



## San Ignacio Lagoon: Economy or Ecology?

Students take on various roles in a debate over the development of a salt production facility at San Ignacio Lagoon in Mexico, a real-life issue concerning one of three major gray whale mating and calving sites.

### SUBJECTS

Science, social studies

### TIME

60 minutes

### MATERIALS

- Role cards student handouts
- Internet access (optional)

### OBJECTIVES

Students will be able to

- argue a specific viewpoint in a debate over the development of a salt production facility at San Ignacio Lagoon.
- articulate different perspectives on a development issue that affects Mexico's economy and the gray whale population.
- debate the merits of protecting versus developing the San Ignacio Lagoon.

### BACKGROUND

With protection from whaling and other forms of human harassment, the gray whale population has returned from a low of a few thousand animals to its pre-whaling population of around 20,000 whales. San Ignacio Lagoon, in Baja California, Mexico, is one of the three main mating and calving sites for this once-endangered whale species.

In the late 1990s, the Mexican government and Mitsubishi Corporation of Japan started making plans to develop a \$150 million industrial salt processing facility at San Ignacio Lagoon. The population of Mexico is increasing, and jobs are badly needed. There is also a need to improve the economy of Mexico. Mitsubishi has the technology and know-how to create large and economically viable developments and is in a position to help develop jobs and contribute significantly to the Mexican economy. The salt processing facility would generate an estimated \$25 million in income.

In the 1970s, the Mexican government set aside the San Ignacio Lagoon as a whale sanctuary, and later the region around the lagoon was given status as the Vizcaino Biosphere Reserve. If the plan to develop the salt processing facility were implemented, giant pumps would force lagoon water onto the desert to evaporate, thus leaving salt. A pier would be built, in the migratory path of the whales, where ships would come to carry off the salt.

Local fishers take tourists in their fishing boats to observe the whales during the calving and mating season. This is an important source of income for the fishers. These local residents and businesspeople, along with environmentalists interested in protecting the whales and other endangered species in the region, fear that the salt production facility would be a danger to the lagoon ecosystem.

### Resolution of the Issue

Preservationists from Mexico and the United States fought this proposed project for five years. On March 2, 2000, Mexico's then-president, Ernest Zedillo, announced that Mexico would not proceed in partnership with Japan's Mitsubishi Corporation to build the world's largest salt evaporation plant in the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site of San Ignacio Lagoon on the Pacific Coast side of Baja California, Mexico.

STANDARDS

**National Science Education  
Standards Grades 5–8**

[http://www.nap.edu/  
catalog/4962.html](http://www.nap.edu/catalog/4962.html)

**Unifying Concepts and Processes:**

Systems, order and organization

**Life Science –**

**Content Standard C:**

Populations and ecosystems  
Diversity and adaptations  
of organisms

**Science and Technology –**

**Content Standard E:**

Understandings about science  
and technology

**Science in Personal  
and Social Perspectives –**

**Content Standard F:**

Populations, resources and  
environments  
Natural hazards  
Risks and benefits  
Science and technology in society

Although the Mitsubishi project was cancelled, the International Community Foundation's (ICF) San Ignacio Lagoon Whale Conservation Project states that the lagoon is still in jeopardy. The cancelled industrial salt production project was a private business/government venture, with 49 percent owned by Mitsubishi and 51 percent owned by the Mexican government. The ICF Web site states that Mexican government officials have been discretely considering divesting Mexico's interest in the project. A private company purchasing the Mexican government's 51 percent interest would not be subject to President Zedillo's cancellation of the private business/government venture. In effect, the industrial salt project could be transformed into a new and viable project.

**TEACHER PREPARATION**

1. Make enough copies of each role card to distribute to one-fifth of the students in the class.
2. Familiarize yourself with the issue facing San Ignacio Lagoon by reading the background information and all five role cards.

