

Potential Risk and Control of Contamination in the Gulf of Aqaba

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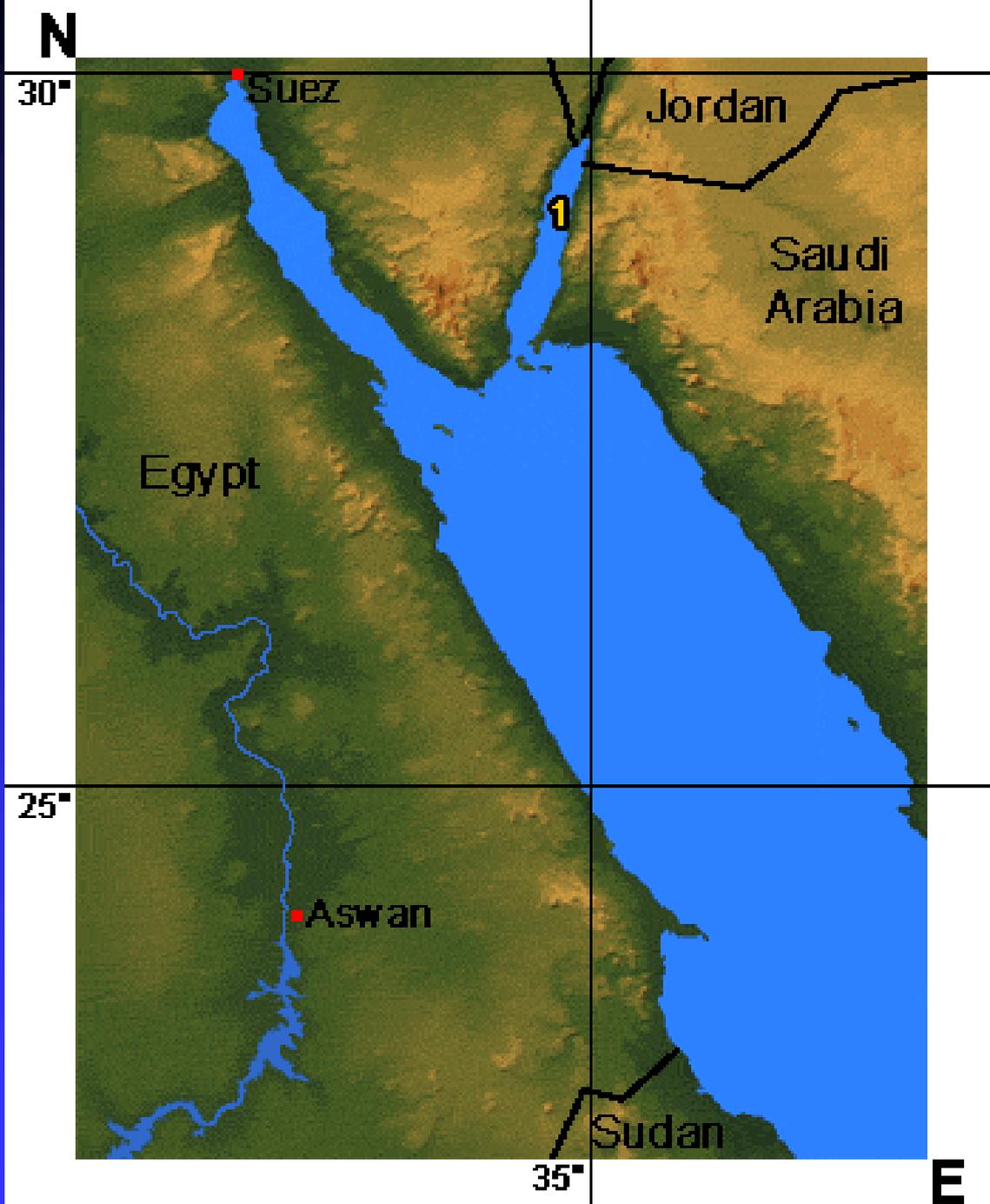
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Introduction

