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Regional Overview on Integrated Coastal and River Basin Management (ICARM) in the NOWPAP Region

POMRAC Technical Report No 5

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EXECUTIVE SUMMARY

This document is the revised Regional Overview Report on Integrated Coastal and River Basin Management (ICARM) in the NOWPAP Region. Structurally, the report is divided into five chapters. In turn, each chapter is divided into relevant sections and sub-sections.

Chapter 1 is the Introduction that provides the report's background and rationale. It starts by describing the evolution of the 'The Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP)', which is one of the 13 Regional Seas Programmes of the United Nations Environmental Program. Then, the importance of ICARM procedures for the Region and the necessary ICARM strategy in the NOWPAP Region are described. As a methodological tool, ICARM requires the adoption of goals, objectives and policies – as well as the establishment of governance mechanisms - which recognize the interrelationships between the two systems (coastal area and river basin).

The next section then describes the geographical scope of the NOWPAP area. As a regional initiative, it covers the marine environment and coastal zones of the following countries: Japan; People's Republic of China; Republic of Korea; and Russian Federation. The geographical scope of the NOWPAP region covers marine, coastal/near shore coasts and offshore basins at these coordinates: from about 121^0E to 143^0E longitude and from approximately 33^0N to 52^0N latitude. This geographical coverage was according to an agreement among China, Japan, ROK and Russia (1994) based on United Nation principles, without prejudice to the sovereign right of any State. The last section highlights the institutional arrangements for developing this regional overview report.

Chapter 2 is the comparative analysis of the present situation within NOWPAP's four Member States. It starts by describing the many values - including aesthetic, ecological, economic, historical and social values - of the NOWPAP region's coasts and river basins. Population distribution and trend is given emphasis for the social conditions. The economic conditions relate to the overall development pattern, as well as to the status of these sectors: agriculture, forestry, fisheries, mineral resources, transportation and tourism. The environmental and/or natural resources conditions that are described include: environmental/physical setting; major river basins/watersheds; land-uses/land cover; coastal habitats; anthropogenic activities which cause inputs

of contaminants to river basins and coastal zones; and, environmental impacts from different sectors of economy.

Chapter 3 focuses on the experiences of ICARM planning and implementation in the NOWPAP Region. It starts with a situational analysis of NOWPAP – both as a region and as a geo-political entity involving four countries. The three major problems/issues relate to habitat degradation, pollution, and non-optimal use of resources. Specifics of pollution issues that were covered include: water quality, air pollution, nutrients, heavy metals, hazardous substances and sediments, oil spills, red tides, marine debris and wastewater.

Key institutional concerns that relate to these problems/issues are discussed. These are broadly classified into three clusters: (1) limited institutional capabilities; (2) inadequate/inconsistent policies; and (3) weak institutional partnerships.

Key national/regional issues are elaborated using the ICARM process, covering both identification of relevant problems and their consequent prioritization. Some examples of land-use management and/or functional zoning schemes in the coastal areas and river basins are provided. The chapter winds down by describing the major interventions or management measured to address the key problems identified. These include strengthening the institutional arrangements to support ICARM, as well as preparation and implementation of pertinent ICARM national plans and/or programs.

Chapter 4 is an overview of national and international policies and laws related to ICARM. The legislative modality to develop national policies is contingent on the existing political system within a NOWPAP member-country. Establishing the most suitable legal framework for an ICARM program is a challenge because of the complex jurisdictional and institutional settings.

International policies are described afterwards. International conventions provide globally-accepted standards for protecting and managing the coastal/marine environments, including their associated catchments and/or river basins. Hence, their national and local implications must be properly understood. International legal instruments may serve as the standards for the development of national policies, as well as the basis for their corresponding ICARM plans and/or programs.

Chapter 5 contains the conclusions, including a synthesis. Its first section covers the proposed national ICARM-related activities and priorities. This covers four key areas: action/direct interventions; institutional development/organizational strengthening; policy and legal reforms; and research/further studies. Then, the proposed regional ICARM-related activities and priorities are described.

The final section winds down with some concluding statements. The transboundary nature of many marine environmental problems calls for a more explicit collaborative actions among the member countries in establishing appropriate regional strategies and action plans to jointly manage the critical environmental and socio-economic issues. Although ICARM has made substantial contribution towards sustainable development and environmental management of the NOWPAP region's river basins and coastal areas, there are still some aspects that may be improved for future initiatives.

1 INTRODUCTION

1.1 Introduction to Regional Seas Programme and NOWPAP Region

The United Nations (UN) Conference on the Human Environment (Stockholm, 5-16 June 1972) adopted the Action Plan for the Human Environment resulting in the establishment of the United Nations Environment Programme (UNEP) to "serve as a focal point for environmental action and co-ordination within the United Nations system". As a consequence, the Governing Council of UNEP chose "Oceans" as a priority area to focus its efforts to fulfill its catalytic and co-coordinating role. The Regional Seas Programme was initiated by UNEP in 1974 as a global programme implemented regionally. Since then, the Governing Council of UNEP has repeatedly endorsed a regional approach to the control of marine pollution and the management of marine and coastal resources, and has likewise requested the development of regional action plans. Agenda 21 and the United Nations General Assembly Special Session (UNGASS) in June 1997 further endorsed such a regional approach to the management of marine and coastal environments.

At present, the Regional Seas Programme includes 13 regions , involving over 140 coastal States and Territories. It is conceived as an action-oriented programme for the management of marine and coastal areas, addressing not only the consequences but also the causes of environmental degradation. Historically, UNEP convened four meetings of Experts and National Focal Points on the development of the Action Plan for the Protection, Management and Development of the Marine and Coastal Environment in the Northwest Pacific Region. These led to the preparation of national reports on the state of the marine and coastal environment and a draft Action Plan. The Action Plan for the Protection, Management and Development of the Marine and Coastal Environment of the Northwest Pacific Region (NOWPAP) and three Resolutions were adopted at the First Intergovernmental Meeting (Seoul, 14 September 1994). This historic event was attended by Japan, People's Republic of China, Republic of Korea and Russian Federation.

The overall goal of the Northwest Pacific Action Plan is: "The wise use, development and management of the coastal and marine environment so as to obtain the utmost long-term benefits for the human populations of the region, while protecting human health, ecological integrity and the region's sustainability for future generations." Wise and/or judicious management is the key to a successful strategy for applying remedies where needed. It is also aimed at protecting either pristine environments or areas that are still of good quality. In this context, the strategy for wise management of the northwest Pacific coastal and marine environment consist of five main elements: (1) monitoring and assessment of

the environmental condition; (2) creation of an efficient and effective information base; (3) integrated coastal area planning; (4) integrated coastal area management; and (5) establishment of a collaborative and cooperative framework.

1.2 Brief introduction of integrated coastal and river basin management in the NOWPAP Region.

In the "Agenda of 21st Century" – held in Rio de Janeiro in 1992 – the countries with marine or ocean boundaries were advised to organize the Integrated Coastal Area and River Basin Management (ICARM). Agenda 21 is a comprehensive plan of action to be taken at various levels (globally, nationally and locally) by agencies of the UN System, governments, and major stakeholder groups in every area in which human impacts on the environment are significant. It was adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Brazil from 3 to 14 June 1992.

Agenda 21 espouses integrated management. Chapter 17 specifically promotes the integrated management and sustainable development of coastal areas. As a consequence, the concept of Integrated Coastal Area and River Basin Management (ICARM) has been formulated. The UNEP and the Priority Actions Programme Activity Centre (PAP/RAC) of the Mediterranean Action Plan jointly prepared the "Conceptual Framework and Planning Guidelines for Integrated Coastal Area and River Basin Management" (UNEP/MAP/PAP, 1999). As such, ICARM is the methodology being promoted to efficiently apply a high level of development of marine sciences and great progress in the study of coastal - offshore regions to attain sustainable development. Its final objective is to reach the sustainable development of the offshore-coastal regions.

There is a plethora of terminologies being used that are conceptually and/or methodologically synonymous with ICARM. Coastal zone management was (CZM) the earliest term used in the US in 1972. This was followed by integrated coastal area management (ICAM) in the developing countries. In the 1990s, the phrases integrated coastal zone management (ICZM) and integrated coastal management (ICM) were also used. Likewise, the term integrated marine and coastal area management (IMCAM) has become popular. Recently, the term ICARM and ICM are used interchangeably to denote integrated management from the watershed/catchment down to the coastal and oceanic environments. It is sometimes referred to as the 'ridge to reef' management.

Within the last 20 years, the interest concerning ICARM has turned to be both regional and global. About 100 countries apply ICARM – in one form or another – in its environment and natural resources management. The great progress in ICARM was reached in Europe, where UNEP, PAP/RAC of MAP, METAP and European Union (EU) have contributed intensively to the development of ICARM concepts and methodologies.

The coastal areas of NOWPAP region are characterized by varying and contrasting social, economic, geographical and geopolitical features. There are differences in political systems among the neighboring countries, density and numbers of population, natural resource potential, natural and climatic conditions and level of development along the coasts. Natural disasters frequently occur such as floods, tsunami, earthquakes and tidal waves. Given these diverse political, geographic, demographic and ecological features, ICARM is suited for the region's integrated management.

1.3 Importance of ICARM procedures for the region and necessary ICARM strategy in the NOWPAP Region

Five corresponding objectives were agreed by the four member states and other institutional partners in line with the five major strategies of the NOWPAP. Objective 4 pertains to "develop and adopt a harmonious approach towards the integrated management of the coastal and marine environment and its resources, in a manner which combines protection, restoration, conservation and sustainable use". Within the NOWPAP's context, a series of tasks and/or activities have been undertaken to pursue the relevant objectives.

After the establishment of four Regional Activity Centres (RACs) and their networks in 2000-2002, the RACs have undertaken several activities. Since the 10th Intergovernmental Meeting (2005), new activities have been initiated by the RACs. One of these is the "Integrated Coastal Zone and River Basin Management (ICARM)." The rationale for this project is the full recognition that the NOWPAP region is among the most highly-populated regions of the world. Therefore, the pressures and demands that this large population brings to bear on the environment are considerable.

ICARM recognizes sustainable development as a conceptual foundation in crafting the NOWPAP plan. As an integrative development-cum-management paradigm, it "involves the simultaneous pursuit of economic prosperity, environmental quality and social equity" (WBCSD 2005). The concept of sustainable development has evolved through major international events that include the: UN Stockholm Conference on Human Development in 1972, development of the World Conservation Strategy in 1980, report of the World Commission on Environment and Development in 1987, the UNCED in 1992, and the World Summit on Sustainable Development (WSSD) at Johannesburg, South Africa, in 2002.

Holistic development is an integrative element of sustainable development. As such, it promotes integrated management taking into account all the relevant development factors, including human and natural resources dimensions. An outcome of UNCED in 1992 is the formulation of Agenda 21 and similar action agendas for individual countries, which contain national strategies to achieve sustainable development. Generally, sustainable development can be characterized by three key interlocking dimensions: (1) environmental, (2) social and (3) economic. Munasinghe (1993) refers to it as a development that is ecologically sustainable, socially acceptable and economically feasible. Munro (1995) classifies these three-pronged dimensions as ecological sustainability, social sustainability and economic sustainability.

ICARM has several associated principles/concepts. One is the precautionary principle. Decisions should be planned using the best available scientific and technical information. In the event that such data/information are insufficient to fully characterize the risks or negative impacts to the natural environment or ecological system, precautionary measures should be used to prevent serious or irreversible harm. Another principle is ecosystem-based management (EBM). EBM is "an integrated, science-based approach to the management of natural resources that aims to sustain the health, resilience and diversity of ecosystems while allowing for sustainable use by humans of the goods and services they provide." (www.eoearth.org/article/Ecosystem-based_management).

The third principle is popularly called as the "polluter pays" principle. It espouses that the cost of environmental control and management must fall in the first place on the polluters. Hence, those who produce negative impacts to the resources and/or environment must either: undertake the necessary compensatory activities or internalize the associated costs. The fourth principle covers the broad concept of carrying capacity. It implies that renewable resources should be exploited only at or below their rates of renewal (Hodge 1995). In the context of both fishery and forest resources, it implies that resource extraction must not exceed the reproductive capability of the resources. This principle also advocates that development be pursued within the carrying capacity of the natural environment – or economic development that is within the limits of acceptable change.

There are also socially-related principles. One is the principle of inter-generational equity and intra-generational equity. Within the framework of sustainable development, this pertains to "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987). The benefits from the use of river basin and coastal resources should be shared between present and future generations of stakeholders within the NOWPAP region. The second concept relates to participatory management. The ultimate goal of sustainable river basin and coastal management can only be achieved effectively through multisectoral and multi-institutional collaboration and participation of all relevant stakeholders. Moreover, the concept of institutional partnership must be duly considered. There is a need to establish appropriate partnership arrangements. These include private-public partnership (government and industry collaboration), as well as innovative partnership schemes between civil society groups and local communities. Collaborative mechanisms must promote policy harmonization and consistency, information sharing and collective action to achieve long-term integrated management.

The economic dimension largely relates to profitability/efficiency. As an enterprise, the economic and/or financial benefits must outweigh the cost of actual management. It implies that those engaged in ICARM-related works must strike a wise balance among competing human needs, the use of resources and economic development. Such a balance among economic, environment and social concerns is being pursued in the NOWPAP region.

Broadly, ICARM requires the adoption of goals, objectives and policies and the establishment of governance mechanisms which recognize the interrelationships between the two systems (coastal area and river basin). The following constitute the four key characteristics of ICARM. First, the objective of ICARM is to develop the sustainable production of goods and services required by society and to resolve conflicts in resource allocation for the production of these goods and services. Secondly, ICARM encompasses the catchment area and the adjacent coastal zone thereby taking into account ecological, economic, social and cultural aspects of this area at various levels of governance. Thirdly, ICARM is based upon a coherent set of strategic, tactical and operational activities and uses technical and managerial instruments to realize its objectives. Fourthly, ICARM is action-oriented in nature, continuous and adaptive in time, and participatory vis-a-vis public and private stakeholders. Overall, ICARM encompasses a comprehensive and integrated approach to addressing environmental management problems taking into account the relevant human and natural resources dimensions.

1.4 Geographical scope of NOWPAP area

The Northwest Pacific Action Plan (NOWPAP) region's geographical coverage include the marine environment and coastal zones of the following countries : Japan; People's Republic of China; Republic of Korea; and, Russian Federation. The geographical scope of the NOWPAP region covers marine, coastal/near shore coasts and offshore basins at these coordinates are from about 121^{0}E to 143^{0}E longitude, and from approximately 33^{0}N to 52^{0}N latitude (Figure 1). This geographical coverage was according to an agreement among China, Japan, ROK and Russia (1994) based on United Nation principles, without prejudice to the sovereign right of any State.

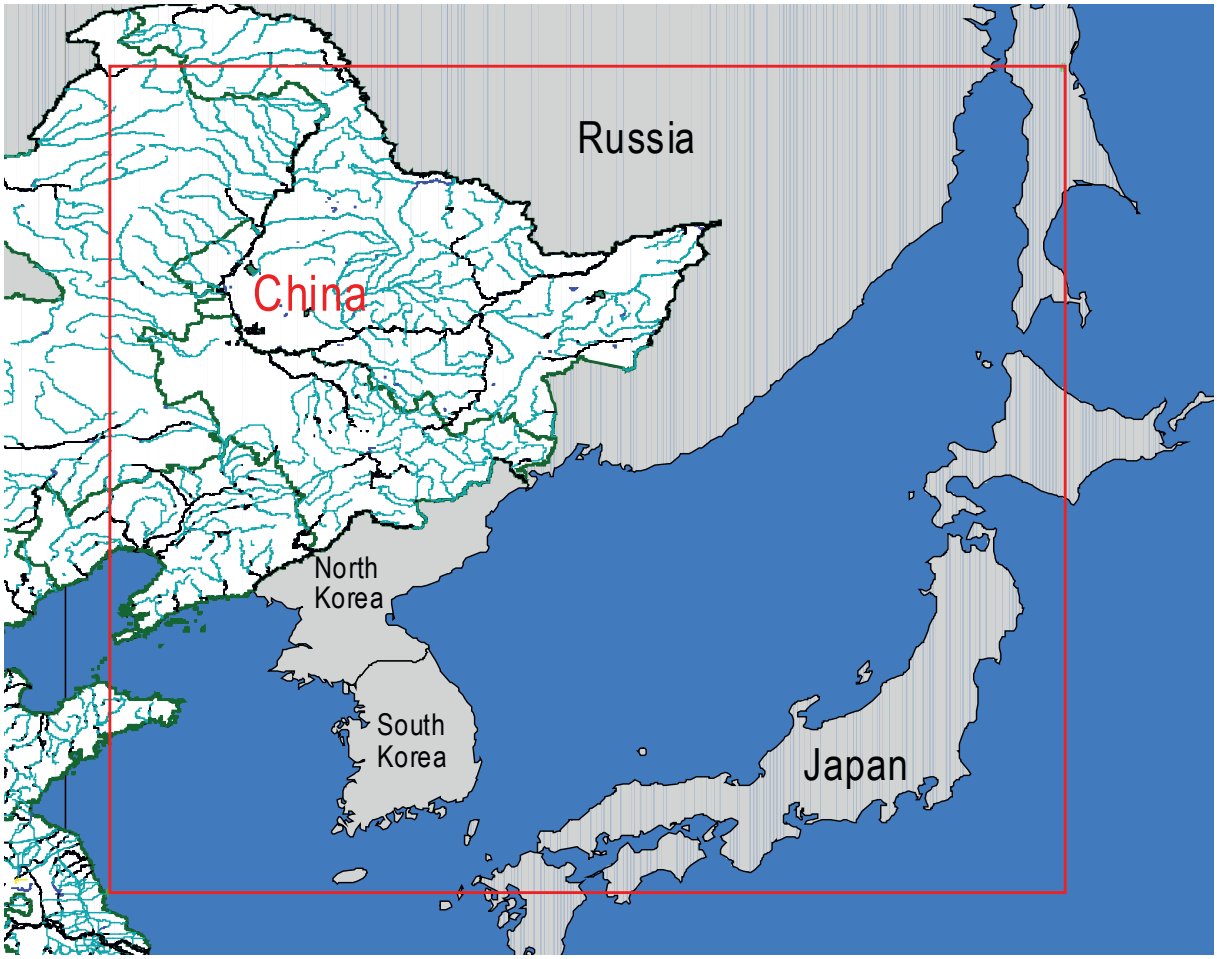

Figure 1. Geographical scope of the NOWPAP region.

From spatial viewpoint, the major region of NOWPAP in Japan is a marginal sea surrounded by the Japanese Islands and the Asian continent. This region is typical semi-closed sea with the southern entrance (Tsushima Straits) and the northern exits (Tsugaru Strait and Soya Strait).

