Indian Ocean Tsunami Warning and Mitigation System (IOTWMS)

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Deadly Disasters in Recent Times

- Most deaths caused by Hydro-meteorological and Geophysical disasters
- Earthquakes and Tsunamis top the list
- Transboundary nature
- Cooperation for early warning services is crucial for building resilience
- Sendai Framework for Disaster Risk Reduction (2015-2030) highlights the need for transboundary cooperation
Some Initiatives for Regional Collaboration

- IOC-UNESCO Tsunami Warning and Mitigation System
- WMO Tropical Cyclone Programme
- UNISDR Global/Regional Platforms
- Climate Risk & Early Warning Systems (CREWS) initiative of WMO, UNISDR, World Bank GFDRR
- IN-MHEWS led by WMO
- ESCAP/WMO Typhoon Committee
- WMO/ESCAP Panel on Tropical Cyclones
- Regional Cooperative Mechanism for Drought Monitoring and Early Warning of ESCAP
- Asian and Pacific Centre for the Development of Disaster Information Management (APDIM)
- Regional Integrated Multi-hazard Early Warning System for Africa and Asia (RIMES)
Indian Ocean Tsunami: 26 December 2004

Causalities totally ~230,000
Over 1.6 people million displaced
Estimated economic losses of $14 billion
Early Coordination Efforts

• Following the tragedy on 25 December 2004, the Nations of the region react.

• IOC-UNESCO given the mandate to develop and implement the establishment of Tsunami Warning and Mitigation System in the Indian Ocean following several international regional meetings:
  – World Conference on Disaster Risk Reduction (Kobe, Japan, January 2005)
  – Phuket Ministerial Meeting on Regional Cooperation on Tsunami Warning Arrangements (Phuket, Thailand, January 2005)
  – Second International Coordination Meeting for the Development of a Tsunami Warning and Mitigation System for the Indian Ocean (Grand Baie, Mauritius, April 2005)

• Intergovernmental Coordination Groups in the Indian Ocean (ICG/IOTWMS), North-Eastern Atlantic, Mediterranean and Connected Seas (ICG/NEATMS), Caribbean and Adjacent Regions (CARIBE-EWS) were formally established by 23rd IOC Assembly, June 2005

• PTWS (formally known as ICG/ITSU) first convened in 1968

• 1st session of ICG/IOTWMS held in Perth, August 2005 (11 Sessions)
UNESCO/IOC Assembly/Executive Council

Working Group for Tsunami & Other sea level related Warning & mitigation Systems (TOWS-WG)
[4x ICG Chairs, WMO, UNISDR, UNDP, IMO, IHO]

Task Team Disaster Management & Preparedness

ICG Chairs, WMO, UNISDR, UNDP...

IOC Secretariat, Tsunami Unit

Task Team Tsunami Watch Operations

Intergovernmental Coordination Group
Indian Ocean Tsunami Warning & Mitigation System (IOTWMS)
Steering Group: Officers, WG Chairs/VCs

Task Team IOWAVE16

Task Team Capacity Assessment of Tsunami Preparedness

Task Team PacWAVE17

Task Team Goals & Performance Monitoring

4x Regional WGs: SW Pacific, SE Pacific, Central American Pacific, South China Sea

WG1 Tsunami Hazard Assessment

WG2 Tsunami Detection, Warning & Dissemination

WG3 Tsunami Disaster Management, Preparedness & Risk Reduction

1x Regional WG: NW Indian Ocean

 WG1 Tsunami Risk, Community Awareness and Preparedness

WG2 Tsunami Detection, Warning & Dissemination

ICG Caribbean & Adjacent Seas (CARIBE-EWS)

Intergovernmental Coordination Group
Pacific Tsunami Warning & Mitigation System (PTWS)
Steering Committee: Officers, WG Chairs/VCs

ICG NE Atlantic & Mediterranean Seas (NEAMS-TWS)

