regions of the Baltic Sea from catchment areas of the countries of the Baltic Sea. Research has consisted of four stages. At the first stage annual average loading of unfiltered phosphorus to various sub-regions for the period since 1997 to 2003 have been calculated (Table 1). At the second investigation phase according to our hypothesis the following exponential equation has been found:

$Q = \exp(6.94 + 8.07.\beta)$ (1)

Where β is part of the area of the given drainage area from the area of all catchment areas of the Baltic Sea.

At the third investigation phase under the formula (1) values of the unfiltered phosphorus input to the Gulf of Finland from the catchment areas of different countries have been calculated (Table 2).

At the fourth investigation phase the following principle of limitation for nutrient reduction to the Baltic Sea has been formulated: quota (Δ) of nutrient reduction of the given country should be in direct proportion to the part of the catchment area of considered country (β) from the common area of all countries of considered water area (D):

$\Delta = \beta D$ (2)

According to the HELCOM Baltic Sea Action Plan to reach good environmental status of the Gulf of Finland it is needed phosphorus reduction on 2,000 tonnes, and nitrogen reduction on 6,000 tonnes (Table 3).

Table 1 Average loading (L) of unfiltered phosphorus to various sub-regions of the Baltic Sea

Sub-region	Q, tonnes	F, km^2	L, gP/m^2a	Sub-region	Q, tonnes	F, km^2	L, gP/m^2a
Gulf of Finland	6,860	29,498	0.233	Danish straits	1,410	20,121	0,070
Gulf of Riga	2,180	17,913	0.122	Kattegat	1,570	22,287	0.070
Baltic Proper	19,250	209,930	0.092	Bothnian Bay	2,460	79,257	0.031
Bothnian Bay	2,580	36,260	0.071	Q input, F water area			

Table 2 Input unfiltered phosphorus to the Baltic Sea from catchment areas of different countries

Country	β	Q, tonnes	Country	β	Q, tonnes
Russia	0,160	3,761	Estonia	0,015	1,168
Finland	0,062	1,706	Latvia	0,002	1,051

Table 3 Distribution of quotas (Δ) for nutrients reduction in the Gulf of Finland

Country	Catchment area, D, km^2	β	Δ (unfiltered phosphorus), tonnes	Δ (nitrogen), tonnes
Russia	276,100	0,669	1,338	4,014
Finland	107,000	0,259	518	1,554
Estonia	26,400	0,064	128	384
Latvia	3,400	0,008	16	48

Greener hydropower by paying for ecosystem services

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Coastal environment is influenced by both oceanic and terrestrial processes, it has been commonly agreed to integrate watershed activities so as to improve coastal management. River is one of the most important physical links between upstream watershed and downstream coast; therefore, water resources exploitation will have great influence on coastal environment. Hydropower exploitation, as a popular development approach, used to be regarded as clean energy, actually has many negative impacts on watershed ecosystem including its damage on water quality, estuary sedimentation, life habitat, landscape, and biodiversity etc. These changes in watershed ecosystem may decrease its benefits for human beings; however, hydropower developers did not consider this kind of environmental costs in the past. In our study supported by National Science Foundation of China, we firstly made a literature review on the application of various theories and methods especially of watershed ecosystem services valuation in this field. In the second part, we will present our preliminary results of the watershed ecosystem services valuation. All watershed ecosystem services affected by hydropower development will be identified and classified, available methods of ecosystem services valuation will be discussed and applied in the targeted watershed, Jiulongjiang Watershed in the Southeast of Fujian Province. The rate of hydropower developers' payment for the watershed ecosystem services will be quantified based on the previous methods; and the results will be analyzed by comparing with other exploiting costs. In the third part, we will also discuss some preliminary study results on the related mechanism to charge hydropower developers and its use methods. The mechanism to charge hydropower developers for the impacts on watershed ecosystem services will make hydropower "greener" since it integrates environmental costs into consideration, and at the same time, compensation will inspire those vulnerable groups to participate the protection activities. All of these also provide an alternative for integrated coastal management.

Freshwater supply for the Changjiang Delta in suspense with the integrated water resources management within the drainage basin

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As the freshwater resources for the city in the estuary are inevitably controlled by the mixing of fresh and salt water, interaction between the river runoff and the sea, forming the estuarine circulation, is of great importance. Because the impact of seasonal changes in the runoff and the variations in strength and the range of the tides there are considerable salinity variations in the estuary and the estuarine freshwater supply is influenced by salt water intrusion resulting in an intermittent lack of fresh water supply. This occurs each year mainly during a salt intrusion at spring tide in the dry season from December to March, when the river discharge is low. Distortion of the flow in each individual channel dominated by ebb or flood tide and phase differences produce a transverse circulation between two bifurcating channels. Thus a salt water and sediment intrusion during flood tide from the North Branch coming into the South Branch during the ebb flows out into the sea through the South Branch. This transverse salt intrusion is the main source of salt water that is regularly present around the intake of the Chenhang reservoir, which presents a problem for a safe fresh water supply to Shanghai. Supply for freshwater supply has greatly increased with the increase of the population in the developing city, especially since the early 1990s when the exploitation of Pudong started. The freshwater supply from our suggested combined reservoirs will be sufficient through the storage of fresh water during the periods of flood or drought, when no intake of fresh water is possible. Nevertheless there are some uncertainties because of the present global climate change and the huge impact of the human driving force in the drainage basin on the land-sea interaction in the estuary because of a decrease in river discharge to the estuary. These uncertainties are increase in the frequency of extreme climatic conditions because of global change, arbitrary water allocation and storage in the upper section of the river, salinity criteria of the discharge at Datong during the dry season, irregular freshwater supply in the lower section of the river and sea level rise and land subsidence in the Changjiang delta area. Their impact will reduce the intensity of mixing of fresh and salt water and inevitably will increase the salt water intrusion, thus threatening a secure fresh water supply. Thus the reasonable suggestions are given for a harmonious and consistent joint development of nature and humans in drainage basin and estuary.

Challenges in the integrated coastal zone management and in the implementation policies and regulations in India

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The 7000 Km long coastal zones of India face challenges from natural as well as human induced environmental changes. Millions of population in these zones directly depends on natural resource bases of coastal ecosystems. Estuaries and deltas in this zone are rich in biodiversity and play a crucial role in fishery production besides protecting the coastal zones from erosion by wave action. But, entire coast of India is under threat from degradation and possible global warming.