Toward Environmental Planning for East Asian Estuaries: Japanese and Chinese Enclosed Bays

H. A. SHAPIRO
Osaka Geijutsu University, Dept. of Environmental Planning, Osaka Prefecture, 585 Japan

East Asia consists of several nations each in different stages of economic development, from developing, to newly developed, to advanced-industrial. In almost every case, the coastal zones of these nations are highly biologically productive. However, they are at the same time also vulnerable to natural hazards, with enclosed coastal waters being particularly vulnerable to pollution. In this paper, an environmental planning approach is introduced, and its application to enclosed water areas and their surrounding land areas in Japan and in China is presented.

The sustainable development of estuarine-centered regions requires careful and thorough environmentally sensitive planning. In this paper, research related to an approach to environmental planning for enclosed coastal waters in two East Asian nations, Japan and the People's Republic of China, is presented. The method used was developed over a ten year period of research by the author on estuarine-centered regions in Japan(Shapiro,1979-1988).The method consists of five basic steps, as shown in Fig.1: (a) conduct an ecological inventory of the natural and socio-cultural resources of the estuary and its surrounding region;(b) interpret this data bank so as to develop hazard,amenity and health-related criteria; (c) use the water-related criteria to define the seaward and landward coastal zones of the region and the types of restrictions needed to apply to all possible future uses therein; (d) develop planning concepts to meet the three objectives of the World Conservation Strategy(1980),i.e. protect essential life-support systems, protect biological/genetic diversity, and plan the sustainable use of renewable resources; and (e) develop planning proposals for long range sustainable development in the region.

Toward Environmental Planning for the Tokyo Bay Area(Japan)

Tokyo Bay is one of Japan's four most important and productive, urbanized/industrial,estuarine ecosystems. It is located in the Kanto area of eastern Japan and is the site of the nation's capital. About 25% of Japan's entire population,i.e. some 30-million people, are concentrated in the Bay region. Of this number, nearly 18-million live in the 16 cities and towns that line the Bay's coast,shown in Fig.2.

In this research, the region's terrestrial and marine geology and topography, surface hydrology, soils, climate, flora and fauna, and present land and water use were first studied and mapped at a common scale. The result is a Geographic Information System(G.I.S.) for the study area and an essential base for environmental planning.

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Next, this G.I.S. was interpreted to develop some criteria for regional and urban environmental planning for the region,including the Bay. First,hazard-related criteria, such as earthquake vulnerability, flood vulnerability, marine explosion and fire hazard potential etc. were developed. Then, amenity criteria,such as aesthetic and culturally valuable areas were mapped.Finally, natural and human health-related criteria, such as aquifer(groundwater) recharge areas,biologically productivity and air-pollution vulnerability (airshed) etc. were all mapped at a common scale.

Following that, the water-related criteria,including quake(tsunami) and flood vulnerability, scenic values, aquifer (groundwater) recharge areas, biological productivity, and maritime explosion and fire potential, among others, were combined to idnetify areas where water and land have mutually strong impacts on each other. The resulting coastal zone for the Tokyo Bay area in shown in Fig.3. All future land,air and water use actions in this zone, as well as adjacent to it, will need to be done in such a way as to protect,restore and/or enhance the quality of the coastal zone environment in particular and the regional environment in general. To do this, a set of general guidelines for land and water uses in the terrestrial,coastal and marine portions of the coastal zone are suggested in Fig.4. No matter what plan is adopted, every future action must be carefully planned so as not to create irreversible negative impacts on the environment.

Toward Environmental Planning for the Jiaozhou Bay Area(China)

In 1978, the Chinese government announced a 10-year plan for national development. Based on that plan, it began to designate certain coastal areas as "Open Port City Regions"(Su,1986) and as "Special Economic Zones"(Osborne, 1986). Investment in urban and industrial growth,foreign trade and technological development etc. is to be concentrated in these coastal areas. However, if growth and development are not done carefully, great environmental detsruction is likely to occur. In this regard, the approach developed and applied by the author in Japan might be useful as well in China. To date, the author has conducted a complete environmental planning study for the Hangzhou Bay region near Shanghai,but since it it not an enclosed bay, it is not reported here. Rather, part of the research,now in progress, on the Jiaozhou Bay area is presented here.Jiaozhou Bay area contains one of the 14 designated Open Port Cities, Qingdao.