**PROCEDURE**

1. **Introduce the issue:** Drawing from the background information, introduce students to the environmental and economic situation at San Ignacio Lagoon, but don't share the final resolution.
2. **Create a decision-making group:** Select three to five students (or parent volunteers) to serve as "staff" for the Attorney General for Environmental Protection of Mexico. Explain that their job is to hear arguments from five groups, each of which represents a different perspective on the issue of developing a salt production facility at San Ignacio Lagoon in Baja California, Mexico. The Attorney General's staff will then form an opinion on the issue and share it with the Attorney General for Environmental Protection of Mexico. The Attorney General will be making a recommendation to the president of Mexico regarding whether to participate in the development of the salt production facility.
3. **Assign roles:** Divide the remaining students into five groups. Assign each group one of the five roles (environmentalists, U.N. scientists, Mexican government representatives, Mitsubishi Corporation representatives and local businesspeople) and distribute the appropriate role card to each student.

**Ocean Literacy:  
Essential Principles and  
Fundamental Concepts**  
[http://coexploration.org/  
oceanliteracy/](http://coexploration.org/oceanliteracy/)

**Essential Principle #1:  
The earth has one big ocean  
with many features.**

- f. The ocean is an integral part of the water cycle and is connected to all of the earth's water reservoirs via evaporation and precipitation processes.
- g. The ocean is connected to major lakes, watersheds and waterways because all major watersheds on Earth drain to the ocean. Rivers and streams transport nutrients, salts, sediments and pollutants from watersheds to estuaries and to the ocean.

4. **Develop statements:** Ask students to read the role cards and become familiar with the perspective of their group regarding development of the San Ignacio Lagoon. Have each group prepare a statement to present at a hearing being held by the Attorney General for Environmental Protection. The statement should articulate the group's position regarding development of the salt production facilities. Encourage students to be creative with their statements; they should not simply read from the position page they are given. They will be given two minutes to make their case.
5. **Stage the national hearing:** Have the Attorney General for Environmental Protection's staff call upon each group and ask for its statement.
6. **Decide the outcome:** Once all the statements have been made, have the Environmental Protection staff convene and decide, based on the evidence they heard, which position to recommend to the Attorney General for Environmental Protection.
7. **Share the results:** Have the Attorney General's staff share their recommendation with the rest of the group.
8. **Discuss:** After the activity, discuss the outcome. Note that environmental issues are complex problems and that they affect people and wildlife locally and globally. Ask the following questions to guide the discussion on the decision-making process:
  - Which of the groups were satisfied with the recommendation made by the Attorney General for Environmental Protection?
  - Why were there such different perspectives on the same issue? Are there multiple viewpoints on every issue? Can you think of anything happening at school about which people have different views?
  - Would it ever be beneficial to compromise your point of view? If so, when and why? If not, why not?
  - What role does science play in policy making?
  - What role does public education play in awareness and action?
9. **Reveal the true-life resolution:** Share the actual outcome of the San Ignacio Lagoon issue. Discuss students' reactions.

#### EXTENSIONS

- Using the Web sites under Further Resources (and any others), have students do additional research into the groups and perspectives, then have them develop personal viewpoints on whether they agree with the outcome.

**Essential Principle #6:**

**The ocean and humans are inextricably interconnected.**

- b. From the ocean we get foods, medicines, and mineral and energy resources. In addition, it provides jobs, supports our nation's economy, serves as a highway for transportation of goods and people, and plays a role in national security.
- e. Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out of and put into the ocean. Human development and activity leads to pollution (point source, nonpoint source and noise pollution) and physical modifications (changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.
- g. Everyone is responsible for caring for the ocean. The ocean sustains life on Earth, and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.

**Essential Principle #7:**

**The ocean is largely unexplored.**

- c. Over the last 40 years, use of ocean resources has increased significantly; therefore the future sustainability of ocean resources depends on our understanding of those resources and their potential and limitations.

**FURTHER RESOURCES**

Additional educator resources for *Jean-Michel Cousteau Ocean Adventures* can be found at [pbs.org/oceanadventures](http://pbs.org/oceanadventures).

