

A Programmatic Approach for Regional Cooperation to strengthen Tsunami Early Warning Systems in the Makran Region

Recommendations Note

April 2017

ESCAP Multi-Donor Trust Fund for Tsunami,
Disaster and Climate Preparedness

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in the Makran Region – Recommendation Note**

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The paper has been issued without editing.

Acknowledgements

The paper was prepared by Harald Spahn, expert for disaster risk reduction, environmental & natural resources management and consultant of ESCAP under the overall direction of Tiziana Bonapace, Director of the Information and Communications Technology and Disaster Risk Reduction Division. The paper benefitted from the advice, comments and support of Sanjay Srivastava, Chief of the Disaster Risk Reduction Section and Edward Turvill, Programme Officer of the ESCAP Multi-donor Trust Fund for Tsunami, Disaster and Climate Preparedness. The ICG-IOTWMS and NWIO-WG Member States who provided input and shared their experiences for this study, are gratefully acknowledged.

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Abbreviations

APDIM	Asia -Pacific Centre for Development of Disaster Information Management
(N)DMO	(National) Disaster Management Office / Organization
EOC	Emergency Operations Centre
EQ	Earthquake
ESCAP	Economic and Social Commission for Asia and the Pacific
ETA	Estimated Time of Arrival
GFZ	German Research Centre for Geoscience
GITEWS	German-Indonesian Tsunami Early Warning System
GIZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
ICG	International Coordination Group
ICG/IOTWMS	Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System
INCOIS	Indian National Centre for Ocean Information Services
INIOAS	Iranian National Institute for Oceanography and Atmospheric Science
IN-MHEWS	International Network for Multi-Hazard Early Warning Systems
IOC	Intergovernmental Oceanographic Commission
IOTIC	Indian Ocean Tsunami Information Centre
IOTR	IOTWMS Tsunami Ready
IOTWMS	Indian Ocean Tsunami Warning and Mitigation System
LDMO	Local Disaster Management Organization
MSZ	Makran Subduction Zone
NTWC	National Tsunami Warning Centre
NWIO	North Western Indian Ocean
NWIO-WG	North Western Indian Ocean - Working Group
PTC	Panel on Tropical Cyclones
SOP	Standard Operating Procedure
SSOP	Synergized Standard Operating Procedures
TEWS	Tsunami Early Warning Systems
TOWS-WG	Working Group for Tsunami and other sea level related Warning and Mitigation Systems
TTF	Trust Fund for Tsunami, Disaster and Climate Preparedness
TWFP	Tsunami Warning Focal Points
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISDR	United Nations International Strategy for Disaster Reduction
WMO	World Meteorological Organization

1. Executive Summary

Since 2009, the Trust Fund for Tsunami, Disaster and Climate Preparedness (TTF) managed by the Economic and Social Commission for Asia and the Pacific (ESCAP) has been raising awareness on the tsunami risk posed by the Makran Subduction Zone (MSZ) to countries in the North Western Indian Ocean (NWIO). In order to develop a programmatic approach to the Trust Fund's engagement in the Makran region, ESCAP has commissioned a consultancy to provide an up-to-date analysis of the Tsunami Early Warning Systems (TEWS) for the NWIO, highlighting the areas requiring further cooperation at regional, national and local levels and to elaborate recommendations on strategic areas of regional cooperation between ESCAP and IOC-UNESCO and other key stakeholders to strengthen the TEWS for the Makran region.

The hereby presented *Recommendation Note* has been developed based on the results from a preceding study („Tsunami Early Warning Systems in the countries of the North West Indian Ocean Region with focus on India, Iran (Islamic Republic of), Pakistan, and Oman” - see separate *Synthesis Report*) regarding the status quo and existing gaps of TEWS in the NWIO countries, the discussions and interviews held during the NWIO Working Group (NWIO-WG) meeting of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) in Tehran, Iran (Islamic Republic of) on 27th / 28th February as well as the outcomes from an analytical workshop organized by ESCAP and ICG/IOTWMS on 1st of March (Annex 1-3).

For Iran (Islamic Republic of), Pakistan and Oman the main threat from the MSZ are near field tsunamis, with minimum travel times of even less than 30 minutes. India is in a slightly different situation with minimum tsunami travel times from the MSZ of > 1hour. The results from the previous analysis clearly indicate that the national TEWS are currently not fully capable yet to cope with the threat of near-field tsunamis from the MSZ. The analysis led to the conclusion that improvements in various fields from risk knowledge, warning service and delivery up to response capacity are required. The study illustrated that the progress of TEWS implementation in India, Iran (Islamic Republic of), Pakistan and Oman varies considerably. While India and Oman have already managed to implement effective warning services at national level, the services in Iran (Islamic Republic of) and Pakistan are still at a development stage. On the other hand, the four countries face a number of shared challenges, especially regarding risk analysis, warning chains, SOPs and response capacity at community level. From the analysis, it was concluded that a more strategic and structured approach is required to improve the systems in a way that they can deal with the near field challenge in a consistent way.

Against this backdrop, a programmatic support process, as proposed by ESCAP, is considered appropriate as it would not only allow the promotion of and contributions to a more structured process to improve TEW with an end to end perspective in the participating countries, but it would also permit addressing interlinked gaps in a more comprehensive way and to achieve a better alignment with national processes.

The proposed programmatic approach should be based on regional cooperation. Even though the provision of tsunami warning is ultimately the responsibility and mandate of national governments, there are a number of challenges which can be addressed best by cooperation on a regional level. Especially the achievement of a better understanding of the risks from the MSZ, and the improvements of tsunami monitoring capacities (earthquake, ocean and earth surface movement monitoring) necessitate close cooperation between the countries. Working in a collaborative way also on the other identified gaps, as the improvement of inundation maps and warning chains and the development of evacuation plans is absolutely recommended as it provides unique opportunities for joint learning processes and exchange of experiences as well as the possibility to offer technical

assistance in an efficient way. Such an approach will not only allow to draw on a broader base of technical know-how but would also benefit countries with lower resource capacities, which might not have the possibilities to conduct such processes by themselves.

The proposed programmatic approach comprises two phases of intervention of approximately two and a half years each and follows the logic of a structured process to build tsunami early warning and preparedness. Phase 1 will support the countries to establish the required preconditions to strengthen self-protection capacities at community level. This includes the improvement of warning services at NTWC level and national warning chains, the development of inundation maps and evacuation plans as well as initiatives by the science community to create a better understanding of the dynamics in the MSZ. Phase 2 will build up on the achievements of the first phase, strengthening ownership and understanding of the national systems by all stakeholders involved and the general public as well as addressing mechanism for up-scaling and roll-out of the previously developed and tested approaches especially regarding evacuation planning and warning mechanism at local level. Further essential topics, as risk analysis and response planning on local level will be addressed to strengthen the participating countries in establishing and providing the required services, guidelines and mechanisms to support communities in the implementation of self-protection arrangements against near-field tsunamis.

The outlined approach is in line with the current ICG/IOTWMS strategy and its focus on downstream processes and the recommendations, priorities and working process of the NWIO-WG. It complements the NWIO country processes, follows the principles of subsidiarity and respects the strategies, responsibilities and mandates of the participating countries. The support provided by the TTF shall focus on strategic inputs, capacity development and the support of pilot activities. Implementation in the countries will be responsibility of the participating member states and requires allocation of adequate human resources and budget. Oman is not an ESCAP member state, but member of the NWIO-WG and considered as a partner and provider of expertise and financial resources in the framework of the intended programmatic regional approach.

As the implementation of the TTF support process goes hand in hand with partner processes in the four countries, a steering and coordination mechanism need to be established. The project proposal shall clearly outline the roles and responsibilities of partner institutions and the required resources from partner countries as well as the support provided by the TTF fund in the different fields of intervention. The implementation process should be closely coordinated with the NWIO-WG. At national level a strong link to the disaster and risk management organizations on national and local levels is required.

The programmatic approach works across multiple levels, from international to local level. It includes the involvement of pilot areas at local level to assure that the mechanism under development are in line with community requirements and to create examples and lessons learnt for future roll-out. Since the very beginning, conditions for further up-scaling of the supported measures need to be identified and adequate mechanism should be agreed with the partner countries to assure future roll-out.

Regarding the provision of the support process, it is recommended to consider the formation of a small consortium under the lead of IOC-UNESCO involving organizations which contribute the required technical expertise and / or support implementation in the four countries. It is strongly recommended to make use of existing experiences and tools, which have been developed by various initiatives and projects in the context of the IOTWMS and other ocean basins. Especially the longstanding experiences in Indonesia to develop tsunami preparedness and early warning in the context of near-field tsunami are considered a valuable resource and reference for the NWIO

countries. In this regards, the GITEWS/PROTECTS project has systematically documented these experiences (TsunamiKIT). The approach of Thailand to establish a warning chain which links the NTWC directly with the communities at risk might be an interesting reference for the NWIO countries and an opportunity for the TTF advisory council member Thailand to share their experience and lessons learned.