Task Team Disaster Management & Preparedness

Steering Group: Officers, WG Chairs/VCs

Steering Committee: Officers, WG Chairs/VCs
ICG/IOTWMS Structure

Elected Officers

Dr. Andi Eka Sakya
Chair (Indonesia)

Dr. Juma Al-Maskari
Vice-Chair (Oman)

Dr. Sam Hettiarachchi
Vice-Chair (Sri Lanka)

Working Groups
Task Teams
Steering Group

Executive Secretary, IOC

Tsunami Unit: Dr Thorkild Aarup, Head

ICG/IOTWMS Secretariat: Srinivasa Kumar, Head

Tsunami Service Providers
Australia, India, Indonesia

National Tsunami Warning Centres
24 Active Member States
The Three Pillars

**Risk Assessment and Reduction**
Systematically collect data and undertake risk assessments

**Detection Warning and Dissemination**
Develop hazard detection, monitoring and early warning services
Communicate threat information and early warnings

**Awareness and Response**
Build national and community response capabilities
IOTWMS Guiding Principles

• International and multilateral cooperation with strong governance provided by IOC

• System-of-Systems
  • Fully inter-operable network of TSPs and NTWCs

• Defined Roles & responsibilities

• Strong Policy-basis
  • Fully owned by the countries, protects all countries, free & open data exchange
  • TSPs only advice (Threat/No Threat)
  • Warnings sovereign responsibility of NTWCs

• Performance Monitoring

Several Partners
Australia, IFIT, MFiT, UN-ISDR, UNDP, UNEP, UNESCAP, WMO, Indonesia, Norway, Finland, Italy, Germany, Ireland, EU, Japan, Canada, USA, Belgium, Israel, Korea, France, Czech Republic, New Zealand, Spain .... And Many more!!
Pilar 1: Risk Assessment & Reduction

• Tools, Methods & Guidelines for Tsunami Risk Assessment published
  – Updated through ESCAP project

• Indian Ocean Probabilistic Regional Tsunami Hazard Maps published

• Assessment and awareness of Makran tsunami hazards
  – 2 ESCAP projects

• Regional Workshops on Tsunami Risk Assessment and Modelling

• Enhancing Tsunami Risk Assessment and Management, Strengthening Policy Support and Developing Guidelines for Tsunami Exercises in Indian Ocean Countries
Pillar 2: Detection, Warning & Dissemination

- Greatly expanded seismic and sea level monitoring networks
- Tsunami Service Framework
- 3 inter-operable Tsunami Service Providers (Australia, India, Indonesia)
- Network of NTWCs
- National warnings sovereign responsibility of authorized national agencies
- Harmonised threat information
- Yearly performance assessments against Key Performance Indicators
- 6-monthly communications test to identify and fix any issues
Operational Elements of TSP Service

Seismological Data

Model Results

Sea level Data

TSP-1

NTWC1

NTWC2

NTWCn

Seismological Data

Warning Status

Threat Information

Seismological Data

Warning Status

Threat Information

Seismological Data

Warning Status

Threat Information

GTS
SMS
FAX
Email
Web
TV
Radio
SMS
Email
Web
SIRENS

Warnings
NDMO
LDMO
Media
Public
Seismic Network (2014)

Regional Networks: AfricaArray, Geoscope, GEOFON, IRIS IDA, IRIS USGS and RIMES
Regional Networks: University of Hawaii Sea Level Network, GLOSS and IOC-UNESCO Sea Level Monitoring Network
Pilar 3: Awareness & Response

- Material to educate NTWCs, emergency managers, communities, schools, tourism, etc in multiple languages including posters, booklets, videos, comics, stickers, guidebooks and leaflets.
- Over 100 capacity development workshops on Standard Operating Procedures for NTWC, DMO, staff and/or Media
- Indian Ocean Tsunami Information Center (IOTIC) in Jakarta hosted by BMKG
- 70th Anniversary of 1945 Makran tsunami commemorative events held in Iran, Pakistan, India and Oman
- Indian Ocean-wide (IOWave) exercises held every two years
- World Tsunami Awareness Day (WTAD)
In the Indian Ocean, four IOWave Exercises have been conducted in 2009, 2011, 2014 and 2016.

