

講 座

## 한국항만의 문제점과 환경친화적 개발 방안

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### Problems of Port in Korea and Environmentally Sound Port Development Scheme\*\*

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#### 1. Opening

The coastal zone of the Republic of Korea has been intensively used for various purposes. The growth of human activities and population in the coastal zone is affecting marine resource habitats and nursery areas, causing changes in local ocean environment. Two of the most highly visible existing uses of coastal space are aqua farming and port development (conservation and development). Particularly in areas with narrow continental shelf bounded by small islands and headlands, there is a high potential for conflicts both at sea and land. There have been several efforts to resolve these conflict in Korea.

Recently, the government initiated the Ministry of Maritime Affairs and Fisheries which is responsible for regulating various coastal activities, including ocean transportation, reclamation & industrial activities, port development, fishery, mariculture, coast guarding, etc. Mitigation measures are being

discussed between the local county and the new ministry. The liaison committee among the governmental bodies is being set up for the coordination of the legal basis for coastal zone management.

In the opening of 21st century, marine oriented activities in coastal areas would be directed by environmentally sound development scheme

#### 2. General Problems

The dramatic growth of coastal populations causes too much fertilizer and feed for the agricultural and aquacultural productions, and acceleration to the industrialization and urbanization of the coastal areas. Untreated and nutrient enrichments are discharged the ocean through the old and overloaded sewer system. Whether the development of port facilities or residential and recreational accommodations close to the water led to extensive bulkheading, landfilling and dredging

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activities. Therefore, it causes change the existing wetlands and estuarine habitat. We can not neglect the leakage from septic tanks, outboard dumping untreated wastes, and increased traffic through estuarine waterways further degraded the coastal ecology.

As coastal development has taken place in a certain area, the original residents have lost their ability to influence local planning decisions as newcomers move into their communities. Local government should find more effective balance between two communities. Sometimes the development causes economical burdens to the residents imposing new cost factors.

### 3. Resources & Activities

#### 3.1 Water Resources

The annual average precipitation in our country is 1,274mm. Thus, the country relatively belongs to the zone of humidity but its precipitation varies greatly from one region to another. The national total volume of annually available water resources is about 126.7 billion m<sup>3</sup>, of which 45% is lost by evaporation and underground infiltration and about 55% is run into the river, most of which is flowed at the times of heavy rainfall during the rainy season of June to September. These features pose a number of problems in the management of water resources. The national water use for various purpose is only 18% of the annual average precipitation. By the percentage of each use, domestic water accounts for 17%, industrial water 10%, agricultural water 50%, and water for river maintenance 14%.

#### 3.2 Maritime resources

Korea is surrounded by the sea on three seas with different oceanographical conditions and has the continental shelves twice as large as the total national land area with about 12,790km of shorelines and coastal sea areas, about half the length of that of Japan and a quarter of that of the United States.

Land resources are limited in supply and growing in their value while, as the demand for lands increases with industrialization and urbanization and ocean pollution is becoming serious, scrambling for potential demand of ocean resources is taking place. The most representative case is the eutrophication of coastal water caused by municipal and industrial effluents, and chronic red tides in south and east coasts.

#### 3.3 Port activities

Ports in Korea are regarded as a strategically important part of the social infrastructure since the early 1970s, so that port development has been mostly carried out by the central government. Even recently, Governmental decisions on port expansion in Incheon, Gunsan, Mokpo, Kwangyang, Pusan, Ulsan, Pohang and the development of new ports in Gunsan and Kadokdo to meet growing demand, functioning the hub ports. Oil spills are the most serious issue to these activities from VLCCs to small fishing boats.

There are obstacles to port development on the west coast such as large tidal range, strong tidal currents and dangerous navigation channels with lots of reefs, migrating sandbanks, shoals, small islands, sedimentation in harbors and foggy days. The east coast is difficult to

obtain a large hinterland for harbors and suitable bays for mooring although the water depth is deep enough. This consideration is necessary for the outfall design, too.