The proposed programmatic approach is linked to issues like multi-hazard approaches, community based disaster risk management, integrated coastal area / maritime management, resilient communities as well as the integration into public and private development processes. This is a field with a wide range of ongoing processes and interventions of numerous actors in each of countries as well as on the regional level. Such an environment requires a suitable coordination mechanism between project implementers, the national partners and ESCAP, which should be defined already in the project design, to avoid duplication of efforts and to make best use of possible synergies.

Within the programmatic approach a clear and realistic strategy for knowledge management and exchange of experiences should be considered. The existing mechanism of IOC-UNESCO with the ICGs at ocean basin level, the *Working Group for Tsunami and other sea level related Warning and Mitigation Systems* (TOWS) at global level and the various Tsunami Information Centres provides an excellent platform and should be systematically integrated into the approach.

2. Introduction

Background of the recommendation note

The Multi-Donor Trust Fund for Tsunami, Disaster and Climate Preparedness (TTF) managed by the Economic and Social Commission for Asia and the Pacific (ESCAP) has provided important assistance to strengthen early warning systems for the Asia-Pacific region, particularly to promote regional cooperation, and address unmet gaps in high-risk and low capacity countries. Since 2009, the Trust Fund has been raising awareness on the tsunami risk posed by the Makran Subduction Zone (MSZ) to countries in the North Western Indian Ocean (NWIO). The Intergovernmental Oceanographic Commission (IOC) of United Nations Educational, Scientific and Cultural Organization (UNESCO) has approached ESCAP in order to expand international cooperation for tsunami early warning and preparedness in the NWIO.

In order to develop a programmatic approach to the Trust Fund's engagement in the Makran region, and based on the decision by the TTF Advisory Council, ESCAP has commissioned a consultancy to elaborate recommendations on strategic areas of regional cooperation between ESCAP and IOC-UNESCO and other key stakeholders to strengthen the Tsunami Early Warning Systems (TEWS) for the Makran region. The Recommendations Note shall outline concrete actionable measures to enhance regional cooperation in the field of TEWS including phases in cooperation.

Methodology

The Recommendation Note is based on the results from a preceding desk study regarding the status quo and existing gaps of TEWS in the NWIO countries, the discussions and interviews held during the NWIO Working Group (NWIO-WG) meeting of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) in Teheran, Iran (Islamic Republic of) on 27th / 28th February as well as the outcomes from an analytical workshop organized by ESCAP and ICG/IOTWMS on 1st of March.

3. General considerations for the programmatic approach

The programmatic approach embraces all four elements as well as cross-cutting issues defined by the United Nations Office for Disaster Risk Reduction (UNISDR) **framework of people-centred early warning**, which aims to empower individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner to reduce the possibility of personal injury, loss of life and damage to property and the environment. A complete and effective early warning system comprises four inter-related elements, spanning knowledge of hazards and vulnerabilities through to preparedness and capacity to respond. The inter-linkages and effective communication channels between the four elements are essential for effective warning systems. Furthermore, a number of cross-cutting issues like effective governance and institutional arrangements, a multi-hazard approach as well as community involvement and cultural and gender perspectives need to be considered.

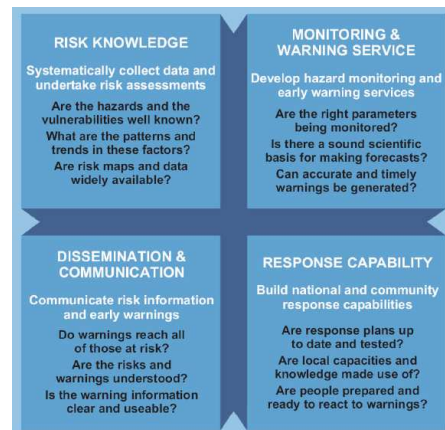


Figure 1: Four Elements of People-centred Early Warning Systems (UNISDR)

The programmatic approach builds on **regional cooperation** to strengthen national TEWS in the four countries involved with an end to end perspective and a multi-level approach. The focus is on India,

Iran (Islamic Republic of), Pakistan and Oman. Oman is not an ESCAP member state, but member of the NWIO-WG and considered as a partner and provider of expertise and financial resources in the framework of the intended programmatic regional approach.

For Iran (Islamic Republic of), Pakistan and Oman, the main threat from the MSZ are near-field tsunamis, with minimum travel times of less than 30 minutes. Comparatively, India is in a slightly different situation with minimum tsunami travel times from the MSZ of > 1hour. The programme explicitly addresses the challenges and requirements of TEW in the context of **near-field tsunamis**. It is worth noting that India faces near-field tsunamis threat in the eastern Indian Ocean along the Andaman Islands. To cope with near-field tsunamis, the following considerations have been discussed during the NWIO-WG meeting in Tehran:

- Early warning systems, policies and procedures must be designed realistically factoring in the short timeframe available before the first wave reaches the coastline. The short warning time in the case of near-field tsunamis require procedures and decision making processes may differ from already established procedures in the downstream part for other hazards with longer warning times;
- People must not rely on an official warning. They must be able to recognize the natural warning signs and take appropriate action. Therefore, in cases of near-field tsunamis, early warning plays a complementary role;
- Nevertheless, tsunami warning is essential, especially when the earthquake was not felt strongly but has the potential to trigger a tsunami (slow earthquakes). EWS are required to call off an evacuation process if data shows that the previously felt earthquake does not have potential to trigger a tsunami and to issue an “all clear” message once the tsunami threat is over;
- The threat of near-field tsunamis requires prioritising ‘self-protection as an approach to strengthening the capacities of the communities at risk. For this, it is important that communities have a high level of awareness and sufficient knowledge to react independently and properly during a tsunami threat. National and local authorities must provide all necessary services and references to enable the communities for this, especially timely warnings and evacuation plans based on scientific hazard assessments.

The proposed programmatic approach comprises **two phases of intervention** of approximately two and a half years each and follows the logic of a **structured process** (Annex 3) to build tsunami early warning and preparedness.

Phase 1 will support the countries to establish the required preconditions to strengthen self-protection capacities at community level. This includes the improvement of warning services at NTWC level and the organization of the national warning chains (with an end-to-end perspective) to assure timely warnings as well as the development of evacuation plans in line with the requirement of the threat from near-field tsunamis. Furthermore, support should be provided to enable countries to develop scientifically robust hazard and inundation maps for all tsunami-prone areas in their respective territories lacking such information. This involves initiatives by the science community to create a better understanding of the dynamics in the MSZ as well as enhancing capacities for tsunami modelling by the specialized institutions in the region.

Phase 2 will build up on the achievements of the first phase and provide support for the achievement of a clear understanding of national TEW in the countries by all stakeholders involved and the public in general as well as to address mechanisms for replicating the tested approaches for evacuation planning and setting-up warning mechanism at the local level. Additionally, capacities for self-protection arrangements at the community level shall be supported with the establishment of local

24/7 mechanisms and warning dissemination technologies, the development of sub-district and institutional evacuation planning in line with the district or city plans as well as the development of strategies to strengthen tsunami awareness and knowledge at community level. Other fields of intervention include a better understanding of the tsunami hazard in the MSZ, tsunami risk assessments and mitigation strategies. Details for the second phase still need to be discussed within the NWIO-WG.

The approach is in line with the current **ICG/IOTWMS strategy** and its focus on downstream processes and the working process of the NWIO-WG. It complements the **NWIO country processes** and builds on the recommendations and priorities defined by the NWIO-WG. The outlined approach addresses critical and strategic issues to improve tsunami warning and preparedness and provides strategic support to the processes in the NWIO member states of the Makran region. It follows the principle of subsidiarity and respects the strategies, responsibilities and mandates of the participating countries (Fig. 3).

The **support process** will focus on providing strategic inputs, capacity development and support piloting. **Implementation in the countries** will be the responsibility of the participating member states and requires allocation of adequate human resources and budget. Since the very beginning, the conditions for further **up-scaling** of the supported measures need to be identified and adequate mechanisms should be agreed with the partner countries to assure future roll-out.



