Managing Coastal Margins

Coastal Erosion and Flooding Management

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Case Study:
Coastal Management focused on decision making process.
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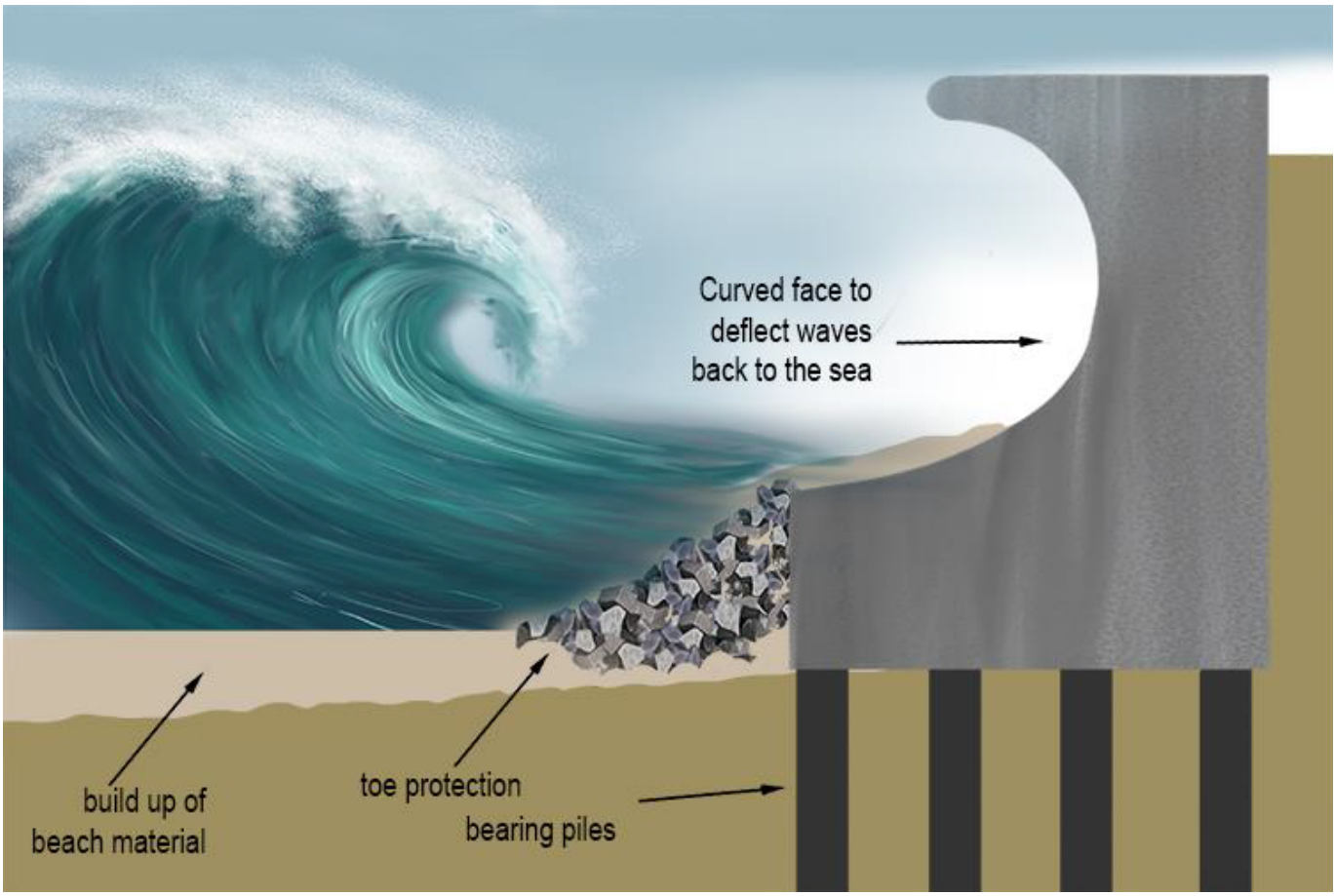
Seawalls

Built parallel to the shore along the landward side.

