4. Bering Strait Dam Proposal - Geography

1. Why in News

1. Utrecht University study examined dam construction across Bering Strait
2. Proposal aims to stabilize Atlantic Meridional Overturning Circulation (AMOC)
3. Revives 1960s geoengineering concept by Petr Mikhailovich Borisov
4. Raises questions about climate intervention, technical feasibility, and ethics
5. Highlights urgency of addressing AMOC weakening due to climate change

2. Atlantic Meridional Overturning Circulation (AMOC)

Mechanism and Function

1. Vast ocean current system operating like global conveyor belt
2. **Process -** Warm, salty surface water flows northward → cools in North Atlantic → becomes denser → sinks → returns southward at deeper levels
3. Critical component of Earth's climate regulation system

Climate Significance

1. Redistributes heat from tropics to higher latitudes
2. Maintains temperature balance across regions
3. Moderates' climate in Europe and North America
4. Influences rainfall patterns globally
5. Essential for climate stability

Threats to AMOC

1. Freshwater influx from melting ice sheets (Greenland, Arctic)
2. Reduces water density and salinity
3. Weakens sinking process in North Atlantic
4. Potential AMOC slowdown or collapse
5. Could trigger abrupt climate changes
6. Possible consequences - European cooling, sea level rise, altered monsoons

3. Bering Strait Dam Proposal

Background and Concept

1. Bering Strait connects Pacific Ocean with Arctic Ocean
2. Allows freshwater inflow into Arctic region
3. Original idea proposed in 1960s by Petr Mikhailovich Borisov
4. Utrecht University study re-examines feasibility

Dam Structure Design

Three separate sections totaling ~80 km -

1. Russian mainland to Big Diomede Island - 38 km
2. Big Diomede to Little Diomede - 4 km
3. Little Diomede to Alaska - 38 km

Located in remote Arctic region

Expected Mechanism

1. Dam would reduce freshwater inflow into Arctic
2. Maintain higher salinity in North Atlantic
3. Higher salinity supports deep water formation
4. Enhanced sinking process strengthens AMOC
5. Potentially stabilizes circulation system

4. Challenges and Concerns

Technical and Geographical Constraints

1. Bering Strait approximately 80 kilometers wide

2. Remote location with extreme weather conditions
3. Limited infrastructure in Arctic region
4. Construction extremely difficult and costly
5. Maintenance challenges in harsh environment
6. Engineering complexity unprecedented
7. Estimated costs potentially prohibitive

Ecological Impacts

Marine ecosystem disruption -

1. Important migration route for whales, seals, walruses
2. Changes in water temperature and salinity
3. Altered nutrient flow affecting food chains
4. Disruption of Arctic biodiversity

Impact on fish populations and commercial fisheries
Consequences for indigenous communities dependent on marine resources

Geopolitical Issues

1. International border concerns -
    1. Strait lies between Russia (west) and United States (east)
    2. Shared sovereignty over waters
    3. Decision-making authority unclear
2. Responsibility for consequences disputed
3. Requires unprecedented international cooperation
4. Current geopolitical tensions complicate negotiations
5. National security implications

Ethical Concerns

1. Large-scale geoengineering intervention -
    1. Deliberate climate system manipulation
    2. Unprecedented scale of environmental modification
    3. Risk of unintended consequences globally
2. Moral hazard - May reduce urgency for emissions reduction
3. Intergenerational justice concerns
4. Consent and participation of affected communities
5. Irreversibility of certain changes
6. Unknown long-term environmental impacts
7. Playing with planetary systems without full understanding

5. Way Forward

Strengthen Scientific Research

1. Enhance climate models for AMOC prediction
2. Long-term ocean monitoring programs
3. International data sharing and collaboration
4. Better understanding of tipping points
5. Improved early warning systems
6. Research on AMOC restoration potential

Prioritize Mitigation over Geoengineering

1. Focus on greenhouse gas emissions reduction
2. Transition to renewable energy
3. Protect and restore natural carbon sinks
4. Treat geoengineering as experimental, last-resort measure
5. NOT substitute for climate mitigation

6. Precautionary principal application

Global Governance Framework

1. International agreements on geoengineering
2. Transparency in research and proposals
3. Consent of affected countries mandatory
4. Environmental impact assessments
5. Risk-benefit analysis frameworks
6. Ethical guidelines development
7. Public participation in decision-making

Alternative Approaches

1. Focus on reducing Greenland ice sheet melting
2. Protect Arctic Sea ice
3. Strengthen natural AMOC resilience
4. Regional climate adaptation strategies
5. Nature-based solutions

Source - https -//www.downtoearth.org.in/climate-change/damming-the-bering-could-a-dam-on-the-far-side-of-the-world-stabilise-the-amoc