Figure 2: Intervention logic for the proposed programmatic approach

It is strongly recommended to make use of **existing experiences and tools**, which have been developed by various initiatives and projects in the context of the IOTWMS and other ocean basins. Especially the longstanding experiences in Indonesia to develop tsunami preparedness and early warning in the context of near-field tsunami are considered a valuable resource and reference for the NWIO countries. In this regards, the GITEWS/PROTECTS¹ project has systematically documented these experiences (*TsunamiKIT*). The documentation comprises guidebooks, tools, and training modules for all relevant aspects of the downstream part. Especially the experiences in applying a structured approach, the development of warning chains and evacuation planning, which all have been tested and validated during more than 7 years of practical application, are considered relevant for Phase 1 of the programmatic approach. The approach of Thailand to establish a warning chain which links the NTWC directly with the communities at risk might be an interesting reference for the NWIO countries and an opportunity for the TTF advisory council member Thailand to share their experience and lessons learned. The Indian Ocean Tsunami Information Center (IOTIC) counts with diverse practical experiences in the field of tsunami exercises, development of SOP at local level, trainings on timeline driven SOPs, media involvement and awareness building. Further, experiences and tools developed and documented by various international initiatives, like the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES), the International Tsunami Information Center (IOTIC) and the North-Eastern Atlantic, Mediterranean and connected seas Tsunami Information Centre (NEAMTIC) should be considered.

Regarding **the implementation of the outlined programmatic approach**, it is recommended to consider the formation of a small consortium under the lead of IOC-UNESCO involving organizations which contribute the required technical expertise and / or support implementation in the four

¹ GITEWS/PROTECTS Tsunami-Kit: http://www.gitews.org/tsunami-kit/index_en.html

countries. GIZ can play a central role with its regional experiences and networks in early warning and disaster management as well as a provider of technical expertise in downstream issues, especially in the development of warning chains and evacuation planning. This could include the active involvement of Indonesian experts who are very familiar with near-field tsunamis. OXFAM could be involved to support implementation at local level in Pakistan. As the implementation of the support process goes hand in hand with partner processes in the four countries, a steering and coordination mechanism needs to be established. The implementation process should be closely coordinated with the NWIO-WG. At national level, a strong link to the disaster and risk management organizations on national and local levels is required. The programmatic approach works **across multiple levels**, from international to local level, and includes the involvement of pilot areas at local level to assure that the mechanism under development are in line with community requirements and to create examples and lessons learnt for future roll-out.

The identification and selection of **pilot areas at local level** should be based on a set of indicators, which allow to obtain the expected results. Indicators include the expressed interest of the political leadership at local level to participate, the assignment of human resources from multiple institutions for the planned processes at local level, the availability of the necessary funding (either by local or national budget) and the availability of a tsunami hazard or inundation map for the respective area. It is recommended to consider at least two pilot areas per country, representing different but representative conditions (like a city or harbour / industrial zone and a rural area) which most possibly have different requirements to build tsunami preparedness and seek the involvement of the private sector in the programmatic approach. The participating pilot communities shall be involved in the IOWave18 exercise to test and demonstrate the mechanism developed within the project. To generate learning from that exercise that can be shared regionally, ESCAP could play a role, similar to the IOWave16 exercise, by supporting a communication strategy, capturing learning, disseminating findings and stories through a dedicated website, and supporting lessons learnt workshops at regional level.

After the project, the Pilot Areas should fulfil the indicators of the IOTWMS Tsunami Ready (IOTR) initiative proposed by TOWS and ICG/IOTWMS. The Pilot Areas could be considered by ICG/IOTWMS as test areas for the design of suitable indicators for the IOTR initiative and to provide feedback for the further development of the tsunami ready initiative at the global level. They further contribute to the achievement of the target G of the Sendai Framework for Disaster Risk Reduction 2015-2030, to substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030 (Indicator G3-G6).

Experiences from previous TTF projects indicate that project approaches, which are closely interlinked with ongoing national and local processes, require a certain level of flexibility during project implementation. A **process-oriented project design** with clear objectives but a certain level of flexibility in regards of timing and concrete activities at implementation level would be helpful to assure a partner-oriented approach.

The proposed programmatic approach is linked to issues like multi-hazard approaches, community based disaster risk management, integrated coastal area / maritime management, resilient communities as well as the integration into public and private development processes. This is a field with a wide range of ongoing processes and interventions of numerous actors in each of countries as well as on the regional level. Such an environment requires a suitable **coordination mechanism** between project implementers, the national partners and the funding agency, which should be defined already in the project design, to avoid duplication of efforts and to make best use of possible synergies. The establishment of coordination and exchange mechanism are considered essential with

the International Network for Multi-Hazard Early Warning Systems (IN-MHEWS), the WMO/UNESCAP Panel on Tropical Cyclone (PTC) as well as with the Typhoon Committee in relation to the “Synergized Standard Operating Procedures for Coastal Multi-Hazards Early Warning System” (SSOP) project. Further on, experiences from previous ESCAP TTF projects should be considered. Project proposals within the programmatic approach should identify possible links and synergies with disaster risk management processes for other natural hazards and promote the integration of TEW into national systems with a multi-hazard perspective.

Within the programmatic approach, a clear and realistic strategy for **knowledge management** and **exchange of experiences** should be considered. The existing mechanism of IOC-UNESCO with the ICGs at ocean basin level, the *Working Group for Tsunami and other sea level related Warning and Mitigation Systems* (TOWS) at global level and the various Tsunami Information Centres provides an excellent platform and should be systematically integrated into the approach. Further, the NWIO-WG is considered as another important mechanism to facilitate knowledge management and coordination between the four countries involved. At IOTWMS level the ICG Working Group 1 on Tsunami Risk, Community Awareness and Preparedness plays an important role.

The hereby outlined regional cooperation to strengthen tsunami early warning in the NWIO-Region, could provide interesting references for similar or future initiatives to address challenges in the field of early warning faced by countries sharing similar framework conditions. In the context of tsunamis, this might refer to conditions, where countries decide not to set up own sophisticated monitoring systems and tsunami early warning centres as they don't have the required capacities and resources (especially LDC countries) or face only a minor or far field threat, and therefore rely on the services from regional tsunami service provider (TSP). In these cases, countries would need to follow a specific strategy, which focuses on the development of the downstream part with close integration into existing structures in the countries with a multi-hazard perspective. To support the development and implementation of such specific strategies, regional or sub-regional cooperation is considered a promising approach as it facilitates the use of joint resources and experiences and contributes to overcome the limitations on resources and capacities faced by LDCs.

4. Recommendations for Phase 1

Objective

NWIO countries have established essential services and guidelines enabling communities to implement self-protection arrangements against near-field tsunamis.

Fields of Intervention

During Phase 1, the programmatic approach shall support four fields of intervention:

1. The improvement of warning services at NTWC level and the organization of the national warning chains (with an end to end perspective) to assure timely warnings. This includes a critical review of the overall NTWS set-up and creating mechanism for coordination and steering of the systems;
2. The development of evacuation plans in line with the requirement of the threat by near-field tsunamis;
3. A better understanding of the dynamics in the MSZ based on research by the science community;
4. The further development of hazard and inundation maps for tsunami-prone areas in the four countries lacking this information by enhancing capacities for tsunami modelling within the specialized institutions in the region.