Jiaozhou Bay is a relatively small(about 400 km^2),shallow estuary opening onto the Yellow Sea,as shown in Fig.5. Qingdao is the largest city in the study area. It is a world famous resort city and now also a thriving industrial center. Its port dates back over 1000 years.

Due to the inaccessibility of mapped information about China,the analysis of satellite photos was done to develop a G.I.S. for the region.Access to some Chinese earthquake information and experts in Japan enabled the development of a preliminary earthquake vulnerability map,shown in Fig.6. In the future, maps of flood vulnerability,biological productivity,cultural and aesthetic values. etc. will be developed. As in the Tokyo Bay area study, the water-related criteria will be combined to identify the region's coastal zone, and a set of general guidelines for all potential uses in the area will also be developed,and planning scenarios may also be envisioned for the Bay area.

Conclusion

Urban, industrial and recreational etc. development in the coastal areas of East Asia is intense and becoming more so. In order to protect the quality of the environment of those areas, especially the pollution and hazard vulnerable,highly biologically productive enclosed coastal waters, an environmentally sensitive approach to sustainable development appears to be a fundamental necessity. In this brief paper, such an approach has been introduced,and applications by the author to enclosed coastal bays of Japan and the People's Republic of China were presented. There is a need, in the author's view, to expand such applications to other nations in the region. The author looks forward to suggestions, advice and cooperation from experts from other Asian-Pacific coastal nations in this effort.

References

1. Shapiro,H.A.(1979)."Comprehensive Environmental Management and Planning for the Osaka Bay Coastal Zone and Its Bayshore Cities,Part I", in Numata, M. ed.,Chiba Baycoast Cities Project,I. Seibunsha,Chiba. pp.78-91.
2. Shapiro,H.A., Ibid.,Part II, March 1980,pp.46-68.
3. Shapiro, H.A.,Ibid.,Part III,March 1981,pp.116-154.
4. Shapiro,H.A., Ibid., Part IV,March 1982,pp.97-135.
5. Shapiro,H.A.,(1986)."Tokyo Bay Area Coastal Urban Ecosystems Environmental Planning Research,Part I", in Obara,H. ed. Integrated Studies in Urban Ecosystems as the Basis for Urban Planning,I. Seibunsha,Chiba,pp.117-159.
6. Shapiro,H.A.,Ibid.,Part II,March 1987,pp.132-182.
7. Shapiro,H.A.,Ibid.,Part III,March 1988,pp.115-136.
8. International Unión for the Conservation of Nature(IUCN),(1980). World Conservation Strategy:Living Resource Conservation for Sustainable Development. Gland ,Switzerland.
9. Su,W. ed.(1986). The 14 Coastal Cities and Hainan Island.Beijing Review, Beijing,China(PRC).
10. Osborne,M. (1986). China's Special Economic Zones. O.E.C.D.,Paris.

