

**Breaking the Disaster Cycle:  
Future Directions in Natural Hazard Mitigation**

*Coastal Erosion Issues; Shifting  
Hazardous Development Costs to Users*

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# *Coastal Erosion Issues; Shifting Hazardous Development Costs to Users*

## ➤ Objectives:

10.1 Understand the nature of coastal erosion processes.

10.2 Discuss the political, social, and economic issues raised by erosion impacts.

10.3 Describe the proposed structural and regulatory solutions to coastal erosion.

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## ➤ Objectives:

10.4 Review the costs of coastal hazards and how they are paid.

10.5 Discuss issues of who should pay for protection of property in hazardous areas.

10.6 Discuss proposed approaches to shifting the costs of hazardous development to property owners, such as risk based taxation.

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## ➤ Objective 10.1

- Understand the nature of coastal erosion processes:
  - Natural processes
    - ✓ wind
    - ✓ waves
    - ✓ current (longshore)
    - ✓ sea level rise
  - Human intervention
    - ✓ construction of jetties and groins
    - ✓ construction of dams
    - ✓ dredging channels or inlets

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**Severe beach erosion in Studio City, CA.** (Source: FEMA)

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## ➤ Objective 10.2

- Discuss the political, social, and economic issues raised by erosion impacts:
  - Rights and responsibilities of beach front property owners
  - Who should bear the costs?
  - Disclosure requirements
  - Permitting processes
  - Federal policies regarding building in hazard areas

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## ➤ Objective 10.3

- Describe structural and nonstructural approaches to coastal erosion:
  - Structural
    - ✓ Hard stabilization
    - ✓ Soft stabilization
  - Non-structural
    - ✓ Relocation
    - ✓ Land use controls
    - ✓ Land acquisition
    - ✓ Expenditure limitation
    - ✓ Public Notification

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## ➤ **Figure 10.2 Mitigating Coastal Erosion: Structural Measures**

### Hard

- Seawalls - Vertical walls built on land and parallel to the beach to absorb wave energy.
- Bulkheads - Similar to seawalls, but are generally smaller. Usually used to protect headland areas and inlet channels.
- Breakwaters - Fixed or floating structures that are built just offshore, parallel the coast. They serve to reduce the energy of waves before they hit the shoreline.
- Revetments - Riprap or interconnecting concrete blocks used to protect dunes and beaches from erosion.
- Jetties - Rock walls or piles built perpendicular to the beach. Generally used to block flow of sand and prevent ship channels from filling in.
- Groins - Similar to jetties. Usually built to capture migrating sand and increase the width of beaches.

### Soft

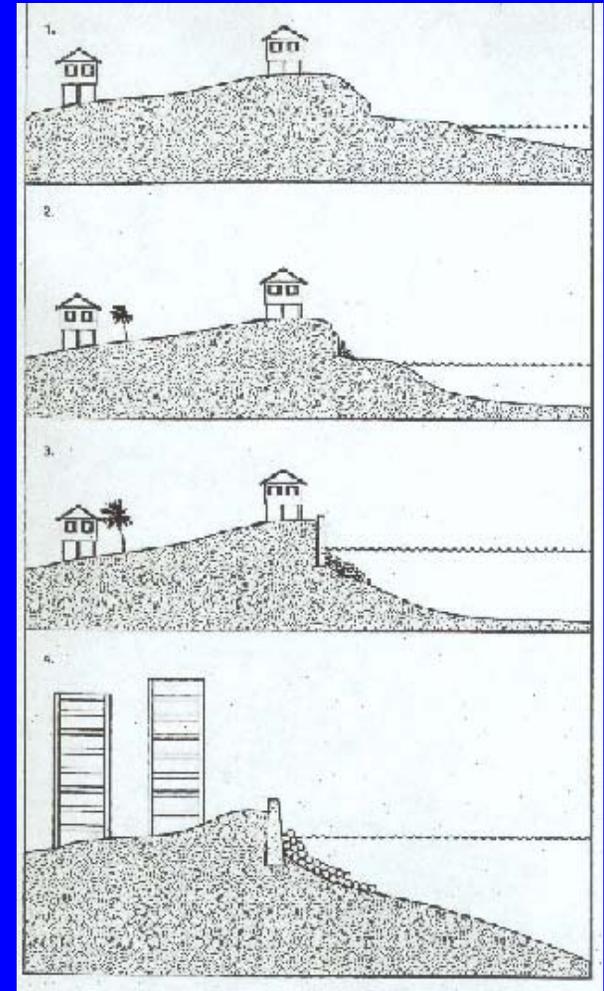
- Beach nourishment – placing sand on an eroding beach.