The Chinese marine parts in NOWPAP mainly refer to the Yellow Sea, which belong to Liaoning, Shandong and Jiangsu Provinces. The terrestrial parts include these five provinces: Heilongjiang, Jilin, Liaoning, Jiangsu and Shandong. Heilongjiang and Jilin are listed as

provinces in the NOWPAP region because Songhua River, Heilongjiang River, Wusulijang River and Tumen River pass through these provinces. The total land surface area of the basin and the total length of the coastline are about 1,004,000 km^2 and 6,054 km, respectively. The regional area accounts for 10.8% of the entire national territory of China.

The Republic of Korea's geographical coverage includes inland and sea areas. Sea area covered for implementation extends from the coastline up to the exclusive economic zone (EEZ). Terrestrial component covers the area from high water mark of coastlines to the landward limit of coastal watersheds. The geographic boundary of ICARM is similar to its National Program of Action (NPA). The ROK's coastline stretches to some 11,942 km. In terms of relative proportion, the coastal area accounts for 31,641 km² (about 32%) of the total territorial land area of 99,514 km². Some 2,550 km² are tidal flats, which account for about 2.3% of the total land area. The territorial sea covers some 71,000 km², while the EEZ covers about 447,000 km². There are 3,169 islands that are distributed around the ROK's marine waters. Comparatively, the west coast is shallow while the east coast is deep.

The Russian Federation's part of the NOWPAP region is located in the North-West Pacific between the Asia coast, the Japanese Islands and the Sakhalin Island. It is specifically situated between 34º26' and 51º41' N and between 127º20' and 142º15' E. It is connected with the Okhotsk Sea, by the Nevelskoy and Laperuza straits in the north and northeast, with the Pacific by the Sangar (Tsugaru) strait in the East, and the East China Sea by the Korean (Tsushima) strait in the south. Far eastern regions of Russia adjoining NOWPAP region are Primorsky, Khabarovsky regions and the Sakhalin Island. Overall length of the Russian part of NOWPAP regional sea is about 6,230 km of shoreline. The total catchment area is about 142,000 km^2.

1.5 Institutional arrangements for developing this overview

This regional overview report was collaboratively prepared by the national authors from the four participating countries. Those who participated in report preparation are the follows: Japan – Dr. Shogo Murakami; People's Republic of China - Ms. Xin Xie, Mingcui Wang and Zhiguo Wang; Republic of Korea – Dr. Hyun Taik OH and Russian Federation – Dr. Ivan Arzamastsev. Report preparation was facilitated by an international consultant.

2 COMPARATIVE ANALYSIS OF PRESENT SITUATION IN NOWPAP MEMBER STATES

2.1 Values of Coasts: Worldwide and NOWPAP region

The values of the coastal zone/area – interfacing dynamically between the land and the sea – cannot be overemphasized. Among others, the coastal region provides the natural resource base for economic development, including agriculture, fisheries, human settlements, maritime trade and tourism. Moreover, millions of livelihoods depend on sustainable use of these resources. Indeed, more than 50% of the world's population choose to live within 200 km of the coast (Hinrichsen 1998). Worldwide, the NOWPAP region is among the highly-populated regions of the world that provide considerable stresses and negative impacts to the coastal environments.

The coastal zone also provides the planet with vital 'free' environmental and/or ecological services. These include the regulation of earth's climate and the genesis of rainfall, as well as a place to receive and treat wastes. In addition, some coastal habitats – such as mangroves, seagrass beds and coral reefs – help to protect residential, agricultural and industrial areas against coastal erosion, flooding and natural calamities. The services and protective functions provided by the coasts are estimated to be more valuable than their intrinsic resources, and may be worth "about US $23 trillion a year, only slightly less than the world's GNP" (GESAMP 2001).

The coastal zone of the NOWPAP region – and its associated river basins - illustrates very well the values of the land-sea fringe areas. The foregoing sections describe some profile information of the four countries that comprise the NOWPAP region.

2.2 Social conditions

2.2.1 Population

In general, majority of the populations are concentrated in the coastal areas of the NOWPAP region. The trends and/or distributions, though, may vary among the member countries.

In China, the populations of Shandong and Jiangsu Provinces in the NOWPAP are relatively large. Their combined populations are within the top five provinces nationwide.

Generally, the population density is larger in the developed cities and provinces in China. Populations of these five provinces account for 21% of the total national population. Nonetheless, the population growth rates in these five provinces are lower than the national average, except Shandong Province in 2006. In 2007, all of them had populations lower than national average.

In Japan, populations are concentrated in the minor NOWPAP side, as well as in Tokyo Bay, Ise Bay and Osaka Bay areas. Generally, there is a decreasing population trend in Japan. The average percentage decline in the population in the major NOWPAP region is 1.6% from 1995 to 2005. Meanwhile, the average percentage decline in the population in the minor NOWPAP region is 1.6% from 1995 to 2005. The population trend in the region of Tokyo Bay and Ise Bay areas have steadily increased. Population density here is very much related with the level of local human activities. The so-called Densely Inhabited Districts – or the DIDs – are largely found in the coastal region where the human activities are very intense.

In Korea, the population growth rates in some coastal cities were three times higher than the national average. The population of the coastal area was just over 13 million in 2005, which was about 27% of the national population. The coastal area has a population density of 402 persons/km^2, slightly lower than that of the national average. Coastal urban and industrial areas, however, are heavily populated with a population density of over 1,000 people/km^2.

The year of 1991 was the first time in the Russian Far East's history when a decline in the total number of population was registered. The recession in 1993-1994 has aggravated the region's already difficult economic situation. Since 1993, the decline in the number of the population – apart from out-migration – has been influenced by the natural decline of the population. The percentage decline in the population among the coastal regions between 1991 and 2000 was recorded as follows: Sakhalin Oblast (17.7%), Khabarovsky Krai (7.6%), and Primorsky Krai (6.2%). The Russian's section of the sub-region supports some 1.6 million people. These include the people in Primorsky Krai (1.2 million), Khabarovsky Krai (139,000) and Sakhalin (217,000).

2.3 Economic conditions

2.3.1 Overall economic development and major industries

The major provinces in NOWPAP region of China include Heilongjiang, Jilin, Liaoning, Shandong and Jiangsu. The gross domestic product (GDP) from these provinces was some RMB 7,508 billion in 2007. This represented about 30% of the nationwide total, and the industrial outputs have been increasing up to the present time.

The GDP increased between 2006 and 2007 in the five provinces. The GDP values for 2007 and the relative increase in percentages between the two time periods by province are as follows: Heilongjiang Province was 706.5 billion RMB (increased by 13.9%); Jilin Province was 528.5 billion RMB (increased by 23.6%); Liaoning province was 1102.3billion RMB (increased by 19.6%); Shandong province was 2596.6 billion RMB (increased by 17.6%); and, Jiangsu province was 2574.1 billion RMB (increased by 18.9%).

Japan's major economic sectors include: agriculture, forestry and fishery; mining; construction; manufacturing; transport; wholesale and retail trade; food industry as well as

hotel/tourism industry; finance and insurance; and other services. On a nationwide basis in 2005, the number of employees working in the primary industries was recorded at 4.8%; the number of employed people of the secondary industries was 26.1 %; and the number of employees in the tertiary industries was 67.2%. The number of employees associated with resource-based activities (agriculture, forestry and fishery) is fairly low. It is estimated at less than 7.9% in the major NOWPAP region which is greater than the national average of 4.8%, while the number of employees in the minor NOWPAP region are as follows: Tokyo Bay area is 1.8%, Ise Bay area is 3.79%, and Setouch Island area is 6.69%. In the case of secondary industries, the percentage of employees ranges from 23% to 27%, except for Ise Bay area. In the case of Ise Bay area, the percentage is 34.1% , which is greater than the national average of 26%.

In Tokyo Bay, Ise Bay and Osaka Bay areas, there was a decline in the number of manufacturing establishments, as well as the number of persons working in such business establishments. From 1995 to 2005, the number of manufacturing establishments decreased from 12,840 to 8,902 units. For the same time period, the number of persons working in such establishments decreased from 322,270 to 246,215 units. The same declining trend was observed in the major NOWPAP region.

The coastal area of ROK has been the major center for industrial development due to easy access to marine transportation. A total of 84 out of 189 large-scale national and local industrial complexes – as well as 40 out of 81 power plants – are located in the area. Gross regional domestic product by industries in the coastal area comprised 41.9% of the national gross domestic product.

Maritime transportation is an important economic sector of ROK. There are 28 trade ports and 23 coastal ports along the coasts of ROK. Total cargo handling capacity and cargo transportation have steadily increased over the last decade. In 2004, the Korean ports handled about 860 million tons of cargo with a cargo handling capacity of 524 million tons. The maritime industry, including the maritime transportation, contributed 7% to the national GDP in 1998. The Korean government plans to increase this GDP share to 11.3% in 2030.

Economic specialization of the coastal areas of Russia - based on the natural resources such as timber, fish and polimetallic ores - will expand. Oil processing industries will most likely appear in Sakhalin and Primorye. Mariculture will be developed in full. Using coal and gas, energy industries will steadily progress. Small hydro-electric stations will be established in little rivers. Ship building and ship repair industries (including oceanic instrumentation) will be also developed. Other industries being given emphasis are iron industry, non-ferrous metals industry, mechanical and metalwork engineering industry, pulp-and-paper industry, building materials, fishing industry, and flour-and-cereals industry.

The value of shipped products (and services) for power generation and electrical energy – as well as gas and water distribution - has been increasing. This holds true for both urban districts and municipal regions. In Primorsky Krai, it increased from 25,638.6 million rubles in 2005 to 29,355.5 million rubles in 2006. Similarly in Khabarovsky Krai, it increased from 21,039.6 million rubles in 2005 to 23,630.5 million rubles in 2006.

2.3.2 Agriculture

Some 33,729,500 ha comprise the cultivated land area in the NOWPAP part in China. These hectarage represent barely 5.5% of the total land area of the five provinces. The major farm products in the NOWPAP part of China include grains, cotton, oil-bearing crops, fiber crops, sugarcane, tobacco, tea and fruits. In 2007, the top three agricultural crops (in terms of total volume) for the five provinces were: grains at 150,327,000 tons; fruits at 43, 227,000 tons; and oil-bearing crops at 5,501,000 tons. In the same year, some 12,994,000 tons of chemical fertilizers were utilized in the five provinces. These consisted of nitrogenous fertilizer, phosphate fertilizer, potash fertilizer and compound fertilizer.

Over the last decade, Japan's agriculture has been on a relatively declining trend. Among others, there has been a decline in value of gross agricultural product - specifically 20% decrease from 1995 to 2005 in the NOWPAP region. There has also been a decline in the number of persons engaged in agriculture. There was a reduction of 51,000 persons, which was equivalent to 18.5% from 1994 to 2004. However, a decline in cultivated land area was small compared to the number of persons and the value of gross agricultural product. There was a reduction in agricultural area by 987 km^2, which was about 3.8% decrease in the NOWPAP region from 2000 to 2006.

In 1997, the Far East region's farming sector generated 5% of Russia's gross agricultural output. The inputs of individual RFE territories for agricultural production depend on varying natural conditions and other climatic factors. Generally, however, the agricultural production of urban districts and municipal regions in the coastal zone of the Russian part of NOWPAP region sea has been increasing. In Primorsky Krai, it increased from 5,316 million rubles in 2000 to 13,604 million rubles in 2006. Similarly in Sakhalin region, it increased from 1,864.5 million rubles in 2000 to 4,091.2 million rubles in 2006.

Moreover, individual households contribute significantly in agricultural production. In 1998, their contributions reached some 60-70% of the total production by volume. Further, they exceeded 80% in the production of potatoes and vegetables (60% for milk and meat). The RFE's main agricultural area is its southern part encompassing more than 90% of the arable lands. More than 36% of arable lands are planted with forage crops. Natural conditions are suitable for growing grain (wheat, barley, oats and corn), vegetables and rice (in southern Primorye), which account for 35% of sown acreage (Alekseev et al. 2001).

2.3.3 Forestry

Forest resources in the China's NOWPAP Region consist of natural forest, man-made forest and afforested land. Heilongjiang has the highest forest cover at 39.54%, while Jiangsu has the lowest forest cover at 7.54%. The 'vegetation rate' of Liaoning Province, Heilongjiang Province and Jilin Province is 28.7%, 41.9% and 42.4%, respectively. In contrast with the three provinces, the vegetation rate of the other two provinces is much lower: 21.5% for Shandong Province and 10.56% for Jiangsu Province.

Of the five provinces, Heilongjiang (84) and Liaoning (81) provinces have the most number of protected natural areas. These cover 2.3 million ha, occupying 5.05% area of Heilongjiang Province. Meanwhile, these cover 2.848 million hectares occupying 9.7% area of Liaoning Province. There are 66 protected natural areas in Shandong province covering about

6% area of the whole province. Jiangsu (26) and Jilin (27) provinces have the least number of protected natural areas, covering 0.738 million ha and 1.846 million ha, respectively.

In Japan, there is very little change (decline) of its forest cover from 1990 to 2005. In the major NOWPAP region, the decline was from 13,733,827 ha to 13,683,780 ha (0.36% decrease in forest area) Meanwhile, in Tokyo Bay, Ise Bay and Osaka Bay areas, the decline was from 4,987,680 ha to 4,936,060 ha (1.04% decrease in forest area) during the same time period. In terms of types of forest, there are more natural forest (59.4%) as compared with man-made or plantation forest (40.6%) in the NOWPAP region. The situation is reverse in the three other areas: there are more man-made forest (52%) as compared with natural forest (48%).

The forest resources of the Russian Far East are of considerable size. About 75% of the total area of Primorsky Krai are covered with forests. On the Sakhalin Island, the forests cover is about 52% of the terrain.

Traditionally, timber processing in the Russian Far East is within the scope and dynamics of logging activities. The bulk of the total timber harvested is exported as round logs. Although the proportion of processed timber was recorded at 47% as recently as 1990, it has dropped two to three times since that time. In 1998, Japan accounted for 52% of the total world imports of sawn and veneer logs. Of the 400 million m^3 timber harvested annually in Russian forests, some 160 million m^3 are lost in various stages of processing.

Some 1,400 forest fires occur during dry or summer seasons. Moreover, the forest areas affected by fire vary from 300,000 ha up to 2,000,000 ha. On the average, 780 forest fires occur annually. The average forest area burned is 190,000 ha annually. The long-term average of forest areas affected by fire is about 325 ha/fire incident.

2.3.4 Fisheries

This sector may be conveniently divided between aquaculture and capture fisheries. The former relates to the culture system, while the latter pertains to the capture of various fish species in the wild. Traditionally – and even up to the present – the fisheries sector has been an important component of both the local and the national economies.

In China, the total production of marine aquatic products in 2007 from five provinces was recorded at 10,202,000 tons. Main harvests included several species of mackerel and yellow-fin tuna. For the same year, this production value was almost double of the freshwater aquatic products, which was recorded at 5,124,000 tons.

Japan's marine fisheries are also conveniently divided into two categories: capture and culture. In the major NOWPAP region, between 2003 and 2006, the production for capture fisheries has declined from 2,660,500 tons to 1,826,200 tons (31% decrease). Meanwhile, the production for culture fisheries has likewise declined from 397,400 tons to 286,100 tons (28% decrease). For both categories, the value of production has declined from 956,897 million yen in 1995 to 630,925 million yen in 2004 (34% decrease). Also for both fisheries, the number of persons engaged was reduced from 138,890 in 1995 to 109,971 in 2003 (21% decrease). The same declining trend has been observed in Tokyo Bay, Ise Bay and Osaka Bay areas. Between 2003 and 2006, the production for capture fisheries has specifically declined from 8,854 tons to 4,624 tons (48% decrease),

Fisheries sector has played an important role in giving livelihood and providing food security to the Korean people. There are 410 designated and 1,829 small-scale fishing harbors. Fisheries production was about 2.7 million metric tons in 2005, with coastal fisheries and aquaculture accounting for 79% of the total production. The total national fisheries production (including domestic and abroad catches) had continuously decreased from 1993 to 2002. Notwithstanding, the trend has been slightly increasing since 2002 mainly due to an increase in aquaculture production. Fisheries production in 2003 was 2,486,000 tons, but the total demand for fishery products was 5,523,000 tons. Hence, the ROK imported 3,037,000 tons of fishery products to meet the excess demand.

Russia's fishery resources include various commercially-valuable species, including migratory fishes. Given its location at the juncture of the temperate and the subtropical zones, the fish fauna of Primorye in the RFE is characterized by high biodiversity that include over 360 fish species. These are in addition to cold-water species, such as cod, navaga, pollock, Far Eastern salmon, gobies and flatfish. In summertime, numerous families of fishes that prefer warm temperature may also occur off the coast of Primorye. Migratory species from the south may also be found in the area, such as swordfish and sablefish.

The fisheries complex in the RFE is composed of fish and seafood catchers, processors, specialized facilities and services, and fish stock reproduction organizations. Close linkages interconnect the different parts of this complex fisheries sector with each other, as well as with other economic sectors. It is serviced by a large number of specialized branches such as shipbuilding, ship repair, transport and reefer fleet, as well as manufacturers of fishing gears and packing materials, among others. Auxiliary services – such as procurement, sales, communications and construction – provide support both to fish producers and specialized services involved. Fishery makes up 35% of the whole agricultural production of Primorsky Krai. Fishing fleet is very active in the waters of Far Eastern seas and the Pacific Ocean. The western sub-region (from the Tumen River's mouth up to the Amur Bay) has a high potential for fisheries development. The vast shallow-water bays and favorable hydrological conditions give rise to valuable resources for the fisheries sector, and provide a good base for mariculture development as well. In the Russian Far East, the highest total fish catch (4,601,000 tons) was registered in 1990. In the following years, the yield was reduced down to 1,717,000 tons in 2002. Then, the yield increased again to 2,150,000 tons in 2008.

2.3.5 Mineral resources

There are significant reserves of major energy and ferrous metals in China's NOWPAP portion. These include petroleum, natural gas, coal, iron, manganese and vanadium. In 2007, the highest volume of production was petroleum, which was estimated at 1,302,609,000 tons. Natural gas came next at 264,180 million m3. Non-ferrous metals and non-metal minerals are likewise abundant that include copper, lead and bauxite. In 2007, the top three estimated reserves were for the ores of magnesite, pyrite and kaolin. These reserves were estimated at 1,920,408,000 tons, 61,088,600 tons, and 286,726,000 tons, respectively.

