NO PREP

Marine Geology and Natural Resources

Includes: Student reading, case study, differentiated questions, teacher key

Name: Period: Date:

Marine Geology and Natural Resources

The Ocean as a Resource

The study of marine geology is not only about understanding Earth's past but also about recognizing how the ocean provides essential natural resources. From fossil fuels to minerals and rare earth elements, the seafloor holds valuable materials that societies depend on. While these resources support economies worldwide, their extraction raises questions about sustainability and environmental protection. Marine

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The Ocean as a Resource

The study of marine geology is not only about understanding Earth's past but also about recognizing how the ocean provides essential natural resources. From fossil fuels to minerals and rare earth elements, the seafloor holds valuable materials that societies depend on. While these resources support economies worldwide, their extraction raises questions about sustainability and environmental protection. Marine geology helps us locate, evaluate, and responsibly manage these resources.

Oil and Gas Beneath the Seafloor

One of the most important resources obtained from the ocean is oil and natural gas. These fossil fuels form when organic material is buried under layers of sediment, heated, and compressed over millions of years. In many places, such as the Gulf of Mexico and the North Sea, oil and gas reservoirs lie beneath the continental shelf. Marine geologists use techniques such as seismic surveys and drilling to locate these reserves. Offshore drilling platforms then extract the fuels, which are transported by pipelines or tankers. While vital for energy production, oil and gas drilling comes with risks such as oil spills, which can harm marine ecosystems. The 2010 Deepwater Horizon disaster is a stark reminder of these dangers.

Minerals and Rare Earth Elements

Beyond fossil fuels, the seafloor holds vast quantities of minerals. Manganese nodules, rich in copper, cobalt, and nickel, lie scattered across abyssal plains. Hydrothermal vent deposits contain valuable metals such as zinc, silver, and gold. These materials are important for electronics, renewable energy technologies, and modern industry. The challenge is that mining these deposits could destroy fragile deep-sea ecosystems. Because hydrothermal vents host unique life forms, scientists

debate whether the benefits of mining outweigh the risks. Marine geology provides critical data to guide these decisions by studying how deposits form and how ecosystems might recover.

Renewable Resources from the Sea

The ocean also offers renewable resources. Offshore wind energy, tidal power, and wave energy are all linked to marine geology, since seafloor conditions determine where turbines and energy platforms can be safely built. Marine geologists evaluate the stability of sites to prevent structural damage and environmental disruption. In addition, sand and gravel are mined from continental shelves for construction. These materials are crucial for cities worldwide but can affect coastal habitats when extracted in large amounts.

Key Information: Table: Marine Geological Resources

Resource	Source	Uses	Concerns
Oil and natural gas	Organic material buried in sediments	Energy, plastics, fuels	Oil spills, greenhouse gases
Manganese nodules	Abyssal plains	Metals for electronics and batteries	Ecosystem destruction from mining
Hydrothermal deposits	Vent systems	Zinc, silver, gold, rare metals	Damage to vent ecosystems
Sand and gravel	Continental shelves	Construction, concrete	Coastal erosion, habitat loss
Renewable energy sites	Offshore geology	Wind, tidal, wave energy	Stability, environmental disruption

Case Study: The Deepwater Horizon Spill

In April 2010, the Deepwater Horizon drilling rig in the Gulf of Mexico experienced a blowout, causing one of the largest oil spills in history. For 87 days, millions of barrels of oil leaked into the ocean, devastating marine ecosystems and local economies. The spill damaged fisheries, killed countless marine animals, and coated coastal wetlands with crude oil. Cleanup efforts took years, and scientists continue to study the long-term impacts. This event highlighted the importance of strict safety regulations and the need to balance energy demands with environmental protection.

1. What caused the Deepwater Horizon oil spill, and what were its impacts?

_____

_____

2. Why is the Deepwater Horizon disaster significant for future offshore drilling practices?

_____

_____

Multiple Choice

1. What are manganese nodules rich in?
    a) Copper, cobalt, and nickel
    b) Silver, gold, and platinum
    c) Iron, sulfur, and calcium
    d) Oil and gas

2. What was the main cause of the Deepwater Horizon disaster?
    a) Undersea earthquake
    b) Submarine landslide
    c) Drilling blowout
    d) Pipeline rupture

3. Why are hydrothermal vent deposits valuable to industry?

a) They provide sand and other construction materials

b) They produce renewable energy

c) They store natural gas reserves

d) They contain metals like zinc and gold

Matching

Write the letter of the correct definition on the line next to each term.

Term	Definition
1. ___ Oil and gas	A) Blowout disaster in 2010
2. ___ Manganese nodules	B) Energy source formed from buried organic matter
3. ___ Hydrothermal deposits	C) Renewable energy supported by offshore geology
4. ___ Deepwater Horizon	D) Source of zinc, silver, and gold
5. ___ Offshore wind energy	E) Contain copper, cobalt, and nickel

Fill-in-the-Blank

1. The 2010 _____ Horizon disaster was one of the largest oil spills in history.

2. Manganese _____ are mineral-rich resources found on abyssal plains.

3. Renewable energy sites such as wind farms depend on stable _____ geology.

Short Answer

Answer each question in 2-4 complete sentences.

1. What risks do oil spills pose for marine ecosystems and coastal communities?

2. Why are rare earth elements from the seafloor important in modern technology?

3. How does marine geology help balance resource use with environmental protection?