

1. STUDY AREA



Figure 1: Geographical Location of Izmit Bay

Izmit Bay is a two-layered water body located at the N-E of the Marmara Sea where brackish waters of the Black Sea overlays the saline Mediterranean water layer. The Bay is about 55 km long and consists of three connected basins. The pycnocline is located at a mean depth of 15-20 m in both systems; having an average salinity of 22 ppt at the surface and 38 ppt at the lower layer. The surface area of the Izmit Bay is 310 km², consisting three sub-basins separated with two sills and contractions. The inner-most (Eastern) basin (max. depth of 32 m) is the most deteriorated and anoxic bottom layers are formed depending on the season. Central basin is the largest with a max depth of 180 m, considerably effected with industrial and domestic discharges. The upper layer of the whole bay is considered to be eutrophic throughout the year where nitrogen is normally the limiting nutrient. The lower layer has low DO content directly linked with the oxidation of autotrophic and anthropogenic organic material.

2. STAKEHOLDER MEETING

Table 1: List of Stakeholders

HA	INSTITUTION	AFFILIATION
NATIONAL AND INTERNATIONAL HARBOUR ACTIVITIES	Under Secretary for Maritime Affairs	PUBLIC ORG.
MANUFACTURING AND SERVICES	Chamber of Industry	PRIVATE ORG.
WASTE DISPOSAL AND TREATMENT	Izmit General Directorate of Water and Waste Water Management / IZSU	PUBLIC ORG.
LAND USE PLANNING AGENCIES	Planning and Consulting Company BELDA	PRIVATE ORG.
NATIONAL AND INTERNATIONAL HARBOUR ACTIVITIES	IZMIT Bay Harbour Authority	PUBLIC ORG.
WASTE DISPOSAL AND TREATMENT	Izmit Waste and Residue Treatment Incineration and Recycling CO. INC. / IZAYDAS	PUBLIC ORG.
COASTAL INDUSTRIES	TUPKAS	PRIVATE ORG.
COASTAL INDUSTRIES	PETKIM	PRIVATE ORG.
COASTAL INDUSTRIES	SOLVENTAS	PRIVATE ORG.
LOCAL GOVERNANCE	Province Industry and Com. Directorate	PUBLIC ORG.
CENTRAL GOVERNANCE	Ministry of Agriculture	PUBLIC ORG.
NATURAL RESOURCE BASED ECONOMIC ACTIVITIES / FISHERIES	Kocaeli Amateur Fishing Assoc.	CIVIL ORG. / NGO
RECREATION	Kocaeli Water sport association	CIVIL ORG. / NGO
COASTAL ECONOMIC ACTIVITY	Enterprises (cafes, restaurants etc)	PRIVATE
COASTAL ECONOMIC ACTIVITY	Land Owners	PRIVATE
LOCAL NGOS	Local Agenda 21	CIVIL ORG. / NGO
CENTRAL GOVERNANCE	Ministry of Environment and Forestry, Industry and Commerce - Public Affairs and Settlement-Transportation	PUBLIC ORG.
LOCAL GOVERNANCE	Province Environmental Directorate	PUBLIC ORG.
LOCAL ADMINISTRATION	Kocaeli Metropolitan Municipality	PUBLIC ORG. / LOCAL GOV.
CENTRAL GOVERNANCE	Ministry of Public Health	PUBLIC ORG.
LOCAL GOVERNANCE	Province Health Directorate	PUBLIC ORG.
MUNICIPALITIES AGENCY	Union of Marmara Municipalities	CIVIL ORG. / NGO

First stakeholder meeting was organized in Kocaeli province located near the coast of Izmit Bay on the 22nd of October 2007. 31 Participants from 16 organizations were participated to the Meeting. The objectives of the meeting was the announcement of this project to the stakeholders and to enhance participation of local and regional stakeholders.

