RUSSIA EARTHQUAKE AND TSUNAMI – GEOGRAPHY

NEWS: On July 30, 2025, an 8.8-magnitude earthquake off **Russia's Kamchatka Peninsula** triggered **tsunami warnings and evacuations across the Pacific region.**

- The **earthquake's epicenter** lies in the **seismically active Pacific Ring of Fire.**
- It was **one of the six strongest quakes ever recorded globally.**
- Comparable in magnitude to Japan's 2011 Tohoku disaster, it reaffirmed the region's high seismic vulnerability.

WHAT'S IN THE NEWS?

Understanding Tsunamis

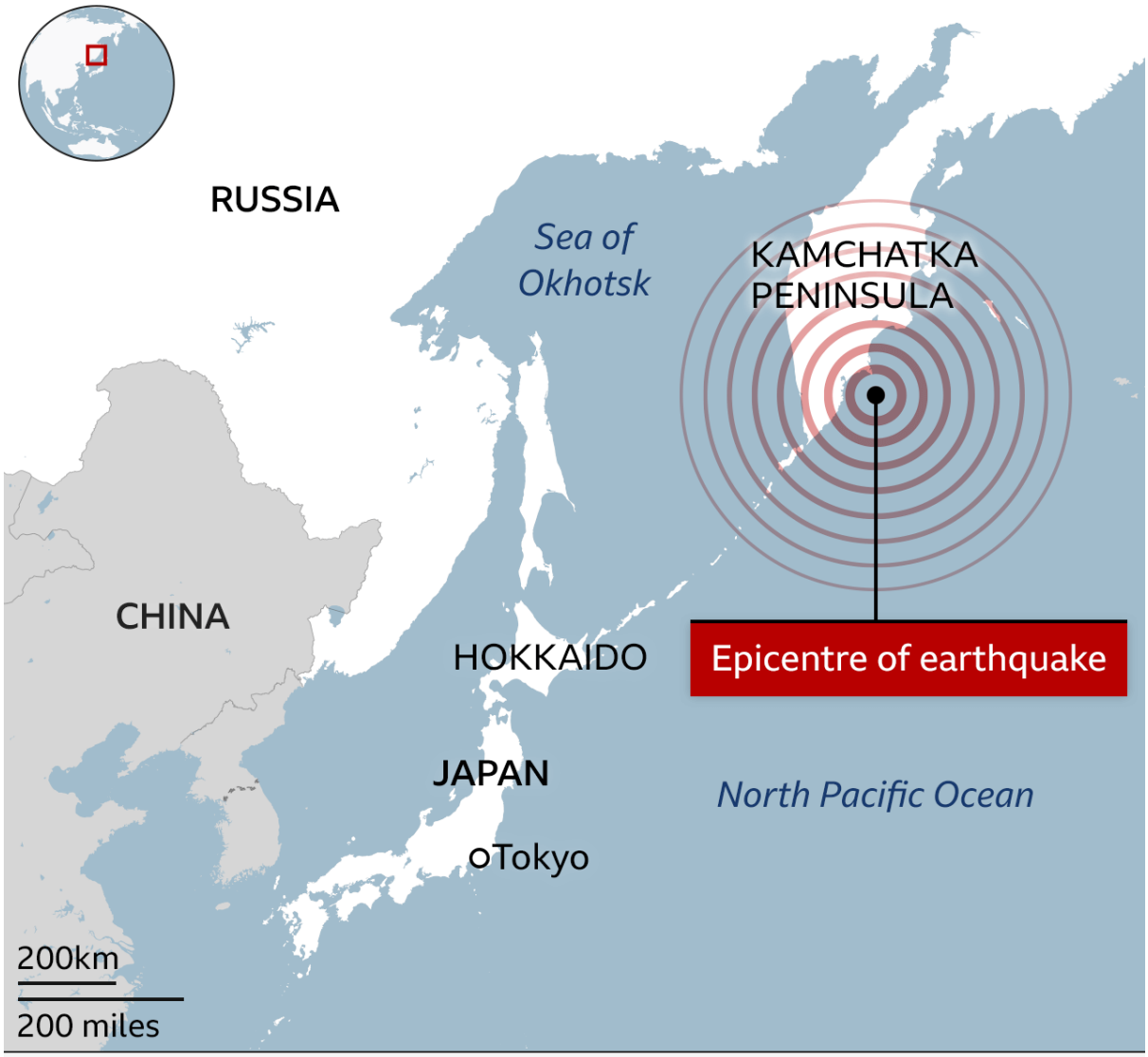
- **Definition**: A tsunami is a series of extremely long and powerful ocean waves generated primarily by sudden underwater disturbances such as earthquakes, volcanic eruptions, submarine landslides, or asteroid impacts.
- **Origin of the Term**: The word "tsunami" derives from the Japanese words "tsu" (harbor) and "nami" (wave), indicating waves that impact coastal harbors with devastating force.
- **Wave Characteristics**: Tsunamis have long wavelengths (over 100 km) and travel at speeds up to 800 km/h in deep oceans. Despite their speed, they may appear as barely noticeable swells in deep water but can rise dramatically upon nearing shallow coastlines.