- Purpose: To armor the coastline and protect landward and prevent erosion and flooding.
- Shape
    - Vertical walls suffer from turbulence at bases.
    - Toe protection is the key part of sea wall design.



- Performance of seawalls depend on
    - Sloping or vertical

    - Permeable or impermeable
    - Rough or smooth
    - Material made from
    - Flatter, Permeable, Rougher walls perform better

Gabions 填石铁笼

Wire-framed cube filled with pebbles.

- Cost effective method.
- Effective at dissipating wave energy.

Revetment 护岸

Protective layer used on sloping surface

- Open structures that advancing waves break, energy dissipated among the boulders.
- Sediment accumulate, encourage establishment of vegetation.

Off-shore breakwaters 防波堤

- Provide sheltered location for shipping
- Protect stretches of coast from high wave energy
- Interfere with the natural transport of sand, blocking the waves that used to keep the sand moving

Groins and Groin fields 拦沙坝(阵)

- Built perpendicular to a coastline.
- Trap sand moving along the coast in longshore transport
- Variety of materials
- Erosion occurs immediately downcoast of groin.

Beach Nourishment / Recharge

Dredging sand from offshore / coastal locations.

Management of Coral reefs and Mangrove swamps

Mangroves 红树林

Salt-tolerant forest that grow in the tidal estuaries and coastal zones of tropical areas.

- Exposed network of prop roots grow down in to sediment.

Benefits:

- Nursery areas and habitats for marine organisms.
- Cleaning polluted water.
- Protection from erosion.
- Provision of food, wooden fuel

Coral Reefs 珊瑚礁

Calcium carbonate structures made of reef-building corals.

Conditions Required for growth:

- Temperature: $\geqslant 20^{\circ}C$
- Depth of water: $\leqslant 25m$
- Strong sunlight
- Salinity above 32 psu.
- Low turbidity and sediment
- Strong waves provide oxygenated water
- No exposure to the air

Fringing reefs 裙礁

Along the margin of a landmass.

Barrier reefs 堡礁

Linear or circular reefs separated from the landmass by a lagoon.

Value of Coral Reefs:

- Biodiversity
- Seafood
- New medicines
- Recreational value
- Coastal Protection
- Economic goods

Coral Bleaching 珊瑚白化

When environment conditions become stressful, *Zooxanthellae* may leave the coral, leaving energy deficient and loss of color.

Exclusive economic zones 专属经济开发区

Nautical Mile 海里

Air space 领空

Subsoil 底土

Internal waters 内水

Water lying between the land belonging to the nation and the baselines it has established. Included in the national territory.

