declared a biosphere zone because of rich flora and fauna and suggested some measures like creation of buffer zone, transition area and core area.

A regional environmental study is required with different parameters as the problems can be classified as anthropogenic, natural and biophysical. An at first an inventory of landuse is required and identified vulnerable spots, both tangible and intangible. Different metrix can be evaluated and arranged on the impact of upstream activities, downstream disaster mitigation and adaption to climate change in the context of conservation, environment and development. Various governments have issued landuse and building regulations, identified safety zones and outlined mitigation measures but efforts are haphazard. Restoration of coastal ecosystem is essential. Sediment control reduction of soil erosion, rainwater harvesting and recharging ground water, use of new type of building design to withstand disaster, control of sustainable pattern of agriculture and fishery, development of salt resistant species etc and conservation of forest, coral reefs and mangroves to absorb carbon.

As Kolkata, one of the large megacities is located nearby (as Dhaka is Bangladesh), use of clean and renewable energy, is required with concept of reduce, reuse and recycle, and nowturing of high land low level environment flow. A structure of governance with participatory processes also required together with a holistic environmental plan for the megadelta. Unesco's IPCC report has already assessed impact of climate change and it is estimated that large coastal in areas Bangladesh, India, China will be inundated. Action is required now for integrated coastal zone management with restoration of ecology. The paper identifies parameters to mitigate changes.

CO_2 dynamics in a coastal sea: Seto inland Sea, Japan

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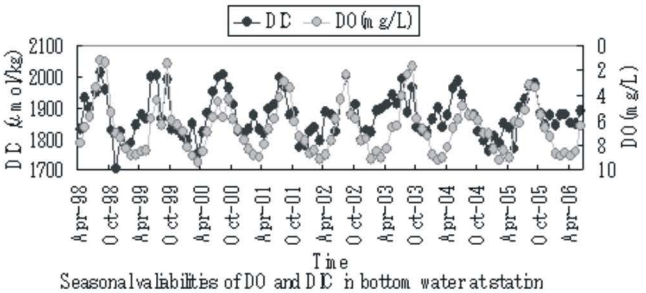
It is well known that the ocean is the biggest reservoir of CO_2 in the global carbon dioxide dynamics. Various CO_2 related data are world widely collected in CDIAC (Carbon Dioxide Information Analysis Center) and delivered on HP. These data in coastal seas are, however, quite scarce. Relatively wide shelf seas spread in East and Southeast Asia, substantially no CO_2 related data are available in these seas.

In coastal seas, anthropogenic nutrients and CO_2 are converted to organic matter by primary production. This organic matter sinks to the lower layer and decomposes into nutrients and CO_2 at this layer. Dissolved oxygen is also consumed at this time. Therefore, the lower layer water becomes a pool of CO_2 and hypoxic water during stratified season in eutrophic coastal seas. While this process is common to the process that occurs in open ocean in the depth range 0 ~ 500 m. Our observation indicates that the process occurs in ~ 50 m depth range in coastal seas.

To reveal CO_2 dynamics in shallow coastal seas, we have been conducting field observations in the Seto Inland Sea and developing method to measure CO_2 related properties. Levels of dissolved oxygen in bottom waters of HARIMA Sound decreases during the summer every year. Seasonal changes of DIC (Dissolved Inorganic Carbon), DO (Dissolved Oxygen), AOU (Apparent Oxygen Demand), Alkalinity and pH were investigated. DIC concentration in bottom water increases during summer due to the decomposition of organic matter mainly originated from phytoplankton (Bottom figure). DIC concentration decreases during winter due to the vertical mixing and CO_2 is released into the air. Development of hypoxic water is intimately related to CO_2 storage in lower layer and to eutrophication.

In this presentation, we represent necessity of CO_2 dynamics study in coastal seas, especially in Asian coastal seas, where eutrophication is now proceeding.



Seasonal variabilities of DO and DIC in bottom water at station H10 of HARIMA Sound from April 1998 to June 2006