Kalpasar Project

Mains: *GS III – Economic Development*

Why in News?

Recently, Gujarat has proposed the Kalpasar Project (Gulf of Khambhat Development Project), with Dutch collaboration.

What is the Kalpasar project?

- **Kalpasar** – The term Kalpasar stands for "Kalp + Sarovar", meaning a reservoir capable of fulfilling future needs.
- The project envisages the construction of a 60.13-km-long dam across *the Gulf of Khambhat,* connecting the eastern and western shores of Gujarat.
- **Freshwater reservoir** – The dam will create a *massive freshwater reservoir* by preventing seawater ingress while storing river water flowing into the gulf.
- The reservoir is expected to have a storage capacity of approximately 7,800 million cubic metres, making it one of the largest freshwater reservoirs in the world.
- **Objectives** – This project serves multiple objectives such as *water storage, irrigation, transportation, renewable energy generation, fisheries development, and regional economic growth.*

Why is the Gulf of Khambhat suitable?

- **Narrowing Gulf Geometry** – The gulf has a wide southern opening of around 180 km that gradually narrows to approximately 5 km in the north.
- This *funnel-shaped configuration* makes dam construction technically feasible.
- **High Tidal Range** – The gulf experiences a tidal range of nearly *13 metres*, among the highest in India.
- Such conditions provide opportunities for advanced water management and tidal regulation.
- **Strategic Location** – The gulf separates water-scarce Saurashtra from

mainland Gujarat and hosts important industrial and port regions such as Surat, Bharuch, and Dahej, enhancing the project's economic significance.

What are the major components of the project?

- **Freshwater Reservoir** – The reservoir will receive water from major rivers such as, Narmada, Sabarmati, Mahi, Dhadhar.
- It will also collect water from several smaller rivers, ensuring continuous replenishment.
- **Diversion Infrastructure** – A diversion canal linked to the Bhadbhut Barrage on the Narmada River is planned to transfer surplus water into the reservoir.
- **Transportation Corridor** – The dam will incorporate:
  - A 16-lane roadway
  - A 4-lane railway corridor
- This will significantly improve connectivity between Saurashtra and mainland Gujarat.
- **Flood Regulation Systems** – Flood regulators will be installed to safely discharge excess water and maintain reservoir stability.

What are the socio-economic, and environmental benefits of the project?

- **Enhanced Irrigation and Agricultural Growth** – Agriculture remains the backbone of rural livelihoods in Saurashtra.
- The project is expected to provide irrigation to approximately 10.54 lakh hectares across nine districts.
- Reliable water supply can, Increase cropping intensity, Improve farm productivity, Promote crop diversification, Reduce dependence on erratic rainfall.
- This can substantially enhance farmers' incomes and rural prosperity.
- **Industrial Development** – Water availability is a critical factor in industrial expansion.
- The reservoir will provide dependable water for industries, supporting Gujarat's manufacturing and industrial sectors.
- Improved water security can attract investments and generate employment opportunities.
- **Drinking Water Security** – The project aims to ensure year-round freshwater availability for urban and rural populations, reducing vulnerability to droughts and seasonal shortages.
- **Groundwater Recharge** – Freshwater storage is expected to rejuvenate

groundwater reserves and local water channels.

- Improved groundwater levels can, Reduce over-extraction, Improve water quality, Enhance long-term sustainability.
- **Reduction in Salinity Intrusion** – Coastal Gujarat faces severe salinity ingress due to seawater intrusion into groundwater aquifers.
- The project is expected to, Reduce coastal salinity, Protect agricultural lands, Improve groundwater quality.
- This will benefit both agriculture and human settlements.
- **Employment and Regional Development** – Construction and operation of the project are likely to generate significant employment opportunities.
- Associated infrastructure development can stimulate, Trade, Tourism, Services sector growth, Urbanization.
- Thus, the project has the potential to transform the socio-economic profile of Saurashtra.
- **Renewable Energy** – The project has the potential to generate:
    - Around 1000 MW of solar power
    - Around 1500 MW of wind power
- These renewable energy installations can meet project requirements and contribute to Gujarat's clean energy transition.
- **Fisheries Development** – The freshwater reservoir will support inland fisheries.
- Fish production is projected to increase significantly over time, creating livelihood opportunities for local communities and enhancing food security.
- **Transport and Connectivity Benefits** – One of the most transformative aspects of the project is improved connectivity.
- Currently, travel around the Gulf of Khambhat requires a lengthy route of approximately 240 km.
- The proposed road and rail corridor across the dam would reduce this distance to nearly 60 km, resulting in:
    - Reduced transportation costs
    - Faster movement of goods
    - Improved regional integration
    - Enhanced economic efficiency
- This infrastructure could become a major catalyst for regional development.