Global Tsunami Risk Zones

- **Pacific Ring of Fire**: Regions around the Pacific Ocean, known for high seismic activity, face the greatest tsunami risks due to frequent subduction zone earthquakes.
- **Vulnerable Countries**: Nations including Japan, Indonesia, the Philippines, New Zealand, Chile, and parts of the US West Coast are particularly at risk.
- **Recent Example**: A powerful earthquake triggered tsunami alerts in countries such as Hawaii, Japan, the US, New Zealand, the Philippines, Chile, and Ecuador, causing widespread panic and emergency responses.

Major Tsunami Events

- **2004 Indian Ocean Tsunami**: Caused by a 9.1 magnitude earthquake off the coast of Sumatra, this tsunami killed over 227,000 people across 14 countries, including India, Indonesia, Sri Lanka, and Thailand.
- **1952 and 2011 Kamchatka Events**: Historical tsunamis in Russia's Kamchatka Peninsula highlight the region's seismic vulnerability, with continued threats due to aftershocks.



Key Tsunami Impacts

- **Human Loss and Displacement**: High death tolls, missing persons, and large-scale displacement are common in major tsunami disasters.
- **Infrastructure Damage**: Ports, coastal towns, bridges, roads, and buildings face catastrophic damage, particularly where structures are not tsunami-resistant.
- **Ecosystem Disruption**: Coastal and marine ecosystems are heavily affected, with long-term salinization of soils, coral reef damage, and biodiversity loss.
- **Health and Sanitation**: Contaminated water sources and breakdown of sanitation infrastructure lead to disease outbreaks and long-term public health crises.
- **Psychological Trauma**: Survivors often suffer from long-term mental health issues such as PTSD, especially in regions lacking psychosocial support services.

Global and National Response Strategies
A. Differential Country Responses

- **Japan**: Activated large-scale preemptive evacuations based on real-time seismic data, limiting casualties.
- **Russia**: Responded after the initial impact; relocated residents in areas like Severo-Kurilsk after experiencing flooding.
- **United States**: Issued timely alerts on the West Coast and Hawaii; prepared shelters for possible high waves (up to 10 feet observed in Hawaii).

B. Aftershocks and Extended Hazards

- **Post-Earthquake Tremors**: Aftershocks up to magnitude 6.9 created prolonged threats, endangering rescue operations and putting further strain on already damaged infrastructure.
- **Prolonged Alert Periods**: Areas remain on alert for days or even weeks due to potential secondary seismic activity.

Preparedness Gaps and Resilience Needs

- **Lack of Awareness and Education**: Many coastal communities lack understanding of tsunami warning signs and appropriate responses.
- **Inadequate Infrastructure**: Weak or poorly planned urban development in coastal zones increases vulnerability.
- **Uneven Recovery Capacity**: Socio-economic inequalities hinder recovery for marginalized populations and delay rehabilitation efforts.
- **Psychological Vulnerability**: Even countries with advanced systems, like Japan, witnessed panic-driven evacuations, highlighting the need for emotional preparedness and community confidence-building.

NDMA (India) Guidelines on Tsunami Management

- **Risk Assessment & Mapping**: Identify vulnerable coastal zones using GIS and historical tsunami data for better planning and zoning.
- **Early Warning System Enhancement**: Integrate seismic monitoring, ocean sensors like bottom pressure recorders, and tide gauges for prompt alerts.
- **Community Preparedness**: Organize regular public awareness campaigns, mock drills, and emergency training for local populations.
- **Infrastructure Resilience**: Construct tsunami-resistant buildings, designate clear evacuation routes, and install informative signage in high-risk zones.
- **Institutional Coordination**: Foster robust cooperation between national, state, and district disaster management authorities for synchronized response efforts.

Key Tsunami Preparedness Initiatives

A. India-Specific Initiatives

- **Indian Tsunami Early Warning System (ITEWS)**:
    - Operated by INCOIS (Hyderabad), set up in 2007.

- Capable of issuing tsunami advisories within 10 minutes of seismic events.
- Recognized for regional services to 28 Indian Ocean countries.

B. Global Initiatives

- **Pacific Tsunami Warning Center (PTWC)**:
  - Based in Hawaii, functioning since 1949.
  - Monitors seismic activity and sea level changes across the Pacific and issues alerts to multiple countries.
- **Indian Ocean Tsunami Warning and Mitigation System (IOTWMS)**:
  - Established post-2004 under UNESCO-IOC to coordinate early warning dissemination and tsunami education among Indian Ocean countries.
- **UNESCO-IOC Tsunami Ready Programme**:
  - Aims to build tsunami-resilient communities through specific readiness indicators.
  - Indian villages such as **Venkatraipur** (Odisha) and **Noliasahi** (Odisha) have achieved Tsunami Ready certification for meeting preparedness standards.

Source: https://www.thehindu.com/news/international/tsunami-russia-earthquake-highlights-japan-alaska-hawaii/article69872209.ece