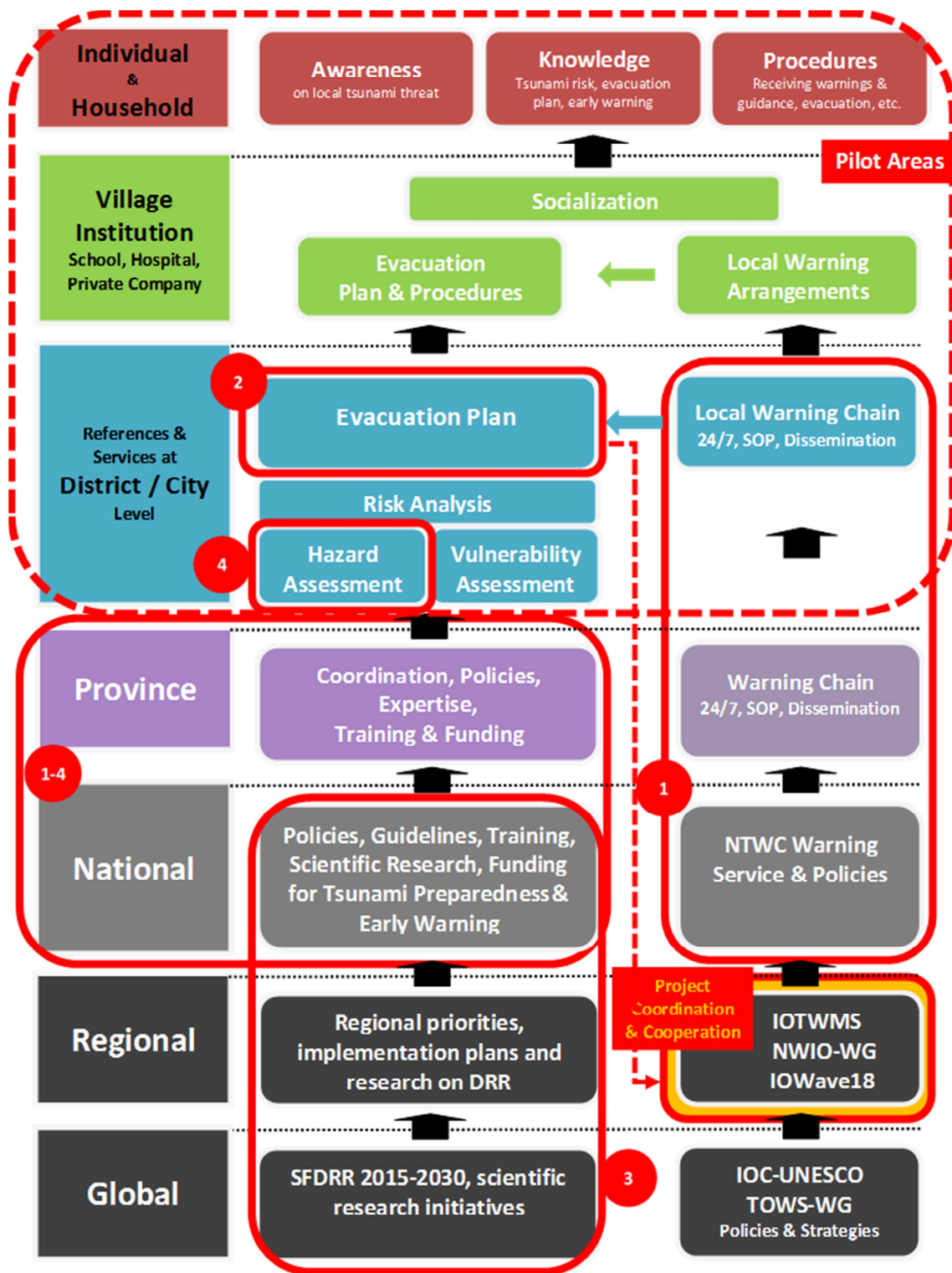


Figure 3: Fields of intervention (1 to 4) within a multi-level and structured approach in Phase 1. Impacts on local level (dotted line) will be limited to the Pilot Areas in the four countries. Implemented mechanism in Pilot Areas will be tested during IOWave18 (dotted arrow). Project coordination, cooperation between the four countries and workshops will mainly take place on regional level (Source: scheme has been adapted from *TsunamiKIT* 2013).

Field 1: Warning Chains

The challenges:

National TEWS in all four countries are not yet fully ready for MSZ near-field tsunamis. A more strategic approach to address the challenges of near-field tsunamis is needed. Timelines and SOPs must match the specific conditions of near-field tsunamis. All four NWIO countries lack a functioning steering and coordination mechanism and / or master plans for further NTWS development. All countries expressed the need to improve coordination between NTWC and (N)DMO and between national and local levels. NTWC-SOPs are not yet sufficiently synchronized with DMO procedures and evacuation procedures and there is no integration yet with SOPs from other hazards.

The need to strengthen capacities of NTWCs for tsunami detection has been recognized. Data exchange for real time seismic and GPS data and the elaboration of related policies and mechanism for data sharing (including calibration) play a central role and bilateral negotiations are currently underway. There is an ongoing discussion within NWIO-WG to define the best configuration and methods for monitoring. Real-time monitoring using GPS for providing information on the displacement of the earth surface caused by the earthquake is considered a promising tool for rapid tsunami prediction.

Warning services at national level still need to be improved in terms of operating realistic timelines and establish 24/7 services. The level of progress varies considerably between the four countries, with Iran (Islamic Republic of) and Pakistan facing more challenges.

The organization of warning chains in all four countries are characterized by too many steps with multiple actors involved. The set-up of the warning chains suffers from unrealistic timelines, unclear roles and responsibilities and difficulties to translate warnings to guidance on what to do. Decision making processes along the warning chain are regarded as critical steps, as they need to respect the existing mandates and countries have not yet established responsive decision-making mechanisms that are quick enough in relation to the short warning times. Providing warning services at local level with coverage along the entire tsunami prone area has yet to be achieved. Public media is recognized as an important actor but arrangements still need to be improved. Public alert systems (sirens) exist only in a few places.

Ongoing or planned country processes:

During the analytical workshop the country representatives identified the following ongoing or planned processes in regards to the challenges outlined above:

- India has already planned to organize SOP workshops and to support local emergency operation centres (EOC) to operate 24/7;
- Iran (Islamic Republic of) has recognized the need to improve warning services at national level and revise the warning chain and has already planned to work on integrated SOPs with the involved stakeholder;
- Oman has planned to further improve the warning chain and to develop warning dissemination tools to reach the coastal areas;
- Pakistan is planning to do advocacy on policy makers to improve the warning chain and dissemination of warning to the communities at risk. The aim is to issue warnings within 7 minutes and develop a corresponding SOP.

Furthermore, ICG-IOTWMS is planning to hold a regional SOP workshop in September 2017.

As a result from the NWIO-WG meeting a recommendation to ICG/IOTWMS has been issued to encourage all Member States to work on their tsunami warning chain with a view to minimise the number of steps (between the NTWC and Public) in the warning chain, and with clear authorisation of responsibilities amongst the NTWCs, NDMOs, LDMOs and Public.

Intervention strategy:

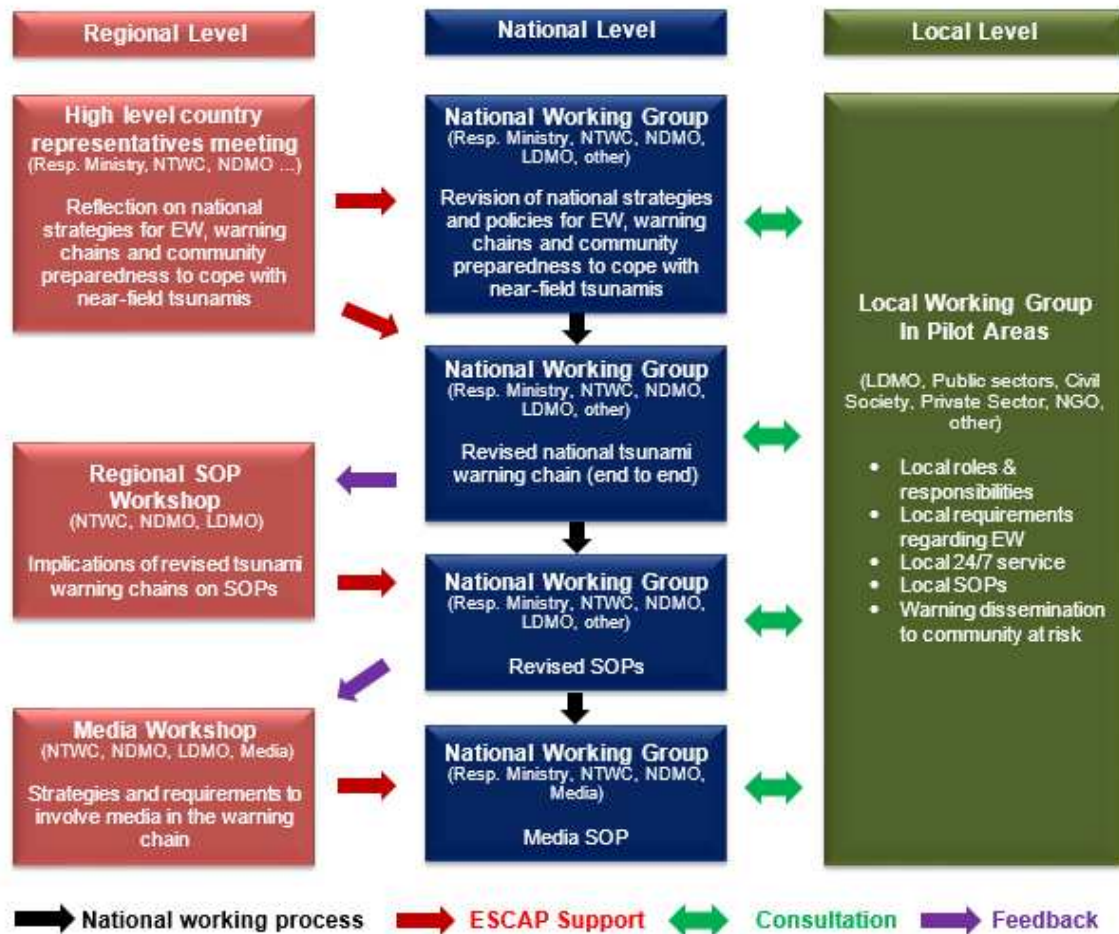


Figure 4: Intervention strategy for strengthening national warning chains

The intervention strategy to improve warning chains is built around a working process at national level in each of the four countries involved. ESCAP support at the regional level will help creating momentum and conditions for the intended change process by bringing together high level representatives from the countries to highlight the need for the further development of the TEWS and the related processes to cope with near-field tsunamis and to advocate for the establishment of the necessary conditions for the proposed national working process. Beyond the tsunami threat, it is projected to promote a discussion how TEW can be integrated into a multi-hazard approach.

