Chapter 44. Estuaries and Deltas

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1. Introduction.

Estuaries and deltas are amongst the most heavily populated areas of the world (about 60 per cent of the world's population live along estuaries and the coast) making them the mos

2. Major threatening processes

Processes affecting the health and condition of estuaries and deltas may be classified into three broad categories that can interact:

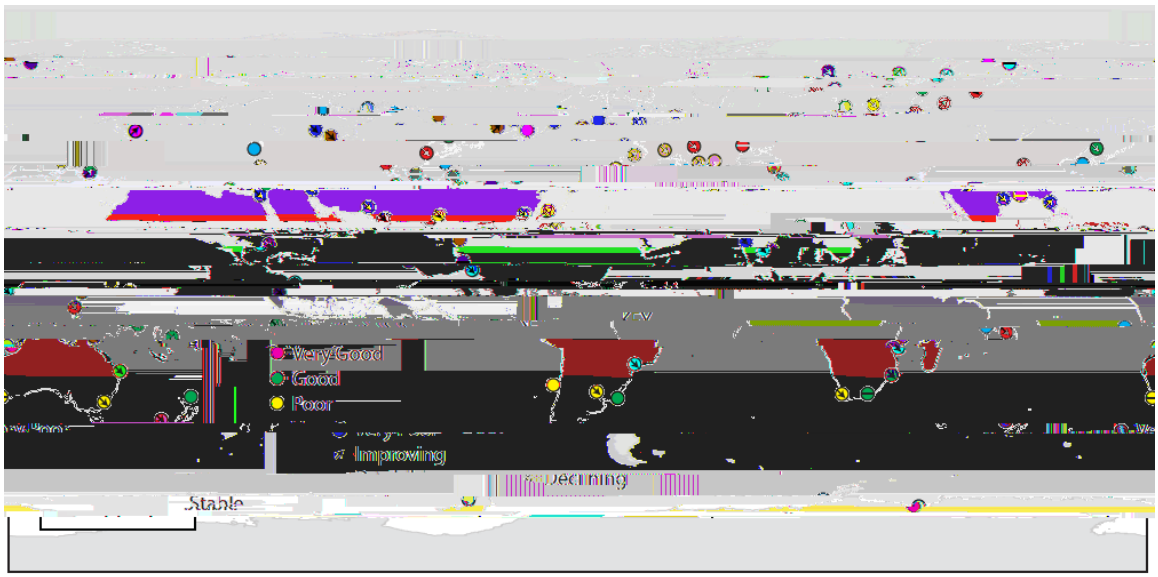
of the Hoover Dam in 1935, delivered a combination of nutrient-rich water and silt to the historic Delta, comprised over 2.5 million acres of wetlands, habitat for an estimated 400 species of plants and wildlife and home to some 20,000 Cocopah Indians (Glenn et al., 2001). All of the freshwater discharge was impounded behind dams by 1963; the wetlands dried up, affecting many dependent species. In 2014, an experimental release of 130 million m^3 of water allowed the restoration of the Colorado Delta to begin, although it will take many years to restore even part of the original wetland area (Witze, 2014).

Some of the first and most severe impacts of climate change will come through greater storm surges caused by a combination of higher sea levels and stronger storms in some areas. In the absence of storm surge, a ~20 cm rise in mean sea level will place 300–400 million additional people at risk of being flooded each year (Geneva Reports, 2009, No. 2, 138 pp. www.genevaassociation.org). Increases in storm surge will increase these numbers substantially. The Organization for Economic Cooperation and Development (OECD) estimates that, in the absence of adaptation, the population in 136 major port cities exposed to storm surges could increase from 40 million in 2005 to ~150 million in the 2070s, with exposed assets rising from 3,000 billion dollars to 35,000 billion dollars (Nicholls et al., 2008). By 2050, sea-level rise in the Ganges-Brahmaputra Delta could directly affect more than three million people and Bangladesh could lose nearly one quarter of the land area it had in 1989 by the end of this century, in a worst-case-

as nurseries to spawn and allow juveniles to grow. Maintaining such ecosystem services is commonly declared as a management goal and is the focus of conservation efforts.

In considering the management of estuaries and deltas, the question of the number of estuaries and deltas on earth arises

Based on published assessments for 100 areas, the global condition of estuaries and deltas (Figure 1) is Poor overall (mean score of 2.07 out of 4). The published assessments gave a Very Poor rating in 31 areas, a Poor rating in 32 areas, Good in 31 areas and a Very Good rating in only eight areas (Table 2 in Appendix, online only). These results are biased by the fact that many studies are carried out in affected areas and hence the scores are skewed (i.e. the overall "Poor" rating is influenced by the many studies that are conducted on affected systems). On the other hand, many of the available assessments are based on only a few measured variables (typically related to water quality or fisheries) and they do not give an overall (integrated) picture of the health and condition of estuarine ecosystems. This factor can influence the outcome of a non-integrated assessment for systems in which the impact is not measured by the parameters used.



The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Figure 1. Estuarine and deltaic condition assessments based on reports for 100 regions (listed in Appendix

Seventy-five studies reported a trend in terms of improving, stable or declining condition (Table 2 in Appendix). Out of those 75 studies, 46 (62 per cent) reported that conditions are declining, 19 (24 per cent) reported conditions were stable and ten (14 per cent) reported an improvement. On no continent does the number of estuaries showing an improving condition exceed the number of assessments of declining condition. Europe has the greatest number of studies that reported improving conditions (five), but only one area was reported to be in a "very good" condition; Africa, Australia and the South Pacific had no studies where conditions were improving. Asia (Japan) Australia and Africa each had one area where the condition was assessed as very good and stable.

6. Gaps in scientific knowledge

Out of the 101 areas assessed, only some are the subject of integrated assessments that include multiple aspects of estuarine environment, including habitats, catchment management, species, ecological processes, physical and chemical processes and socioeconomic aspects. Very few (about 10) areas had assessments that included all aspects of estuarine environments, to provide "fully integrated" assessments. There are 41 areas where assessments included at least three different aspects, producing partially integrated assessments. Another 25 areas had assessments concerned only with some aspect of estuarine water or sediment quality. Thus a critical gap in scientific knowledge is the availability of fully integrated environmental assessments for estuaries and deltas.

Out of the many possible aspects of the environment that could be assessed, water quality and biological aspects are most commonly assessed, whereas socioeconomic aspects are assessed the least often, which is thus a knowledge gap. One other aspect of condition assessment is the trend (improving, stable or declining) that was assessed in 74 out of 103 areas. The assessment of trends is a critical piece of information for decision-makers, but which is missing in about 26 per cent of assessments. Furthermore, the time interval over which the trend is measured varies between studies, from one year to other arbitrary periods of human impact (as much as a century or longer). Thus the comparison of trends is confounded by differences in the time spans they relate to; international agreement on standards for reporting condition trends is needed to overcome this problem.

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