The value of shipped products (including services) for mining operations in urban districts and municipal regions in the coastal zone of the Russian part of NOWPAP regional sea is significant. Notwithstanding, the trend varies. In Primorsky Krai, it increased from 6,384.2 million rubles in 2005 to 6,994.2 million rubles in 2006. In contrast, the value decreased from 13,803.6 million rubles in 2005 to 13,536.9 million rubles in 2006 in Khabarovsky Krai.

There are substantial deposits of hydrocarbons in Sakhalin. For oil and condensate, the actual extraction was 1.7 million tons in 1997. It is expected to increase to 25.5 million tons in 2010. In the case of natural gas, the actual extraction was 1.8 billion m3 in 1997. It is projected to increase to 36.3 billion m^3 in 2010.

2.3.6 Transportation

Maritime transport and trade are quite significant in the region. There are some important ports in China, such as Dalian port, Yantai port, Qingdao port, Lianyungang port and Shijiu port. Significant volumes of freight are handled by these major coastal ports in the NOWPAP part of China. Between 1990 and 2007 alone, the volume handled by the top two ports were as follows: Dalian – from 49,520,000 tons (1990) to 222,860,000 tons (2007); and Qingdao – from 30,340,000 tons (1990) to 265,020,000 tons (2007).

There are 13 principal ports in Japan. Values of exports and imports in these principal ports increased from 1995 to 2005. The values of exports increased from 26,311 billion yen in 1995 to 35,049 billion yen in 2005. Similarly, the values of imports increased from 16,867 billion yen in 1995 to 28,267 billion yen in 2005. The proportion of contribution of these 13 ports to the entire country has gradually declined. The ratio of values of exports to total exports in Japan decreased from 63.4% in 1995 to 53.4% in 2005. Meanwhile, the ratio of values of imports to total exports in Japan decreased slightly from 53.5% in 1995 to 49.6% in 2005.

In the RFE, the bulk of port facilities are concentrated in Primorye Krai, Khabarovsky Krai and in Sakhalin Oblast. The major ports that are situated here are capable of handling up to 100 million tons of cargo annually. In 1997, these ports handled a total of 28 million tons, which was equal to 74% of the RFE's total turnover in sea ports. The region's largest ports – Vladivostok, Nakhodka, Vostochny and Vanino – are connected with the Trans-Siberian Railway and the Baikal-Amur Railway. The transport sector of the Sakhalin Region is one of the leading segments in the RFE's complex economy. Nearly all the cargoes arriving for Sakhalin and the Kuril Islands are delivered by cargo boats, by ferries, or by railway wagons through a sea ferry passage at Vanino-Kholmsk.

The Region has 11 seaports. There are eight sea trade ports located in Kholmsk, Korsakov, Alexandrovsk, Poronaisk, Uglegorsk, Shakhtyorsk, Boshnyakovo, and Krasnogorsk. The ports of Korsakov and Kholmsk are largest. The coal and timber shipments go through the other ports. In 1999, the international ferry communication was opened between the ports of Korsakov and Wakkanai (Japan).

2.3.7 Tourism

Tourism is on the rise in the NOWPAP region given its many attractive tourist destinations. In general, tourism in China has increased considerably over the last two decades. In 2007, some 9,204,500 international tourists arrived in the NOWPAP part of China. For this period, the tourism receipts was recorded at US$6,871,000,000. China has also several world-class, nature-based public recreational sites in the NOWPAP area. These include the: Daheishan National Forest in Liaoning; Songhua Lake in Jilin; Mingyue Island beauty spot in Heilongjiang; Zhongshan Mausoleum in Jiangsu; and Taishan Mountain in Shandong.

The Russia portion has also become attractive to tourists due to its mild climate, relatively high degree of land development, warm sea, aesthetic coastal landscapes, presence of many relict species of animals and plants, exotic natural features, and ancient historical monuments. The southernmost south region practically coincides with the borders of Peter the Great Bay. The aesthetic beauty of the shores, favorable climate and sandy bays and beaches make this region suitable for recreation. Deposits of curative mud in the south of this sub-region catalyze the development of curative-sanatorium establishments.

The central sub-region (coastal zone of Amur and Ussuriisk Bays) is the most developed part of the Primorsky Krai. It has also a relatively high development potential. The coastal zone is rather rugged. Sheltered parts of bays are suitable as rural recreation zones. Foreign tourist arrival has likewise been increasing. In 1996, the number of foreign tourists who visited were as follows: Primorsky Krai – 260,000; Khabarovsky Krai – 200,000; and, Sakhalinskaya Oblast – 19,000. In 1997, these figures increased to 300,000, 220,000 and 25,000 in these three sites, respectively. Because of its proximity to China, Primorsky Krai and Khabarovsky Krai have about 80%, of the total number of tourists entering and tourist abroad from and to China. The share of Amurskaya Oblast is about 90%, Most Chinese tourists visiting the RFE are traders who bring Chinese goods and products to sell at the local markets. For example, in 1997, Primorsky Krai accommodated some 23,000 tourists coming from China.

2.4 Environmental conditions / brief information on natural resources

2.4.1 Environmental /physical setting

In China, the major relief of Jiangsu Province, Shandong Province and Liaoning Province are hilly and plain regions. On the other hand, mountainous regions cover substantial proportion of the other two provinces. In addition, the water area of Jiangsu province is quite large covering some 17% of the whole province. The major cities in NOWPAP region in China include Harbin, Changchun, Shenyang, Dalian, Yantai, Qingdao, and Lianyungang.

China's marine parts in the NOWPAP region mainly refer to the Yellow Sea. As such, the Yellow Sea is a half-closed continental shelf flat sea; the seabed hypsography inclines to center from north, east and west. Water depth in most parts is less than 60 m, while the average depth is 44 m. Its climatic regime, water characteristics and life-forms are greatly influenced by the continent. Given deposition of mud and sand (from Liao River, Yellow River, Huai River and Yangze River), the Yellow Sea received the most quantity of mud and sand throughout the whole world. In summer, the water temperature is high and the salinity is low. Meanwhile in winter, the water temperature is low and the salinity is high. The salinity of the Yellow Sea changes from 30 to 32 PPT, while the annual average water temperature ranges from 14°C to 19°C.

In Japan, several volcanic ranges throughout the country have produced the complicated and quite diverse geographical configuration. About 70% of Japan's land area is mountainous. Henceforth, the lowland area where human activity is generally intense is comparatively small compared to that of hilly land and upland. These natural features have dictated the patterns of development of agriculture and industry.

On the Pacific side, the summers are hot and humid and seasonal winds come from the southeast. On the major NOWPAP region side, northwesterly winter winds come from the

Asian continent, seasonally bring heavy snows. Coastal regions, except Hokkaido, have rainy seasons from June to mid-July. From August to October, typhoons hit nearly the whole region of Japan. On the other hand, the coastal regions of the Setouchi Island Sea around the main island (Honshu) and Shikoku have relatively moderate climate, except during the rainy season.

In the case of Russia, the morphology of sea bottom is characterized by a weakly developed shelf stretching from 15 km to 70 km along the seacoast. About 80% of the Russian part of Japan/East basin is comprised of numerous mountain ridges. Mountains are relatively young (about one million years old), and almost all of them belong to the mountainous country of Sikhote Alin. The average height of mountains is 600 m. Oblachnaya Mountain is the highest and its height is 1,855 meters above sea level. Sakhalin is one of the largest islands in Russia. It is washed by the Sea of Okhotsk and the NOWPAP's regional sea. The island stretches 948 km from north to south. The area of the island is about 76,400 km^2.

The warmest month in the ROK is August, when the temperature in the north equals 13-14°C. In the south and in the Korean Strait, the temperature reaches up to 27°C. The lowest temperature (0-1.5°C) is typical for February, when ice is formed in the northern shallow-water areas. In the Korean Strait, the temperature decreases to 12-14°C during the same period.

The NOWPAP region's sea is located in two climatic zones: subtropical and moderate. Within the bounds of these zones, there are two sectors with different climatic and hydrological conditions: (1) a severe cold northern one (partially covered with ice in winter), and (2) a mild, warm one, adjacent to the Japanese and the Korean coasts. The main factor forming the sea's climate is monsoon circulation of the atmosphere. The main atmospheric circulation systems over the NOWPAP region sea are the Aleutian Low, the Pacific High, and the Asian Center of the atmosphere activity which is located above the continent.

2.4.2 Major river basins / watersheds

In China's NOWPAP region, the major rivers' basins of the region include Songhua River, Liao River, Hai River, Yellow River, Huai River and Yangtze River. The total discharge of these bodies of water was about 1,193.1 billion tons per year. In China, the total quantity of riverine waters that flow into the sea is 1,600 billion m^3 every year. From this total, the 57% comes from the Yangtze River, while 3% comes from the Yellow River. About 3% of the total water quantity is drained into the Yellow Sea. Hai River that covers the two provinces of Hebei and Tianjin discharges indirectly to the NOWPAP region through the Bohai Sea, which connects to the Yellow Sea from the west. The part of Shandong in Huai River basin also provides inputs to the Yellow Sea. The part of Jiangsu, in Yangtze River basin, provides inputs indirectly to the Region through the Yellow Sea.

In Japan, there are 35 major rivers (first class rivers) flowing into the major NOWPAP region, while 32 rivers drain into Tokyo Bay, Ise Bay and Setouchi Island Sea. The average catchment area in the major NOWPAP region is 2,563 km^2. The, area is comparatively smaller in the minor NOWPAP region at 1,638 km^2. The river gradient in the NOWPAP region is from 1/100 to 5/100, which is quite large. The population density in the major NOWPAP region is 141 persons/km^2), while the figure in the minor NOWPAP region is higher at 767 persons/ km^2). These figures indicate that the human activities are concentrated and more intense in the minor region, especially in the areas around Tokyo Bay, Ise Bay and Osaka Bay.

In Primorsky Krai of Russia, 12 main rivers and several dozens of small ones discharge into the sea approximately 40 km^3 of water annually. For the Sakhalin Island, this value is 3.3 km^3. In Khabarovsky Krai, the Amur River supplies approximately 360 km^3 of water annually.

2.4.3 Land-uses / land cover

There is a great variation among the NOWPAP countries in terms of land use. In the NOWPAP part of China in 2007, some 83,850,000 ha of lands were devoted for agriculture. On the other hand, some 8,325,000 ha were allotted for construction and/or human settlements.

In Japan, forestry is the largest land use category in each of the prefectures. The only exceptions are Tokyo Bay area, Osaka and Kagawa prefectures. The ratio of inhabitable area in each of the prefectures in Tokyo Bay area ranges from 60% to 67%. The ratio of paddy field area that characterizes the land use in Japan is 17.7% in the major NOWPAP region and 14.7% in the minor region. Built-up areas are concentrated in the coastal regions as well.

In the case of Russia, the land area amounts to more than 600 million ha and is composed of three main types: forested land (44%), reindeer pasture (30%) and barren land (22%). Farm land accounts to no more than 1% of the region's land resource. This proportion greatly varies from 10% in Primorye Krai to about 1.5% in Khabarovsky Krai and Sakhalin Oblast.

2.4.4 Coastal habitats

Coastal wetlands are highly productive ecosystems/habitats. They serve as spawning and nursery grounds for various species of fishes and other marine organisms. Coastal wetlands also serve as nesting grounds, staging areas and migration stopover for waterfowls and other sea birds.

Due to well-developed tidal mudflats, most coastal wetlands in ROK are distributed on the western and southwestern coasts. Less than 10% of the coastal forests remain in heavily developed urban areas. Meanwhile, over 20% of coastal forests exist along the coast in less developed rural areas.

In the coastal waters of Russia around NOWPAP region, more than 500 species of macrobenthos are found. Among them are over 200 species of macrophytic algae. The most common groups of animals are bristle worms, bivalves and amphipods. Biological resources harvested here are several species of fish, algae and echinoderms. In its northern coastal boundary, at least 300 species of macrobenthos have been recorded. At depth of 0-5 m in open and semi-closed bays, there are widespread communities of Japanese and Chicory blade kelp, Irish moss and Miabe seagrass.

Fauna and flora in this sub-region feature a higher percentage of subtropical species. Rough estimations of plankton and benthos include about 519 species of benthic animals, 85 macrophytic algae, 3 seagrasses, 190 phytoplanktons, 100 fish species and 3 marine mammals. Coastal waters have high productivity supported by organic detritus being brought in by the rivers flowing into semi-closed bays. Warm-water tropical sea snakes, turtles and sharks have been seen observed in the area.

2.4.5 Anthropogenic activities which cause inputs of contaminants to river basins and coastal zones

Despite the vital contributions of river basins and coastal ecosystems to human well-being, they have seldom been managed appropriately. Either worldwide or in most regions, many coastal resources and environments are in peril. The key problems confronting the coastal zone include habitat degradation, non-optimal use of resources, and pollution. Many economic activities are inputting contaminants to river basins and coastal zones. These include unsustainable agriculture and forestry practices, unsustainable mining activities, and inadequately regulated development of various industries and human settlements.

In China, the main pollution in the sea is brought about by land-based pollution. With the increasing development activities at the river basins, many rivers carry with them contaminants that are ultimately drained into the marine and coastal environments. Most wastewater sources have been treated well before discharge; however, some sewages are directly discharged into the sea.

In Korea, intensive coastal development since the 1970s has resulted in some negative impacts to the riverine and marine environments. Large-scale industrial complexes and urban areas are located in the coastal watersheds, which act as big pollution sources. Rapid urbanization and industrialization of the coastal area are responsible for increased inflow of domestic sewage and industrial wastewaters into the Korean seas, thereby reducing the effect of the treatment facilities. Too crowded aquaculture farms and the resultant interference of seawater movement are also causing the deterioration of the coastal water quality in some areas.

Most of the conditions above described for China and Korea also exist in Japan and Russia. There are variations in severity of the conditions, though, among countries within the NOWPAP region. Anthropogenic activities which cause inputs of contaminants to river basins and coastal zones are discussed in some details in Chapter 3.

2.4.6 Environmental impacts from different sectors of economy

There are many economic sectors that operate in the river basins and coastal areas of the NOWPAP region. There include aquaculture, construction, energy, fisheries, maritime trade, oil and gas, shipping and ports and tourism. Simply told, the river basins and coastal regions provide the natural resource base for socio-economic development. These areas are therefore significant not only for human well-being, but also for biodiversity and maintenance of crucial ecological processes.

Without integrated development of the river basins and the coasts, however, there are some negative environmental impacts that result. Such negative impacts affect either the human population or the human environment – at times, both are affected. Unregulated land-based activities, for instance, are also accelerating the destruction of coastal forests which have provided a protective buffer zone for coastal communities from natural disasters, such as tidal waves and typhoons. Sewage pollution, as another example, has massive effects on human health. It also results in some economic losses by: (1) ruining significant areas for tourism and recreation through poor water quality, and (2) increasing the incidence of toxic algal blooms which render fish unsafe for human consumption.

Excess nutrients from agriculture and forestry also promote the growth of epiphytic algae and increase the risk of toxic algal blooms. These problems are compounded by the accumulation of solid wastes, chemicals, pesticides and heavy metals in coastal waters from agriculture, mining, shipping and industry (Rawlings et al. 1998). Highly sectoral approach to development, therefore, often results in greater poverty, more resource use conflicts, and reduced contributions of the relevant sectors to the economy. Environmental impacts from different sectors of the economy – coupled with burgeoning population – are discussed in more detail in Chapter 3.

3 EXPERIENCE OF ICARM PLANNING AND IMPLEMENTATION IN NOWPAP REGION

This chapter is divided into two sections. Section 3.1 presents an analysis of the situation in the NOWPAP countries. This covers the key ICARM issues/problems, both from the human and environmental dimensions. Section 3.2 highlights the key ICARM issues – both national and regional – and the management measures that have been and/or being undertaken to address them. These cover management measures such as land-use management (or functional zoning), institutional arrangements, policy development and related measures.

3.1 Analysis of situation in NOWPAP countries

The previous chapter offered glimpses/highlights of the comparative description of present social, environmental and economic situation within the NOWPAP Member States. In this section, the facts about the major problems/issues/challenges are presented, and their interconnections are elucidated as well. These issues are intricately linked, and it has been duly recognized that the most effective way to address them is to implement a carefully planned and integrated program for the river basins and coastal areas.

Figure 1 schematically illustrates a summary of the major issues confronting the river basins and coastal areas of the NOWPAP region. If the problem of the NOWPAP region may be summarized in a single statement, it can be stated that its river basins and coastal areas have yet to be fully managed in an integrated manner. Such unsustainable management results in reduced societal contributions (including lesser socio-economic benefits) and greater resource use/intersectoral conflicts. In specific terms, the not yet fully functional integrated management of the river basins and coastal areas are manifested by the following: (1) habitat degradation, (2) pollution, (3) non-optimal use of resources, and (4) cross-cutting issues.

The main cause of the above problems — or what prevents the governing bodies or entities from resolving them — is “constraints in integrated system of governance.” Hence, all these problems can be ultimately linked to a institutional/management system that is not yet fully effective. These problems/issues and their interrelationships are examined more closely in the succeeding sections.

3.1.1 Habitat degradation

Habitat degradation is also synonymous with destruction of natural ecosystems. Human activities that continue to cause widespread destruction and alteration of important fish habitats in the coastal zone include damming, reclamation of inter-tidal areas and creation of navigation channels. Among others, seagrass beds and coastal forests have been degraded. Destruction and degradation of such critical habitats are strongly correlated with the decrease in marine biodiversity and productivity.

The destruction and alteration of habitats is considered to be the greatest of all threats to biodiversity, and the most widespread human impact on the coastal zone (GESAMP 2001). Threats to biodiversity have been magnified considerably because at least half the world's mangroves and coastal wetlands have been lost (GESAMP 2001). Unregulated human activities are impairing the functional integrity of coastal and marine ecosystems, thereby reducing the natural goods and services that they provide. Some specifics in the NOWPAP region are provided.

In Japan, substantial wetlands have been lost. Some 1,689 ha (6.9% reduction) of wetlands were lost in the major NOWPAP region between 1978 to 1994. About 1,410 ha, (11.4% reduction) on the other hand, were lost in Tokyo Bay, Ise Bay, and Setouchi Island Sea areas for the same time period. The destruction rate for wetlands are as follows: Tokyo Bay – 89.4% between 1945 to 1983; Ise Bay – 63.3% between 1955 to 2000; and Setouchi Island Sea – 23% between 1949 to 1995.

In Korea, the degradation of coastal habitats has been happening in strategic places. Destruction and degradation of such critical habitats are strongly correlated with the decrease in marine biodiversity and productivity. Productivity and profitability of fisheries have been declining also due to marine environmental degradation.