High seas 公海

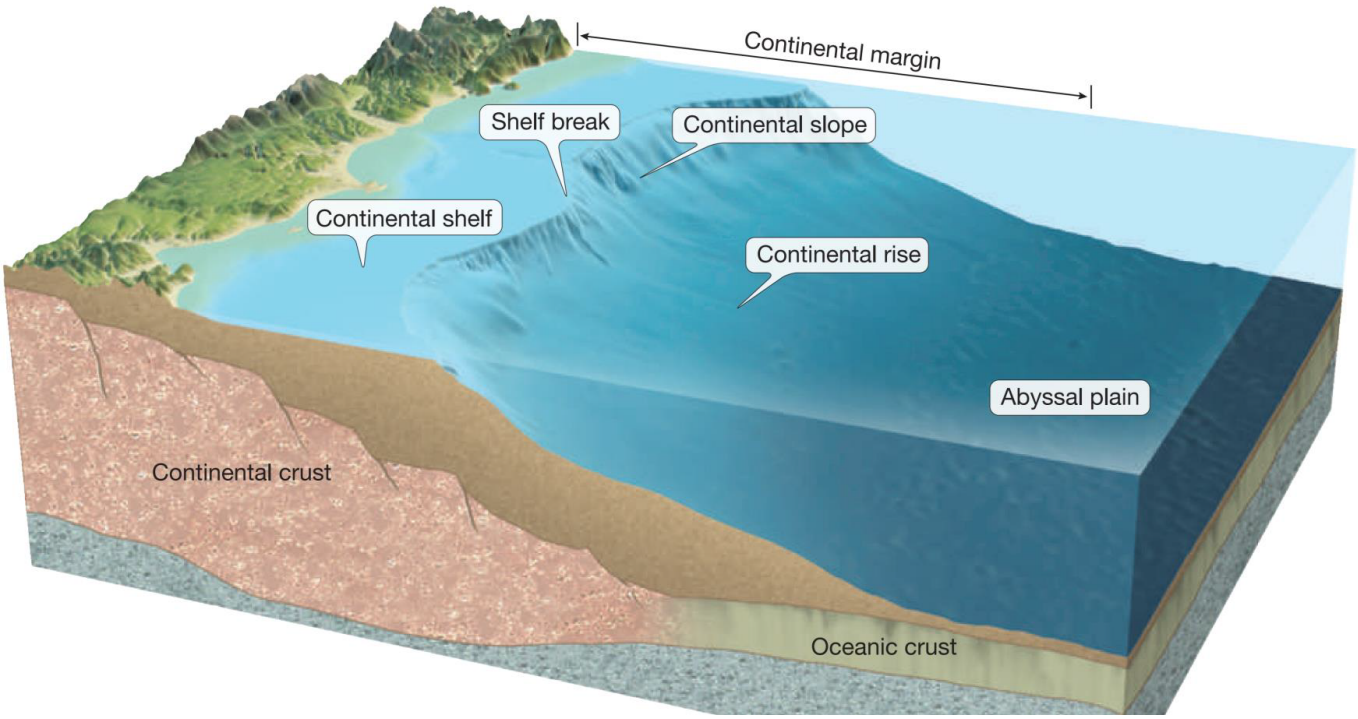
Right of free passage for all vessels on the high sea.

Continental Shelf 大陆架

Flat zone extending from the shore beneath the ocean surface to a point which a marked increase in slope angle occurs.

Continental Slope

The area between the continental rise and continental shelf.



Territorial Sea 领海

Sovereignty of a nation extends to a belt of sea adjacent to its coast of uniform *12 nautical miles*. Extends to air space and subsoil.

- Baseline is low-water line along the coast.
- Right of free passage is provided within territorial seas and straits for international navigation.

Contiguous Zone 毗连区

Zone adjacent to the territorial sea that within *24 nautical miles* from baselines.

- May exercise the control necessary preventing infringement of lows and regulations.

Exclusive Economic Zone (EEZ) 专属经济开发区

A coastal nation has sovereignty rights over all the economic resources of the sea, seabed and subsoil, extending up to *200 nautical miles* from the baseline.

If the continental shelf exceeds EEZ, the zone is extended to *350 nautical miles*.

- Within EEZ, country has right to explore, use, conserve and manage all natural resources situated.

Law of the Sea 海洋法

New law of Sea treaty was adopted.

Ocean Management Futures

Demand for Abiotic Resources

Petroleum

Ancient remains of microscopic organisms, buried within marine sediments.

- Offshore drilling platforms provided 30% of crude oil produced today

Gas Hydrates

Compact chemical structures made of water and natural gas.

- Occur beneath *Arctic permafrost*
- Equivalent to twice as other sources of carbon.

Sand and Gravel

Rock fragments that are washed out to the sea and shells of marine organisms.

- Used as *aggregate* 混凝土骨料 in concrete.