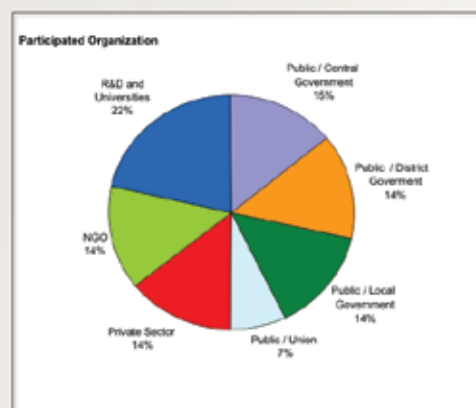


Figure 2: Distribution of the Participated Organizations



A View from Stakeholder Meeting

The duration of the meeting was one day and had two sessions. In the morning session pre-proposed impacts were discussed. In the evening, pre-proposed impacts voted by participants, writing numbers from one to five on papers for each importance degree. Then, discussion was focused on policy issues related to the chosen impact.

3. POLICY ISSUE

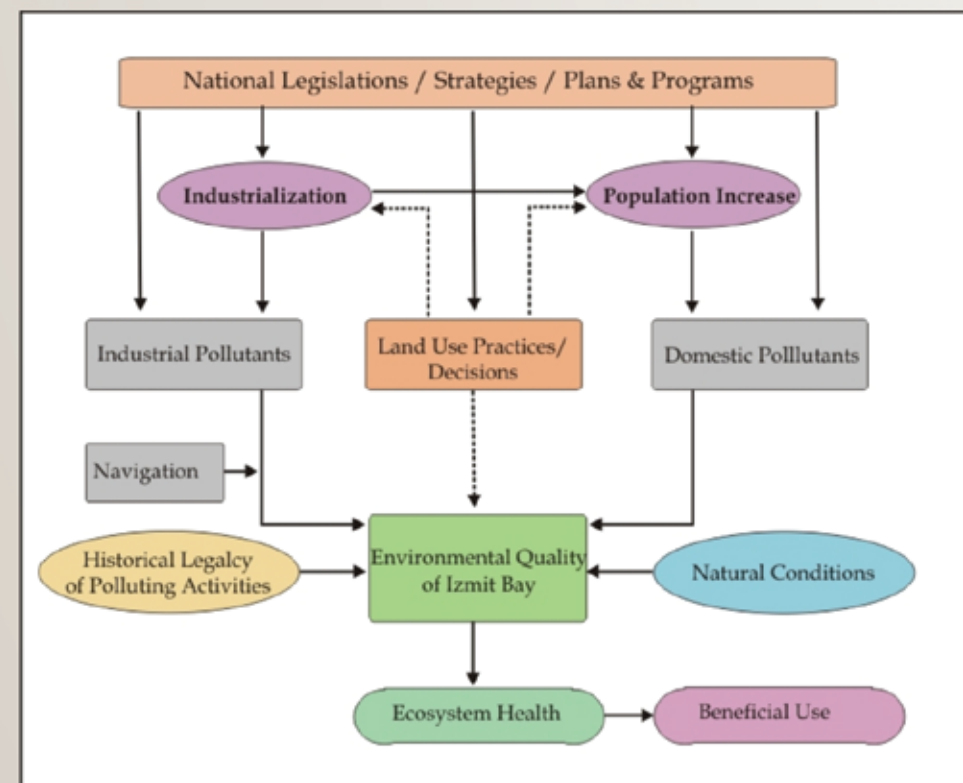
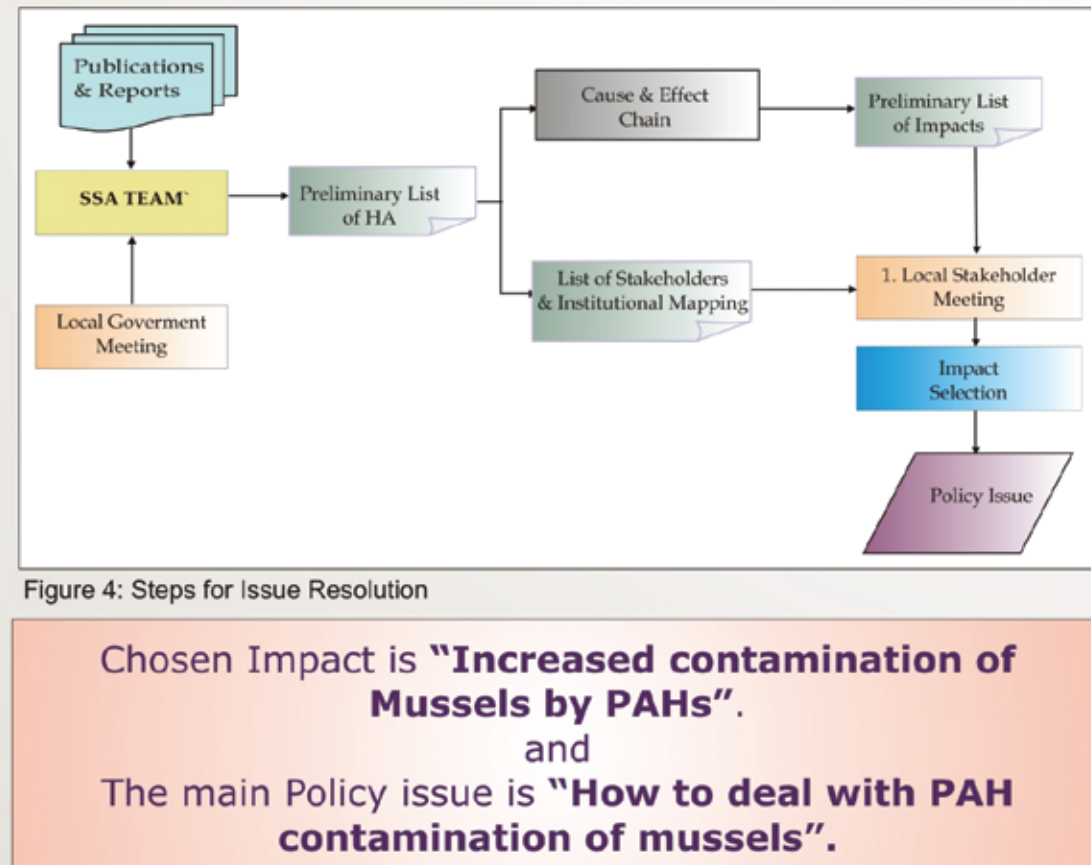