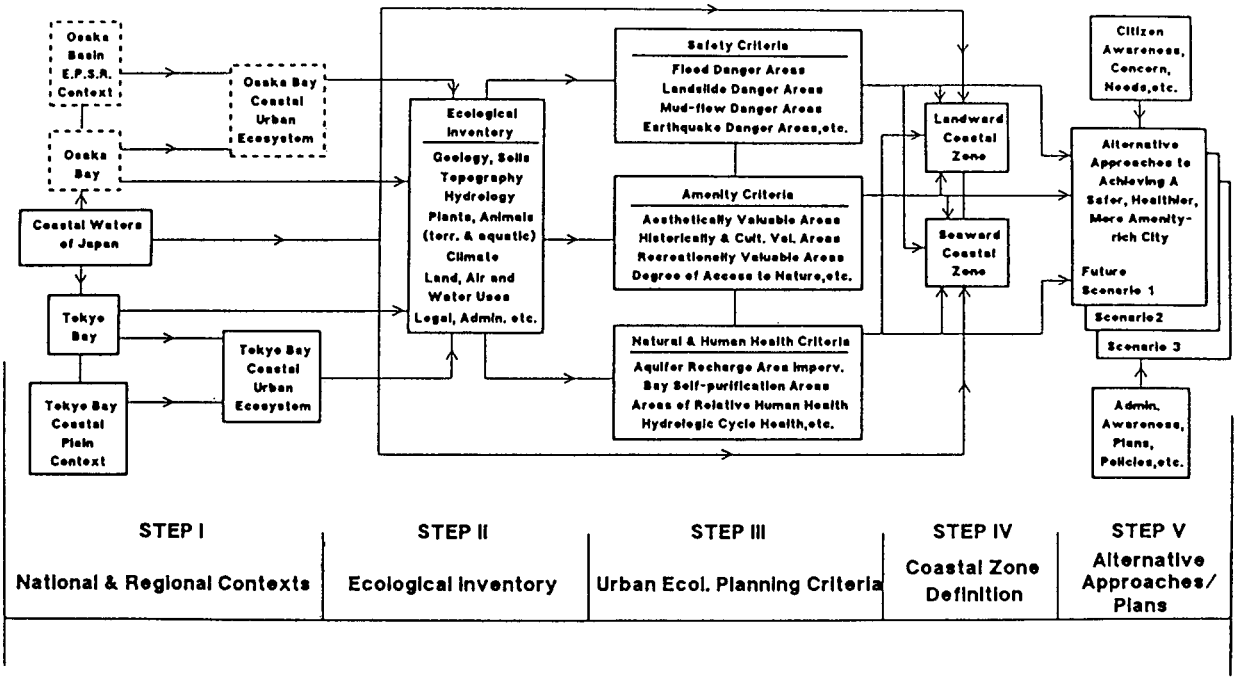

Fig. 1. ENVIRONMENTAL PLANNING METHODOLOGY FOR ENCLOSED BAYS

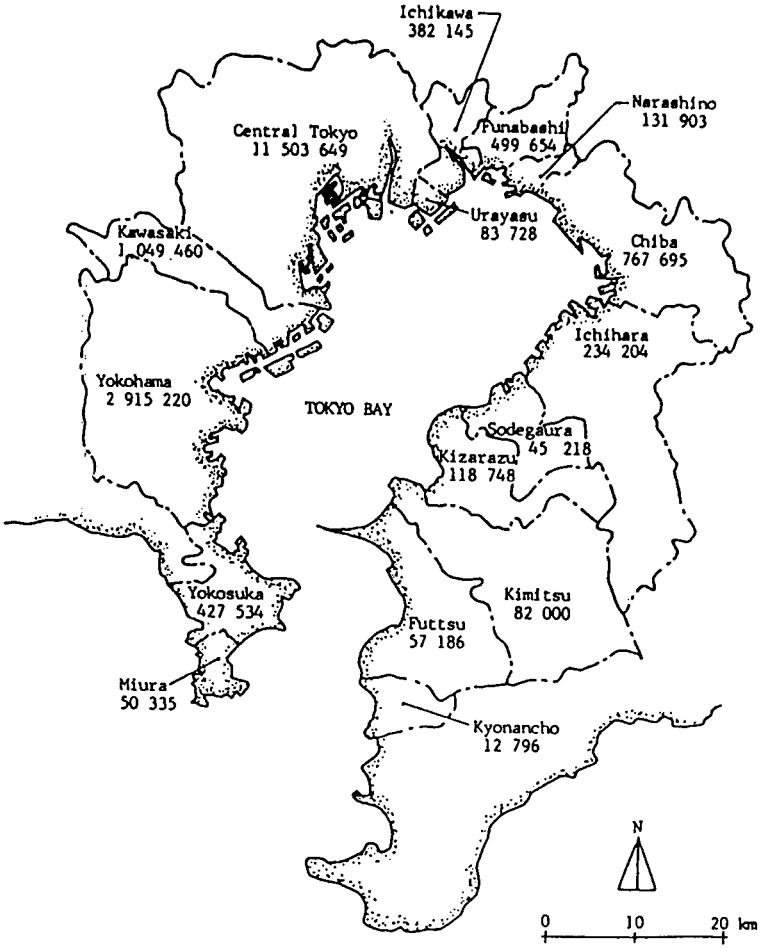

Fig.2. TOKYO BAY AREA COASTAL CITIES (1984 population)

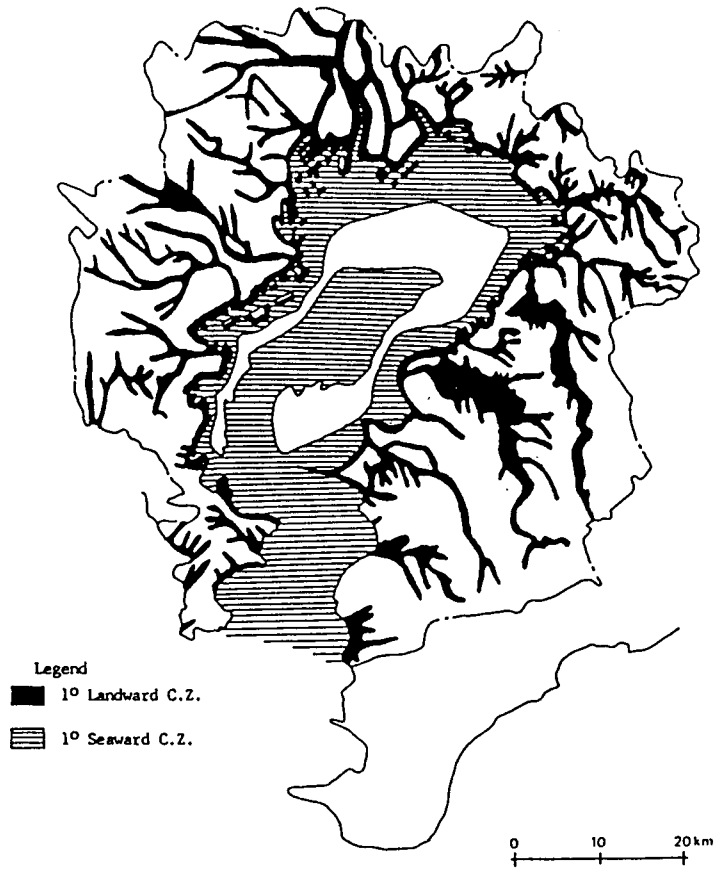

Fig. 3. TOKYO BAY AREA PRIMARY COASTAL ZONE

Fig.4. GENERAL DEGREE OF RESTRICTIONS ON COASTAL ZONE USES

	Land Uses / Evaluation Criteria	TERRESTRIAL								COASTAL								MARINE							
		Housing	Industry	Agriculture	Forestry	Fac. Recr.	Nat. Recr.	Energy Fac.	Other	Housing	Industry	Port Fac.	Fishing	Fac. Recr.	Nat. Recr.	Energy	Other	Landfill	Housing	Harbor Fac.	Comm. Fishing	Recr. Boating	Windsurfing	Other	
SAFETY	Earthquake/Tsunami Hazards	X	X	+	+	O	+	X		X	X	X	O	O	+	X		X	X	O	O	O	O		
