no significant adverse effects on the priority use. Finally, a restricted function applies to those that should be reduced, moved out or closed altogether due to their detrimental effects on the priority function and other functions (Xue et al., 2004, p. 281).

A primary purpose of an integrated functional zonation scheme is to ensure the allocation of sea-space or marine resources for optimal use. The integration determines which activities will have the least impact on the environment and will help to avoid and/or minimize use-conflicts. Through the study and integration of existing functional zones, a coordinated, legalized functional zonation scheme is produced.

5.2.6 Capacity building through incorporating scientific elements and training

The success of ICZM programme in Xiamen is made possible by the inclusion of a Marine Expert Group. The Group, comprising marine scientists, economists, and legal and other technical experts, was established by the Municipality in 1996 as a means to integrate science into policy-making and management. Through providing essential socio-economic, ecological and technical advice to policymakers and the best available information, the Group enhanced the capability of government in terms of making responsible and informed decisions (PEMSEA, 2006, P. 25).

Xiamen, since launching its ICZM programme, has served as one of the training sites for the annual regional ICZM training course. The highly practice-oriented training course, using field examples from Xiamen and other sites as case studies, offers coastal managers opportunities of assimilating strategies, tools and methods in coastal and marine management (Chua et al., 1997, p. 246). Such training and integration of scientific elements greatly increase the capacity of government agencies as well as NGOs, contribute to the sound decision-making and policy formulation.

5.2.7 Public awareness and inclusion campaign

The MMCC, through its office, has organized several activities related to increasing public awareness and concern for the marine environment. Several practices and approaches have been harnessed for this purpose. A weekly column in a local newspaper focusing on marine resources and their environment was created. A book entitled “The Sea and Xiamen” was published in 1994 (Chua et al., 1997, p. 245). “We own the sea”, a follow-up publication, was released the following year. Other campaigns, such as municipal-wide knowledge contests, marine educational programmes primarily for students, were also initiated in order to improving the marine and environmental awareness of the public (PEMSEA, 2006, P. 42).

Public awareness has a far-reaching impact in promoting government concerns and management actions. It greatly changes the attitude and perception of citizens, reduces the implementation costs, enhances the public participation and ensures the sustainability of the ICZM programme (PEMSEA, 2006, P. 42).

5.3 Lessons learned from practicing integrated coastal management in Xiamen

The ICZM initiation in Xiamen has achieved the goal of reforming the objectives, structure and processes of governance that control how coastal resources are allocated. As Chua et al. (1997, p. 250) stated: “There is greater public awareness of

environmental concerns, a stronger political will to address environmental problems, and improved perception on the integrated management system among the resource managers and concerned scientific community.” The major lessons learned can be listed below:

(1) An inter-agency, multi-sectoral coordinating mechanism, which involves all relating governmental agencies, should be established to effectively address the cross-agency management issues related to the planning and utilization of coastal and marine resources and resolution of user conflicts.

(2) Legislations both at the national and local level should be harmonized and developed to provide substantive and procedural foundations for integration and cooperation.

(3) The ICZM programme should base on the capacity of governmental agencies to enable them to undertake integrated management and resolve user conflicts. Efforts should be made in the identification of channels to strengthen the local capacity.

(4) The public awareness campaign can be used as a tool to raise general environmental concerns and encourage stakeholders in the decision-making process (Chua et al., 1997, p. 250).

(5) Marine functional zoning scheme along with other coastal space plans can be an effective tool to optimize the sea-space and marine resources allocation. However, such plans should be a result of consensus and negotiation among the agencies and stakeholders.

(6) Action plans should be developed within the framework of a coastal strategy and address priority issues identified during the environmental profiling stage.

The Xiamen ICZM approach exemplifies the essence and principle of integration, points out a new route for the better governance on the coastal resource and space allocation and serves a model for the YRD coastal management.

CHAPTER 6

6 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Given the significant contributions of any coastal resource to the local economy, people's livelihoods and social amenities, the importance of the coastal zone is thus self evident. As Clark notes:

The coast is a place where a great abundance of life is nurtured and must be conserved in the face of increasing development pressures. It is a place of high priority interest to residents, to commerce, to tourism, to the military, and to a variety of industries. It attracts dense populations and undergoes great environmental modification through land conversion, sea dredging, and water pollution caused by urban, industrial, and agricultural development.