Also try:

- American Cetacean Society <http://www.acsonline.org/issues/grayWhales/sanignacio.html>
- International Community Foundation San Ignacio Lagoon Whale Conservation Fund [http://www.icfdn.org/campaigns/signacio\\_whalefund/fs\\_silwhalefund.htm](http://www.icfdn.org/campaigns/signacio_whalefund/fs_silwhalefund.htm)
- Jean-Michel Cousteau's Ocean Futures Society [http://www.oceanfutures.org/jmc/messages/salt\\_mining\\_sil.asp](http://www.oceanfutures.org/jmc/messages/salt_mining_sil.asp)
- Mitsubishi Corporation <http://www.mitsubishicorp.com/en/index.html>  
<http://www.mitsuwww.essa.com.mx>
- The World Factbook <http://www.cia.gov/cia/publications/factbook/geos/mx.html>

**AUTHORS**

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**CREDITS**

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## Environmentalists

Environmentalists oppose the development of the salt mining operation. Major industrial activity in other settings have often resulted in long-term environmental impacts that were unpredictable at the outset, and environmentalists are concerned that this will be the case with the salt mining operation at San Ignacio Lagoon.

Construction of the evaporation ponds will flood 52,150 hectares and will likely have environmental impacts on the landscape, hydrology, underwater acoustics and air quality in the region. Operation of the salt mine facility in the lagoon will lead to increased noise levels from the water pumps and other equipment. The ponds, roads and community will experience habitat loss. These impacts may in turn affect wildlife, including birds of prey and land mammals such as bobcats, desert cottontails and antelope.

Changes in water flow may decrease water temperature and salinity in the lagoon. It is not known whether this would have an impact on birthing whales or calves.

Environmentalists are also concerned about a pier that will be built outside the mouth of the lagoon for the loading of salt onto boats. The pier will be an obstacle to gray whales entering and leaving the lagoon, and the boats docking and departing the pier may be especially dangerous to young whales.

Large ships may pose a hazard for migrating whales because the ships and the whales could collide. The ships will certainly increase sound levels and are likely to create oil spills and other waste discharge.

Environmental groups feel that the Mexican government set this lagoon aside as a whale sanctuary in the 1970s for good reason and that it should be preserved as a refuge for the whales. There are other bays and coastlines in Mexico that are not gray whale mating and calving grounds that would make better choices for major industrial development.

## U.N. Scientists

The United Nations declared Mexico's San Ignacio Lagoon a World Heritage Site in 1993. It is a gray whale calving and mating site. In addition, the region is home to endangered antelope, sea lions and black sea turtles. Only about 90 endangered pronghorn antelope remain in the area of the San Ignacio Lagoon. The reserve is Latin America's largest wildlife sanctuary.

Experts from the United Nations acknowledge that an existing salt factory at Guerrero Negro, a nearby lagoon that is also part of the World Heritage Site, has undeniable social and economic value. It has greatly strengthened the regional economy and provides an outstanding refuge for wild birds, as do most salt pond operations.

But there are two parts to every saltworks: the cultivation areas and the industrial areas. The cultivation areas, where evaporation occurs and salt is generated, generally create a relatively low-impact way of using the land productively. The industrial areas -- where the salt is processed, stored and transported -- are the source of most of the environmental risks.

The brine left after salt production is heavy with magnesium and bromide salts, which can pose a poisoning risk to wildlife. A six-month-long study by the Mexican Attorney General for Environmental Protection found that in December 1997, 94 endangered sea turtles died from exposure to toxic brine wastes from the Guerrero Negro saltworks. The report also revealed a May 1998 fish kill from a 4-million-gallon spill of toxic brine waste and notes that when the investigators collected their sediment samples, they found 287 batteries in the lagoon, indicating illegal disposal of hazardous materials.

