4-15-2011

Lecture 10: Human activities and future coast

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10 Human activities and future coasts

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NOTE – No “Historical Perspective” Section
Only 20 pages total (vs. 72 for Beaches/Barriers), 7 figures (vs. 32 for Beaches/Barriers)

10.1. Human Activities and Future Coasts

-- Future coastal will be increasingly “human dominated”
-- The past is not as clear a key to understanding response to human activities

Examples of coastal changes expected from human activity:

-- Enhanced erosion due to loss of sediment supply
-- Shoreline “hard” and “soft” armoring for protection of property
-- Beach construction and “nourishment” for recreational use
-- Harbor construction and dredging (and spoil disposal) for economic activity
-- Loss of morphodynamic ecosystems (e.g., coral, mangroves, marsh, oysters, SAV) from over-harvesting and degraded water quality
-- Coastal “reclamation” and land expansion for economic activity
-- Coastal preservation and re-engineering for maintaining/enhancing natural environment
-- Impacts of human-induced climate change: sea level rise, potentially more severe storms
**Maldives:**
- Indian Ocean atoll chain
- Area 100 mi²
- Population 380,000
- Max elevation 2.4 m (1

**Figure 10.1.** Malé, capital of the Republic of Maldives, is a reef island on the rim of a coral atoll. It has been the site of population concentration and the fringing reef has been mined to extend the land area of the island. Erosion during heavy seas has necessitated construction of a seawall around much of the island and detached breakwaters along the seaward reef flat. This contrasts with natural islands (background) which are protected by reef.

**Figure 10.2.** Human action (H) and the coastal system:
(a) viewed as a perturbation, for instance beach nourishment; (b) altering boundary conditions, for instance damming of a river altering sediment input; and (c) as an intrinsic component of the system, for instance where dredging of a channel shoal is undertaken when navigation is threatened, in response to a threshold water depth. Schematic response of morphology of landforms is shown on the right. Morphology returns to pre-disturbance state in the case of the perturbation; it remains altered where the boundary conditions change, and exhibits repeated negative feedback as a threshold is approached in the case where human action is intrinsic to the system.
10.3 Tourism and the Resort Cycle

-- Exploration – few visitors
-- Involvement – initial tourist response
-- Development – intense tourism promotion
-- Consolidation – carrying capacity reached
-- Stagnation (potential) – tourism declines

Figure 10.3. Model of barrier island settlement and the resort cycle (based on Meyer-Asselt, 1985 and Nordstrom, 1994a, 2000). The five stages, exploration, involvement, initial development, further development and consolidation are shown to have socioeconomic definition, but to also be expressed in the morphology of the island, with increasing human modification of the shoreline. Grand Isle, a barrier island in southern Louisiana is an example.

10.4.3. Human Adaption to Change on the Coast

a) Vertical wall

b) Curved concrete wall

c) Rubble-mound

d) Revetment

Figure 10.5. Broad types of seawall (based on Carter, 1988). (a) The vertical wall occurs in high-energy setting and reflects wave energy with the potential to set up a standing wave (clapotis); wave-break piles may attenuate some energy if installed. (b) The curved concrete wall causes the plunging wave to break. (c) The rubble-mound is a lower energy option; whereas (d) the revetment would be suitable for the lowest energy setting.
Prospects

Human society is having impacts on the global environment

Coastal landforms evolve through morphodynamic adjustments to boundary condition changes

Recognizable patterns provide a morphodynamic framework for the better management of coastal areas

Coastal scientists must continue to test and refine models and acknowledge shortcomings

Move toward “soft” engineering solutions must assess risks posed by potential hazards

Future studies of coastal environments must be interdisciplinary

Understanding how coastlines respond to sea level, whether natural or human-induced, remains a priority