(J. Clark, 1997, P. 192)

In addition, the coastal zone has to be conserved in an integrated manner, not only by its intrinsic nature, but because of its diversified uses. In most countries coastal waters and their resources are considered *jure communia*. That is, they are not owned by any person or agency but are common property accessible equally to all citizens (Clark, 1997, p. 192). This inherent nature of coastal resource implies the consequences of one party's actions to some extent will be shared by others. In other words, fragmented decisions often produce externalities (Underdal, 1980, p. 163). If no external regulation has been imposed, such nature will invite 'irresponsible'

behaviour, i.e. it can lead one party to do things that it would not have done had all the consequences been entirely his/hers which eventually, results in various conflicts. Thus, when it comes to the exploitation of common or open-access property, the market approach tends not to produce socially optimal outcomes, which justify the government intervention.

However, diversity of coastal resources often denotes multiple users. The management of different resources, traditionally, is mandated to various governmental agencies. Such sectoral planning or management is nevertheless in contradiction with the interdependent and interactive nature of multiple uses, which induce inefficiency in allocating resources, equitably distributing costs and benefits and resolving conflicts. Therefore, policy integration is particularly desirable to conserve and protect coastal resources as a whole.

The YRD coastal zone, with its rich coastal resources, is essential for the regional and local socio-economic development. Despite the fact that the coastal area is subjected to governance by a considerable number of governmental agencies and legislations, the resources are still on the fringe of depletion. Disputes arising from the allocation of coastal spaces and natural resources, pollution and construction induced externalities generate spatial, functional and inter-generational conflicts. These conflicts, failed to be addressed through the official channel, and in turn, cause remarkable losses and greatly undermine the basis for sustainable development.

A close examination of the institutional framework in the YRD relating to aforementioned issues leads to 3 conclusions: the inadequacy of cooperation and integration mechanism within the governmental agencies; the insufficiency of agencies' capability and capacity to address the problems and the lack of public participation. Needless to say, within such institutional framework and configurations, the coastal zone can not be managed in a sustainable manner. To solve this problem, we need draw lessons and experiences from other places which

face a similar conundrum, share the same nature while successfully mitigating the problem and achieving sustainability.

Xiamen, under the auspicious of GEF/UNDP/IMO, has successfully developed an ICZM demonstration project and exemplified the effectiveness of integrated approaches in addressing the coastal crisis. The success of ICZM based on institutional development at the local level, particularly the establishment of decision-making mechanisms consensus building among major stakeholders and harmonization of the legal framework. Moreover, the institutional arrangement provides a framework for, and facilitates progress in, developing coastal strategies, addressing priority issues, enhancing public awareness and participation, and capacity building towards ICM goals. Based on these findings, considering, also, the unique regional perspective and distinctive feature of the YRD, the following framework for the ICZM is recommended.

6.2 Recommendations for the integrated approach of the YRD coastal zone

6.2.1 General institutional arrangements

A key objective of this phase is to develop management framework, mechanisms and processes that ensure the participation of various stakeholders in making coastal policies and decisions, including governments, nongovernmental organizations, the private sector, local communities, which constitutes the basis for the implementation.

6.2.1.1 Cooperation and inclusion mechanism

Clark (1996, p. 42) notes that coastal resource management requires involvement at all levels of government. Therefore, in addition to the local mechanism, both central and regional institutional arrangements should be considered.

At the central level, a national interagency coordination mechanism within the State Council should be established to oversee the implementation of the National

Coastal and Marine Policy and the strengthening of the role of an existing competent national agency to provide secretariat services for the above mechanism; what is more, a cross-sectoral committee or the restructuring of an existing committee within the framework of the NPC to provide a focus for coastal and marine issues as an important stakeholder consultative forum.

At the local level, coastal municipalities in the YRD should integrate multiple agencies under one coordination umbrella. A coastal and marine management committee would be a desirable option. The committee, incorporating local government, relevant agencies such as land and sea use planning and management, natural resources management and environmental protection and a technical group, should be directly under the leadership of the municipality. Such an arrangement can ensure making ICZM a government initiative and fully involve the local government in ICZM development and implementation.

The regional setting should possess two principal functions: vertical and horizontal integration. At the vertical dimension, it should bring national, regional and local hierarchies into one scheme and thus link the policy formulation, implementation, evaluation and improvement together. While at the horizontal dimension, various governmental agencies, NGOs, technical groups as well as other important stakeholders should be involved in ensuring a balanced and unified decision-making mechanism. Considering, also, that the new institution should cause the least disruption to present institutional alignments, it is proposed to establish the YRD Integrated Coastal Management Council (YRDICMC) as a coordinating structure (Figure 15).