- The Gulf of Aqaba (GOA) is one of the two northward extensions to the Red Sea, surrounded by Egypt, Saudi Arabia, and Jordan and Israel.
- It has a width ranges from 5 km at its northern tip, to a maximum 25 km and then narrows back to 6 km at the straits of Tiran.
- The GOA has an average water depth of 800 m. Its maximum depth is about 1800 m. The straits of Tiran, has a maximum depth of 250 m.
- The length of the GOA on the Jordanian borders is about 26.5 km.

Introduction

- The semi-enclosed nature of GOA along with the semi-enclosed nature of the Red Sea, has given it a unique ecosystem with unique biological diversity.
- The Red Sea supports higher levels of species diversity than any Eastern Indian Ocean region.
- The mean residence time of water ranges (1 -3) years, with an average 2 years.
- The relatively small volume results in the accumulation of pollutants, which is one of the most important concerns about the sustainability of inland and offshore activities.

City of Aqaba

- It is the only city in Jordan that has an access to the sea. It has a population of 75,000.
- In 2001, the government of Jordan has declared the city of Aqaba along with the surrounding area a free zone which called Aqaba Special Economic Zone (ASEZ).
- The purpose of such move is to make the zone a haven for commerce, tourism, and technology.
- This is expected to increase No. of population, tourists, industrial and commercial activities, wastewater discharge, to a point that the environmental richness of the Gulf becomes threatened, unless special steps are taken.

Gulf of Aqaba

- To preserve the marine environment in ASEZ, regulations call for the preparation of a comprehensive Environmental Impact Assessment (EIA) for major projects like:
 - ◆ Oil refineries.
 - ◆ Thermal power stations.
 - ◆ Land reclamation for the purpose of industry or recreation.
 - ◆ Construction of major hotels and entertainment complexes.
 - ◆ Construction of highways, railways, airports, harbors or marine ports.

Gulf of Aqaba

- Comprehensive EIA is also required for various industrial activities, waste disposal activities, and fish breeding farms in the sea.
- Other projects need either preliminary evaluation or are exempted from EIA. Environmental auditing is an important part of the regulation to monitor, prevent, and mitigate any environmental threats.
- The regulation also has provision for air protection, solid and hospital waste, and used mineral oil.

Gulf of Aqaba

- To protect the marine environment, the regulations prohibit the disposal of oils, oil mixtures, garbage, litter, sewage and ballast waters from ships without prior approval and in designated areas.
- The captain of the ship is required to maintain an oil record book recording all processes conducted related to transferring, loading, unloading, leakage, oil discharging and so forth.
- Ships should be equipped with pollution minimizing equipment. Fines are used in the regulation as a mean to deter from polluting the environment.

Potential Sources of Pollution

- In 1994, Jordan and Israel signed a peace treaty, Since that time they pursued a regional approach for the environmental protection of the Gulf of Aqaba.
- The two Governments agreed to cooperate in developing legislative, regulatory, planning and emergency response measures to protect the Gulf.
- As the Gulf lies between a number of countries, individual measures from one country can not solve these environmental problems, regional cooperation between the riparian countries is vital.

Tourism

- The GOA is a highly valued area as a national, regional, and international tourism center. It has amazingly clear, deep, calm, and warm water with spectacular underwater life.
- There are about 1000 fish species, 110 species of reef building coral, and 120 species of soft corals.
- At the present time, the No. of visitors to Aqaba is 600,000, and is expected to increase sharply in the future.
- Large influx of tourists has brought with it environmental degradation that threatened the same components of the ecosystem.

Tourism

- The spectacular coral reefs are an example of these threatened components.
- Waters with high numbers of swimmers, divers, snorkelers, and recreational boats have caused severe damage to coral reef structures in these waters.
- Tourists tend to step on living corals or anchor their boats in coral reef areas thus breaking off pieces of corals.
- Unless educated and regulated, higher numbers of tourists would severely degrade the quality of the marine ecosystem.