UNESCO believes the proposed saltworks could destroy the unique qualities that qualify San Ignacio Lagoon as a World Heritage Site. The noise of pumping 6,000 gallons of water per second out of the lagoon could also negatively impact gray whales in ways that have not yet been studied. The scientists think the associated facilities (industrial area, infrastructure and pier) would involve major changes to the land inside and near the World Heritage Site. At least a part of the area would be transformed into urban and industrial land. This would constitute a substantial and significant change from the current condition of the site.

## Mitsubishi Corporation

Mitsubishi Corporation wants to partner with the Mexican government and develop an evaporation salt production facility. The project is in keeping with the goal of the Mitsubishi Chemicals Group to help create an affluent society by supplying essential chemicals and chemical products (including salt) to numerous industries.

Mitsubishi feels that a salt facility would greatly help the Mexican economy by providing much-needed jobs for its citizens. The plant is expected to generate \$25 million in income each year, which would be shared by the Mexican government and Mitsubishi.

San Ignacio Lagoon is a perfect location to establish a salt production facility because the region has very few cloudy days, an abundance of seawater and a very low population density, all of which are very good for salt production. Costs would be kept relatively low and disruptions to the area would be minimal.

This development will have no significant impact on the small local population of fishers, nor will it harm the whales in the region. Whales breed in the lagoon and not in the shallows or nearby landscape where the salt ponds will be located. There is plenty of space, and no species will be threatened with extinction by this project.

According to a Mitsubishi representative, a UNESCO report on the possible development of a salt production facility clearly says that such a facility can operate in harmony with a World Heritage Site and doesn't harm whales. Mitsubishi feels that opponents of the project have misstated the claims made in the UNESCO report and that in reality, UNESCO acknowledges equally the economic benefits and benefits to bird life and the possible environmental problems.

Mitsubishi Corporation feels the salt pond facility can be developed without harm to the environment and wants to help build the economy of Mexico by providing additional income for the country and jobs for its citizens.

## Mexican Government

The Mexican government faces the challenges of boosting economic growth, improving Mexico's international competitiveness and reducing poverty. These are the economic factors of greatest importance to the people and the government of Mexico.

Forty percent of Mexico's population lives below the poverty line, and 25 percent to 29 percent of the population is either unemployed or underemployed. Jobs are badly needed. Per-capita income (income per person) is just one-fourth that of the United States, and the distribution of income is highly unequal. There are many poor people in Mexico.

Mexico's economy is dependent on a mixture of modern and outdated industry and agriculture. It is important that the country develop and modernize its industrial base in order to boost economic growth and better compete in the world market. A salt production facility, developed in partnership with Mitsubishi Corporation, would be a major step forward and could greatly brighten the country's economic future.

The Mexican government, together with Mitsubishi, expects to earn up to \$25 million per year from the salt plant.

## Local Businesspeople

In general, local businesspeople fear that the proposed salt production facility near the San Ignacio Lagoon will negatively impact the fisheries and whales upon which they depend. Many local businesspeople earn their income by fishing or as whale-watching tour guides.

The Ejido Luís Echeverría Álvarez (LEA) has led an effort to organize people whose livelihood depend on the San Ignacio Lagoon. Ejidos are land collectives - groups of rural residents who together own and manage rural lands. The LEA feels it is important to preserve the lagoon. Its members have created a conservation easement along the shores of the lagoon, that is, they have agreed to limit development on specified acres of their lands. The LEA encourages other ejidos in the area to follow its example by preserving specified acres of their lands in the San Ignacio Lagoon wetlands.

The Laguna Baja Asociación Rural de Interés Colectivo (ARIC) is a coalition of nine ecotourism businesses operating in San Ignacio Lagoon leading whale-watching trips for tourists visiting the area. ARIC members hold permits issued by the Mexican government to lead tours and have exclusive rights to work as whale-watching guides. Their livelihood depends on healthy lagoon ecosystems, and they are worried about the impacts of the possible evaporation pond and salt production facility.