The area of the ROK's coastal wetlands has decreased considerably by 20%: from 3,203 km² in 1987 to 2,550 km² in 2005. Such decrease in area is mainly attributed to reclamations and other coastal development activities. It is expected that more coastal wetlands will disappear with on-going and newly-proposed reclamation projects in the coastal areas, which are mostly aimed at providing lands for commercial districts, agriculture and livestock industries, cities and harbor facilities.

Land-based activities are also accelerating the destruction of coastal forests, which have provided a protective buffer zone for coastal communities from natural disasters such as tidal waves and typhoons. Less than 10% of coastal forests remain in heavily developed urban areas. Meanwhile, over 20% of coastal forests exist along the coast in less developed rural areas. Reserve areas have dramatically increased to protect sensitive and vulnerable coastal and marine ecosystems since 1996.

3.1.2 Pollution

Pollution in the NOWPAP region is manifested in various forms. They occur in both air and water, and are present in both the riverine and marine environments. Generally speaking in China, the main controlled contaminations are chemical oxygen demand (COD)

and ammonia nitrogen (NH3-N) in freshwater. On the other hand, COD, biochemical oxygen demand (BOD), inorganic nitrogen (IN) and active phosphate (P) are the contamination in the marine waters.

In Japan, there are seven major environmental pollutions identified. These are: air pollution, water pollution, soil pollution, noise pollution, vibration, ground subsidience and bad smell. In 2004, the average number of cases against environmental pollution per prefecture recoded within the NOWPAP region were as follows: air pollution - 596; water pollution - 199; soil pollution – 6; noise pollution – 404; vibration – 53; ground subsidience – 2 ; and bad smell - 329. In Korea, the rapid increase of pollutants into the coastal waters is coming from the inputs from land-based sources as well as non-point pollutant sources. The various forms of pollution are arbitrarily classified into several sections below for simplicity of description/ presentation.

3.1.2.1 Water quality

In China, the Yellow Sea has been a recipient of pollutants being discharged from the land. There has been a decrease in the amount of pollutants that are ultimately deposited into the sea since 2005. For example, the quantity of COD discharge from both industry and household was 3,292,000 tons in 2005. This decreased to 3,127,000 tons in 2007. As another instance, the quantity of ammonia discharge from both industry and household was 348,000 tons in 2005. This decreased to 302,000 tons in 2007.

Three provinces are involved the NOWPAP region in China for direct discharge of pollution loads. These are Liaoning Province, Shandong Province and Jiangsu Province. The pollution loads include the wastewaters from main industrial plants and sewage that are directly discharged into the coast. In 2007, the total amount of direct discharge of waste water was 0.77 billion tons, while the total amount of COD was 85,000 mg/L. The status of sea water quality in offshore area of three coastal provinces varies. Liaoning province's water quality in the offshore areas is gently polluted. The situation is similar in Jiangsu province. Meanwhile, Shandong province's water quality in the offshore areas is fairly good.

The overall water quality status of Yellow Sea in 2007 was good: Grade I and II sea water account for 85.2%, 1.5% higher compared to 2006; Grade IV and above seawater account for 5.5%, 0.6% lower as compared to the previous year. The percentage of Grade III sea water, however, was recorded as going down. Key pollution elements affecting the water quality in the offshore areas were oils, inorganic nitrogen pH and activate phosphate.

For water pollution in Japan's NOWPAP region, 401 incidences were recorded. Water pollution in the river network has little variability. The average BOD ranged from 0.94 to 0.85 mg/L between 2003 to 2006 in the major NOWPAP region. Characteristics of water environment are different for enclosed sea areas in major NOWPAP region. The water quality standards (Class A) for enclosed seas of Maizuru, Miyazu and Kumihama in Kyoto Prefecture were not achieved in 2005 (Hiruma 2008).

In Korea, the pollution loads in terms of BOD increased to about 40% during the last decade. The coastal and estuarine water quality has been of great concern in ROK due to its impacts on biological diversity, seafood safety and tourism potential. The overall coastal

water quality has remained at seawater quality grade II (1~2 mg/L) in terms of COD since 1991, despite the continuous investment in pollution treatment facilities. Rapid urbanization and industrialization of the coastal area have been responsible for the increasing inflow of domestic sewage and industrial wastewater into the Korean seas, thereby reducing the effect of the treatment facilities.

Some Special Management Areas (SMAs) and semi-enclosed bays, however, were heavily polluted. As such, the water quality exceeded grade II. In some cases, the values were outside the seawater quality criteria. Over the last five years, occurrences of DO concentration less than 5 mg/L have been recorded in the SMAs. In the waters of some SMAs, DO concentrations were lower than 3 mg/L during summer season.

In Russia, the overall volume of wastes coming from the southern and eastern districts of Primorsky Krai ranged from 390 – 398*106 m^3 from 1997-2002 based on official data (Natural Resources and Protection of Environment 2003). Assessment by the experts (Gavrilevski et al. 1998) for Vladivostok estimated the annual volume of waste waters at about $420*10^6$ m^3, plus $63*10^6$ m^3 of the storm-water wastes.

Chemicals form part of discharges from Primorsky Krai rivers that flow into the sea. The water media were Artyomovka, Avvakumovka, Maksimovka, Margaritovka, Partizanskaya, Razdolnaya, Rudnaya, Samarga, Serebryanka, Tsukanovka, Tumen and Zerkalnaya Rivers. On the average for 2002, the values for BOD, COD and DO were beyond the maximum permissible concentration (MPC) for the Russian fresh water bodies.

3.1.2.2 Air pollution

For air pollution in Japan's NOWPAP region, 1,220 incidences were recorded. Russia's terrestrial air composition in the central part of the Ussuriisk Taiga and in the Sikhote-Alin Biosphere Nature Reserve was appraised. More than 73% of pollutants are estimated to have emanated from China. More specifically, the most heavily polluted air masses come from the east along the trajectories from Japanese and Korean Peninsula. Principal pollutants are SO_2, NO_2, CO and dust. The situation is most unsatisfactory in Vladivostok, Dalnegorsk and Rudnaya Pristan. The distribution of pollutants in the air emitted by the largest cities in the Primorsky Krai clearly stretches for hundreds of kilometers.

Based on 2002 data, the air in Primorsky Krai was mostly contaminated by NO_2 and benz(a)pyrene. The highest NO_2 levels were registered in Artyom, Ussuriisk and Vladivostok. Values recorded were up to 0.28 mg/m^3, which is 7 times higher than the MPC. The highest B(a)P contents were measured in Partizansk, Ussuriisk and Vladivostok. Recorded values were 14 times higher than the MPC. The main sources of NO_2 are emissions from industrial enterprises (including thermal power plants) and from automobiles.

3.1.2.3 Nutrients

In China, chemical fertilizers containing nitrates are being discharged into the Yellow Sea. The total amount of NH_3-N was 41,400 tons; the total amount of oils was 4,000 tons; and the total amount of total phosphorus was 8,100 tons. The main pollutants are total phosphorous, ammonia and COD_{Mn}.

In Japan, there has been continuing efforts in order to improve the water quality of enclosed ocean bodies. Hence, the allowable discharge limits for COD, nitrogen and phosphorus are specified for the plants that discharge more than 50 m^3/day of wastewater.

In Korea, nutrients are discharged into the seas through rivers, as well as through sewage treatment plant outfalls and from the air as well. With the construction of sewage treatment plants, point sources are well under control. More attention should be given to the management of non-point sources. Urbanization is directly related to increase in pollution load from non-point sources. Pollution load from non-point sources accounted for 26% of the total pollution load in 2000. Hence, there was a considerable increase from 21% in 1995.

Airborne input of nutrients is gaining an interest with regard to the reduction of nutrient loads into the marine environment. Even though there are very few data and information on airborne inputs of nutrients into the marine environment of ROK, recent researches showed that airborne nitrogen inputs were estimated to be 10~20% of the total nitrogen inputs.

For Russia's Primorsky Krai Rivers, the values for ammonium (NH_4), nitrogen dioxide (NO_2), nitrate (NO_3) and phosphate (PO_4) were beyond the MPCs for the Russian fresh water standards. Peter the Great Bay, which has a very high population, will most likely have the maximum impacts. For the whole Russian mainland coast within the NOWPAP region, the anthropogenic flux of phosphate reaches up to 80% of the total river discharge. This is in addition to the direct input of phosphorous to the coastal waters.

In 1998, fertilizer application in the Chinese sector of the Tumen NET Area was substantial. These included 13,558 tons of nitrogen and 1,066 tons of phosphate. Some 749 tons of pesticides were applied in 1998, of which 28% were insecticides.

3.1.2.4 Heavy metals, hazardous substances and sediments

In China, heavy metals that cause pollution include lead and mercury. These are transported through these water bodies: Chaobaixin River, Daliao River, Daling River, Duliujian River, Hai River, Huai River, Luan River, Songhua River, Tumen River, Wusulijiang River, Yalv River, Yangze River, Yellow River, Yi River and Yongdingxin River. Heavy metals and v-phen are monitored in some river sites. Results show that only a few sites exceed the national standards. In Japan's coast, the annual average for incidences of harmful liquids was less than 10 cases from 2001 to 2005.

Heavy metals and hazardous substances are new environmental issues in the marine environment of ROK. Although only limited data and information are available for these pollutants, most coastal waters of ROK are in good condition with regard to heavy metals and hazardous substances. Their concentrations in water column and sediments are largely within domestic legal standards or foreign standards (for materials without domestic standards). Pollution by heavy metals and hazardous substances is increasing, however, in semi-enclosed bays and estuaries. This is particularly true in areas next to industrial complexes, harbors and densely-populated urban areas.

Sediment quality in the coastal waters of ROK is good overall. Notwithstanding, organic contamination has been observed in coastal waters close to urban and industrial

centers. Among Coastal Environment Management Areas (CEMAs), Marine Protected Areas (MPAs) have lower sediment COD concentrations compared with the national average. However, SMAs have much higher values than the national average.

Heavy metals have significant adverse impacts on food safety and marine ecosystem health. Surveys revealed that surface waters and sediments in trade ports and near industrial complexes are polluted with heavy metals. Except for a very few cases, however, heavy metal concentrations are within the legal standards for human heath safety. Concentrations of Cu were in the range of 0.90 to 829μg/L in sediments and 0.04 to 24.6 μg/L in seawater. Concentrations of Hg in sediments varied from 0.003 to 0.316 μg/L, and those of Pb in seawater from 0.004 to 0.693μg/L. Most heavy metals in seawater or sediments were recorded either within the seawater quality standards of ROK, or within the guidelines of other countries with sediment quality standards. Exceptions were for values of Cu in sediments of heavily polluted areas. In some marine areas, COD, cadmium and lead exceed the national standards.

For the rivers in Primorsky Krai, Russia, the values for suspended solids and sufract (concentration of anionic detergents) are beyond the MPC concentration for the Russian freshwater bodies. A comparison of the assessments of the metals run-off in dissolved forms and with suspended solids revealed that more than 80% of overall run-off of metals are carried in solid phase. For particulate-bound elements, such as Fe and Pb, the roles of particulate forms increase up to 98-99%.

Metal pollution is also very prevalent. In cities and in settlements to the south of the Russian Far East, the MPC of lead was exceeded in several places. An average daily admissible concentration is 0.3 kg/m^3. In Rudnaya Pristan, the annual average level of lead is twice as high. This value holds true for all the large cities in the northern part of NOWPAP region seas and river basins. For example, in Vladivostok, which is the largest city and industrial center on the Russian coast of this basin, the recorded pollutants in the late 1980s and early 1990s from stationary sources were equal to 799,000 t/year.

The western coast of the northern part of NOWPAP region seas can be divided into four regions according to the pollution loads: (1) Amur Lagoon, (2) northern region, (3) central region, and (4) southern region of Primorsky Krai. Water composition in the Amur lagoon is influenced to a great extent by the Amur River. In the lagoon waters, there is a high concentration of detergents, petroleum hydrocarbons and heavy metals. There is also a fairly high turbidity. The Amur River's flow can be traced (in terms of metal content) to coastal waters of the Sikhote-Alin Nature Reserve. In recent years, the development of oil industry in the territory of the Northern Sakhalin and its shelf has caused serious concerns regarding the state of marine ecosystems.

In the northern region – from the Zolotoy Cape to Povorotny Cape – the major sources of pollution to coastal waters are ore-mining and ore-chemical production. The largest operations are located near Rudnaya and Zerkalnaya Bays. Pollutions include large quantities of Pb, Cu, Zn, Cd, As, B, as well as other chemicals in dissolved and suspended forms. A build-up of pollutants are bio-magnified in the tissues of marine organisms, making them inedible or unfit for human consumption. No concentrations above the background levels are found around Olga Bay with its harbor for the Pacific Fleet of Russia.

The impact of the tailings discharged into the Tumen River on the biodiversity is considerable. Sands and fine sediments are deposit in the quieter regions and smother many aquatic flora. Local communities living downstream of discharges will be adversely affected by reduced water quality for either domestic purpose or irrigation use.

3.1.2.5 Oil spill

In China's part of the NOWPAP region, some 82 oil spill incidents were recorded between 1995 and 2005. The most number were 21 incidents in 1998 in Zhujiang River involving 1,000 tons of diesel oil. As a main pollutant, the values obtained for oils exceed the standard by 2.5 times.

In Japan's marine region, the incidences of oil pollution fluctuated from 327 in 2001, 382 in 2003, and 229 in 2005. Meanwhile, the incidences recorded for the same time periods in Tokyo Bay, Ise Bay and Setouchi Island Sea areas were 161, 139 and 105 that were about half of the total incidences. There was the highly publicized January 1997 Nakhodka oil spill that occurred off Fukui Prefecture. This incident will likely occur with greater frequency in the future.

3.1.2.6 Red tides / harmful algal blooms

In China, some 713 red tide (technically referred to as harmful algal blooms or HABs) incidents were recorded between 1995 and 2007. The most number recorded was 119 incidents in 2003.

In Japan's marine region, red tides have occurred 37 in 2001; 43 in 2003; and 18 in 2005. These cases were about half of the total recorded occurrences.

The frequency, intensity, and areal size of red tides in the coastal waters of ROK have greatly increased over the last three decades. These incidents of HABs have caused significant economic damage to the aquaculture industry. Toxic red tides have occurred since 1990s, leading to massive deaths of fish and shellfish. Areas of red tide occurrences have also extended from the southern coastal waters to the entire coastal waters. The accumulated economic damage incurred by red tides was US$ 119 million during the period of 1995 to 2005, with a peak in 1995 at US$76 million.

3.1.2.7 Marine debris, solid wastes and ocean dumping

In Japan's marine region, the occurrences of waste materials were recorded at 103 in 2001; 124 in 2003; and 94 in 2005. Meanwhile, the recorded occurrences for the same time period in Tokyo Bay, Ise Bay and Setouchi Island Sea areas were 46, 48 and 19. Hence, the observed number of occurrences have gradually decreased.

Dumping of wastes in the marine waters of ROK is regulated under the London Dumping Convention. Such activities are likewise prohibited in the national laws like the Marine Pollution Prevention Act and the Natural Environment Conservation Act. Ocean dumping has rapidly increased due to population growth and economic development in the coastal area. To respond to the increase in volume of dumped wastes, new regulation is being applied to achieve a 50% reduction of the amount of current dumping.

Marine debris is also increasingly becoming a threat to coastal economic activities, as well as to marine organisms. Some 30% of the total volume of disposed marine debris were estimated as plastic materials. Annual generation of marine debris was estimated at the maximum of 142,000 tons in 2002. In terms of proportion, land-based debris comprised 34.2% of the marine debris collected in coastal beaches and sea-based debris accounted for 65.8%, based on counting the number of collected marine debris.

3.1.2.8 Wastewater / sewage

In China, substantial amount of pollutants are discharged from the five coastal provinces. Wastewater discharges have been on the rise over the last decade. Wastewater from industry was estimated at 5.71 billion tons in 2001, and this increased to 6.09 billion tons in 2007. Meanwhile, wastewater from households was recorded at some 5.7 billion tons in 2001, which increased to 6.6 billion tons in 2007. From 2005 to 2007, wastewater from industry has decreased. On the contrary, wastewater from household has increased slightly. There has been an increase in the amount of main pollutants being deposited in the coastal areas of the Yellow Sea. Wastewater discharge from both industry and household was only 0.2 billion tons in 2001. This increased to about 1.52 billion tons in 2007.

In Japan, the Sewerage Law in 1970 requires the establishment of "comprehensive basin-wide planning for sewerage systems". Through this national law, public sewerage systems have been developed for the prevention of water environment. In cases when the effluents discharged into the water bodies are not sufficiently treated flows, advanced water treatment is being undertaken in addition to the conventional secondary treatment.

In Korea, sewage is a chronic threat to public health and the coastal environment. Improperly treated sewage from land is the major cause of water quality deterioration, leading to eutrophication and bottom anoxia. As a result of continuous investment for sewage treatment facilities, the average sewage treatment rate of the coastal area increased in 2005. However, this is still low compared to the national average. Most investments on sewage treatment facilities in the coastal area have been concentrated in urban coastal areas. As sewage discharge from household accounts for about 53% of organic pollutant input in terms of BOD, the Korean government has expanded investment in the construction of sewage treatment plants. Such investments in physical infrastructure will increase the sewage treatment rate in the coastal area to 80% in 2011.

Peter-the-Great Bay is the most populated part of the coastal area in the Russian Far East. A total amount of $400*10^6$ m^3 of wastewaters are produced annually which are discharged into the sea. Only 10% of this wastewater undergoes treatment.

3.1.3 Non-optimal use of resources

Non-optimal use of resources largely relate to coastal and marine resources. This particularly relates to the overexploitation of the fishery resources. Productivity and profitability of fisheries may have been declining due to decreased fishing grounds with the proclamations of neighboring countries of their EEZ boundaries, as well as stock depletion from over-fishing.

In Korea, there has been stock depletion due to overfishing. In Russia, there has been over-exploitation of some coastal resources. Over-exploitation in this context refers

to the capture of fish, shellfish or marine invertebrates at a level that exceeds the maximum sustainable yield of the stock. Further, illegal trade, where the catch is sold directly in the open sea and the 'discards' are thrown back into the sea, does not declare the actual volume of catch. Hence, it is speculated that the rate of harvesting due to illegal fishing in some countries of the Region is at the same level (or even at the higher level) as compared to the legitimate fishing activities.

In the northwest Pacific, total catches are increasing again, after a short decline following their maximum production levels about a decade ago. Most of these changes result from increases in landings of small pelagic species. Overfishing and competition among the neighboring countries of China, Republic of Korea, Japan and Russia are often blamed for the fisheries decline in the northern part of NOWPAP region seas. The catch in North Korea may be very high – and possibly almost as high as that of Japan – which is about 2.5 million tons. Although most conventional (commercially-targeted) species are fully exploited, the total volume of catch might still be increased to about 13 million tons. This may be due in part to the use of different fishing gears.