	Flood/High-tide Hazards	X	X	O	+	O	+	X		X	X	O	O	X	+	X		X	X	O	O	O	O		
	Landslide Hazards (due to ppt)	X	X	O	+	X	+	X		X	X	O	O	X	+	X		NA							
	Explosion/Fire Hazards	X	X	+	+	X	+	X		X	X	X	O	X	+	X		X	X	X	X	X	X		
	Other																								
WELFARE	Aesthetic/Scenic Values	O	X	O	+	O	+	X		O	X	X	O	O	+	X		X	O	X	O	+	+		
	Scientific Values	X	X	X	O	O	O	X		X	X	X	O	O	O	X		X	X	X	O	O	+		
	Cultural/Historic Values	O	X	O	O	O	+	X		X	X	X	O	O	+	X		X	X	X	O	+	+		
	Educational Values	O	X	O	O	O	+	X		X	X	X	O	O	+	X		X	X	O	O	O	O		
	Other																								
HEALTH	Aquifer Recharge Areas	X	X	O	O	O	+	X		X	X	X	+	O	+	X		X	X	O	O	+	+		
	Biologically Productive Areas	X	X	X	O	X	O	X		X	X	X	+	O	+	X		X	X	X	+	+	+		
	Air Pollution Pot. (Airshed)	X	X	O	+	O	+	X		X	X	O	+	O	+	X		X	X	O	+	+	+		
	Other																								