Figure 3: Factors effecting environmental quality of Izmit Bay



Chosen Impact is "Increased contamination of Mussels by PAHs".
and
The main Policy issue is "How to deal with PAH contamination of mussels".

More than 300 industrial effluents around the İzmit Bay exist where a high number of smaller discharges pollute Dilderesi River that considerably contributes to the PAH pollution of the central basin. Major petrochemical industries are located in the Northern part of the Bay.

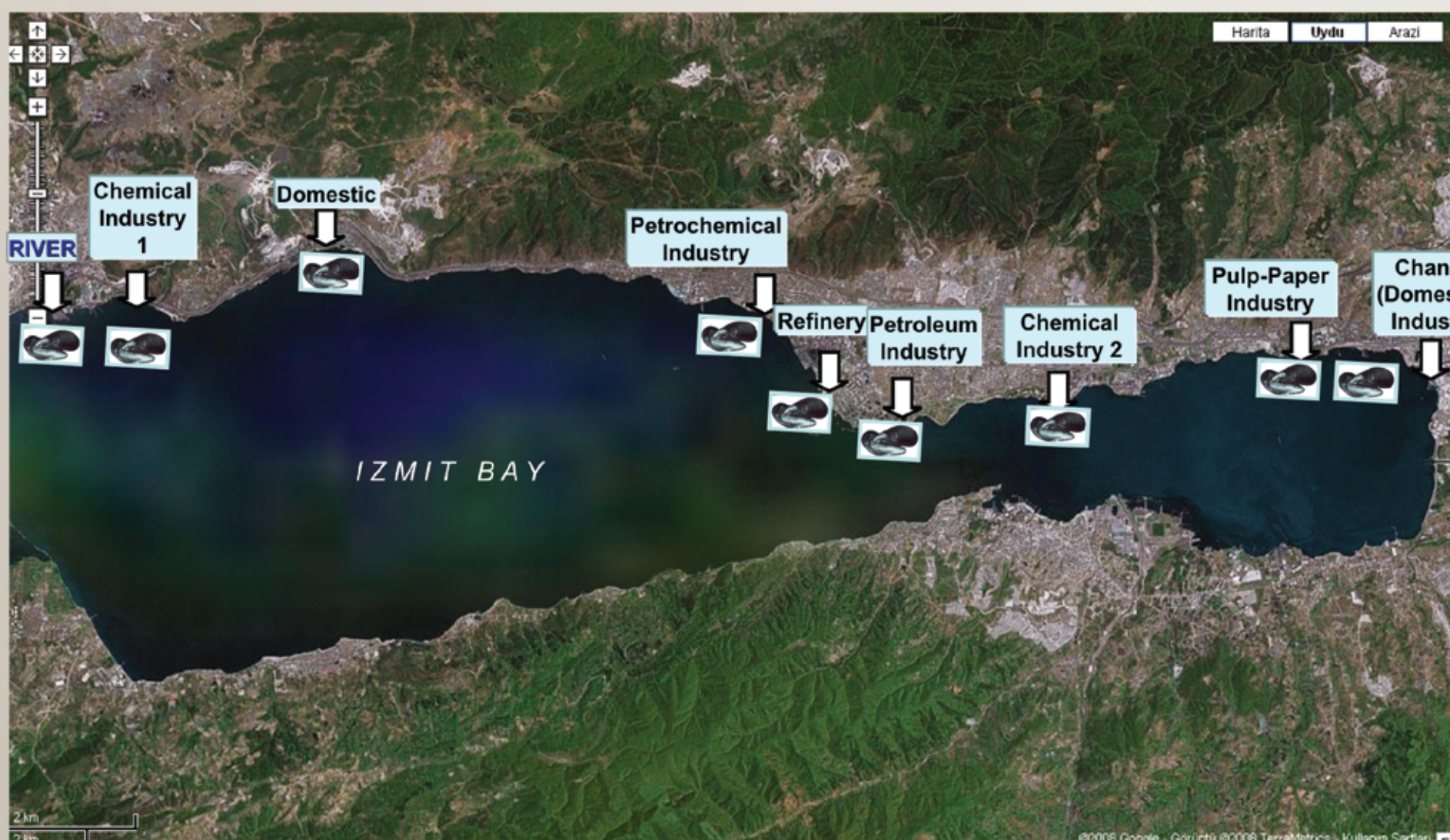


Figure 5: Location of the Discharges and Mussels

The impact of industrial inputs to the ecosystem have been observed especially in the sediments of the Bay and the mussels. The most polluted (in terms of mussel and sediment pollution) areas are the East Channel and Dilderesi stream/river inputs and the petrochemical industrial area. On one hand, naturally found mussels are collected for human consumption in an uncontrolled way creating an unidentified risk for human health.

4. ECOSYSTEM COMPONENTS & VIRTUAL SYSTEM

External inputs

- 8 main discharges
- Domestic discharges from North and Eastern part of the Kocaeli Province
- PAH from ship traffic will be estimated
- Atmospheric source of PAH
- Solar irradiance as energy source for primary production
- PAH input from urban runoff

Boundaries

- Coastal mixed layer
- Boundaries to be considered: North of the Bay (east & middle basins)
- Water exchange with adjacent water bodies (western and southern basins)
- Only Kocaeli province on the landward side

5. ECONOMIC DIMENSION

Approximately 2 million people live around the Izmit Bay, mainly in 3 large metropolitan centers, Izmit, Yalova and Tuzla, and several smaller industry towns. Izmit Bay and its surroundings is one of the most heavily industrialized regions of North-eastern Turkey, with large petrochemical and chemical plants and ship-yards; heavy steel industries; textile and related industries; pulp and paper processing plants and automotive industries.