Today's harvesting of marine biological resources in the Far Eastern Russia is at a lower level when compared with the catch levels in the 1990s. Nonetheless, the catch rates of the most commercially-valuable fish species remain largely the same. Hence, such catch rates result in the decrease of the fish stocks. Some species of crabs, sea hedgehogs and Alaska Pollack have declining natural stocks.

3.1.4 Cross-cutting issues

Cross-cutting issues are broadly classified into natural disasters and climate change/sea level rise. Natural disasters have been negatively impacting on the resources and residents of river basins and coastal areas. In China, natural disasters include earthquakes, storm and tidal surges, typhoons and cold waves and coastal erosions. Between 1995 and 2005, 103 storm and tidal surges were recorded. During the same time period, 14 deadly earthquakes happened in the NOWPAP part of China. In 1969, the deadliest earthquake occurred in Bohai Sea with an intensity of 7.4 M_L.

Earthquake and tsunami are the natural disasters that have occurred most within Japan's coast. In particular, both have occurred in Tohoku District. Six major earthquakes have occurred in major NOWPAP region between 1983 to 2008. The magnitude in the Ritcher Scale reached as high as 7 M_L for the earthquake that occurred off the southwest Hokkaido in 1993. Such earthquake was combined with tsunami, which resulted in more than 200 human casualties.

Natural disasters have likewise occurred in Russia. The coast of the Peter the Great Bay is sometimes exposed to tsunami, arising after seaquakes in the northern part of NOWPAP region seas. On the whole, the Russian coast of the northern part of NOWPAP region seas and the Peter the Great Bay underwent a series of four tsunami waves that were accompanied by destruction of both lives and properties. These happened in 1907, 1940, 1983 and 1993. In 12 coastal locations along the Peter the Great Bay and near the open sea, where serious sea level rise was registered, the incoming wave height exceeded two meters. In five of the locations, the wave height reached four meters. Large waves were recorded along the western coast of the Muraviov-Amursky peninsula and in other locations. Sakhalin Island is

highly vulnerable for both earthquakes and tsunamis. Some areas of Russian territory with the NOWPAP region are prone to flooding. Vladivostok has a probability of flooding at level 4. It means that the area has a 40% chance of being flooded once every 2.5 years.

Sea level rise is another concern in China. On the average, the sea level of the Yellow Sea arises at 2.5 mm per year. From 2004 to 2006, the sea level of the Yellow Sea was higher than the last years. The year 2006 was particularly striking because its sea level was recorded at 74 mm, which was significantly higher than the average level. The issue of sea level rise is often associated with climate change.

The four key problems – habitat degradation, pollution, non-optimal utilization of resources and cross-cutting issues – that confront the facing the coastal areas and river basins described above often act in concert. For example, reclamation of foreshore land and increased sedimentation from agricultural reduce the extent of fish nursery habitats. Moreover, chemical pollution lowers the water quality of the remaining coastal habitats. The combined assaults on the coastal may reduce productivity, resulting in loss of livelihood options, particularly for those who are dependent on the coastal resources. The heavy of coastal dwellers on aquatic resources alone is a compelling argument for their conservation. The economic well-being of some coastal inhabitants is intricately linked with the status of estuarine and inshore ecosystems and the fish stocks that they support. The situation is exacerbated by cross-cutting issues, such as natural disasters, sea level rise and climate change.

3.1.5 Institutional issues

In general, there are constraints in integrated system of governance that lead to some forms of institutional failures and/or limitations. Among the causes of institutional failures in managing the coasts are: inadequate legal and policy support, lack of technical 'know-how' on the part of managers and political leaders, lack of coordination among sectoral agencies and limited involvement of coastal stakeholders, particularly the private sector and marginalized groups (Scura et al. 1992, Chua et al 1992, Chua 1996, 1998).

Broadly, however, the governance and/or institutional problems within the NOWPAP region may be broadly classified into three categories: (1) capability limitations of institutions/ organizations; (2) legal/policy institutional partnerships. Such institutional problems are also manifested in varying forms and degrees in other coastal regions of the world. These issues are intricately related, and have likewise varying degrees of overlap. There are still limited institutional capabilities, as the responsibilities to manage the many complex issues in river basins and coastal areas are shared among many institutions both at the local and national levels. At this stage, however, some agencies still have capability limitations that prevent them from fulfilling to the fullest their institutional mandates or responsibilities. The management agencies are hampered by some limitations in infrastructure facilities, the lack of financial resources, and inadequate human resources, among others.

Secondly, the conditions have been constrained by inadequate/inconsistent policies. In the past, majority of the laws, policies and regulations were oriented towards sectoral management. For example, forestry, fisheries and water have specific sectoral policies with strong sectoral focus. Integrated management of river basins and coastal areas has been constrained by some conflicting policies. Some national policies may at times be in conflict

over the short-term. For example, some policies may promote the sustainable utilization and conservation of coastal resources. Such environment-oriented policies, however, may run counter with key economic thrusts and priorities. Some economic policies, as examples, promote the full industrialization of the fisheries sector. Further, some policies could be enacted with limited scientific basis.

Constraints in institutional partnerships are often manifested in limited or weak coordination among concerned agencies and stakeholders. Such problem in coordination may occur either horizontally or vertically. For example, national regulatory agencies should ideally work closely with the local regulatory units. Yet more often, the collaboration is quite loose, resulting in weak enforcement of national environmental standards and regulations. Weak partnerships are also seen between management agencies and institutions involved with research and development (R&Ds). Hence, there is often limited use in management of relevant technical information. Many government agencies and/or instrumentalities have strong tradition for sector management.

3.2 Key national/regional issues and measures to address them

This section highlights some key ICARM issues – both national and regional – and the management measures that have been and/or being undertaken to address them. These problems/issues primarily relate to: (1) riverine and marine pollution; (2) degradation of coastal habitats and ecosystems; and (3) non-optimal utilization of resources. There is an array of institutional problems or constraints that may be attributed to the persistence of these ICARM issues. Such institutional problems within the NOWPAP region largely relate to: (1) limited institutional capabilities; (2) inadequate/inconsistent policies; and (3) weak institutional partnerships. Hence, solutions must cover the relevant facets of these key problems/issues. Key management measures adopted include land-use management (or functional zoning), institutional arrangements, policy development and related measures. These concerns are highlighted/described in the sub-sections below.

3.3 National/regional priorities and alternatives of problem solving

3.3.1 ICARM process

ICARM planning is a cyclical process following a sequence of basic steps from situational analysis to synthesis and action. For the purposes of this guideline, the steps involved in the planning process are as follows: (1) initiation, (2) analysis of the existing situation, (3) identification of conflicts and opportunities, (4) identification of goals and alternative courses of action, (5) implementation, and (6) monitoring and evaluation. Issues were identified following this generic process. This is similar to the generic, six-stage ICM process from issue identification/assessment to evaluation (Cicin-Sain and Knetch 1998).

In China, the main pollution in the sea areas is caused by land-based pollution. Therefore, the main measures of preventing the sea pollution are aimed at reducing the land-based pollution, reinforcing the works of controlling the land-based pollution sources. Hence, ICARM is very important to preventing sea pollution in China.

To address relevant ICARM issues in Japan, it has undertaken the following measures: established a national strategy; amended pertinent laws; and developed relevant

science and technology programs. These actions come from experience of having overcome environmental pollution over the last 40 years. In the field of water pollution, the Total Pollution Load Control System (TPLCS) has been developed as a pioneering work of ICARM in Japan. Since the governance of river basin, coast and sea area should be pursued comprehensively and integrally, ICARM in Japan is positively promoted as part of achieving a sustainable society that is in harmony with the ecosystems. In the field of water pollution in enclosed sea and coastal zone, the Japanese government has been aggressively implementing environmental protection countermeasures directed to control and to reduce land-based pollution from their watershed sources.

In Korea, the assessment of environmental problems was the first step to formulate practical actions. ICARM issues cover a very wide spectrum of marine environmental problems. The assessment process led to the setting of priority issues, which is inevitable considering the limitations in financial and personnel resources to effectively address the prioritized issues. The Korean government has assigned management priorities for marine environmental issues in formulating the 3rd National Comprehensive Plan for Marine Environmental Conservation (2006~2010). The Ministry of Land, Transportation, and Maritime Affairs (MLTM) reevaluated the priorities in the plan based on their relative importance (see Figure 3). Key considerations include environmental and socioeconomic impacts, severity of problems concerning food security and poverty alleviation, public health, coastal and marine resources and ecosystem health (including biodiversity), and social and economic benefits and users (including cultural values). The impacts and areas being affected by ICARM issues are divided into three classes of small impact, moderate impact, and severe impact. On the other hand, the adequacy of the legal and institutional mechanisms was grouped into three: insufficient, moderate, and sufficient.

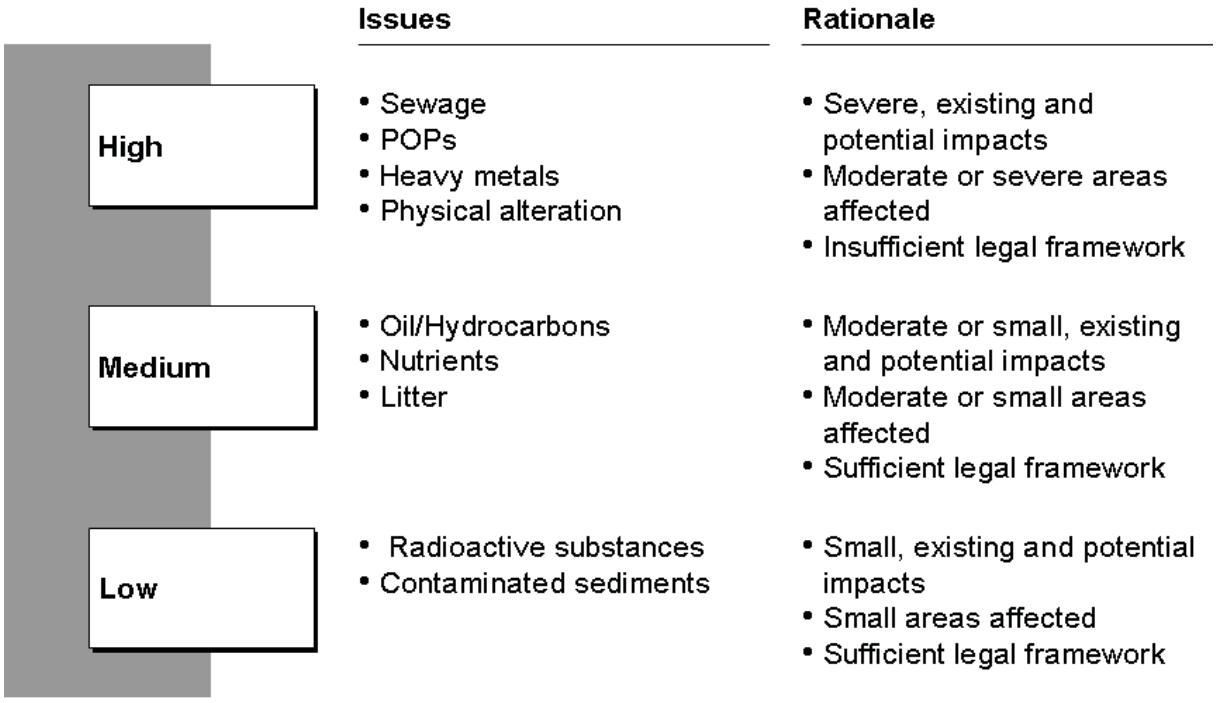

Figure 2. Priority ranking of the ICARM issues in RO Korea.

3.3.2 Interventions to address the identified/priority issues

The main works for China's Yellow Sea have been related with environmental protection in recent years. These works cover five aspects. One is the formulation of laws, rules and regulations. Two is pollution prevention for contaminants coming from both land and sea. Three is the conservation of marine biological diversity. Another emphasis is on international cooperation in oceanic environmental protection. The fifth focus is on implementation of sustainable development strategy in ocean and coastal areas.

Given the rapid industrial development along the sea and the strong environmental pressure, the China's central government has instituted five key measures to prevent marine pollution. First, the targeted industrial outputs were adjusted. The second measure was enhancing the treatment of industry pollution sources using suitable/advanced techniques, as well the adoption of clean or environment-friendly technologies. The aim was to reduce the quantity of industrial wastes, and at the same time increase the ratio of re-use. For the third measure, following the polluter-pay principle, the polluters have been required to treat their waste products locally in the best way possible. Direct discharge to the sea of untreated industry wastewaters was likewise prohibited. The fourth measure was improving the engineering designs and more vigilant supervision of coastal industries. Fifthly, the total quantity of waste materials being discharged was controlled through a certification system. Hence, each industry was allocated with the amount of pollutants that it may discharge. With these five measures, the total quantities of pollutants are gradually being reduced.

As additional measures to prevent further pollution, city/town planning and development efforts have been strengthened. The collecting pipelines and treatment facilities of the cities' sewage were established along the coasts, especially the removal of nitrogen and phosphorous. It is anticipated that by 2010, the treatment ratio of sewage in all main coastal cities will be up to 70%, while the treatment ratio of garbage will be up to 80%. At the same time, the Ministry of Envrionmental Protection (MEP) strengthens the pollution prevention capability of the cities along the sea through innovative measures, such as "cities assessing", "models setting up" and "biological model area building".

To prevent coastal agricultural pollution, biological agriculture (including organic farming) is being actively promoted. These include controlling soil erosion, as well as reducing the use of chemical fertilizers and pesticides. Livestock breeding (both stocking density and size of breeding area) was regulated in environmentally-sensitive coastal areas. In order to control pollution, port management has likewise been strengthened. These entailed building in some large ports some treatment facilities for wastewater, used oil and solid wastes.

Biodiversity conservation and/or habitat protection has also been a key management measure. In 2005 year, some 230 fishery protection areas and 17 rescue centers of wildlife and aquatic animals were established. There were also over 82 different types of wetland protection areas, covering 397 hectares. Among them were protection areas for harbor seals in Dalian City, birds protection areas between East Asia and Australia, and wild goose and duck protection areas in East Asia.

Many training activities and programs related to ICARM were implemented in China. These included the training on: preventing ocean from land pollution influence, sustainable

mode of farming and fishery, integrated database and information system, environmental policy and automatic monitoring of surface water. These trainings were intended for capacity building, both at the local and at the national levels.

In Japan, measures for improving water environment at enclosed sea and coast have been conducted. Land-based development activities have likewise been regulated. With accelerated economic development, some wetlands and seashores were rapidly lost by reclamation for settlements and establishment of industrial facilities. In terms of water pollution, the measures were anchored on Total Pollutant Load Control, which is a pioneering work in the development of ICARM in Japan.

In Korea, the ICARM's program interventions were aimed to protect and rehabilitate coastal habitats. Parallel with this aim is to ensure the sustainable use of coastal resources (both living and non-living). Primary approaches to achieve these goals are "anti-degradation of current environment and ecosystem condition" and "improvement of deteriorated coastal environment". The objectives for attaining such goals are classified into enhancement of ecosystem health, improvement of water and sediment environment qualities, and strengthening of legal and institutional bases.

As a consequence, reserve areas have dramatically increased to protect sensitive and vulnerable coastal and marine ecosystems. The establishment of MOMAF in 1996 (which was merged into MLTM in 2008) has facilitated the establishment of protected areas. As of 2005, a total of 422 sites in the coastal areas were designated as reserves for ecosystem protection in the sea and on land, occupying 10.6% (10,603. 6km²) of the national territory. A total of 2,556 km² of marine waters were likewise designated as fishery resources conservation zones.

To preserve biodiversity in the Russian Far East, the Far Eastern National Marine Reserve was established. Such reserve includes 630 km^2 of sea, 63 km of shoreline and 12 islands. To protect the marine boundaries of the reserve, a security area of 3 mile breadth was established. Moreover, a 500-meter broad borderline (buffer) around its land boundaries was established.

3.3.3 Examples of existing schemes of land-use management (or functional zoning) in coastal areas and river basins

Given the multiple uses and sectoral conflicts that occur in river basins and coastal areas, a zoning scheme is often developed and implemented to effectively harmonize the various economic uses and competing interests of stakeholder groups. As such, the zoning scheme ensures that the socio-economic activities being undertaken provide the optimum societal benefits. ICARM zoning allocates the use of areas based on agreed socio-economic and environmental/ecological criteria. Therefore, coastal use zoning is intended to promote rational resource utilization taking into account social equity, economic development and environmental integrity.

The development of a zoning plan is ideally based on solid science – if not, it must use the best available scientific information. The zoning plan provides the governments and/or agencies involved with a regulatory tool for regulating development projects, allocating resources, and protecting the natural environment. Examples of zoning schemes within the NOWPAP region are provided below.

In China, the coastal (nearshore) and oceanic sea are divided according to environmental functions. In coastal sea, the environment function area is divided into four classifications largely based on water quality standards. These are: (1) first class – for fishery area and natural protection site for rare and endangered species, among others; (2) second class – mainly for sea breeding area and outdoor sports and recreation area; (3) third class – for common industry water area; and, (4) fourth class – for harbors and general working areas.

In oceanic sea, the environment function area is divided into two classifications with corresponding water quality standards. The 'first class' covers shipping area around harbors; fishing grounds and fishery resources breeding area; mineral resources exploitation area; tourism area; energy exploitation area; and reservation area. There are 10 kinds that belong to the first class category. For the 'second class', there are 33 kinds of uses under this classification.

Presently, there are 29 national natural protected areas in China. These areas cover about 250,000 km^2. There are also eight special protection sea areas (also called as marine protected areas or MPAs). These MPAs protect threatened, vulnerable and rare species, such as lancelets, harbor seals, white dolphins, chelonians and spun gold swallows. Coastal habitats and/or ecosystems being protected include red forests, coral reefs, wetlands, oceanic islands and lagoons, as well as natural landmarks and historical sceneries.

In Japan, zoning may be viewed within the context of Total Pollutant Load Control System (TPLCS). Under this scheme, the governor of each prefecture makes Total Pollutant Load Control Plan to achieve the pollutant load reduction target. This generally consists of concrete measures such as: (1) reducing pollutant from household; (2) reducing pollutant from industry; and (3) reducing pollutant from agricultural land. As a measure for reducing pollutant from industry, regulation of pollutant load through Total Pollutant Load Control Standards has been implemented. The total pollution load control standards are applied to specified facilities with amount of discharge of 50 m^3/day or more. These are calculated by effluent concentrations and amounts of discharge. In addition to this, guidance for small industrial facilities to reduce pollution load of effluents has been conducted.