- 59,000 persons from 12 countries evacuated.
- All 24 Indian Ocean Member States involved their NTWCs.
- 92% involved NDMOs, 79% involved Local DMOs and 63% involved media.
- UNISDR deployed international observers and film crews in India and Seychelles.
- IOC-UNESCO conducted an online survey that was co-ordinated in-country by the IOWave16 National Contact.
- UNESCAP helped develop outreach materials and supported a post-IOWave16 workshop (Bandung, December 2016).
- IOWave18 in September 2018
Challenges and Way Forward

- **Documented the Achievements**
  - Indian Ocean much safer against tsunami threat

- **Identified the Gaps**
  - Improve hazard & risk assessment including vulnerability & exposure
  - Communication of scientific findings to public in easily understandable format
  - Regional cooperation for Makran region
  - Capacity building at national level for public awareness & preparedness for self protection

- **Sustainability**
  - **System Maintenance**
    - Sustain observation network
    - International collaboration to share resources
    - Regional perspective to be fed to national plans
  - **Financial Resources**
    - Annual costs of TSPs – US$ 5-8 million
    - Annual total cost of IOTWS (regional & national) excluding mitigation – US$ 90 million ± 10 million
  - **Political commitment**
    - National plans for TWS with mandated budgets, codified in law & Key functions institutionalized

**International Conference to commemorate 10th Anniversary of Indian Ocean Tsunami**
24-25 November 2014, Jakarta, Indonesia
160 participants from 28 Countries, 10 UN agencies, 10 Media organisations, NGOs and Private Organisations

**To be sustainable in long term, Tsunami warning systems should:**
- Link to the disaster management community
- Be part of a multi-hazard warning system including tropical cyclones and storm surges
- Have stronger downstream part - Integration of TEW into national & local DM, public and private sector; stronger client orientation
- Focus on “Last Mile”

**Intergovernmental Coordination**
- Complex, multi-national, multi-agency system
- Continue to build on Intergovernmental arrangements through IOC UNESCO
- IOC UNESCO should continue to lead the coordination towards globally harmonized, workable & sustainable TWS with partner organisations such as WMO, IHO, ISDR, ESCAP...
- International organisations are key players to develop national capacities
- Integrate with broader international frameworks
• Greater emphasis on community awareness and preparedness to help ensure more appropriate responses to tsunami warning information.
• Indian Ocean Wave Exercises should encourage increased participation from coastal communities – IOWave18 in September 2018
• Capacity assessment of tsunami preparedness to be carried out in all Member States
• Guidelines on tsunami ready to be developed for Indian Ocean Member States and a pilot project to be implemented
• The Northwest Indian Ocean region should continue collaborative efforts on better warning and mitigation of the Makran subduction zone
• Continue Capacity Development Workshops for development of integrated NTWC-DMO-Media SOPs
In Conclusion: Fostering Regional Cooperation

• Establishment of inter-governmental and regional cooperation platforms across common ocean basins for tropical cyclone and tsunami, and in river basins for floods has deepened regional cooperation
  – good regional observation networks
  – early warning systems established for specific hazards
  – enhanced regional/national capacities for generation of warnings and information sharing

• Efforts needed to strengthen and expand the warning systems already built and make them part of an integrated multi-hazard approach
  – Gaps in “last-mile” (Awareness & Response) - Warning chains, SOPs, etc.
  – Large differences remain in the capacities of countries, especially LDCs and SIDS
  – Enhance efforts to transform existing cooperation mechanisms into multi-hazard platforms with extended range of products and services that are sustainable

• Strong policy support at the national level
  • to ensure multi-hazard early warning systems are well-integrated within the overall framework of national disaster risk reduction plans
  • commitment towards regional collaboration with earmarked funding (through national investments/national foreign-aid funding/regional mechanisms/UN agencies, etc…)