Furthermore, ESCAP support will provide technical assistance to adapt the national warning chains and SOPs (Regional SOP Workshop). Providing additional backstopping to National Working Groups should be offered based on country requests. Once national warning chains and related SOPs have been adapted, specific arrangements and SOPs for public media will be addressed to assure a functioning channel for warning dissemination to the communities at risk. Along the entire working process, a close link between the National Working Group and the selected pilot areas needs to be

maintained to understand the requirements, capacities and possibilities of tsunami early warning at local level and its relation to the management of other natural hazards. This can be done through consultations and / or joint workshops between local and national stakeholders.

Outcomes (and Performance Indicators):

1. A mechanism for steering and coordination for the TEWS at national level in each country considering integration into a multi-hazard approach;
2. The design of a tsunami warning chain for a near-field tsunami threat;
3. Revised SOPs along the warning chain;
4. Policies and SOPs for Public Media for warning dissemination.

Outputs:

1. Advocacy, promotion, invitation and organization of a high level meeting to discuss and reflect on national strategies for TEW, warning chains and community preparedness in the context of near-field tsunamis;
2. A regional workshop to analyse and revise warning chains and discuss the implications for the related SOPs;
3. A regional Media workshop to share experiences and mechanism to involve media in tsunami warning dissemination and outline requirements for related SOP development;
4. Backstopping to National Working Groups as requested.

Partner contributions in each of the participating countries:

- Advocacy and promotion for a regional high level meeting of representatives from the four countries to discuss and reflect on national strategies for TEW, warning chains and community preparedness in the context of near-field tsunamis;
- Set-up and steering of National Working Groups to discuss and revise national strategies for TEW, warning chains and community preparedness in the context of near-field tsunamis as well as to adapt related SOPs with an end-to-end perspective including specific arrangements and SOPs for public media;
- Assign participants to assist a regional SOP training and assure that results from the workshop are reported back to the National Working Group;
- Establish working relations with relevant public media regarding tsunami warning dissemination and promote participation of selected representatives in the regional media workshop;
- Organize a working process between the National Working Group and public media representatives to agree on roles and responsibilities, arrangements and procedures for warning dissemination by the media;
- Provision of the necessary human and financial resources to run the agreed processes.

Further on, it is recommended that countries start elaborating a comprehensive documentation on the overall set-up of their TEWS, a description of the warning chain, warning services and products as well as the roles and responsibilities of the main actors involved in the system, including the local level. The Indonesian “Tsunami Early Warning Service Guidebook for InaTEWS” is considered a useful reference in this regards.

Field 2: Evacuation Planning

The challenges:

Tsunami evacuation plans are considered a core element in any tsunami preparedness process as they combine key information on local tsunami hazard, with warning and evacuation procedures, thus providing essential orientation for the community safety in an emergency situation.

Local evacuation plans, describing safe zones and evacuation strategies as well as local warning procedures represent a solid base for building tsunami awareness and knowledge at village and household or individual level. These plans are the task and responsibility of local authorities, but require the participation of multiple stakeholders.

Tsunami evacuation plans should be acknowledged as an official government document. This makes it a credible and binding reference for institutions at all levels of government, NGOs, the private sector and the local population. Based on such officially endorsed evacuation plans, facilities like schools, hospitals, hotels, and communities can develop their own evacuation procedures (Fig. 6)



Figure 5: Evacuation planning at different levels

Mostly, evacuation plans have yet to be developed in all four countries despite being considered a priority and a precondition to advance with tsunami preparedness initiatives and to enable the communities at risk to react on early warning.

Ongoing or planned country processes:

During the analytical workshop the country representatives identified the following ongoing or planned processes in regards to the challenges outlined above:

- **India** has already planned with DMOs and assigned resources to implement evacuation planning processes at community level in Gujarat province;
- **Iran** (Islamic Republic of) is planning to implement evacuation planning processes at community level;
- **Oman** is planning to implement evacuation planning processes at community level as well as safe buildings for shelter in selected areas;
- **Pakistan** announced plans to implement evacuation planning in three locations: Gwadar, Ormara, and Pasni.

All four countries have recognized the need for evacuation planning as a priority and are committed to implement such processes during the next two years.

Intervention strategy:

The intervention strategy to support evacuation planning is built around working processes on national and local level in each of the four countries involved. ESCAP TTF support on the regional level will provide information on existing approaches, standards, methodologies and best practices for tsunami evacuation planning as well as recommendations for the NWIO countries what fits best and how to proceed regarding the development of a set of own policies, standards and approaches

for evacuation planning. In addition, ESCAP TTF support will provide training for selected staff from partner institutions of all four countries to build a pool of national experts, who will facilitate and accompany evacuation processes in the selected pilot areas. The training will provide a methodology for the planning process, information on technical aspects like the development of evacuation strategies, zoning, map design and evacuation procedures as well as facilitation techniques to assure a participatory and consultative approach at community level. Furthermore, ESCAP TTF will support backstopping during the planning processes in pilot communities to strengthen capacities of the facilitators, to assure quality in the processes and outputs as well as to obtain feedback for possible adaptations of the methodology based on local experiences and requirements. Technical guidance and advice should be provided for example by building on and leveraging the distinct downstream experiences from Indonesia.

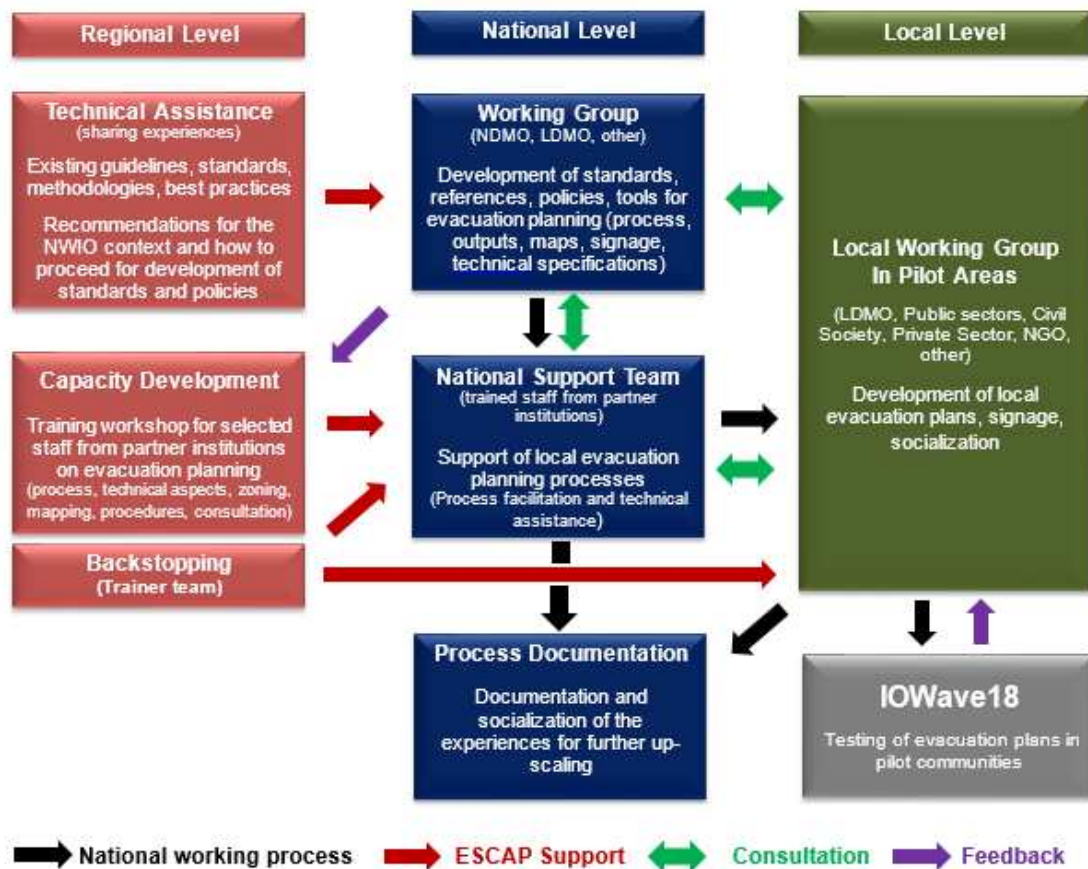


Figure 6: Intervention strategy for strengthening evacuation planning

At country level, the national partners will set up a working group to develop a set of own policies, standards and approaches for evacuation planning and identify a group of resource persons to integrate a National Support Team, which will be assigned to facilitate evacuation planning processes in the pilot communities and to participate in the regional training workshop provided by ESCAP TTF support. Partner countries assure that the Support Team will be provided with adequate resources to accompany local processes in the pilot areas. The implementation of evacuation planning in the pilot areas will be conducted by a local working group integrating representatives from all relevant sectors and concerned groups. The local working group will receive methodological and technical support from the National Support Team. The preconditions for selecting the pilot areas are a strong local