### 3.4 Reclamation & Closure Activities

Reclamation to get extra space for agriculture caused the spatial alteration of coastal areas. Reclamation work is also connected with dredging and mining. A total area of 410 sq.km has been reclaimed, mostly on the west coast(70%). The purpose of reclamation has been mostly agricultural (92%), while industrial and residential purposes comprise only 7% and 1%, respectively. In the next two decades, the Korean government will invest to the reclamation work for industrial and residential space along the coast. These are related to the new port plan in Kadokdo, Gunsan, and Kwangyang with the supporting hinterlands, including urbanization, trade, industry, power plants and waste disposal.

Presently, west and south coast of Korea have filled, and lost some historic wetland and inner water areas. One of serious problems on reclamation work is inducing the sea level increase (20-40 cm, Mokpo City, Global sea level change 3mm/year). Sea level rise is a major concern for coastal urban planning and structural design. This changed the design level for the coastal structures and caused to restructure the lowland cities.

The shifts in use of harbor and estuary space, diversion of reservoir for irrigation, it was indicated that environmental factors were impacting the balanced coastal system including drainage and bulkheading of wetlands, diversion of freshwater flows, conversion of upland areas from forest or field to urban

settlements, and intense use of water space, disrupt the delicate balance of salinities, temperatures, and vegetation necessary to support fish stocks and shellfish population, etc.

### 3.5 Recreational Activities

For the resort area, recreational activities have taken over land and water space originally available to local fishermen. The waterfront, leisure-styled residences, theme park, yacht clubs and the marinas, the harbor-view restaurants and hotels preempt the wharves and fishing landings, the transit shed and related marine industrial business due to the economical reason. Occasionally conflicts appears between these two.

Therefore, from a long range perspective the following measures must be taken to insure the effective use of ocean resources:

- (1) Development potentials of the maritime resources: ocean biological, mineral, and natural resources
- (2) Conservation measures for rational use and development of ocean space: coastal tidelands, marine stock farm, and reclaimable areas
- (3) Ocean conservation measures: ocean pollution and disaster control
- (4) Technologies: development of ocean resources, monitoring, and scientific & engineering research

In order to make the above measures to be effective, there must be a legal and administrative system with regard to the use of coastal area and ocean space. This system can be categorized into three types: inland, coast, and marine.

#### 4. Environmentally Safe Port development

Man must be able to understand the natural processes occurring in the coastal environment and therefore expect his own effects on the environment.

Someone says, leave the ocean without touching & adding, then it cures by itself. Today, natural disaster is a big problem but artificial one is really serious. As the development of the coastal areas has proceeded, so the space available for aqua/maricultural operations has diminished and problems are to be appeared. It is necessary to form non-traditional patterns of access to the coastal use.

##### 4.1 Environmental Aspects - Mitigation m

###### 1) Water Quality

- (1) provide open end to the port basin (natural flow & tidal flushing) - Odaiba case
- (2) provide sewage (remove other discharges) and outfall design
- (3) avoid land formation(marine deposits) and reduce dredging&dumping operation

###### 2) Air Quality

- (1) dust from land reclamation and construction (use marine deposits left in place)
- (2) reduce road traffic and port equipment exhaust emissions (maintain limits)

###### 3) Noise

use of specially quietened equipment and noise barriers (maintain limits)

###### 4) Ecology

- (1) select site of the sparse marine and terrestrial ecology
- (2) rebuild or move the ecological sanctuary

###### 5) Visual Impacts

use of landscape measures and minimize glare (screening)

###### 6) Waste Management

operate waste collection & treatment service, recycle or incinerate

#### 4.2 Approaches

Technology gives a vital tool for the conservation measures. Expectations with the physical and numerical tool will support the possible change. Establish the fact that the coastal and inland water areas are of basic value to man in order to live on the earth and concern about the space usage.

It is conceived that use of the coastal areas for urban purposes could be kept to a minimum by creating cities of people living in areas not considered habitable in early days, in order to develop the most valuable land along the coast, and putting a buffer zone called green belt. A convenient transportation system (delivery and retrieval) should be backed up for this approach. The success of this concept is relied on an efficient economical transportation system linking between coastal distribution terminals and major inland metropolitan areas, and linking between the coastal distribution terminal and offshore facilities. In that way we could have the natural resources - agriculture/aquaculture areas last longer.