In the case of Korea, zoning may be linked with the Total Pollutant Loads Management System/Total Maximum Daily Loads (TPLMS/TMDL). Experiences originated from inland areas led to its introduction in the coastal areas and the implementation of TPLMS in river basins. The MOE has established and implemented the TPLMS based on the watershed management concept since 2004. The TPMLS was introduced to Masan Special Management Area by MOMAF (now MLTM) in 2005. Successful implementation of the TPLMS requires stronger coordination and cooperation among relevant agencies, especially MLTM, MOE and local governments.

As part of general zoning, the Korean government has adopted this strategy by identifying the environmental issues and specifying the areas concerned. It has also developed the specific implementation plan for each site in order to maximize the outcomes. The Korean government has divided the entire coastal area into 50 management units based on the characteristics of watersheds and their hydrology and socioeconomic conditions, such as population growth and competing demands on land. Management priority has been established for these management units based on the identified environmental issues such as water quality, sediment quality, benthic ecosystems, harmful algal blooms, heavy metals and

persistent organic pollutants. For each pollutant, the management units were classified into five priority groups based on the severity of the environmental status and its impacts: very low, low, medium, high, and severe. The Korean government acknowledges that well-planned and measurable refinements in budgetary and resource allocations among relevant government agencies are needed in order to achieve the specific goals of each management unit.

In Russia, there is functional zoning of coastal territories (see Figure 4). The goal is to develop and realize the developmental programs of natural-economic complexes of coastal zones for natural-economic districts of Krais and oblasts of the Russian Far East. This zoning is in connection with the agreed goals for the regional development. This takes into account the local peculiarities of the natural resources/environment and the level of social-economic development. In terms of process, it involved the systematic-structural analysis of database, thematic maps and atlases, as well the evaluation of literary and archival records. Zoning was aimed to determine essential directions in the developmental programs of the territories. It was also designed to create the mechanism for complex management of the coastal zones at the level of partial natural-economic territories within the subjects of the Russian Federation.

Figure 3. The natural-economic districts of the Peter the Great Bay.

In practice, the spatial boundaries of the zoning system have to be defined first. Often, these boundaries are set by law and are comprised of administrative units. Russian legislation lacks legal texts which define coastal zone (area of land and sea, which are associated with socio-economic parameters) as an integrated system from the point of view of both economics and ecology. The principles of delimitation for the coastal zone of Peter the Great Bay (the northern part of NOWPAP region seas) were developed by specialists from Pacific Geographical Institute FEB RAS. The landward boundary of coastal zones follows the watersheds that practically coincide with the administrative district boundaries. Maritime

boundary of the coastal zone is the outer limit of territorial waters. Highlighting offshore strip is within the areas of responsibilities of Russian Federation and Primorsky Krai (Figure 5). Area of responsibility for water areas of administrative districts are limited by perpendicular line from seashore of the points of intersection of administrative borders with coastline until intersection with the outer limits of territorial waters. In deeply indented coastline of bays (such as Amursky Bay and Ussuriisky Bay), the perpendicular line follows until intersection to midlines divided by these bays. The users of water areas must follow the regulations provided by their states. The water area is marine zone adjoining to the coast, which is two miles in width.

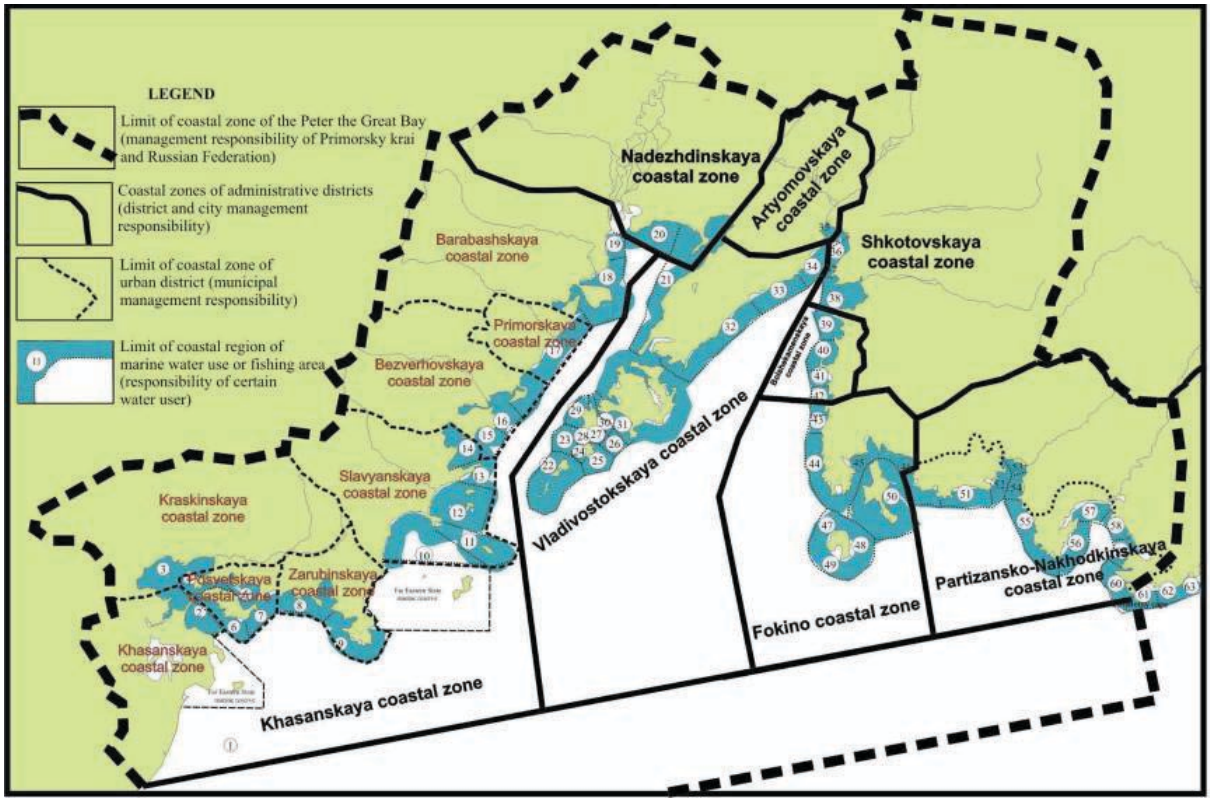

Figure 4. The boundary delimitation of the Peter the Great Bay coastal zone.

3.3.4 institutional arrangement to support ICARM

An ICARM program or an ICM program can be effectively sustained through the establishment of functional institutional arrangements. Institutional arrangements is defined by Sorensen and McCreary (1990, p 1) as the "composite of laws, customs and organizations and management strategies established by society to allocate scarce resources and competing values." ICARM recognizes the importance of operationalizing inter-agency and multi-sectoral coordinating mechanisms that involve all concerned stakeholders in planning, implementing, evaluating and continually improving programs for sustainable coastal development.

Institutional arrangements must be closely linked with the other coastal governance elements, such as legislation, policies, strategies and plans. Brunckhorst and Coop (1999) argues that future sustainability will depend on the system of resource governance that mediates the influences of society and economy on one hand, and continuance of ecosystem

functional processes on the other. A key challenge, therefore, is "to fashion ways to ensure that the actions of the coastal and ocean institutions at each level of government are harmonized with one another and are consistent with agreed coastal goals and policies" (Cicin-Sain and Knetch 1998, p 149). It is noted that institutional integration cut across various economic sectors, government bodies and even international agencies. The NOWPAP countries have developed appropriate institutional arrangements to support their ICARM initiatives. Highlights are given below.

Overall, the National People's Congress (NPC) supervises the system to protect the marine environment in China. The governments at all levels are involved in administrating the system. The MEP, however, is the lead agency in environmental protection. MEP instructs and supervises the work of offshore environment protection all over the country. There are other agencies that support the MEP. These include the Ministry of Agriculture (MA), National Marine Administration (NMA) and State Forestry Administration (SFA).

China's institutional set-up for ICARM has a strong environmental monitoring dimension. It has been undertaking environmental monitoring since 1973, with more than 2,700 environmental monitoring stations established across the country. Chinese environmental monitoring network has been monitoring urban air quality, air pollutant emission, acid rain, water quality of ground water and surface water, seawater quality of offshore area, urban noise, radiation, ecological state in some typical regions, industrial sewerage, solid waste and serious pollution accidents, among others. China National Environmental Monitoring Centre is an institution directly affiliated with the MEP. It provides technical support supervision and technical service for the environmental supervision management of MEP, plays a role as network and training center of national environmental monitoring, and provides professional guidance for the national monitoring system.

The Offshore Marine Environmental Monitoring Network of the MEP was set up in 1994. It consists of China National Environmental Monitoring Center, and the environmental monitoring stations of the coastal provinces, autonomous regions and municipalities directly governed by the Central Government. There are 74 members in this network. In 2002, the MEP set up the Offshore Environmental Monitoring Center under China National Environmental Monitoring in Zhoushan, and 6 sub-stations of the National Offshore Marine Environmental Monitoring Network under China National Environmental Monitoring Center that are situated in Dalian, Tianjin, Qingdao, Xiamen, Shenzhen and Beihai.

Institutional arrangements are linked with the country's policies, standards, rules and regulations. There are more than 60 standards for environmental quality and pollution in China. There are specific parameters in each standard. These include: 109 parameters in environmental quality standard for surface water; 39 parameters in sea water quality standard; 71 parameters in integrated wastewater discharge standard; 10 parameters in ambient air quality standard; and 33 parameters in integrated emission standard of air pollutions. Some parameters relate to solid waste, noise and radioactivity.

According to "Law of Environmental Protection" (Chapter I, Article 7), the environmental protection should be carried out by several departments and ministries. The national monitoring tasks are undertaken by different ministries, based on the types of water bodies. The MEP is responsible for the whole surface waters – such as lakes, reservoirs, and rivers - underground waters, coasts and nearshore seawaters, as well as wastewater discharge

from these sources. The monitoring parameters are water qualities, biology, sediments and discharge volumes. The Ministry of Water Resources is responsible for the water resources, through the whole water movement process, from the generation up to the allocation for various uses. The main monitoring variables are the water quantities and the hydrological characters. The National Marine Administration is responsible for the surveys of off marine water qualities in four marine areas.

In Japan, there are several institutions involved in river basin and coastal management. As shown in Figure 6, six key ministries provide key roles in ICARM planning and management. The Ministry of Environment provides regulations for the prevention of water pollution. The Ministry of Land, Infrastructure and Transport (including Meteorological Agency and Japan Coast Guard) deals with river basin management of flood, water resources and environment, sewerage, systematic utilization of national land, prevention of marine pollution and coastal management, including marine transport and safety. The Ministry of Agriculture, Forestry and Fisheries is primarily concerned with sustainable agriculture, as well as sectoral forestry and fishery issues. The Ministry of Health, Labor and Welfare deals with water supply, including resources on the seafloor. The Ministry of Education, Culture, Sports, Science and Technology focuses on research and development and education related to water environment, among others. The Ministry of Foreign Affairs handles diplomatic policy related to water issues, particularly those that are transboundary in nature.

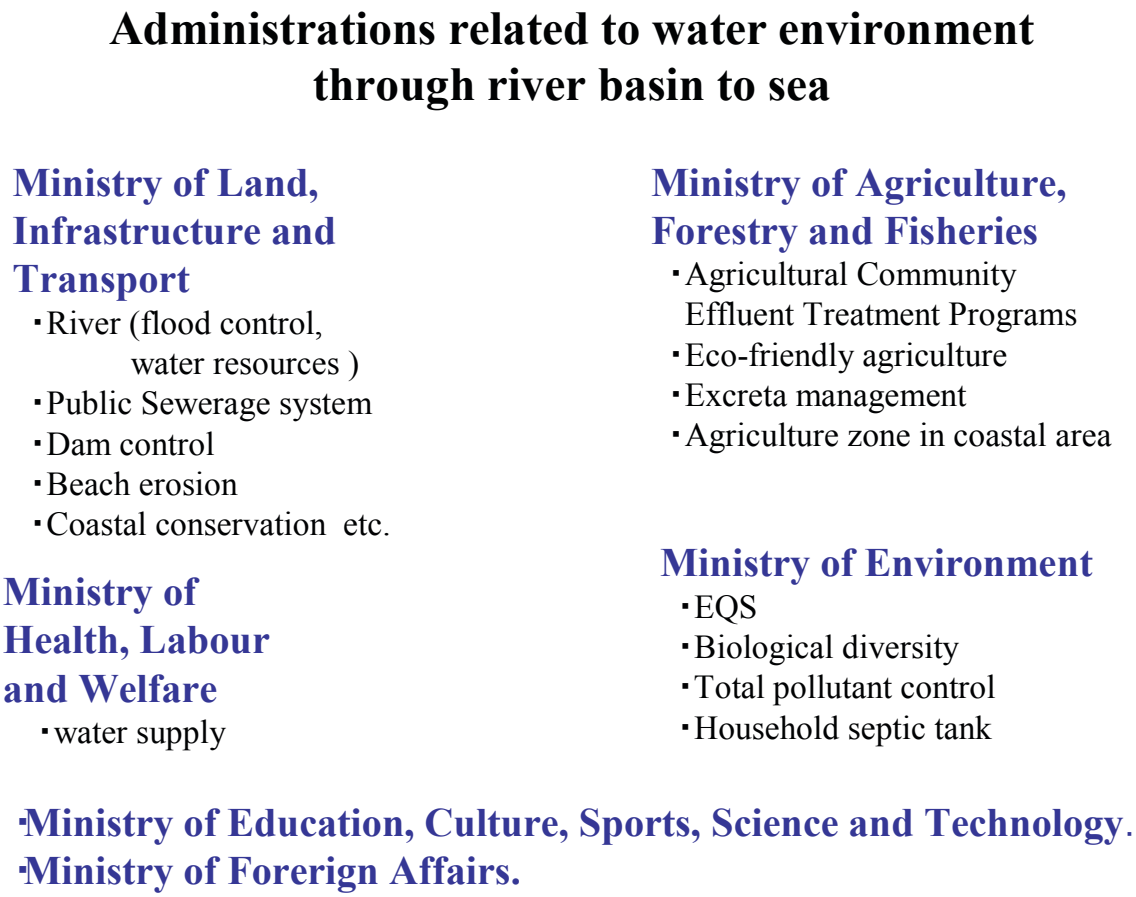

Figure 5. Administrations related to water environment in Japan.

A total of 78 municipalities (cities and self-governing) border the seas and they account for 32% of the total land area. The central and local governments are vital players in the conservation and protection of the coastal environment. In general, the central government is responsible for navigation, shipping, oceans management, marine protected areas, migratory birds, habitat protection and management, and waste disposal control at sea.

In Korea, the efforts of Korean people and its government to manage integrated coastal and river basin environment was initiated with the creation of the Ministry of Maritime Affairs and Fisheries (MOMAF) in 1996, which became the MLTM in 2008. The Ministry of Environment (MOE) was earlier established in 1994. Hence, the MLTM and the MOE are the two leading government agencies that are mandated to protect the marine environment from land-based activities. Both agencies provide the firm basis for systematic approaches to manage coastal resources and marine ecosystems.

The MOMAF (now MLTM) and the MOE jointly formulated the Governmental Directive on the Establishment of Cooperating Body to address the land-based environmental issues in 2006. Supporting ministries included the Ministry of Agriculture and Forestry (MOAF), the Ministry of Government Administration and Home Affairs, the Ministry of Construction and Transportation, and the Ministry of Science and Technology. Ministries and agencies have responsibilities to establish and develop legal and institutional mechanisms within the geographic boundary. Among others, their responsibilities include the enactment of new laws, the establishment of national plans, the development of better management tools and the application of new concepts. They shall secure funds for the implementation of national policies, management arrangements and environmental remediation projects. Most of enforcement and implementation activities are delegated to the local government units.

Major responsibilities to manage land-based activities and pollutants in ROK are separated into two ministries: MLTM and MOE. Although these two ministries work cooperatively, each has its own functions and roles in terrestrial or marine environmental management. Although the MLTM has the legal authority to control pollutant input into the marine environment from land-based sources, the MOE implements all the key measures to manage land-based activities. These management measures include the establishment of effluent standards, construction of sewage treatment plants, inspection of pollution sources and enforcement of environmental regulations. Most polices and action plans aimed to control pollutants from land-based activities are enforced by the provincial and local governments. Exceptions are radioactive substances that are controlled by the Ministry of Commerce, Industry, and Energy (MOCIE) and the Ministry of Science and Technology (MOST).

3.3.5 ICARM national plans and/or programs

The package of investments, inputs and activities for ICARM may consist of ‘projects’ ‘programs’ or ‘plans’. Most often, these terms are used interchangeably. Whatever terminology is used, these investments, services or activities are designed to attain the goals and objectives of ICARM. Highlights from the four countries are given below.

On 1 October 2001 year, the document titled “The Campaigns to Preserve China’s Bohai Sea” was published by the State Council. Its component programs include the establishment of sewage treatment units and the installation of garbage disposal units. The seven coastal provinces are also developing their own programs to prevent marine pollution.

In order to reduce pollution accidents, some urgent plans specifically-aimed at oil spills and leakage of hazardous substances were developed. National plans to address major pollution accidents in the sea are likewise being developed by MEP and some agencies along the coastal provinces.

During the tenth-five-year (2001-2005) national planning in China, the MEP had made some important basin pollution preventing programs duly approved by the State Council and consequently implemented. These programs included the "tenth-five-year pollution preventing program in Liao River Basin", "tenth-five-year pollution preventing program in Hai River Basin", and "tenth-five-year pollution preventing program in Huai River Basin". The eleventh-five-year (2006-2010) pollution preventing programs in Yangtze River Basin, Yellow River Basin, Huai River Basin, Liao River Basin, Songhua River Basin and Hai River Basin were submitted to the State Council by MEP. These programs included infrastructure facilities (sewage treatment plants and garbage collection units), as well as sustainable agriculture programs to reduce the amount of pollutants that flow into the sea.

A national biological diversity protection plan was developed for China. This document guides the country's works and on-the-ground actions about biological diversity protection. A biological environment protecting compendium in China was likewise developed. It provides the relevant references for biological resources, including oceanic resources.

Ten years ago, an integrated program for protection woods (forest resources) along the coasts in China was implemented. Because of this program, the forest cover ratio increased from 24.9% percent to 35.45%. Currently, the second period's integrated program for protection of woods along the Chinese coast has been initiated. This second period integrated program will improve greatly the biological diversity and associated resources along the sea.