interest and political willingness to establish a tsunami evacuation plan, a formal commitment from the LDMO to take a lead in the process, the provision of time resources for local working group members, and adequate funding for the planning and implementation processes as well as the availability of a tsunami hazard or inundation map for the affected area.

The developed evacuation plans and procedures in all four countries within this initiative shall be tested during IOWave18. Learning from the planning processes in the pilot areas and the IOWave18 exercise shall be brought into the National Working Group responsible for the development of policies and standards.

Timewise, it is not expected that the National Working Group will have finalized their tasks before starting the planning processes in the pilot areas. It is intended that practical experiences from the working process in the pilot areas will be considered to design adequate policies and standards.

To facilitate further scaling-up and roll-out to other areas in the countries, the experiences from the planning processes in the pilot areas will be systematized and documented. Furthermore, it is expected that the members of the National Task Team will be available to assist in the following roll-out process in the countries.

Outcomes (and Performance Indicators):

1. A set of national policies, standards and approaches for evacuation planning in the participating countries;
2. Tested and approved tsunami evacuation plans in selected pilot areas providing references for further up-scaling;
3. National mechanism to support the development of evacuation plans at community level in remaining tsunami prone areas in all four countries.

Outputs:

1. Information package on existing approaches, standards, methodologies and best practices for tsunami evacuation planning as well as tailored recommendations for the NWIO countries including concrete steps for the development of context-specific policies, standards and approaches;
2. A regional training workshop for selected participants from the member countries to build the required capacities to facilitate and provide technical expertise for evacuation planning processes at local level;
3. Backstopping during the evacuation planning processes in pilot communities to strengthen capacities of the facilitators, to assure quality in the processes and outputs as well as to obtain feedback for possible adaptations of the methodology based on local experiences and requirements.

Partner contributions in each of the participating countries:

- Set-up and steering of National Working Groups to develop a set of national policies, standards and approaches for evacuation planning;
- Identification of members to integrate the National Support Team and assure their availability to assist the regional training, to facilitate the evacuation planning processes in pilot areas and the subsequent process documentation;
- Identification of Pilot Communities, agreements with local stakeholder on the working process and the required contributions and establishment of a feed-back mechanism;
- Provision of the necessary human and financial resources to run the agreed processes.

Field 3: Risk Knowledge

The challenges:

To develop adequate risk assessments in the NWIO area it is important to achieve a better understanding of the seismo-tectonic setting and dynamics of the MSZ in order to generate more realistic risk assessments for the region and the affected countries. Improved risk assessments will allow to optimize warning processes and to develop more realistic preparedness strategies at national and local levels. During the ICG/IOTWMS meeting in 2015, the importance of clarifying the earthquake and tsunami potential of the Makran subduction zone was highlighted and ICG/IOTWMS encouraged the Member States to acquire new datasets such as the GNSS, seismic and other geological data. The development of a unified tsunami hazard map for the Makran region was considered a foundation for future risk assessment activities.

Besides achieving improved knowledge on the tsunami hazard, a better understanding of the specific characteristics of vulnerability and exposure in the area and the development of risk assessments and risk maps for planning purposes is necessary. This will be addressed in Phase 2 of the programmatic approach.

Ongoing or planned country processes:

During the NWIO-WG meeting, Iran (Islamic Republic of) presented an ongoing initiative in partnership with **Oman** and Germany to acquire seismic profiles across the western part of the MSZ. **Oman** has already developed risk assessments for nine priority locations and intends to expand to other areas.

Intervention strategy:

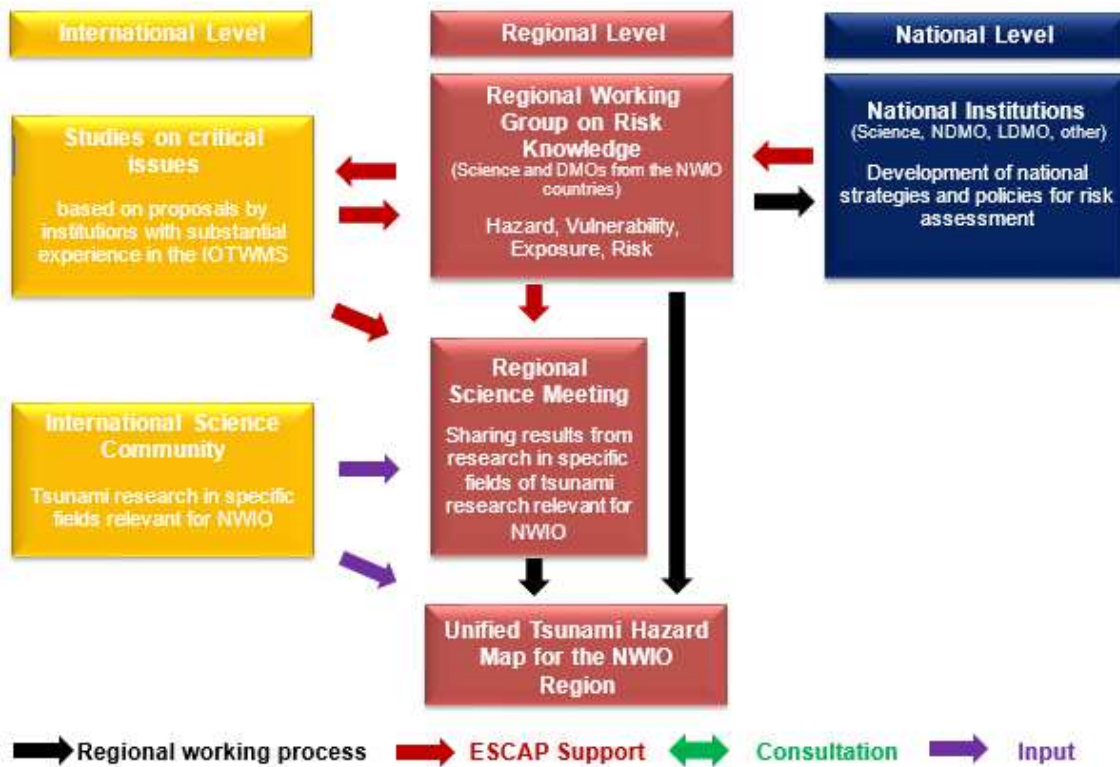


Figure 7: Intervention strategy for improving risk knowledge

To address the challenges related to better risk knowledge, Phase 1 of the programmatic approach will solely focus on the tsunami hazard. Most of the intervention will take place at the regional level with international support and a link to the concerned institutions in the four countries.

New scientific insights are considered necessary for a better understanding of the MSZ. Although the TTF does not typically fund scientific research, the programmatic approach should consider studies on critical issues as well as supporting sharing of scientific knowledge and the translation of scientific results into tools for practical risk management. For this purpose, the following mechanisms are proposed:

1. Support the establishment of a regional working group and working process between NWIO countries on risk knowledge. The focus of the group should clearly go beyond the traditional scientific approach for hazard assessment, considering the need to develop comprehensive risk assessments on national and local levels in line with the requirements of tsunami risk management;
2. Co-funding of studies for relevant research on critical issues like maximum magnitude and source mechanism for tsunami modelling. Such studies should provide results within a relatively short period of time. It is recommended to prioritize already existing proposals and institutions with practical experience in the context of IOTWMS (like GEOMAR, GFZ, INCOIS);
3. Support the organization of a scientific exchange meeting building on the results from the International Conference on Reducing Tsunami Risk in the Western Indian Ocean held on 22-23 March 2015 in Muscat (Phase 2). The regional meeting will gather scientists who can provide the findings from tsunami-specific research. The following fields have been proposed: (a) the overall understanding of seismo-tectonic setting and dynamics of the MSZ, (b) the establishment of maximum magnitude, (c) paleo-tsunami research in the region, (d) tsunami modelling for forecasting and planning purposes, including set-up of related monitoring networks in the region (i.e. GNSS), and (e) secondary tsunami sources such as submarine landslides.