Key

Severe Conditions = X Limited Conditions = +

Moderate Conditions = O Not Applicable = NA

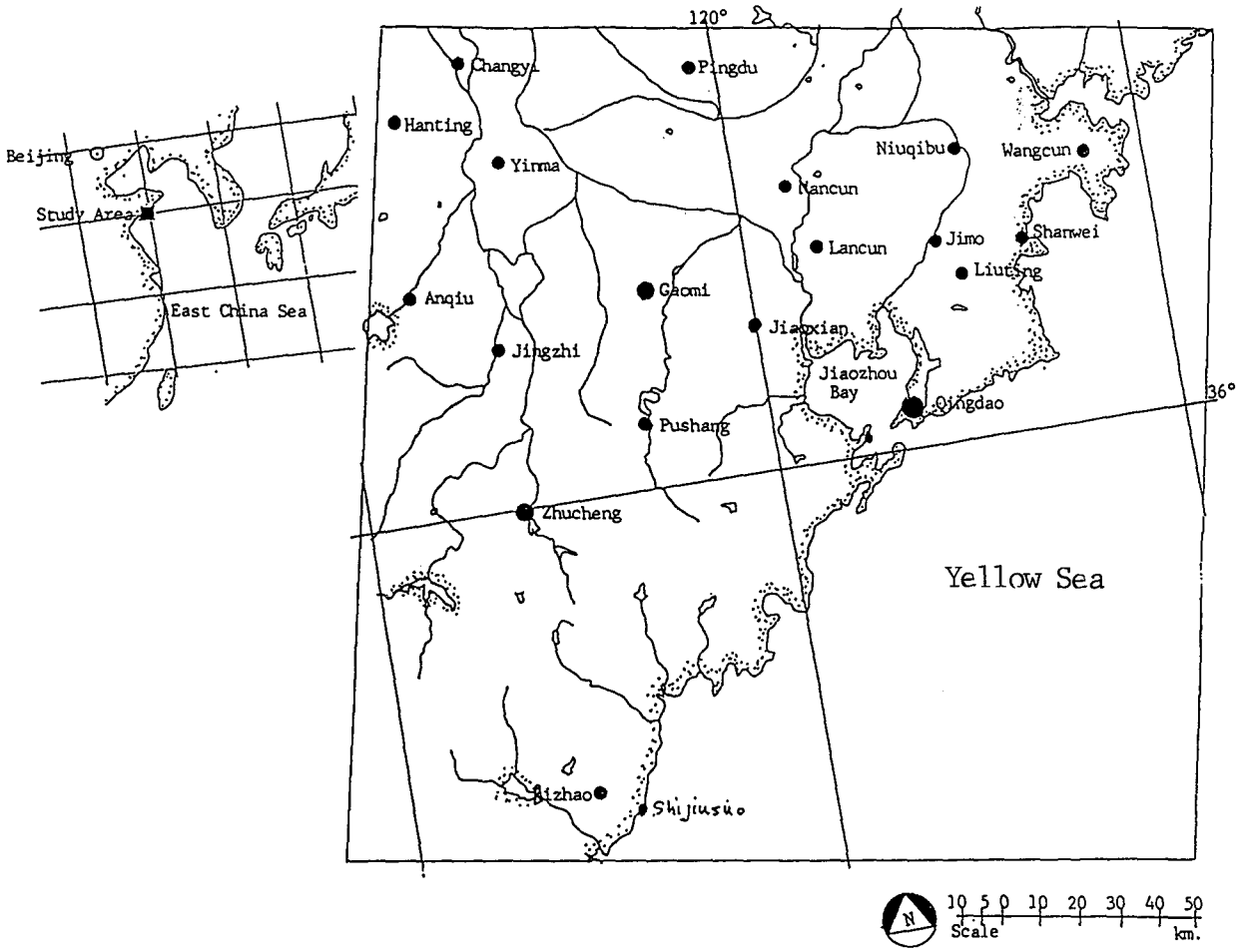