Gujarat’s Chronic Water Scarcity

• Gujarat occupies nearly 6% of India's geographical area and depends predominantly on the southwest monsoon for rainfall. However, rainfall distribution remains highly uneven across regions.
• The regions of Saurashtra, Kutch, and North Gujarat, frequently face water shortages, with drought-like conditions occurring almost every third year.
• Since 1900, Gujarat has experienced nearly 30 major droughts, making long-term water security a critical developmental concern.
• Water scarcity affects:
  - Agricultural productivity
  - Industrial growth
  - Drinking water availability
  - Groundwater sustainability
  - Rural livelihoods
• Against this backdrop, the Kalpasar Project emerged as a strategic solution to ensure year-round water availability.

Why Dutch expertise matters?

- **Netherland collaboration** – India's collaboration with the Netherlands is rooted in shared challenges such as, Coastal flooding, Salinity intrusion, Water scarcity, Sea-level rise.
- The Netherlands is globally recognized for its advanced water-management systems developed over centuries.
- **The Afsluitdijk Model** – A key example is the Afsluitdijk Dam, completed in 1932.
- The 32-km-long structure, Separated the North Sea from the Ijsselmeer freshwater lake, Enhanced flood protection, Enabled freshwater conservation, Improved navigation and connectivity.
- The success of the Afsluitdijk demonstrates how large-scale engineering solutions can transform vulnerable coastal regions into economically productive landscapes.
- Dutch technical expertise can therefore help India address engineering, environmental, and operational challenges associated with Kalpasar.

What are the challenges and concerns?

- Despite its potential benefits, the Kalpasar Project faces several challenges:
  - High capital investment requirements
  - Environmental concerns regarding marine ecosystems
  - Impact on coastal biodiversity
  - Sedimentation management

    - Resettlement and rehabilitation issues
    - Long implementation timelines
- Comprehensive environmental assessments and stakeholder consultations will be essential to ensure sustainable implementation.

What are the Ethical dimensions involved?

- **Ecological Justice and Biodiversity–** Closing a tidal estuary alters the natural hydraulic and salinity regimes.
- This raises ethical concerns regarding the destruction of estuarine ecosystems and the habitats of aquatic species, such as the migratory Hilsa fish.
- **Livelihood Security for Fishing Communities** – The Gulf supports significant fishing economies.
- Drastic changes to water salinity and tidal flows threaten to displace or destroy the livelihoods of traditional fisherfolk in the region.
- **Ethical Responsibility** – Project planners bear an ethical obligation to integrate livelihood protection, fair compensation, and sustainable economic transition models for these vulnerable coastal communities, rather than externalizing the social costs of the dam.
- **Sustainability and Intergenerational Equity** – By integrating tidal, solar, and wind energy, the project promotes renewable energy, which upholds the ethical duty of mitigating global climate change for future generations.
- **Resource Preservation** – There is an ethical risk that disrupting silt movement and river discharge into the sea could result in unintended long-term geographical and ecological consequences for the entire western coastline.

What lies ahead?

- The Kalpasar Project represents one of India's most ambitious water infrastructure initiatives.
- By creating a massive freshwater reservoir, improving irrigation, enhancing water security, generating renewable energy, and strengthening transportation links, the project seeks to fundamentally transform the socio-economic conditions of Saurashtra and Central Gujarat.

- Collaboration with the Netherlands, particularly through lessons drawn from the Afsluitdijk experience, provides valuable technical expertise for realizing this vision.
- If implemented sustainably, Kalpasar could emerge as a landmark example of integrated water resource management and climate-resilient development in India.

Reference

The Indian Express| Kalpasar Project

KALPASAR| Gujarat.Gov

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