The Asia-Pacific Centre for Development of Disaster Information Management (APDIM), established in Tehran, may facilitate and mobilize information and knowledge-sharing between tsunami associated coastal risk countries both in Indian Ocean as well as Pacific basins particularly on multi-scale geospatial information for risk assessment and monitoring and provide support for the development of impact based forecasting and risk based early warning to the coastal hazards.

Outcomes (and Performance Indicators):

1. Availability of latest scientific insights on the tsunami hazard from the MSZ as an input for risk assessment activities in the countries;
2. Concept and inputs for a unified regional tsunami hazard map.

Outputs:

1. Gap analysis and strategy for regional cooperation to develop a unified regional tsunami hazard map developed by a NWIO working group on risk knowledge;
2. Results from studies on critical issues such as maximum magnitude and source mechanism for tsunami modelling implemented by international scientific partner institutions;
3. Exchange of latest scientific results and studies from international studies on the tsunami hazard in the MSZ.

Partner contributions

National governments assign staff from relevant institutions to a regional working group on risk knowledge to exchange experiences and discuss concepts and methods for tsunami risk assessment. National institutions will consider these inputs for the development of national standards, concepts and policies for risk assessment.

To facilitate the participation from diverse countries, and simplify logistic and visa issues, the regional scientific meetings may be hosted in Oman.

Field 4: Modelling and Inundation Maps

The challenges:

Tsunami modelling and the derived inundation maps are preconditions for tsunami forecasting and tsunami risk assessments, to develop realistic tsunami preparedness strategies and the basis for the development of evacuation plans. While databases with tsunami scenarios have been developed for forecasting purposes, inundation maps are available only for few areas along the coastlines of the four countries. The NWIO-WG members expressed the need to improve knowledge regarding source mechanism, scenario development and modelling techniques in order to improve databases of pre-calculated scenarios and to provide better inundation maps for all coastal areas. Inundation maps are needed also for risk-sensitive planning and should consider other coastal hazards as well like storm surges and seiches.

Ongoing or planned country processes:

During the analytical workshop the country representatives identified the following ongoing or planned processes in regards to the challenges outlined above:

- **India** has identified the need to make inundation maps accessible for legislators, decision makers and the public, although no activities have been planned yet in this regards;
- **Iran** (Islamic Republic of) plans to obtain better bathymetry data as a basis for further inundation mapping. Currently only for Chabahar higher resolution bathymetric data is available;
- **Oman** has inundation maps for nine priority locations and intends to expand to other areas;
- **Pakistan** has planned to work on tsunami modelling considering a variety of magnitudes to improve forecasting capacities as well as creating information for planning purposes.

Intervention strategy:

The NWIO-WG members proposed to foster regional cooperation and exchange of knowledge on tsunami modelling and inundation mapping. Support from international experts would be highly appreciated. A gap analysis is needed first to provide orientation on fields which require further improvements. The group is aiming to develop a unified approach for tsunami modelling to assure state-of-the-art results and intercomparable results throughout the region. In case of persisting limitations due to availability or inadequate resolution of data, alternative inundation mapping approaches should be identified and validated.

It is recommended to co-fund studies for development of relevant models and scenarios. Such studies should be able to provide results within a relatively short period of time. It is recommended to approach international institutions with practical experience in the context of the IOTWMS (like AWI, BOM, INCOIS).

The modelling experts will need to consult NDMOs to discuss requirements of hazard assessments and inundation mapping for mitigation and preparedness as well as risk-sensitive development planning. An agreement on priority areas will be required.

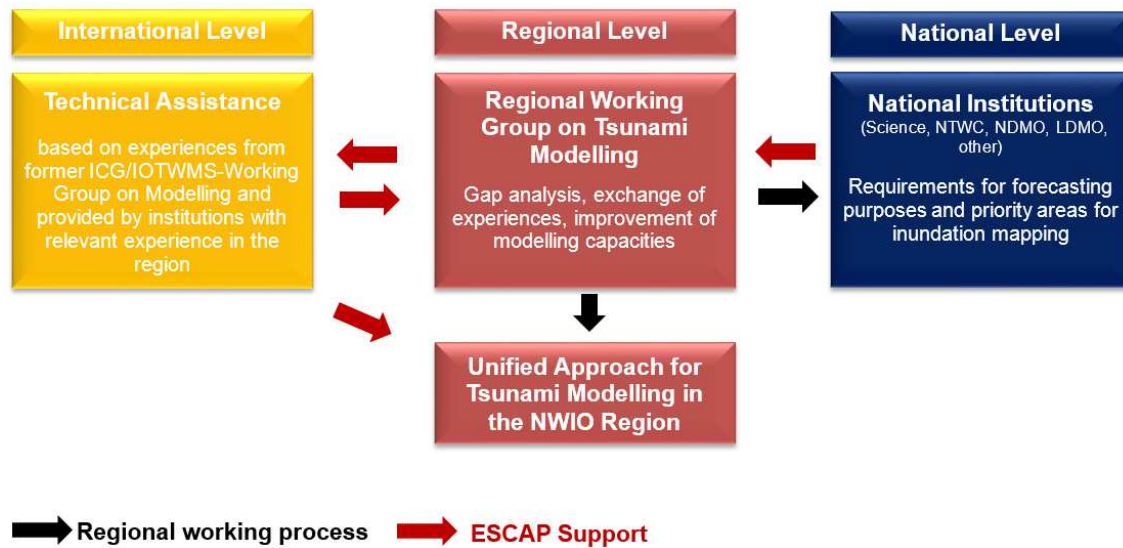


Figure 8: Intervention strategy for improving tsunami modelling and inundation mapping

Outcomes (and Performance Indicators):

1. Specifications for a unified approach for tsunami modelling and inundation mapping for the NWIO region;
2. Increased capacities and knowledge on tsunami modelling in the participating countries;
3. Improved databases for tsunami forecasting at NTWC level;
4. Increased coverage of areas with scientifically robust inundation maps for tsunami, storm surges and seiches as well as information for risk-sensitive planning.

Outputs:

1. Gap analysis on tsunami modelling and inundation mapping;
2. Capacity development for members of a NWIO regional working group on tsunami modelling and inundation mapping including the provision of inputs from international expertise;
3. Support of regional working group meetings on tsunami modelling and inundation mapping with the aim to develop specifications for a unified approach for tsunami modelling in the region.

Partner contributions

National governments will need to assign staff from relevant national institutions to a regional working group on tsunami modelling and inundation mapping, in order to realize a gap analysis, exchange experiences and enhance capacities regarding concepts and methods for tsunami modelling. National institutions in the partner countries will take up these inputs for the development of improved databases for tsunami prediction and to provide inundation maps for local authorities.

5. Recommendations for Phase 2

Objective

NWIO countries have established comprehensive services and provide guidelines as well as mechanisms to support communities in the implementation of self-protection arrangements against near-field tsunamis.

Fields of Intervention

During Phase 2, the programmatic approach will support the following fields of intervention:

1. The achievement of a clear understanding of national TEW in the countries by all stakeholder involved and the general public;
2. Strategies for up-scaling the tested and validated approaches to support self-protection at local level developed in Phase 1;
3. Tsunami risk assessment and development of mitigation strategies looking at a multi-hazard risk management approach and considering risk transfer / financing solution where appropriate;
4. Roll-out: Strengthening of self-protection arrangements at local level: establishment of local 24/7 mechanism and warning dissemination technologies, promotion of the development of sub-district and institutional evacuation plans in line with the district or city plans, development of strategies to strengthen tsunami awareness and knowledge at community level including public and private sectors;
5. Strengthening tsunami emergency response plans as well as response capabilities in selected pilot sites;
6. Ongoing: A better understanding of the dynamics in the MSZ based on research by the science community.