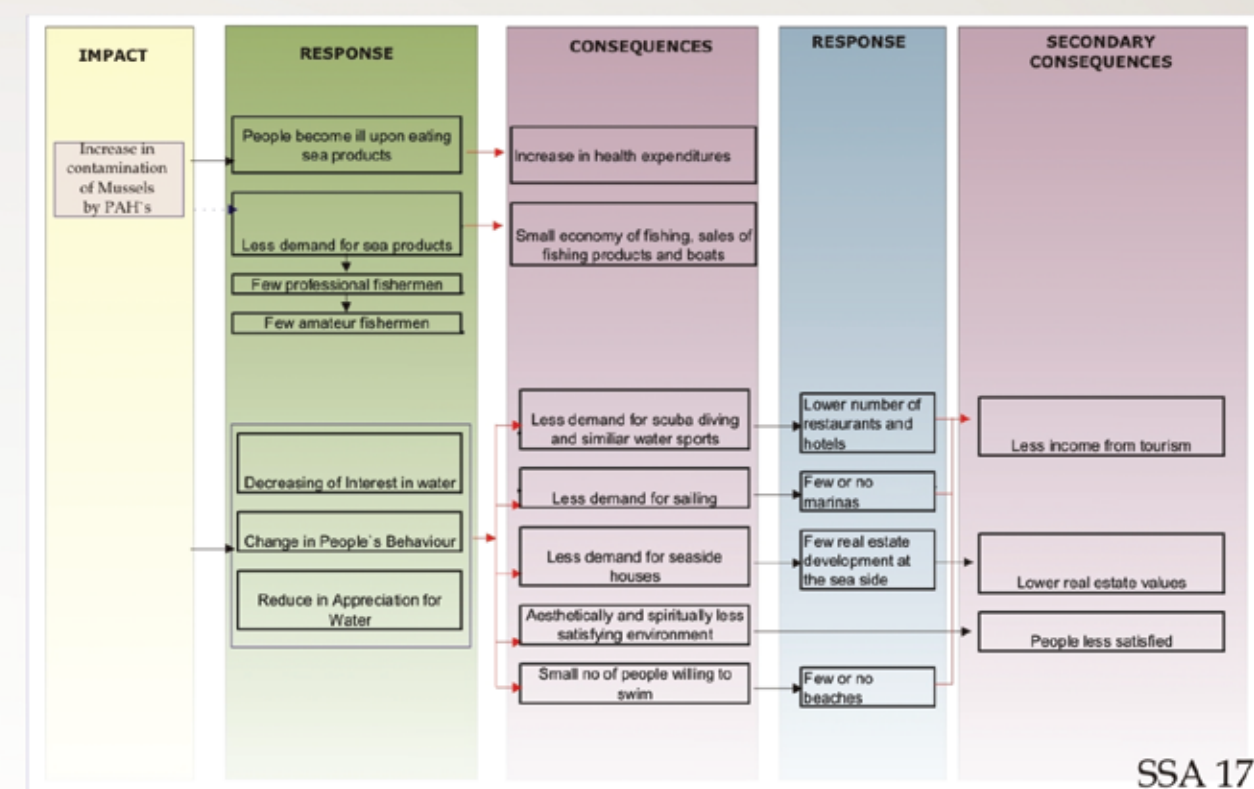


Figure 6: Issue & Respons Chain

Table 2: Economic Dimesion of the CZ System

Economic drivers of change	Ecosystem goods and services	Socio-Economic Indicators
Heavy industry	Seafood products safety	Trends in cancer cases/year
Maritime	Natural amenities - recreation	Number of cancer cases/year
	Waste assimilation capacity	Proportion of coastal urban population connected to sanitation network
	Coastal tourism	Amount of investment for environmental dimension
	Recreational fishing	Number of industries applying ISO 14001 and TQM
	Spiritual value	Number of hotels or other tourism places and tourists
		Fisheries statistics
		Sales of local seafood products
		Number of water sport clubs (yachting, diving etc), boats for recreational purposes
		Number and income of the restaurants and cafes
		Real estate value
		Number of amateur fishermen

About 75% of the economic activities in the region is based on industry (intensively applied at the North of the Bay), agriculture contributes to about 3.5% (mostly at the South of the Bay) and other activities including harbour facilities, shipping and fisheries constitute 21.5%. Among the industrial activities, petrochemical and oil refinery, pulp and paper, harbour facilities are the major ones.