Some plans are linked with environmental monitoring. Several entities are involved in red tide monitoring. Those involved in coastal environmental monitoring chores included satellites, planes, ships, buoys and land stations. In the past years, some special monitoring works have been carried through in China, such as "coast environmental quality status and its developing trend monitoring" and "coast red diatom monitoring". As a result, several environmental monitoring documents came out, such as the "Bulletin of Environmental Quality in People's Republic of China" and "Bulletin of Fishery Environmental Quality in People's Republic of China". Including some special reports that were issued regularly, these reports provided the basic information for public about the nation's coastal environmental quality.

Japan has prepared to start ICARM by establishing a national strategy, regulating and amending laws as well as developing relevant science and technology programs. Key initiatives include the: (1) proposal of strategic environmental policy in Japan; (2) stipulation of Basic Act on integrated land and coast management ; and (3) realization of the concept and methodology of ICARM under the leadership by the Japanese Government. These actions come from experience of having overcome environmental pollution over the last 40 years. In the field of water pollution, the Total Pollution Load Control System has been adjusted as a pioneering management effort of ICARM in Japan. Since it is a self-evident truth that the governance of river basin, coast and sea area should be undertaken comprehensively and integrally, ICARM in Japan has been positively promoted as part of achieving a sustainable society that is in harmony with the ecosystems.

The Korean government has already established and implemented the national initiative and action plans to protect the marine environment, even though there has not been a single integrated action plan for implementation. This National Program of ICARM was prepared in an integrated manner, based on cooperation among relevant ministries. In 1995, the Korean government initiated the National Clean Water Action Plan to improve coastal water qualities and protect coastal environments from land-based activities. The core part of the plan is the construction of sewage treatment plants in coastal area.

The establishment of the National Comprehensive Plan was the first step to manage and protect marine environment and resources in a cooperative manner among relevant authorities. It was the first strategic plan for marine environmental management and budget was allocated for the expansion of publicly-owned pollutant treatment facilities. The MLTM and the MOE are the co-leading ministries responsible for marine environmental protection, especially in terms of integrated coastal and river basin management.

Total pollution load management system (TPLMS) was introduced in 1998 through the establishment of 'Comprehensive Water Quality Management Plans for Four Major River Basins'. Although coastal waters are not covered by these comprehensive plans, it is expected that the successful implementation of various pollutants load control in the plans would significantly reduce land-based pollutants load and improve water qualities of large estuaries. For coastal areas not covered by the Comprehensive Water Quality Management Plans and TPLMS, action plans for nine Coastal Environmental Management Areas (CEMA) has been implemented since 2001. CEMA, a watershed-based approach to marine environment management, include coastal watersheds in their boundaries, which provide a legal basis for controlling land-based activities and pollution sources.

There is no distinct national ICARM program yet in Russia. Nevertheless, a series of management measures aimed at solving some of the key ICARM problems are being carried out. The first set of activities relate to research and scientific studies. A complex study was performed by the Russian Academy of Sciences within the network of federal target-oriented program named "The World Ocean". The researchers developed theoretical and methodical basics for the complex management of the coastal areas of Far Eastern seas, the Black Sea, the Caspian Sea and north-eastern coast of the country. Secondly, a network of reserves situated in the coastal and marine areas were established. These consist of Kedrovaya Pad Zapovednik in the Far East,, Federal Natural Reserve for Far-Eastern Leopards, National Marine Biospheric Reserve and Sikhote-Alin Zapovednik. Finally, for a number of regions, ICARM action plans were developed.

The implementation of the strategic plan for the development of integrated coastal management in the Bay of Kandalaksha (Plan of Action) may be taken as an example. The strategic plan for development of an integrated management system in the coastal area of the Bay of Kandalaksha has three phases. These are the: (1) preparatory phase, (2) practical phase, and (3) implementation phase. In the preparatory phase, the key activities include: inventory of the current state of the coastal area; estimating the demand for natural resources from stakeholder groups; economic valuation of the coastal resources; analyzing and identifying coastal problems, including their relative prioritization; defining coherent management units; and analyzing relationships among diverse stakeholders and assess the potential for conflicts.

The practical phase consists of implementing diverse projects to address the identified and prioritized problems. The practical phase also includes the: development of specific projects to address the coastal area problems; establishment of appropriate institutional arrangements; creation of a GIS database; and development of proposals for creating an integrated monitoring system. The implementation phase is aimed at consolidation of the results from the previous stages. This includes the following features: zoning of the coastal area; improvement of local legislative and normative bases; and development of investment policy to support the coastal area enterprises. The degree of public involvement/participation may be used as a performance indicator for this phase.

The operational experience in the field of ICARM planning in the northwest of Russia involved the participation of various stakeholders. Students and staff from the Russian State Hydrometeorological University (RSHU) in St Petersburg have been visiting the Bay of Kandalaksha to undertake scientific studies as inputs to the plan. Various methods and tools to build consensus among the stakeholders have been developed. Continuing education is an important aspect of ICARM. To this end, the RSHU and the Kandalaksha Centre ran vocational courses in 2003 and 2004 on the topic 'Small business management in the coastal zone'. The courses were designed to help business managers understand the impacts of businesses on the environment and the local population.

Two further steps have helped in making ICM/ICARM a reality in Kandalaksha. First, there was the creation of an integrated coastal management working group within the administration of the Kandalaksha Municipality. Secondly, there was the preparation by the working group, in conjunction with the RSHU, of a Strategic Plan for the ICARM/ICM program. Such ICM program is needed to provide for the rational use of natural resources, maintenance of ecological stability, incorporation of social and economic factors, and minimization of extreme natural and anthropogenic impacts.

4 OVERVIEWS OF NATIONAL AND INTERNATIONAL POLICIES AND LAWS RELATED TO ICARM

Policies and laws are considered as products of legislation. Broadly, legislation may refer to laws being passed by law-making bodies at appropriate levels of governance. Legislation involves developing and implementing national and local laws, which support new and existing policies that facilitate the effective implementation of an ICM program. Creating an adequate legal framework for an ICM/ICARM program is a challenge because of the complex jurisdictional setting it operates (Cicin-Sain and Knetch 1998).

The legislative modality is also contingent on the existing political system. Some countries have national governments that have strong roles in enacting coastal legislations. Other countries have some forms of decentralized schemes, where there are relatively high degrees of local governments' involvement.

Legislation involves developing and implementing relevant laws, rule and regulations at all level of governance to facilitate the effective implementation of an ICARM program. These may cover inter-agency and multi-sectoral arrangements, land-use and sea-use zoning schemes, registration, licensing and market-based instruments, as well as surveillance and enforcement mechanism. Legislation is in effect one of the tools for regulating the use of the river basins and coastal areas.

This chapter is divided into two sections. Section 4.1. describes the overviews of national policies and laws related to ICARM. Meanwhile, section 4.2 provides the overviews of international policies and laws related to ICARM.

4.1 National policies

Enactment of laws and policies are usually brought about by a 'trigger' event or a stimulating factor. In the Republic of Korea, marine environmental protection has become a public agenda only in the middle of 1990s. Large-scale red tide outbreaks and oil spills in the mid-1990s led the Korean government to establish strategic action plans and policies to address these critical issues. Conservation of the coastal wetlands has become a major environmental issue as the valuable ecosystem has been disappearing due to intensive development in the coastal areas. Serious ecological and economic damages from these environmental disasters contributed to raising public awareness on marine ecosystem protection. Similar environment-related triggers were experienced in the other NOWPAP countries.

There is a considerable variation on how a national coastal and marine policy is developed among the countries in the NOWPAP region. Such national policy provides the guidance and/or basis in developing legislation at the local level. Examples of relevant policies and laws for the four countries, as well as policy development processes, are provided below.

In China, the legal system of environmental protection is primarily based on the constitution of the People's Republic of China. Specifically, it is guided by the Law of Environmental Protection (1989), which serves as the main legal framework. In order to provide specific guidelines to protect the marine environment, the Law of Marine Environmental Protection was enacted in 1999. This law provides the basic guideline in protecting the sea environment, conserving the ocean's resources, preventing pollution, maintaining ecological balance, safeguarding human health, and promoting sustainable development.

In implementing the relevant laws, the Chinese government has developed an associated system of supervision and monitoring. The state authorities have punished some establishments that have committed polluting and/or destructive activities. These punitive measures have contributed in promoting more effective conservation of the sea. To control pollution, therefore, many laws and policies at the national and local levels are set to regulate discharges at the point sources.

The legal instruments – expressed in terms of laws, legislations and standards – related to the contaminants inputs on the environment are varied. There are 13 main laws that were approved by the People's Representative Committee of China. These cover specific resources – such as fisheries and wildlife – and also terrestrial and marine environments. There are 16 major legislations, which were approved by the State Council of China. Among others, these include the following legislations: 'Managing Guidelines to Keep Contamination and Damage from Pollutants in Terrestrial Sources (1990)', 'Management Ordinance of Environmental Protection on Projects (1998)', and 'Detailed Rules on Implementation of the Law of Prevention of Water Pollution (2000)'. There are 11 national standards, which were approved by the national government or respective ministries. Examples include: 'Water Quality Standard for Fisheries (1989)', 'Integrated Wastewater Discharge Standard (1996)', and 'Standard for Pollution Control of Sewage Marine Disposal Engineering (2000)'. In some provinces, some local laws were enacted and duly implemented. As an instance, the "Guidelines of ocean using and managing in Shandong province" was enacted in 2004. Appendix 1 provides a list of pertinent national laws and regulations in China.

Japan has a comprehensive array of environmental legislations dating back to the 1950s. Since effluents from industrial facilities came under close scrutiny as the main causes of water pollution, two laws were enacted in the latter half of 1950s. The first legislation was the 'Law for Water Quality Control', which stipulated the water quality standards for the public waters designated by the national government. The second legislation was the 'Law for Industrial Effluent Control', which was aimed at complying with the water quality standards. However, the system was not so adequate and pollution problems had become more serious given the country's rapid industrialization. Therefore, the 'Basic Law for Environmental Pollution Control' was enacted in 1967. For better water management, the 'Water Pollution Control Law' was also enacted in 1970. However, these laws were inadequate for the enclosed sea because their stipulations relate mainly to the restriction of effluent concentration. In addition, problems have become complicated as

shallow water areas and natural seashores have been converted into landfills. Frequent occurrence of massive red tides in the Seto Inland sea led to the enactment of the Interim Law for conservation of the environment of the Seto Inland Sea in 1973. The competent local governments designate the natural seashore of the Seto Inland Sea and the sea facing it as a conservation area to protect the valuable natural seashore accessible to the public. Moreover, this law stipulated the restriction on factory establishment and strong restriction for reducing the pollutant load of COD from the industry. The control of landfill was also stipulated in this Law. In 1978, the Water Pollution Control Law and Interim Law for conservation of the environment of the Seto Inland Sea were amended. Such stipulated the Total Pollutant Load Control, starting from 1979 and targeting on COD. Furthermore, nitrogen and phosphorus were designated as environmental standards and their effluent regulation were stipulated in 1993. In 2001, the fifth Total Pollutant Load Control was established, adding nitrogen and phosphorus to COD.

In Japan, legislations related to river basin management and coastal management consist of these three categories. The first category is the 'basic law'. It is directed particularly to policy considerations, institutions, environmental standards and disciplines. This category includes the 'Basic Environment Law', 'Basic Act on Ocean Policy' and 'Fisheries Basic Act'. The second category relates to the 'management of national land and environment'. Examples are the 'Water Pollution Control Law', 'Sewerage Law', 'Law to Ensure Sustainable aquaculture Production' and 'River Law'. The third legislative category pertains to the 'protection and conservation of environment'. This includes 'Law of Environmental Impact Assessment', 'Law Relating to the Prevention of Marine Pollution and Maritime Disaster', and 'Law for the Conservation of Endangered Species of Wild Fauna and Flora'. A recent trend in amending the law is to add the improvement and conservation of aquatic environment from standpoint of sustainable utilization of terrestrial and aquatic ecosystems. For example – in the case of River Law – improvement and conservation of the riverine environment is added to its original objective of flood control and water resources management. In the case of Coast Law, conservation of the river environment and its sustainable utilization is added to the original objective of seashore protection.

In Korea, the enactment of the Coastal Management Act and the establishment of Clean Water Initiative were the turning point in introducing a watershed management approach to land-based activities in coastal areas as well as associated river basins. Acts and statutes relevant to the protection of the marine environment from land-based activities and pollutants can be divided into three categories: (1) laws that provide policy directions and standards for environmental management; (2) laws for the management of pollutants and improvement of environmental conditions; and (3) laws relevant to protect and reconstruct coastal environment. Nineteen laws are considered as major legislations to manage land-based activities. Such laws are based on these three criteria: (1) whether an act provides overall policy directions for the marine environment protection; (2) whether an act includes collection and treatment instruments of land-based pollutants; and (3) whether an act includes policies for the conservation of coastal habitats and ecosystems. Relevant legislations and their corresponding institutional mechanism are provided in Appendix 2.

Moreover, laws closely related to the ICARM issues can be classified into three groups according to their spatial coverage of the coastal area. Laws that cover both land and sea areas are framework acts that provide overall policy directions for the national environmental management and acts to control and manage pollutants. Laws to manage physical alteration and destruction of habitats also cover both terrestrial and marine areas.

The enforcement of two remaining groups of laws is exclusively restricted either in land or in sea. Those laws that cover the land area manage pollutant input to water bodies such as lakes, streams and river, and seas. The laws that mainly apply to the marine area are meant to manage pollutants input into the sea, land or sea-based, and to protect and marine ecosystems.

Since 2006, the Korean government started to reinforce policies that are designed for the protection of coastal ecosystems and habitats. Such policy initiatives include the enactment of Law on the Conservation and Management of Marine Ecosystem, the amendment of Public Waters Reclamation Act and Coastal Management Act, and the strict application of environmental impact assessment on coastal utilization and development projects.

One of the major conceptual legal documents on issues concerning marine activities of the Russian Federation is the Maritime Doctrine of the Russian Federation for the present period to the year 2020. The Maritime Doctrine contains the provisions for the marine activities that are related to the: Concept for National Security of the Russian Federation, Foreign Policy Concept of the Russian Federation, Military Doctrine of the Russian Federation, Functional Directions of the National Sea Policy of the Russian Federation before 2010, and other legal documents of the Russian Federation. Legal status of the economic activities in the Far Eastern Seas are determined by the following: The Federal Law on Russian Continental Shelf; The Federal Act on the Internal Maritime Waters, Territorial Sea and Adjoining Zone of the Russian Federation; The Federal Law on the State Border of the Russian Federation; and The Federal Law about Exclusive Economical Zone of the Russian Federation. Moreover, there are numerous departmental regulatory documents concerning specific maritime activities. There are no direct legal regulations in the Law of the Russian Federation concerning enforceability of ICARM and sustained nature management in the marine coastal areas. Russia needs modern coastal laws for sustainable natural resources management.

4.2 International policies

International conventions provide globally-accepted standards for protecting and managing the marine environments (Chua 2006). Hence, their national and local implications must be properly understood. International legal instruments may serve as the standards or basis for the development of national policies, as well as ICARM plans and/or programs. Appendix 3 provides the major international conventions as they relate to various facets of coastal and marine governance.

The implementation of international conventions and “soft laws” on coastal governance involves certain instruments, one of which is legislation. For instance, the legislation of a national coastal and/or marine policy is ideal as it establishes a cross-sectoral framework. This is important to the proper implementation of an ICARM program. Moreover, such a policy would provide the guidance, as well as courses of actions, for the sub-national or local governments in the management of their respective coastal and marine environments. Appendix 4 lists the major international instruments relating to the coastal and marine environment.

China has been actively engaged in international cooperation in oceanic environment protection. Currently, China has signed some important international conventions cooperation deliberations, such as “United Nations Convention on Law of the Sea in 1982”, “International Convention on Civil Liability for Oil Pollution Damage in 1969”, “Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Material in 1972”, “International Convention for the Prevention of Pollution from ships 1973 (MARPOL 73/78)”, “Convention on Biological Diversity Pacts in 1992”, and “Ramsar Convention on Wetlands in 1971”. Many of the international conventions listed in Annex 4 have likewise been ratified by the three other countries.

5 CONCLUSIONS

This final chapter consists of three sections. Section 5.1 describes the proposals for future national ICARM-related activities and other priorities in the NOWPAP region. Section 5.1 highlights some recommendations for future regional ICARM-related activities in the NOWPAP region. Section 5.3 summarizes the experiences and lessons learned in ICARM planning and implementation, as well as the rationale and/or justification to continue the ICARM initiatives in the NOWPAP Region.

5.1 Proposed national ICARM-related activities and priorities

5.1.1 Direct action/intervention

In China, the proposal is to implement the Total Pollutant Load Control System. Such a system is aimed at controlling the total quantity of pollutants coming from the lands. Associated with this is a system of discharging licenses for the polluters.

In the case of Russian Federation, tourism development has been recommended. Several regional governments (Primorsky Krai in particular) have made tourism development a major priority for economic development. As an economic endeavor, tourism requires low investment and provides high employment. Tourism will be a stop gap measure until long-term investment is attracted to redevelop the RFE transportation, fishing, timber and mining industries. To attract foreign tourists to the RFE, the federal government and local administrations are trying to improve the existing tourism infrastructure. These are undertaken by encouraging local and foreign investment funds and private companies to invest for the regional tourism development. Further steps will be related to the implementation of social-economic programs for tourism development of Siberia and Far Eastern Russia.

5.1.2 Institutional development and organizational strengthening

It has been recommended in China to strengthen the institutional capability for coastal environmental management. This proposal to strengthen the environmental protection agencies – as well as strengthening collaboration with different partner agencies – are contained in the national eleventh-five year plan. Having a strengthened institutional system for environmental management shall lead to better implementation of laws, policies and regulations for integrated management of the river basins and coasts.

In Japan, institutional development has been proposed in preparation for full implementation of ICARM. Hence, the need to streamline the governance from the national level down to the local level on the basis of national strategy and a basic law has been duly recognized. At present, Japan does not have yet the law of integrated coastal area and river basin management. As such, water pollution and aquatic environmental issues are being addressed by several agencies involved in water environmental management. In the near future, integrated management starting from the top of the mountain through river catchments all the way to the sea will be duly established. New trend towards integrated environmental management has been arising from these circumstances.

The Korean government has very unique institutional system in the field of coastal environment management. The MLTM and the MOE have their own functions and roles regarding environmental protection in marine and inland area, respectively. The establishment of cooperative and integrated mechanism between the MLTM and the MOE is essential to effectively manage and control the land-based activities. While affairs and responsibilities of the two ministries have been incorporated into the National Comprehensive Plan for Marine Environmental Conservation, a more consolidated cooperative approach with other relevant partners need to be introduced on the basis of legal or institutional framework.