The YRDICMC is a representative group of all interests within the region. These interests include indigenous peoples, economic uses, social, cultural, conservation and science interests, local, provincial and national government. A council would comprise at least two representatives from each relevant national government agency,

provincial and local government and representatives from the YRCC. In addition to the basic government representation, other stakeholders would include indigenous people, the maritime industry, coastal waterfront industry, tourism, and resource sectors such as fishing, oil and gas. It is reasonable to expect representation from any one interest group as such should not exceed one-third of the non-government members of the YRDICMC.

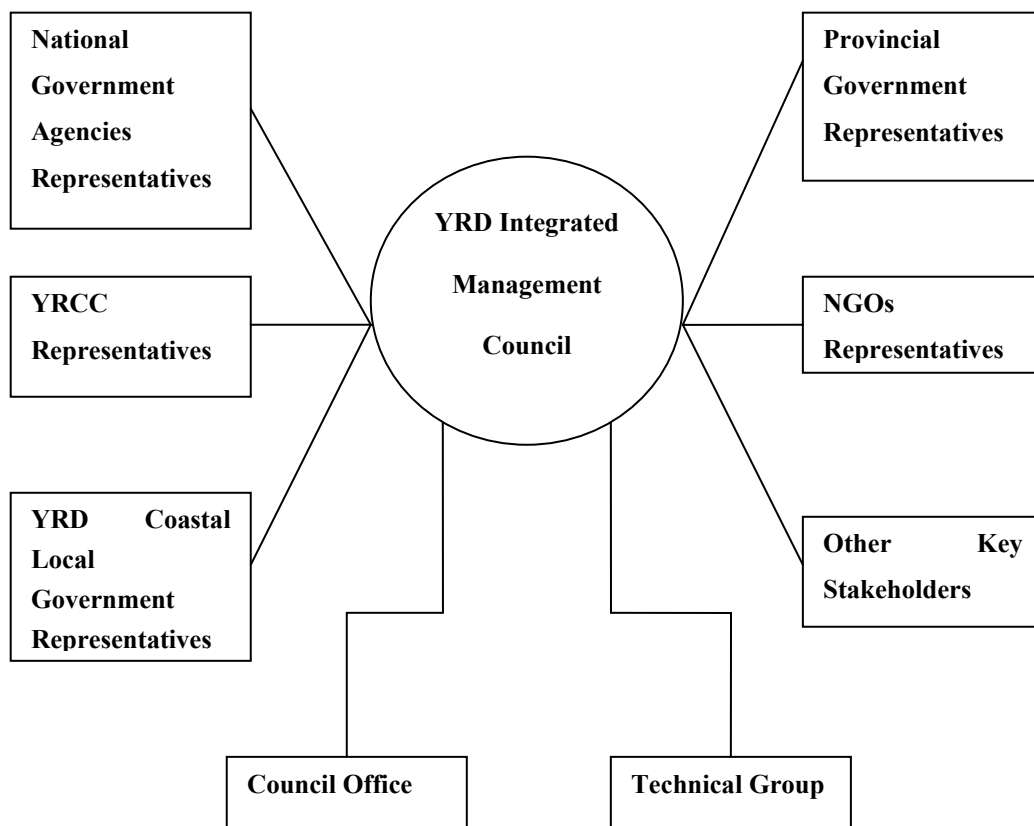


Figure 15 - Structure of the YRD Integrated Coastal Management Council (YRDICMC)

The YRDICMC is primarily responsible for inter-institutional and inter-regional coordination within the region. The council would, broadly speaking, focus on issues listed below:

- Providing the forum to address cross-regional issues, e.g., projects, activities or uses that have impacts on coastal uses or environment at other regions.

- Contributing a venue for discussing the effectiveness of national coastal and marine policies through a mechanism linking the vertical government levels.
- Carrying out inter-institutional assessment to determine the status of the YRD coastal environment through collecting information from national government agencies and local government.
- Recommending the appropriate management response to restore ecosystem health in the YRD region.
- Providing technical and financial assistance including information, guidelines and good practices on the development and implementation of ICZM at the local level.

6.2.1.2 Legal framework

A review of the legal framework on the priority issues in the YRD region reveals the insufficiency of those legislations in addressing the problems and conflicts. These national legislations, to a large extent, remain single-sector oriented; addressing only certain sectoral resources and management issues and appear to be too general to be practicable at the local level. Therefore, the formulation of new integrated and holistic legislation and the amendment of existing instruments are justified.

1. Promulgation of the Coastal Zone Management Act (CZMA)

It was a fallacy that the problems in the YRD were largely characterized as resulting from the misuses of resources and weak environmental protection. A general perception was held that these problems could be addressed through the improved implementation of existing polices and laws relating to resource conservation and environmental protection. Contrary to that, the analysis of the root causes of coastal conflicts manifested that the “system failure” of the sectoral management approach in addressing cross-sector issues is the true culprit.

