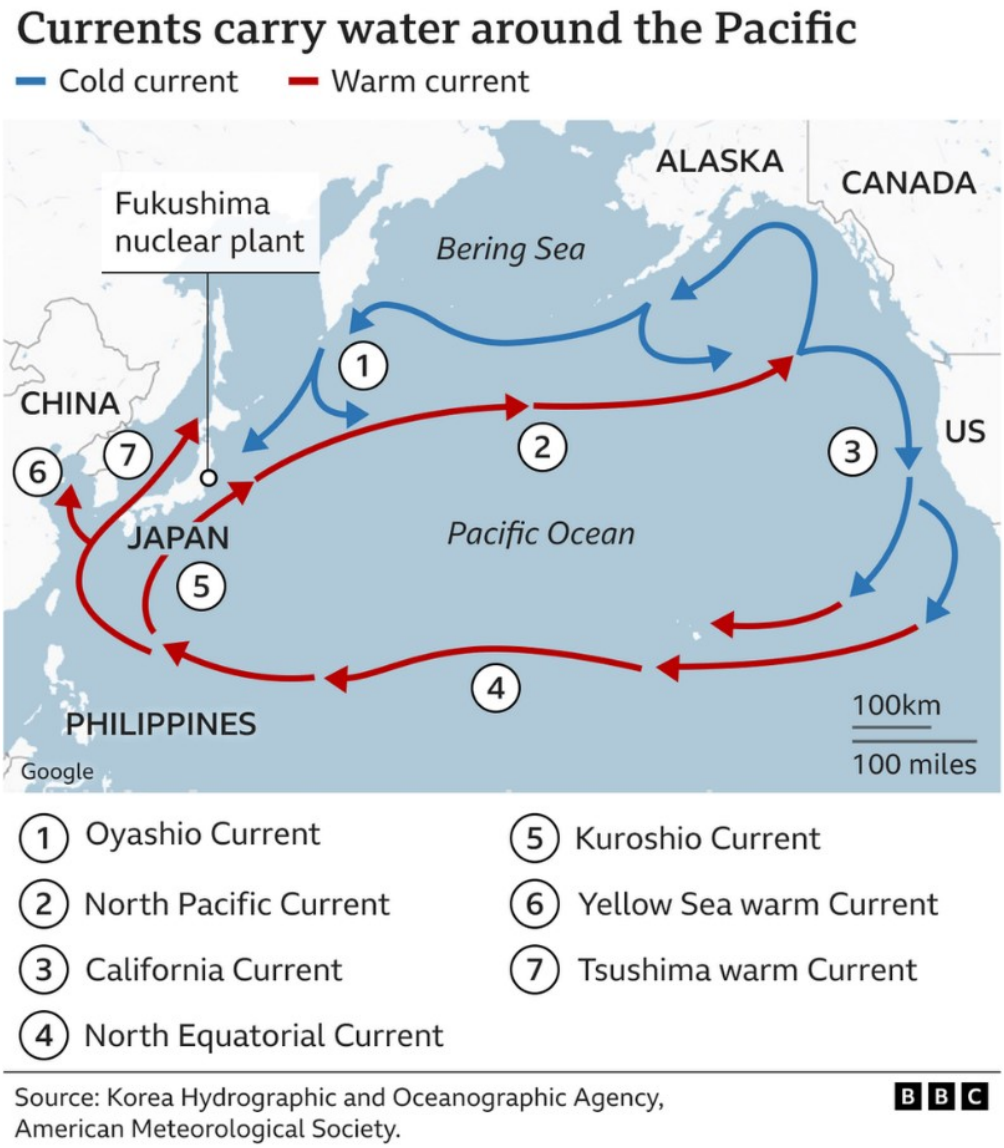
# Ocean model for Fukushima's wastewater release

**Prelims –** *Current events of national and international importance.*

## Why in News?

*Recently, in Fukushima Daiichi Nuclear Power Plant researchers estimate the amount and timing of tritium release with an ocean circulation model, so far it is focused on local coastal waters.*

- **Waste water release in Fukushima -** In August 2023, Japan started releasing treated wastewater into the ocean.
- This wastewater is a result of cooling the damaged reactors at the Fukushima plant after the 2011 earthquake and tsunami.
- The water is treated using the ***Advanced Liquid Processing System (ALPS),*** which aims to remove most radioactive materials, but not tritium.
- The released water is diluted with seawater to reduce the concentration of tritium. This process is expected to last for 30 years.
- Japan asserts that the water has undergone treatment and dilution prior to its discharge into the ocean.
- The water has a concentration of approximately 190 becquerels of tritium per litre, which is significantly lower than the *WHO's drinking water threshold of 10,000 becquerels* per litre (Bq/L).
- **Concerns -** Waste water released into the ocean nearby Fukushima will not be contained to waters surrounding Japan.
- It will be carried by ocean currents, particularly the cross-Pacific Kuroshio current, to other parts of the world.
- Marine creatures that travel vast distances, phytoplankton (organisms that float freely), and microplastics can all serve as Trojan horses to disseminate radionuclides over long distances.




## The recent Ocean Model

- **Done by –** University of Tokyo and Fukushima University.
- **Objectives –** To trace the spread of tritium from Fukushima's planned 30-year wastewater discharge throughout the Pacific Ocean.
- **Scientific technique used** – COCO 4.9 ocean circulation model combined precise estimates of the amount and timing of tritium.

***Tritium*** *represented by the symbol "T" or "$^3$H," is a radioactive isotope of hydrogen. It is the heaviest and rarest form of naturally occurring hydrogen. It has one proton and two neutrons.*

- **Analysis - Tritium Injection –** The researchers 'injected' tritium into the model in 2 phases.
  - 179-181 TBq for the 2011-2019 period the model's surface layer to mimic the Fukushima disaster's effects.

    - 480 TBq over 2023-2051 some 11 m below the surface This dose is the highest possible the Tokyo Electric Power Company is expected to release during the discharge.

- **Key Findings –** The significant spike immediately following the 2011 accident, tritium levels in the open Pacific remained well below detectable limits.
- They explored three scenarios, present-day conditions, a strong warming pathway (SSP5-8.5), and ocean eddies.

***Eddies*** *are circular currents of water or air that form when a fluid's main flow is disrupted, causing swirling or rotating motion.*

- The peak concentration reached only 0.002 Bq/L—25 times lower than the natural background radiation present in seawater.
- Warmer oceans shift the Kuroshio Current northward, speeding up tritium's reach to Asia's coasts by 3 years.
- Ocean eddies may transport small amounts to North America or the South China Sea but the concentrations remain safely low.
- **Significant –** The facility is releasing tritiated water so slowly, the radiation it's responsible for is lower than that due to natural and historical sources.
- Half-life of about 12 years, it levels remained undetectable across the wider Pacific in model projections through 2099 even under extreme warming or worst-case eddy transport scenarios.

**Reference**

The Hindu| Fukushima Wastewater Release

SHANKAR IAS PARLIAMENT
Information is Empowering