5.1.3 Policy and legal reforms

For China, a proposal for controlling the land-based pollution sources includes enacting more appropriate environmental laws and standards system about judicious management of the sea. In particular, the "Law of Marine Environmental Protection (1999)" needs to be amended. There is also a need to enact new laws and policies concerning marine conservation.

Japan is moving towards strengthening its Environmental National Strategy. In 2007, the national government decided to formulate the future directions of strategic environmental policy in Japan. This is embodied in the document titled, "Becoming a Leading Environmental Nation Strategy in the 21st Century: Japan's Strategy for a Sustainable Society". Such strategy includes the proposals on the international framework in the G8 summit.

In this national strategy, eight priority strategies to be implemented within the next few years are presented. Strategies that are related to the ICARM approach are Strategies 2, 4, 6 and 8. Strategy 2 emphasizes a society in harmony with nature. Hence, development of ecological service-based approach, which is closely allied with the EBM or ecosystem-based management, will be pursued. Strategy 4 emphasizes international environmental cooperation on the basis of overcoming pollution and scientific knowledge. Strategy 6 emphasizes creating vibrant and beautiful communities on the basis of interrelationships among countryside, urban, waterfront and forest uses. Strategy 8 emphasizes to make efforts for building an Environmental Nation by promoting government-led initiatives. This strategy also aims to establish a system through which environmental efforts are properly evaluated through a market mechanism. Hence, ICARM in Japan will be expected to be developed on the basis of these key strategies.

Also in 2007, together with the proposal of strategic environmental policy, the Basic Act on Ocean Policy was enacted. This is the first basic law that states "Comprehensive

Governance of the Oceans" and "Integrated Management of the Coastal Zone". Hence, stipulation of this basic act is quite important to develop ICARM in Japan. Some of its important provisions directly relate to ICARM. Article 2 describes the purpose of the law towards 'harmonization of the development and use of the oceans with the conservation of marine environment'. Moreover, Article 25 describes "Integrated Management of the Coastal Zone" as basic measures. Hence, the stipulation of Basic Act on Ocean Policy is expected to accelerate the movement towards enhancing integrated river basin and coastal management.

For Korea, there are also proposals for revision of the existing legal and institutional framework. The present legislative framework is broadly contained in the umbrella of the Marine Pollution Prevention Act, the Water Quality Conservation Act, and the Special Act for Four Major River Basins. There are several other laws that complement the provisions in the primary acts, such as the Waste Management Act, the Hazardous Material Management Act, the Wetland Conservation Act, the Public Waters Reclamation Act, and the Public Waters Management Act. Under these laws, the various programs and plans to reduce land-based pollution loads are being developed and implemented. Hence, the integration and/or streamlining of these laws will lead to better implementation of the proposed ICARM-related initiatives.

5.1.4 Research and further studies

In China, strategic researches are needed about the quantification and/or modeling of the carrying capacity of the coastal areas. More scientific studies are needed to enhance the monitoring works in the coastal areas. These may involve enhancing the monitoring capability to quantitatively assess the impacts, as well as reduce the damage of red tides.

In the case of Korea, more surveys and investigations are required to better evaluate the pollution of the coastal waters of ROK by heavy metals and hazardous substances. Because pollution by POPs is in progress in some coastal areas, in-depth monitoring and surveys are necessary for areas near heavily populated urban areas and industrial complexes. Available data are very limited on the levels of POPs in seafoods, despite great public concern on the problem. Seafoods are among the staple foods in ROK. New research strategies and regulations on the management of the POPs prepared in the late 1990s need to be backed up with new scientific information so they could be properly implemented.

Strengthening decision making support system in ROK also needs to be based on solid science. One of the major challenges that decision-makers face is how they systematically evaluate management alternatives to properly address environmental issues. This is more complicated if socio-economic factors are taken into account, because they involve conflicts among competing stakeholders concerning the use of environmental resources. One major reason concerning policy failures in the marine environment management in ROK is the lack of accurate information as references in consultations and discussions in policy making and implementation processes. Securing reliable scientific data and information is very critical in selecting the best alternative and minimizing resource use conflicts.

5.2 Proposed regional ICARM-related activities and priorities

The transboundary nature of many marine environmental problems calls for collaborative cooperation among countries in establishing appropriate regional strategies

and action plans to jointly manage the priority environmental issues. Many multilateral agreements were made and regional environmental cooperation bodies were formed such as the Northeast Asia Conference on Environmental Cooperation (NEAC) and the Northeast Sub-regional Programme of Environmental Cooperation (NEASPEC).

In China, it has been proposed to enhance international cooperation. This includes implementing GPA, fulfilling the international pacts, promoting the programs of Northwest Pacific Action Plan and East Asian Seas Action Plan.

Collaborative regional trainings are likewise recommended. In the past, various training programs were undertaken collaboratively among partner countries. On 22 December 2005, "the environment managing workshop about east and north Asia" was held in Beijing, which was participated by staff from Japan, Korea and China. The main aim of the training was to enhance collaborative research works concerning environmental management in these three countries. In June 2007, the "International workshop about garbage management in Northwest Pacific area" was hold in Rizhao City, whereby personnel from Korea, Japan, Russia and China took part in the workshop. Between 2006 and 2007, there were four collaborative monitoring activities between Russia and China in the boundary rivers of Heilong River and Wusuli River. The monitoring engineers from the two countries undertook joint sampling and analysis.

There are three specific proposals from China for future regional priority activities in the NOWPAP Region. One is strengthening communications that include extending advanced techniques and experiences on marine pollution prevention to reduce and/or further prevent the pollution in Yellow Sea. The second proposal is to set up environmental data managing system of the Yellow Sea. This would cover inputting and managing time-series data of relevant regions, sharing the databases, compiling environmental quality report of the Yellow Sea, as well as clarifying the duties and responsibilities of the different countries in the NOWPAP Region. Thirdly, there is a need to use uniform monitoring methods and assessment standards. In this way, the data from different countries could be acceptable and comparable. The training programs for adopting common methods and standards should also be developed.

Korea has been actively espousing international and regional cooperation. Hence, the ROK has actively participated in regional cooperation - bilaterally and multilaterally - as one of the leading countries. In particular, the ROK spearheaded the formulation of the Tripartite Environment Ministers' Meeting among ROK, China, and Japan for regular discussion of major environmental issues in Northeast Asia. This event was first held in January 1999. Moreover, environmental cooperation with Southeast Asian countries has been steadily increasing through environmental preservation programs, environmental industry exchange, and knowledge partnership program since the first Environment Minister's Meeting between ROK and Vietnam in 2000 (MOE, 2006).

Bilateral cooperation between the ROK and the other countries in Northeast Asia has been developed as a promotion tool for regional environmental cooperation. Environmental cooperation with China started with the establishment of ROK-China Environmental Cooperation in 1993. Based on this agreement, the Joint Committee on ROK-China Environmental Cooperation has been held annually since 1994. Through this committee, 16 bilateral cooperation projects were authorized and major national environmental

policies of each country were discussed. With Japan, the Joint Committee on ROK Japan Environmental Cooperation has been held annually since 1994. At the 7th meeting held in Tokyo, Japan, the committee authorized 27 cooperation projects and agreed to strengthen cooperation for the WSSD Plan of Implementation, the Climate Change Convention, and the Stockholm Convention on Persistent Organic Pollutants. Furthermore, ROK established an environmental cooperation agreement with Russia in 1994 for collaboration in research areas like the protection of transboundary migratory birds. The ROK aims to strengthen these regional initiatives.

Russia has likewise proposed management measures related to oil spills. Such maritime accidents have occurred in the northern part of NOWPAP region seas. If the northern parts of the NOWPAP nations act to establish a regional oil spill response mechanism, this may prevent future ecological and public relations disasters. The 1997 "Nakhodka" oil spill clearly demonstrated that Japan and the northern part of NOWPAP region countries are not prepared to deal with catastrophic oil spills. Thus, there is need to develop a regionally-based, cooperative oil spill response mechanism.

Japan has espoused continuing efforts towards "Ecosystem-based management" based on science and technology. The Council for Science and Technology Policy (CSTP), Cabinet Office, is the command center for Japan's integrated efforts to advance science and technology (S&T) in a comprehensive and well-planned manner. It is comprised of the prime minister, relevant ministers and experts. The CSTP also takes the leadership concerning environmental science and technology, and has promoted the development of integrated management from the river basin down to the sea. Period of the first stage of study was for five years from 2001 to 2005. Its main objective was to restore the urban environments through improvement of water environment from land areas down to the coasts and bays.

Russia has recognized that in order to guide and control this wide variety of physical, biological and ecological issues, the previous highly sectoral approach to management is no longer sufficient. There is a need to develop a new environmental management approach that takes into account the intimate functional linkage between the coast and the river basin systems. An integrated approach leads to better coordination of policy making and actions across sectors (water resources, forestry, agriculture, urban development, environmental protection, etc.). Geographically, then, it may ultimately lead to a more rational use of resources and more effective environmental protection. This integration could be best achieved through collaborative efforts among the adjoining countries.

Another regional proposal is greater public involvement. As Agenda 21 and the Plan of Implementation of the World Summit on Sustainable Development Plan have emphasized, an effective and sustained resource management requires great interest and support from local communities and relevant stakeholders. Their active involvement are crucial in planning and implementation of environmental policies and programs. In recent years, environmental NGOs have played an important role in raising public awareness and pressing the government to adopt more environment-friendly policies and decisions. Along with NGOs' active movement, the central government and the local government's levels are building partnerships with relevant stakeholders in decision making processes. These are achieved through the establishment of bodies like river basin management councils, public fora, and coastal environment management councils.

5.2.1 Conclusion, synthesis and future direction

Experiences of ICARM planning and implementation in the NOWPAP Region indicate some levels of initial successes and significant contributions in integrated management. Existing situations in the NOWPAP countries – particularly on the territories related to the NOWPAP region – were thoroughly documented. Existing ICARM issues were identified and systematically analyzed. Opportunities or positive conditions for development were likewise diagnosed. Key management issues relate to pollution, habitat/ecosystem degradation and non-optimal use of resources. Cross cutting issues include natural disasters, sea level rise and climate change. Some problems were focused to specific countries, such as localized depletion of fishery resources. Other problems, however, are regional in scope, such as those that relate to oil spills. These problems/issues may be traced to institutional limitations and/or inadequacies in integrated management.

The ICARM-related issues were duly prioritized. Appropriate program and/or project interventions have been undertaken and/or being undertaken to address the above key management problems/issues. These led to the development and/or adoption of suitable of land-use management schemes (or functional zoning) in coastal areas and river basins. Somehow, these program and/or project interventions were able to reduce pollution, conserve the remaining coastal habitats/ecosystems, and promote more optimal/judicious utilization of resources.

Although ICARM has significantly improved both the human and natural dimensions in the NOWPAP region, much still needs to be done. Hence, recommendations have been forwarded to address better national priorities, as well as international (transboundary) issues. These management recommendations relate to – among others – some direct on-the-ground interventions, institutional strengthening, policy development, and catalytic researches/ studies. The experiences and lessons learned in ICARM planning and implementation in NOWPAP Region will become the basis then towards adoptive management. Given many development opportunities, as well as capable institutional systems, both at the national and regional levels, the continuation of ICARM in the NOWPAP Region has become more apparent.

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Appendix 1. *Main Laws and Regulations Related to the Contaminants Inputs on Environment*

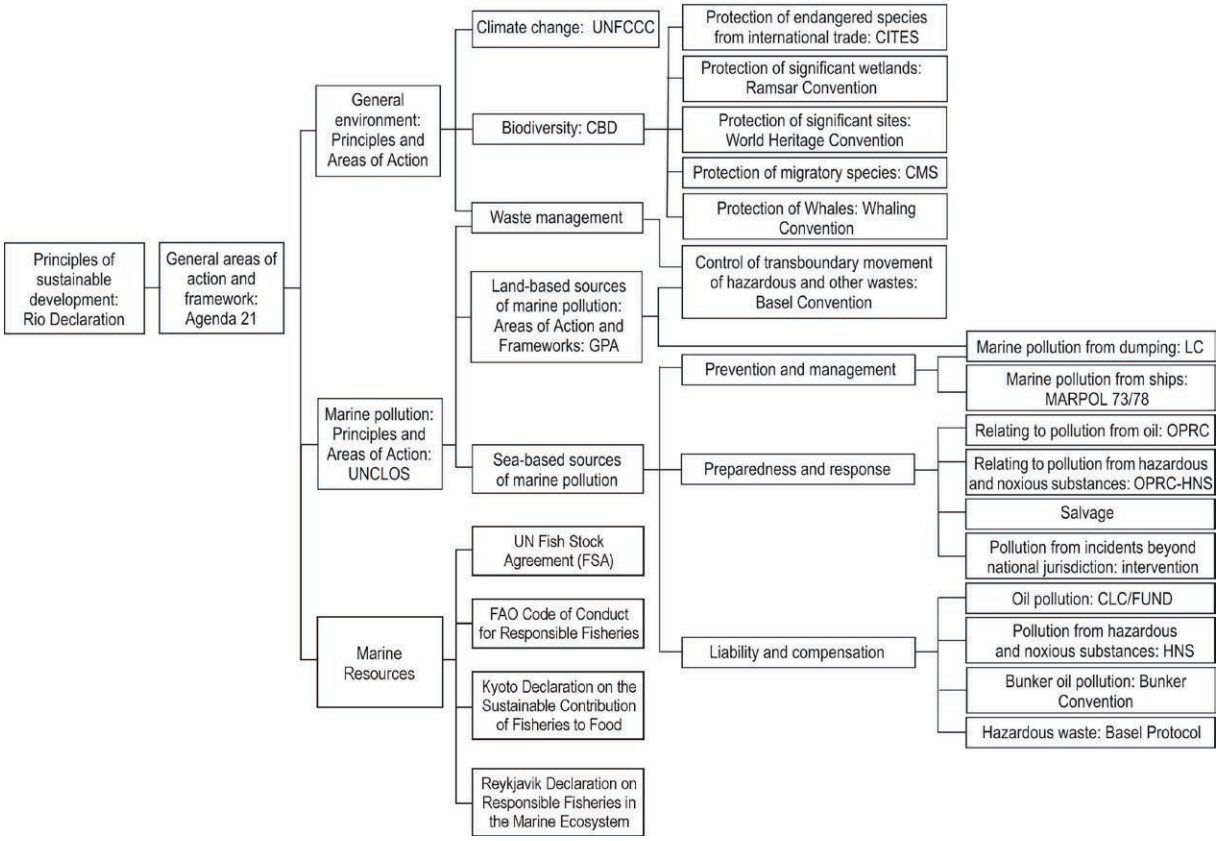
Type	Name and Published Year of Document	Approved by
Law	Law of Fishery (1986)	People's representative Committee of China
	Law of Reservation for Wild Animals (1988)	
	Law of Environmental Protection (1989)	
	Law of Water and Soil Conservation (1991)	
	Law of Mines Resources (1996)	
	Law of Marine Environmental Protection (1999)	
	Law of Water (2002)	
	Law of Promotion on Clean Production (2002)	
	Law of Environmental Influences Assessment (2003)	
	Law of Prevention on Environmental Pollution by Solid Wastes (2004)	
	Law of Prevention and Control of Water Pollution (2008)	
	Circular Economy Promotion Law of the People's Republic of China (2008)	
	Energy conservation law of the People's Republic of China (2009)	
Legislation	Managing Guidelines to Protecting on Propagation of Aquaculture Resources (1979)	State Council of China
	Managing Guidelines to Prevention Marine from Shipping (1983)	
	Managing Guidelines to Keep Contamination and Damage from Coastal Construction and Engineering (1990)	
	Managing Guidelines to Keep Contamination and Damage from Pollutants in Terrestrial Sources (1990)	
	Rules on Implementation of the Law of Prevention of Terrestrial Wild Animals (1992)	
	Technical Guidelines on Environmental Impacts Assessment (1993)	
	Rules on Implementation of the Law of Prevention of Water and Soil (1993)	
	Rules on Implementation of the Law of Prevention of Aquicolous Wild Animals (1993)	
	Guidelines on Natural Preservation Zones (1994)	
	Guidelines on Preservation of wild Plants (1996)	
	Management Ordinance of Environmental Protection on Projects (1998)	
	Detailed Rules on Implementation of the Law of Prevention of Water Pollution (2000)	
	Implementation Guidelines on Law of Forests (2000)	
	Regulation of the management of levy and usage of pollutant discharge fee (2003)	
	Regulation of the management of prevention and control of the coastal project pollution on marine environment (2007)	
	Regulation of the management of prevention and control of the maritime project pollution on marine environment (2006)	
Standard	Sanitary Standard for Drinking Water (1985)	National or Ministries
	Water Quality Standard for Fisheries (1989)	
	Quality Standard for Agricultural Irrigation (1992)	
	Wastewater and Sludge Disposal Standard for Municipal WTP (1993)	
	Integrated Wastewater Discharge Standard (1996)	
	Sea Water Quality Standard (1997)	
	Discharge Standard for Municipal Wastewater (1999)	
	Environment Quality Standard for Surface Water (2002)	
	Standard for Pollution Control of Sewage Marine Disposal Engineering (2000)	
	Technical Specifications Requirements for Monitoring of Surface Water and Waste Water(2002)	
	Specification for offshore environmental monitoring(2008)	

Appendix 2. Legislative and institutional mechanism

Category	Law and act	Government
Setting policy directions and standards for management of environment	Framework act on the national land	MOCT
	National land planning and utilization act	MOCT
	Framework act on environmental policy	MOE
	Framework act on marine fishery development	MOMAF (now MLTM)
	Coastal management act	MOMAF (now MLTM)
	Marine pollution prevention act	MOMAF (now MLTM)
Management of pollutants and improvement of environmental condition	Water quality conservation act	MOE
	Special act on watershed management and community support for 4 major river basins	MOE
	Sewage act	MOE
	Act on the disposal of sewage, excreta, and livestock wastewater	MOE
	Wastes control act	MOE
	Toxic chemicals control act	MOE
Protection and rehabilitation of coastal and marine ecosystem	Wetlands conservation act	MOMAF (now MLTM)/MOE
	Natural environment conservation act	MOMAF (now MLTM)/MOE
	Public waters management reclamation act	MOMAF (now MLTM)
	Law on the conservation and management of marine ecosystem	MOMAF (now MLTM)
	Natural parks act	MOE
	Wildlife protection act	MOE
	Protection of cultural properties act	MCT

Appendix 3. *International conventions in an integrated implementation network.*

Figure 1: International conventions in an integrated implementation framework.



Source: PEMSEA (2003)

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