Economy- direct and indirect market flows of goods and services of CZ resources : Harvesting of naturally found seafood products and recreational fishing could be considered as direct market flows of goods whereas natural amenities-recreation and coastal tourism value could be considered indirect market that would be effected by the increased contamination of mussels.

6. SOCIO-ECONOMIC COMPONENTS AND INTERACTION WITH CZ SYSTEM

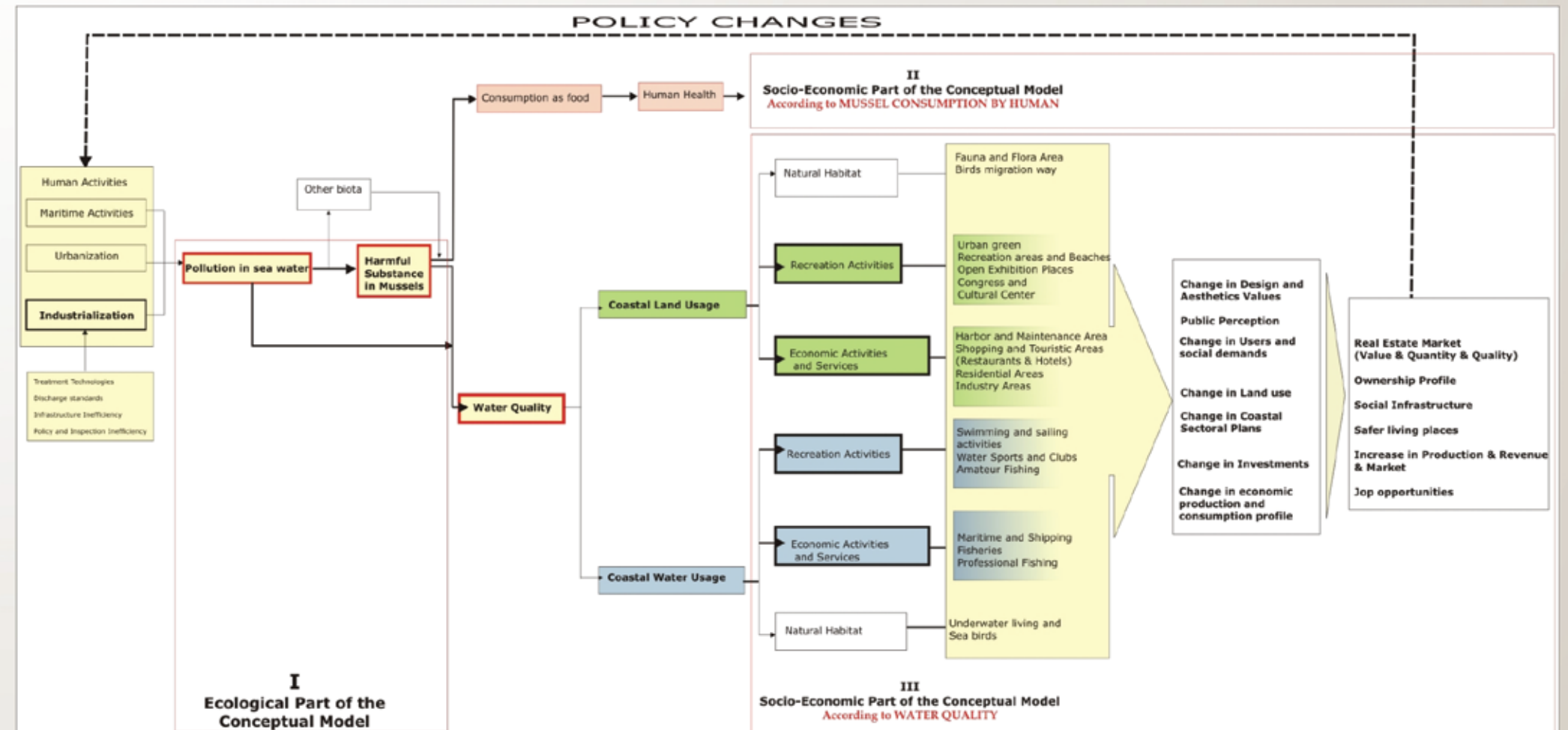


Figure 7: General Structure

7. CONCEPTUAL MODEL OF THE ESE SYSTEM

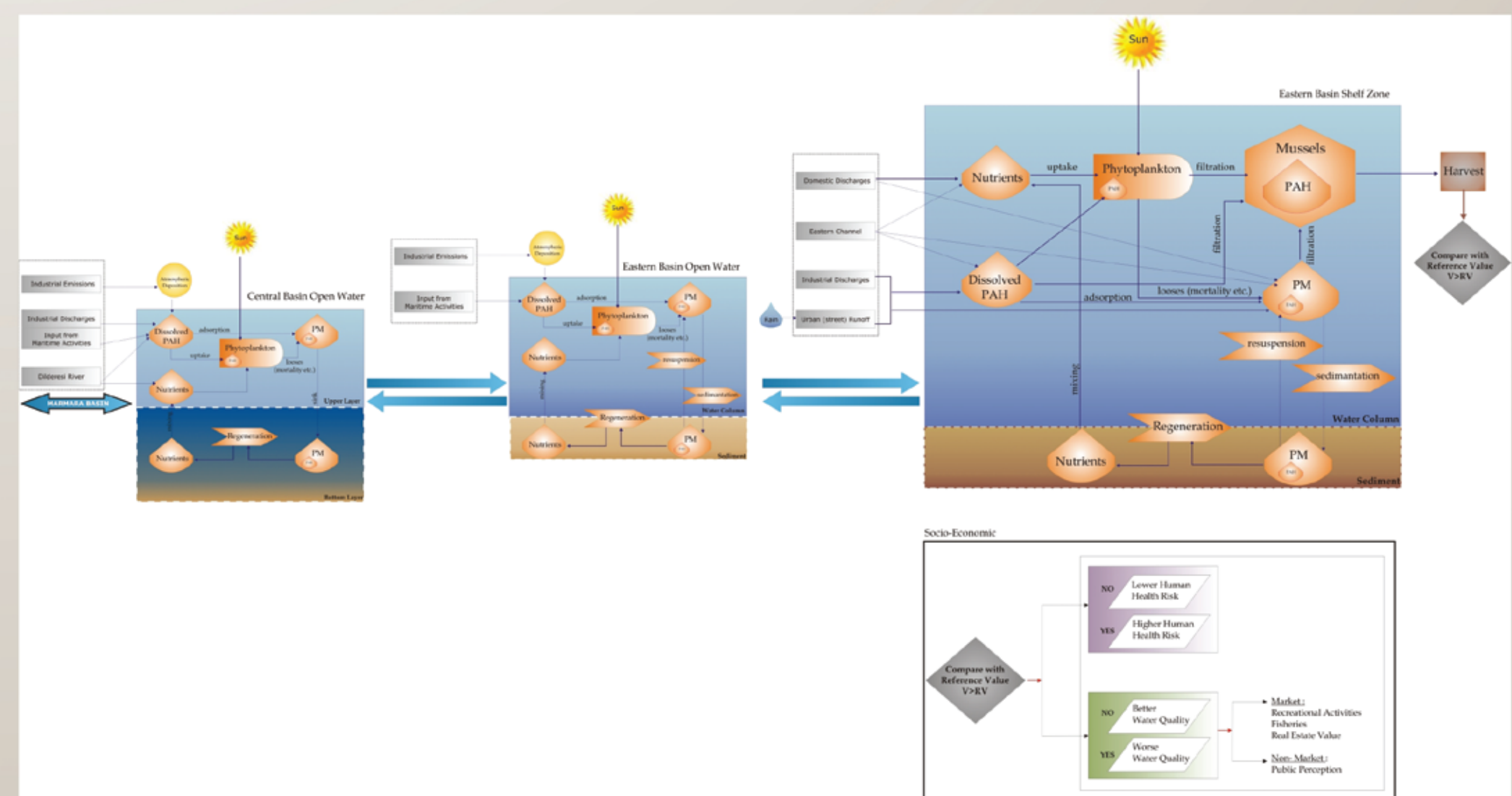


Figure 8: Conceptual Model of the Ecosystem