Therefore, the proposed CZMA should put an emphasis on both the physical environment and the management systems involved. This should include:

- Stipulating the importance of coordinated and unified coastal and marine resource planning and management;
- Establishing an interagency coordinating committee to effectively integrate the appropriate sectors into an umbrella program;
- Enhancing public awareness of the unique nature of the coastal zone and of the importance of its effective conservation and the sustainable management and utilization of its resources for the benefit of present and future generations
- Developing coastal zone management plans and programmes in light of priority issues
- Promoting public participation in management and decision-making.

2. Development of regional and local legislation

Subordinate legislation at the regional and local levels as a supplemental measure to the national legal system should be enacted to precipitate the ICZM programme. Such legislation should at least encompass:

- Integrated planning and management of both land and sea use in the YRD coastal zone;
- Implementation and enforcement of the environment protection laws locally;
- Procedures for involving the key stakeholders in the EIA and ICZM process;
- Mechanisms for resolving conflicts arising from coastal resource use, property rights and project developments.

3. Amendment of existing instruments

Certain modifications need to be made to eliminate the loopholes existing in the current national legislation. These legislations cover transjurisdictional water pollution, EIA and fishery law. First of all, the mandates of government agencies should be clearly defined. Each organization, such as MWR and SEPA, should have a clear idea of their roles and responsibilities under the Law, whether separate or cooperative. The overlaps and ambiguities in the Law need to be eliminated and interpreted. Secondly, there should be a mechanism provided for operating in a

coordinating manner where a unified and integrated approach is required. YRCC, for example, could be an inter-ministerial body operating under the umbrella of both MWR and SEPA. Such an institutional arrangement can formulate a holistic water resource and pollution prevention scheme; harmonizing the planning, monitoring and enforcement functions. Also, the requirements for public participation should be subscribed by most of these instruments instead of merely being informed. Such participation is a way to ensure that popular knowledge and experience is indeed integrated into the planning and management process. It also gives a better guarantee for the quality of the solution identified and for its adaptation to a particular condition. Furthermore, inclusion in planning and decision-making promotes involvement in the actual implementation of decisions.

Some legislation, however, apart from these, requires fundamental amendment. The current EIA legislation was primarily designed as a pollution-control instrument, and although the last 10 years have seen attempts to address other issues (such as ecological, visual, and social impacts), fundamental reorientation will only be achieved by redesigning the Law according to the internationally recognized principles of EIA practice and implementation, set within the wider policy framework of sustainable development. Therefore, the new legislation should employ a broader vision, new methods such as cumulative impact assessment and a public participating perceptive.

6.2.1.3 Capacity building

The need for competent human resources is more evident than ever to redirect regional regimes towards sustainable coastal and ocean development. Agenda 21 identified pertinent areas for human resources development. Coastal and ocean managers need a sound interdisciplinary knowledge of complex multi-sectoral problems with versatile organizational, analytical and communication skills, and an appreciation of political, economic, social and cultural issues in coastal and marine areas. These qualities are critical for the running of institutions with management

responsibilities, decision-making authority and to interact with diverse public constituencies.

The successful performance of these tasks calls for:

- the establishment of regional education programmes on a major scale, and it should be a responsibility of the state to provide the necessary catalytic role among universities. In other words, educational and training facilities including new ICZM orientated courses, training materials and specialized faculty or instructors should be put in place in order to meet the needs for an ICZM approach.
- the inclusion of sciences throughout the decision-making process. This is essential in providing information for coastal and ocean management and improving the quality of decisions.
- the involvement of international organizations at the local level to help increase the capacity of local governance of China's coastal and marine environment.

6.2.2 Specific issues

6.2.2.1 Zoning

As discussed early, the zonation scheme can be used as a tool to effectively mitigate the use conflicts in the YRD coastal zone. Two factors should be taken into consideration when designing the YRD zoning scheme, namely, integrated zoning and public involvement.

First of all, the zonation of the coastal zone should recognize connections among land-based and sea-based activities and institutions. Albeit SAUL established the marine functional zoning scheme, it did not provide channels through which zoning of the wet side can be in line with that of the dry side. Also, the formulation of zonation by SOA has to recognize the authority of other government agencies in designating areas for specific uses. The Maritime Safety Administration, for example, enjoys the power of designating anchorages, waterways and other vessel traffic

schemes under the Maritime Traffic Safety Law of the People's Republic of China. Any unilateral decisions by SOA or Maritime Safety Administration in designating the sea uses would eventually end up in conflict. Therefore, the compilation of the YRD zoning scheme has to incorporate other key stakeholders. Such requirements can be fulfilled through an appropriate coordination mechanism.