Tourism

- The building of infrastructure and hotel resorts, which produce heavy sedimentation on the corals that are detrimental to the well being of such corals.
- It should be noted that successful tourism and environmental protection of the GOA are interdependent.
- The lack of environmental control will severely restrict Jordan's ability to attract private investments and international tourism.
- Successful tourism will depend on clean, non-polluted water and healthy coral reef ecosystems.

Tourism

- Tourism should provide the countries bordering the GOA with economic incentive to preserve their underwater ecological system.
- Time may come in the GOA when environmental improvement projects would be more economically feasible than building hotels and resorts.
- Therefore, environmental impact assessment studies should be implemented for tourism development projects in the GOA.
- As a result of peace treaty, the Red Sea Marine Peace Park (RSMPP) in the GOA established.

Tourism

- The RSMPP embodies the coral reserves of both Aqaba and Eilat. It includes the Coral Reef Reserve extending 2 km in Eilat, and the Aqaba Marine Park, extending 7 km in Aqaba.
- The RSMPP calls upon Jordan and Israel to collaborate in research efforts to protect the GOA coral reefs and marine biology.
- In addition comparable policies and regulations designed to protect the coral reefs as a tourist attraction should be implemented.
- Long term monitoring and research programs along with educational and awareness programs are planned.

Oil Spills

- An oil spill is probably the most devastating and visually compelling form of pollution.
- Oil pollution can damage the reproductive system of corals, interfere with the production of larvae, and inhibit normal settling.
- Oil can also induce feeding and behavioral changes among fauna.
- Experiments indicate a range of responses to oil, including abnormal mouth opening and feeding behavior, mucus secretion, decreased growth rate, and increased rate of tissue death.
- Factors that reduce light penetration, such as continuous thick films of oil, interrupt the photosynthetic cycle of specific coral reefs.

Oil Spills

- In 1995, Egypt, Israel and Jordan have prepared an Upper GOA Oil Spill Contingency Plan. it has established an emergency response centers in each country to coordinate efforts in the event of a spill requiring a regional response.
- To reduce the possibilities of large spills and reduce their effects, they have to allocate responsibilities and financial burdens, conduct joint training exercises, and set mandatory design and operational standards for cargo vessels and oil tankers operating within the Gulf.
- Small oil spills in the GOA is inevitable, the impacts of these spills can be minimized if proper regulations are implemented and enforced.

Wastewater Discharges

- Wastewater discharge into marine areas has a negative impact on the sustainability of underwater ecosystems.
- High SS in the effluent can accumulate on coral reefs which prove to be detrimental to their well being, high SS can also reduce light penetration to the bottom,
- Reduced light penetration interrupts the photosynthetic cycle of specific coral reefs.
- Corals need sunlight because they depend for their survival on tiny algae that live in their tissues.
- The photosynthetic algae provide the polyps with carbon, and benefit in return from nitrates and phosphates

Wastewater Discharges

- The total area of the GOA is comparatively small with high concentration of economic activities that produce wastewater along the coast. This requires stringent regulations, monitoring and enforcement in order to preserve such ecosystem for future generations.
- In 1987 the city of Aqaba started its first wastewater treatment plant and the effluent was used for irrigation.
- Recently the plant has been converted to an extended aeration plant thus improving the treatment efficiency.
- Therefore no wastewater discharges to the GOA since 1987.

Wastewater Discharges

- Until 1996, municipal wastewater from Eilat was discharged into the shallow coastal waters of the GOA after only minimal treatment, causing frequent beach closures and coral reef decline.
- Eilat municipality has stopped discharging its sewage into the Red Sea and diverts its effluents through a 40-km pipeline to the north to irrigate date fields. A new treatment facility is in advanced planning stages.
- Development in ASEZ, which is expected to increase its population to about 250,000, will dramatically increase water demand and wastewater generation. Ban on wastewater discharges into the Red Sea should be carefully investigated.