In order to induce industrial linkages and the balanced regional development, the following basic policy guidelines might be adopted:

- (1) encourage small medium industrial estates of optimum size in local areas (basis: available resources)

- (2) carry out the environmental impact study and strengthen the pollution control measures
- (3) select and develop the appropriate areas to accommodate the relocated industries
- (4) construct the transportation network for distribution

#### 1) Reconstruction of Harbor Function - Ol

In the past decades, the transportation industry including shipping have sharply risen. To better compete with other transportation modes, the shipping industry has introduced technological advances such as ship size and containerization, etc. But while the shipping industry has made great efforts on modernizing, most of the ports have not kept pace.

Many ports have been unable to cope with the increased land traffic due to limited access roads and waterways are often too narrow and too shallow to handle the new super ships.

These obsolete facilities often force shippers to move their ships to ports with new facilities and better services, therefore, the cash inflow to these old ports have diminished and caused decay of piers and wharves which inhibit port efficiency. Modernization of obsolete facilities, equipment and operation methods is the main task in these old ports. A major problem facing ports today is the lack of space.

#### Effective Solution:

- (1) Site improvement - better land usage in the port and its surrounding area
    - ① eliminating facilities which are inefficient, unprofitable or unfit for modern operations because of size or location - space expansion
    - ② improvement of purification - enhance circulation
- make openings, provide filtering &

aeration, apply fluidized sand bypassing and submerged control structures

- (2) Multistory warehouse/transit shed (vertical circulation ) freeing the old warehouses for recreational or other commercial uses(return to the citizen)

- ① Vertical distribution of goods for storage (crane, conveyors, ramps, etc.)
- ② Additions and reroute to the land traffic servicing the new warehouse to remove a bottleneck of flow
- ③ Yokohamas solution - a good example of harmony (conserve old historical building together with relocation and reconstruction)

#### 2) New Technology - Multi-function facility

There is a revolution in ocean shipping operations in terms of equipment and cargo handling methods. Supersized vessels (ULCC tanker, 6th generation container, etc.) require deepwater mooring facilities or harbor and channel depths substantially greater than available. Provision of such depths creates another problems both natural and manmade, such as physical, ecological, safety, and economic/financial. But it eliminates noise and air pollution problems from the urban area adopting floating and modular units, anchored by cables in deep water.

#### Effective Solution: Trans-port:

- (1) Interface of air-land-sea transportation modes (common terminal facility) with available options: above surface, surface, and below surface connections
- (2) Stratify or separate vertically the transportation modes
- (3) Direct connection to the hinterland with a submerged tunnel/tube monorail, pipelines, conveyors - continuous access to the

terminal

- (4) Modern technology - coexistence (structure & coastal environment)

### 3) Interim - Transition of developme

The proceeding concepts which dealt with old and new ports demonstrated the necessary treatment of the most present day and the future. Much thought should be given to the interim between the present and the projected future development, transition concept. The planner is not only faced with conventional economic, social and political pressures but has also the maintenance of environmental resources, especially in coastal and inland water areas which are currently being abused and destroyed.

#### Effective Solution:

- (1) introducing environmental concern and thought (buffer zones - green belt)
- (2) developing more efficient use of patterns in coastal and inland waters and their surroundings
- (3) modernizing delivery and retrieving systems
- (4) providing unified distribution of passengers and cargo throughout the port

## 5. Closing

There are three important components to be considered in determining the dynamics between port development and coastal conservation:

central and/or local governmental policy and budget, industrial investment, and public awareness or complaints. Of course, there exists the force of each part relative to others in determining the final policy depends on the political, socio-economic and environmental backgrounds of a country.

We need to assess the environmental impacts more carefully. I like to cite the following: Often, the will of the majority focused on a special issue or activity may be imposed without an understanding of the impacts on the minority and other activities. When dealing with political system of majority rule and competitors for the scarce resources they utilize, attention should be made to achieve harmony with the characteristics of versatility and small numbers, deriving the most common benefit all concerned with coastal ocean space utilization and accommodating with minimum conflict, multiple uses both now and in the future.

Environmentally sound development is the only solution for the coming 21st century, the new era for the worlds oceans.