General Studies-1; Topic: Changes in critical geographical features (including waterbodies and ice-caps) and in flora and fauna and the effects of such changes

Ocean Acidification

1) Introduction

- Ocean acidification is an emerging global problem.
- Around a third to a half of the CO2 released by human activities is absorbed into the oceans which has a direct, chemical effect on seawater, which we call ocean acidification.
- Ocean acidification is happening because as CO2 from fossil fuels dissolves in seawater, it produces carbonic acid and this lowers the pH of the water.
- Ocean acidification is progressing rapidly around the world, new research has found.

2) Consequences

- Plastic pollution, overfishing, global warming and increased acidification from burning fossil fuels means oceans are increasingly hostile to marine life
- Ocean acidification will affect corals. This will, in turn, affect one million species that have made corals their homes.
- Coral reefs will erode faster than they can rebuild. When shelled organisms are at risk, the entire food web may also be at risk.
- Some algae and seagrass may benefit from higher CO2 concentrations, as they may increase their photosynthetic and growth rates.
- Most marine species seem to be more vulnerable in their early life stages.
- Changes through acidification will be made worse by climate change, pollution, coastal development, over-fishing and agricultural fertilisers.
- These changes will affect the many services the ocean provides to us.

3) Socio-economic Impacts

- **Food**
  a. Ocean acidification has the potential to affect food security.
  b. By 2100, the global annual costs of mollusc loss from ocean acidification could be over US$100
- **Coastal protection**
  a. Marine ecosystems such as coral reefs which protect shorelines from the destructive action of storm surges and cyclones will be affected.
  b. Ocean acidification is affecting the coastal estuaries and waterways.
- **Tourism**
  a. This industry could be severely affected by the impacts of ocean acidification on marine ecosystems
  b. Acidification could damage the Arctic tourism economy and affect the way of life of indigenous peoples.
- **Carbon storage and climate regulation**
  a. The capacity of the ocean to absorb CO2 decreases as ocean acidification increases.
  b. More acidic oceans are less effective in moderating climate change.

4) Ocean Acidification in Indian Ocean

- The Arabian Sea is witnessing acidification of its surface waters, a consequence of excessive carbon dioxide in the atmosphere
- The ocean acidification in northern Bay of Bengal is mainly due to pollutants mixing with sea water from the Indo-Gangetic plains.
- During winter, air blowing from land to the sea carries all pollutants with the wind and deposits in the ocean during transit.
- Study shows rapidly decreasing presence of marine phytoplankton in the western Indian Ocean.
- A report warns that the Indian Ocean may be reduced to an ecological desert, given the levels of ocean warming.
- The ocean acidification in the Arabian Sea and Bay of Bengal will devastate one of the most pristine, most fertile regions, the Indian Ocean.

5) Way Forward

- Reducing global greenhouse gas emissions (mitigation) is the ultimate solution to ocean acidification
- Improvements in water quality: Monitoring and regulating localised sources of acidification from runoff and pollutants such as fertilisers.
- Development of sustainable fisheries management practices: Regulating catches to reduce overfishing
- Sustainable management of habitats: Increasing coastal protection, reducing sediment loading and applying marine spatial planning.
- Substantial research on Climate engineering to know the feasibility and impacts of its approaches.
- Educate or sensitize the common citizens on the risks posed by the climate change and ocean acidification.
- Reducing the consumption of carbon-oriented energy sources