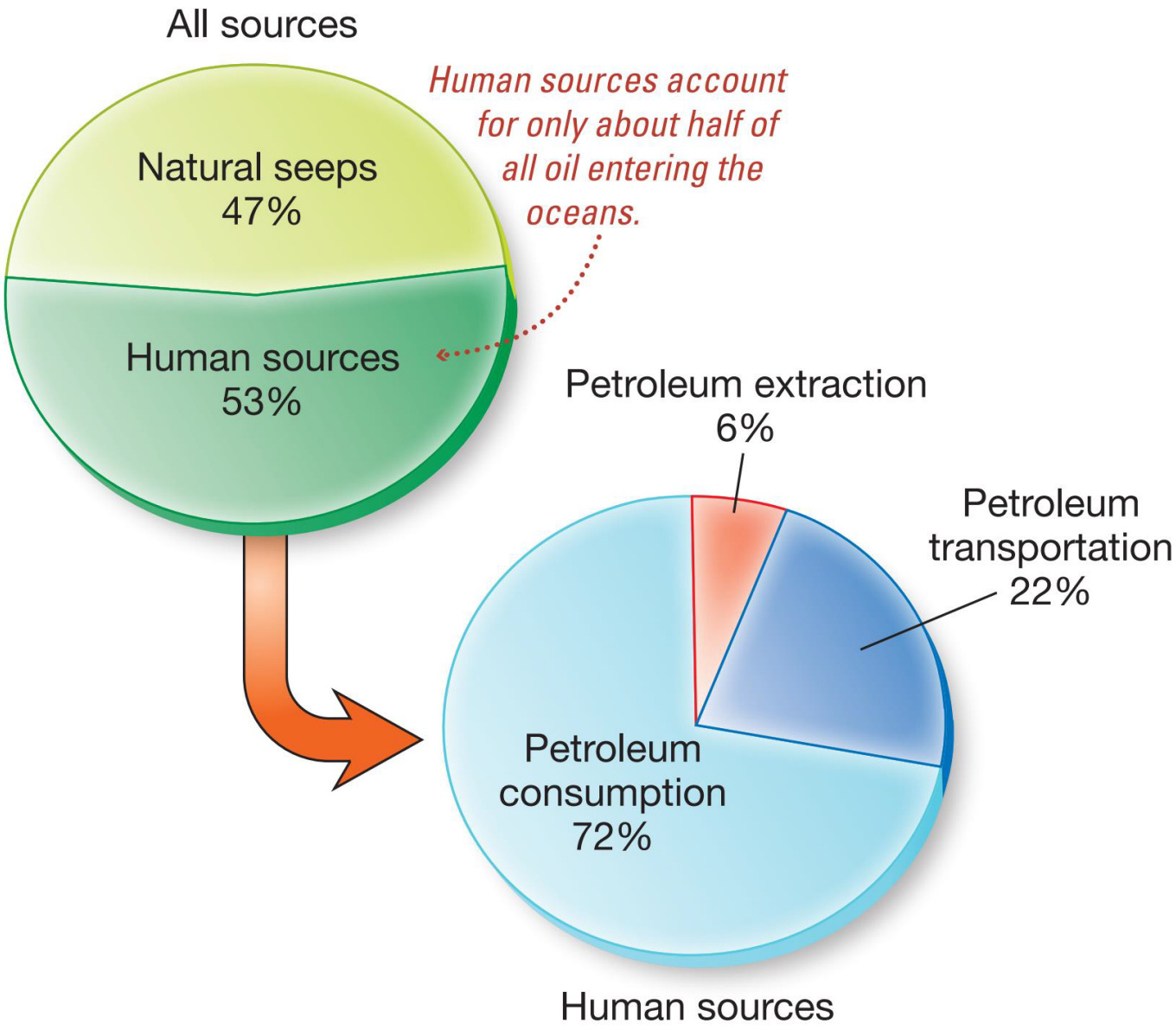
Valuable minerals

- **Gem-quality diamonds** in South Africa and Australia
- **Tin** in southeast Asia from Thailand and Indonesia
- **Platinum and Gold** in offshore deposits.
- **Titanium** in Florida beach.
- **Salt deposits**
    - Low-lying areas near the lagoon is flooded with seawater, evaporated in arid climate and leave deposits of salt.
- **Manganese nodules**
    - Round, hard lumps of metal which contains concentrations of manganese, iron. copper, nickel and cobalt.
- **Phosphorite**
    - Sedimentary rock consisting of phosphate minerals.
    - Used to produce phosphate fertilizer

- **Rare earth metals**
    - Deep-sea hot springs pulled these elements our of seawater and enriched them in sea floor muds.