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## ➤ Figure 10.3 Saga of a Seawall

- 1) An eroding shoreline threatens buildings.
- 2) In response, homeowners build seawall.
- 3) Overtime, the wall's size is increased, and the beach has disappeared.
- 4) Fifty years later, the seawall is huge, the beach is gone, the shore face has steepened, and the house is gone. Condominiums replace beach cottages, but no beach remains for visitors to enjoy.

Source: Adapted from Pilkey and Dixon, 1996:42



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## ➤ **Figure 10.4 Mitigation Coastal Erosion: Non-Structural Approaches**

### **Relocation**

- Removing or relocating structures away from eroding areas

### **Land Use Controls**

- Zoning - divides land into separate land-use districts or zones and establishes the uses and density of development allowed in each zone.
- Subdivision ordinances - governs the division of land into smaller parcels for development or sale.
- Building setbacks – establishes minimum distance that new construction must be set back from the ocean's edge

### **Acquisition**

- Public purchase of property prone to erosion

### **Expenditure Limitation**

- Limits public expenditures for infrastructure that supports development in erosion-prone coastal areas

### **Public Notification**

- Notifies potential purchasers of potential threats from erosion

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➤ **Figure 10.5 Relocation of Cape Hatteras Lighthouse**

(Source: North Carolina Department of Transportation)



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## ➤ **Figure 10.6 States with Setback Controls**

➤ Alabama	yes
➤ Alaska	no
➤ California	yes
➤ Connecticut	no
➤ Delaware	yes
➤ Florida	yes
➤ Georgia	no
➤ Hawaii	yes
➤ Louisiana	no
➤ Maine	yes
➤ Maryland	yes

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## ➤ **Figure 10.6 States with Setback Controls**

➤ Massachusetts	no
➤ Michigan	yes
➤ Minnesota	yes
➤ Mississippi	no
➤ New Hampshire	yes
➤ New Jersey	yes
➤ New York	yes
➤ North Carolina	yes
➤ Ohio	no
➤ Oregon	yes
➤ Pennsylvania	yes
➤ Rhode Island	yes

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## ➤ **Figure 10.6 States with Setback Controls**

➤ South Carolina	yes
➤ Texas	no
➤ Virginia	yes
➤ Washington	yes
➤ Wisconsin	yes
➤ American Samoa	yes
➤ Guam	yes
➤ Northern Marianas	yes
➤ Puerto Rico	yes
➤ Virgin Islands	yes

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## ➤ Objective 10.4

- Review the costs of coastal hazards and how they are paid:
  - Costs to coastal property owners will average a total of \$530 million per year
  - Economic and non-economic costs to public
  - Federal government role
    - ✓ National Flood Insurance Program

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Flooded coastal development in Wrightsville Beach, NC

(Source: FEMA)

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## ➤ Objective 10.5

- Discuss issues of who should pay for protection of property in hazardous areas:
  - Until 1950s cost borne locally
  - Disaster Relief Act of 1970 expands federal role
  - Who benefits from hazard mitigation?
  - Who pays for hazard mitigation?
  - Incentives and disincentives for building in hazardous areas

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Cliffside erosion in Pacifica CA. (Source: FEMA)

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## ➤ Objective 10.6

- Discuss proposed approaches to shifting the costs of hazardous development to property owners, such as risk based taxation:
  - Risk-based taxation
    - ✓ How it works
    - ✓ Advantages
    - ✓ Disadvantages