Urbanization & Industrial Pollution

- Urban development and industrial pollution impose high environmental pressure on the GOA.
- The last three decades has altered 30 to 40% of the Jordanian coastline from a pristine natural environment to a heavily used port and industrial area.
- With declaration of ASEZ, rapid increase in port and industrial activities is to be expected, causing degradation of coral reefs and loss of biological diversity.
- One of the most serious aspects is the strong tendency to develop the coast in a strip-like fashion, which inevitably degrades the environment along the coast.

Urbanization & Industrial Pollution

- Development projects should be directed away from the coast. This would preserve the marine ecosystem and shore for recreational activities and tourism.
- Near coast infilling and construction increases sediment loading onto the seabed which can not be tolerated by Coral reefs.
- Industrial discharges into the Gulf also contain suspended particles and heavy metals. Sources of metals include land-based operations such as fertilizer manufacture and sea-water desalinization.
- Industrial activities have put the fringing reefs under pressure and increased coral diseases by 10-fold.

Urbanization & Industrial Pollution

- Values of phosphate concentrations, heavy metals, and algal cover are higher at or near industrial sites.
- A reduction of 50% in fish abundance and changes in the relative abundance of different fish communities were observed.
- It was suggested that future industrial development should be restricted to already industrialised areas.
- The exportation of phosphate in the port of Aqaba is a major environmental problem. 1% of phosphate was lost into the atmosphere during the loading process before 1993. This has been reportedly to be reduced by 80 - 85 %.

Urbanization & Industrial Pollution

- The dust settles increasing the water born phosphate concentration, reducing water clarity, and increasing sediment load.
- Thermal pollution is also a consequence of industrial development, heated cooling water is discharged into the Gulf increasing the water temperature higher than ambient water about 5 to 8 °C.
- Increase in temperature of a few degrees can have profound affects on these organisms.
- With the planned new power plant and other industrial facilities in the future, careful monitoring should be practiced in the coming years.

Other Sources of Pollution

- Recreational activities are a major source of solid waste and litter. Jordan's GOA beaches and near-shore reef and sea grass areas are heavily impacted by discarded plastic and other synthetic materials.
- There are negative ecological effects of solid waste and litter on sea fauna. The effects include strangulation and entanglement, starvation and death from ingesting of plastics resulting, and concentration of synthetic chemicals up the food chain.
- The Port of Aqaba has solid waste receptacles in port areas and provides a daily garbage collection service via barge to ships anchored offshore.

Other Sources of Pollution

- The problem of solid waste and litter should be solved on a regional scale, as much of the litter found on the Jordanian side of the GOA has regional origin.
- A solid waste strategy that integrates land-based solid waste management issues with those associated with ship and boat-generated marine litter should be developed.
- In addition, sound solid waste management practices in Aqaba town, Aqaba ports and in the whole region of the GOA and the Red Sea should be promoted.
- Environmental hazards associated with land transportation result from the high truck volume to and from the Aqaba Port and the industrial facilities.

Other Sources of Pollution

- The use of waste oil as a dust suppressant in unpaved truck repair yards is a further environmental hazard.
- Air pollution, especially that leaded gasoline is still the main gasoline type used in the Aqaba region is an additional environmental hazard.
- The absence of a clear hazardous waste management policy, has caused used asbestos brake linings, exhausted automotive batteries and worn tires to be discarded in a haphazard and, in some cases, health-endangering manner.
- All the above problems are shared with the Israeli and Egyptian sides of the GOA.

Other Sources of Pollution

- A new and unique source of pollution, however, comes from the Israeli side, that is pollution from fish farms. Limits should be imposed on these farms in order not to harm the corals and sea creatures in the Gulf.

Thank you