Ocean Pollution

Oil Spill

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Case Study:
1. New Carissa on fire off the Oregon Coast
2. Exxon Valdez, 1989
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DDT and PCBs

Persistent, biologically active chemicals that have been introduced into the oceans by human activities.

- Capable of causing cancer, birth defects and other harm.
- Enter the marine area through atmosphere and river runoff.
- Undergoing *bioaccumulation* and *biomagnification* process.
- The ban of DDT caused dramatic increase of malaria cases.

Plastic Pollution

Large floating regions of trash in oceans of the world.

- **Eastern Pacific Garbage Patch** 东太平洋垃圾带
- Microplastics consists of small plastic particles through waste-water plant due to their size.
- Large pieces of plastics may cause entanglement and ingestion of marine animals.
- Floating plastics pieces has high affinity for toxic compounds.
- Limitation toward single-use plastic, recycle plastic and dispose properly are to reduce the amount of plastic in the area.

Ocean Eutrophication

Enrichment of waters by a previously scarce nutrient that can trigger an overabundance of algae.

Use of Biotic Resources

Overfishing

Occurs when the majority of the population is sexually immature and therefore unable to reproduce.

- **Maximum sustainable Yield**: The maximum amount of fish biomass that can be removed yearly from a stock and still allow the population to be sustained indefinitely.
- **Recreational fishers**: Pose more threat than commercial fishing. But the practice of *catch and release* helped to sustain fish populations.
- **Incidental catch** 附带渔获物 Including any marine organisms caught incidentally by fishers seeking commercial species, accounting for nearly one-fourth of the world's total marine fish catch.
- **Bottom trawling** Dragging heavy nets along the bottom of the ocean, destroy coral reefs and disrupt sediment and bottom marine life.

- **Ghost fishing** Lost or discarded fishing gear continues to catch fish or other organisms. Use biodegradable material could solve this problem.

Consequences of Overfishing

- Decline of marine fish population and Overall Size of fish in a Population
- Loss of large predatory fish due to food shortage

Fishery Management

- Assessing ecosystem health
- Determining fish stocks
- Analyzing fishing practices
- Establishing areas closed to fishing
- Setting and enforcing catch limits.

Methods of Fishery Management

- Reducing bycatch
    - Banning some types of fishing gear
    - Develop more selective gear and fishing practices
- Decreasing fish catch
    - Direct buyouts of government
    - Reducing subsidies to fishing interests
- Harvest tax
- Changing quota system
    - Encourage environmentally friendly fishing methods.
- Individual transferable quotas
    - Fishers have economic incentive to protect the resource.
    - May result in elimination of smaller fishing operators.
- Regulating harvest beyond EEZs
    - Fish size limits
    - Fish number limits

    - Number of fishing times limits
    - Number of boats limits
    - Number of new boats limits
- Marine Protected Areas
    - Small pockets of habitats that helping restore commercial stocks.
    - Poorer countries in less-developed world are hard to regulate sanctuaries.
- Choosing Seafood Wisely

Aquaculture

Advantages

- Job Opportunities
- Increase Revenue
- Reduce seafood deficient
- Increase scientific knowledge
- Emphasis on protecting coastal waters from pollution
- Reduce fishing pressure on wild stocks.

Disadvantages

- Conflicts with other waterbody users
- Pressure on wild stocks that are used to create feed pellets
- Amplify disease and parasites to wild populations
- Pollute water system with excess nutrients.
- Compromise local gene pools with native species
- Threaten livelihood of fisherman
- Unpredictable for small communities to severe weather, predators, disease, and global competition.
- Loss of aesthetic beauty of coastline.