Fig. 5. JIAOZHOU BAY AREA AND VICINITY LOCATION (P.R.C.)

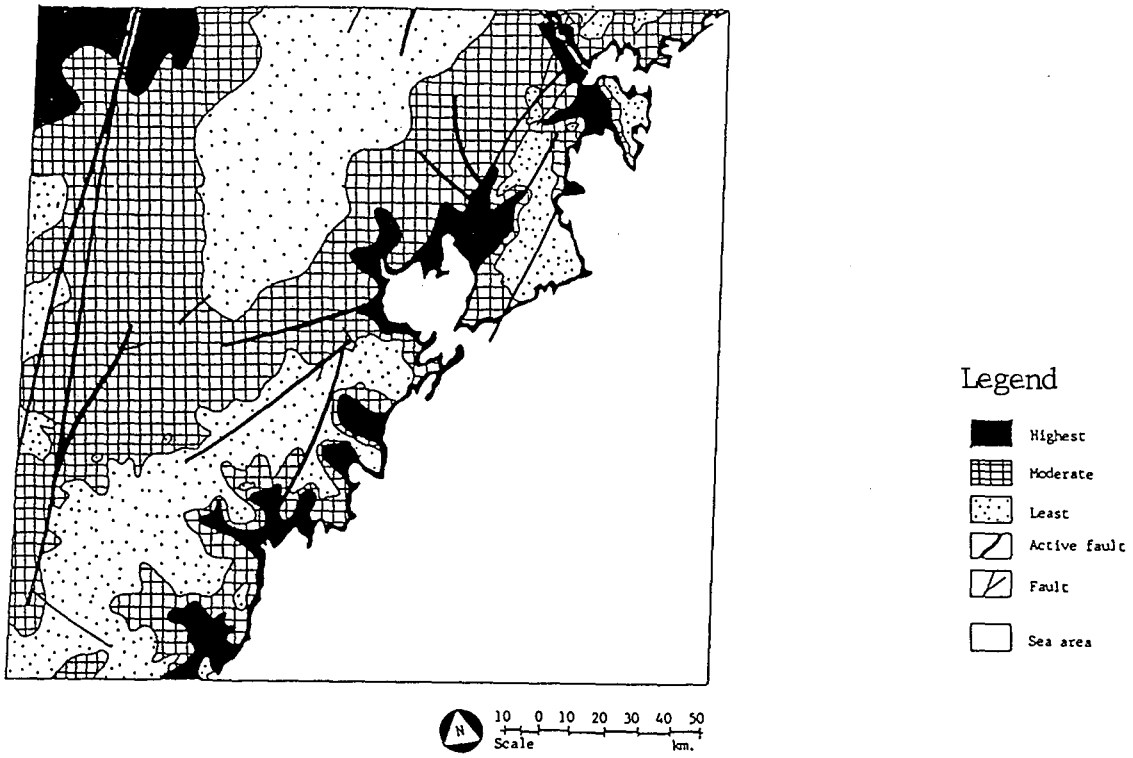

Fig. 6. JIAOZHOU BAY AREA RELATIVE VULNERABILITY TO EARTHQUAKES