Secondly, public involvement, as discussed before, is a key element in mitigating and minimizing the potentiality of conflicts in the planning phase. Stakeholders who have been involved in the formulation of a zoning scheme are more likely to support them. Public participation should be encouraged by the entire management body to ensure the quality, the effectiveness, and the equity of zonation proposals.

6.2.2.2 Pollution mitigation

The coastal pollution and eutrophication are one of the major sources of conflicts. Aside from the deficiency of a legal framework, the pollution issue also attributes to a lack of an effective marine monitoring network, insufficient waste treatment facilities as well as low public awareness. To protect the coastal and marine environment, the aforementioned factors should be focused upon.

1. Marine monitoring network

To overcome the deficiencies in the conventional monitoring system, a paradigm shift should be made both in the monitoring mechanism and standards.

The YRD region should develop a collaborative marine monitoring network and program to optimize monitoring efforts, share resources, exchange methods, standards and results. Such a network should not supplant the existing sectoral monitoring plans of the participating institutions, but rather seek coordination and standardization. Tasks could be distributed among the members based on their relative competencies, and members should regularly submit monitoring results for validation and consolidation.

Various indicators including water quality, sediment and bioaccumulation in organisms should be targeted and appropriate seawater quality standards should be developed. The development of standards as such should also bring the different sea use zones requirements into consideration. The water quality for aquaculture, for instance, should be much more stringent than that for a port area.

2. Waste treatment

One effective way to abate the nitrogen and phosphate concentration in the industry effluents and city sewage is to develop sewage treatment plants. Sewage treatment is a multi-stage process to renovate wastewater before it enters the sea. The goal is to reduce or remove organic matter, solids, nutrients, disease-causing organisms and other pollutants from wastewater. Each receiving body of water has limits to the amount of pollutants it can receive without degradation. Therefore, sewage treatment plants serving in the YRD region should have a commensurate capacity to meet allowable levels of BOD5, suspended solids, coliform bacteria and other pollutants after treatment.

3. Public awareness

The far-reaching effects of involving the public in the promotion of environmental concerns and management actions should be fully recognized. The Committee at the local level should initiate various activities geared towards enhancing public awareness and concern for the environment as part of the ICZM. The media and training program should be utilized and developed, which may include, the creation of columns in local papers tackling environmental and resource concerns; development of training programmes for local residents and industries; television and radio programmes targeting coastal environment issues. By improving the marine and environmental awareness of the public, mandatory measures aiming to mitigate pollution can be voluntarily observed, with environmental-friendly

attitudes and behaviour being actively created. As a result, the cost of enforcement and monitoring can thus be significantly reduced.

6.2.2.3 Environmental Impact Assessment

To overcome the various shortcomings of EIA described in the previous section, there are three priorities: the orientation of EIA represented in the legislation needs to be changed, which has been described above; EIA guidance and education need to be improved; and public involvement needs to be markedly enhanced.

Most of the problems identified in the previous section suggest that there is a continuing need to provide EIA education to the various participants in the EIA system, including administrators, assessors, experts, developers, NGOs, politicians, and the public. Depending on the target group, the form of education will vary, the most extensive being required for the licensed agency staff carrying out assessments, and the EPB staff. However, more general awareness training is still very important for the other groups. Moreover, the official approach to EIA has been very technocratic and if the YRD region is to move to a wider, more adaptive process, EIA education will need to change to lead that movement. A major area for future improvement is in the production of more specific guidelines, as this will contribute to reducing discretion in the EIA process and promoting its consistent implementation around the region.

Under the current EIA system, the public have no right to see the final Environmental Impact Report and cannot be involved in the assessment process. This must be rectified if the process is to operate as an effective environmental management tool. Ideally, the 'public' should be extended to project beneficiaries; local residents; voluntary organizations such as Local Resident Committees; indigenous peoples; nonresident social groups who may use local resources; and selected social categories, such as women or the elderly.

Whether public involvement is required by law or not, practitioners need to be made aware of the many benefits that come from an inclusive and participatory approach to impact assessment. While the EIA Law may set a minimum requirement that is still rather limited when compared with good practice principles for public involvement in EIA, there is nothing to prevent the informed practitioners, perhaps in association with local NGOs and neighbourhood associations, from doing more. EIA education has an important role to play in this area.

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