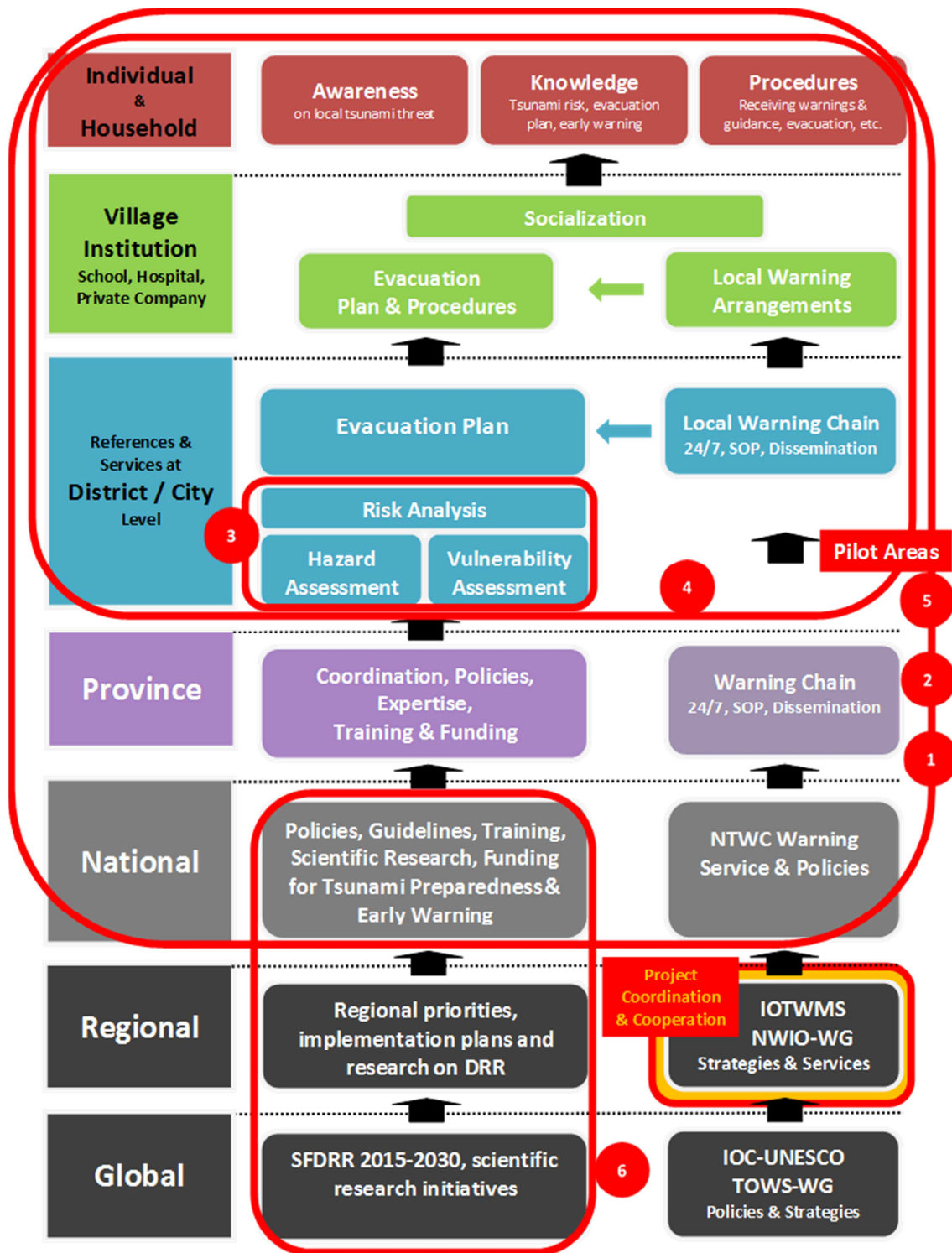


Figure 9: Fields of intervention (1 to 6) within a multi-level and structured approach in Phase 2. Activities related to Field 5 will only be implemented in Pilot Areas. Project coordination, cooperation between the four countries and workshops will mainly take place on regional level (source: scheme has been adapted from TsunamiKIT 2013).

6. References

ESCAP (2017): Tsunami Early Warning Systems for the countries of the North West India Ocean with focus on India, Iran (Islamic Republic of), Pakistan, and Oman – Synthesis Report

GIZ (2013): TsunamiKIT, updated Version

ICG/IOTWMS (2015): The Indian Ocean Tsunami Warning and Mitigation System 10 years after the Indian Ocean Tsunami: Achievements, Gaps and Sustainability for the Future – Report by ICG/IOTWMS Secretariat

ICG/IOTWMS (2015): Regional Working Group for the North West Indian Ocean (WG-NWIO), First Meeting Report, Muscat, Oman, 14–15 October 2015

ICG/IOTWMS (2015): Regional Working Group for the North West Indian Ocean (WG-NWIO), Proceedings from Second Meeting, Tehran, Iran (Islamic Republic of), 27–28 February 2017

ICG/IOTWMS (2017): Draft Recommendation and Actions from the 2nd NWIO WG Meeting including Recommendations to the ICG/IOTWMS

UN (2016): Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction

UNISDR (2006): Developing Early Warning Systems: A Checklist

7. Annexes

A1: Agenda UNESCAP Programme Approach Workshop in Tehran / Iran (Islamic Republic of)

UNESCAP Programme Approach Workshop Multi-Donor Trust Fund in the Makran region

Tehran, Iran (Islamic Republic of), 01 March 2017

09:00 am – 04:00 pm

AGENDA

1. Introduction
 - 1.2. Objective of the workshop, expected results and agenda
 - 2.2. Background: UNESCAP Multi-Donor Trust Fund objectives and strategic focus
2. Key elements to strengthen TEW in the Makran Region

Create a common understanding of key issues to be dealt with in order to strengthen TEW in the Makran region
3. Ongoing or planned initiatives in the Member States to address these issues
 - 1.2. Initiatives in the individual countries
 - 2.2. Regional cooperation
 - 3.2. Other opportunities (TOWS)
4. What need to be done beyond?
5. What kind of support is required?

And what particularly is expected from ESCAP support?
6. Outline of elements for a programmatic approach for regional cooperation between IOC-UNESCO, key stakeholders and ESCAP taking into account the ICG-IOTWMS mid-term strategy:

Strategic areas to support, objectives and expected results, partner structure, roles and contributions, methodologic aspects, programme phases and time horizons
7. Summary, conclusions and follow-up



A2: Participants UNESCAP Programme Approach Workshop in Tehran / Iran (Islamic Republic of)

No	Name	Designation and Address	Meeting Representation
IOTWMS Officers & Member State Representatives			
1	Juma Said Ahmed Al-Maskari	Director General Public Authority for Civil Aviation Meteorology P.O.Box 1, P.C. 111, Muscat, Oman j.almaskari@met.gov.om 00968 24354555, 00968 99262656 00968 24354501	Chair, ICG/IOTWMS NWIO WG Vice-Chair, ICG/IOTWMS Representative of Oman
2	Dr. Nasser Hadjizadeh Zaker	Director of Iranian National Institute for Oceanography and Atmospheric Science Address: #3, Etemad Zadeh St., Fatemi Ave., Tehran , Iran (Islamic Republic of), 1411813389 Email: inioas@inio.ac.ir , nhzaker@inio.ac.ir Tel: (098)2166944867, Fax: (098)2166944866	Vice-Chair ICG/IOTWMS NWIO WG Representative of Iran (Islamic Republic of)
3	Dr. Mohammad MOKHTARI	Director of National Center for Earthquake Prediction International Institute of Seismology and Earthquake Engineering, 26 Arghavan Ave., Loavnsana BLVD, Farmaneh Tehran Iran (Islamic Republic of) Email: mokhtari@iiees.ac.ir	Vice-Chair ICG/IOTWMS WG-2 Representative of Iran (Islamic Republic of)
Member State Representatives			
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6	Ghazala Naeem	Resilience Group Disaster Risk Management Consultant & Architect 73, Street 76-B, E-11/2, Islamabad, Pakistan ghazala_ghq@hotmail.com +92-51-2305484, +92-300-4250695	Representative of Pakistan
7	Naseer Ahmad Gillani	Chief (Water & Environment) Ministry of Planning, Development & Reform Room No. 351, P-Block, Pak Secretariat, Islamabad. naseeragillani@yahoo.com +92519204953 +923335123412 +92519219332	Representative of Pakistan

No	Name	Designation and Address	Meeting Representation
8	Said Abdullah AlHarthi	Director of Meteorological Technical Services National Multi Hazard Early Warning Center Directorate General of Meteorology (DGMet), Public Authority for Civil Aviation (PACA) Muscat Int. Airport , 1, Post Code 111 s.alharthy@met.gov.om +(968)24 354700, +(968)99330306 +(968)24 348501	Representative of Oman
9	Dr. Mahmood Reza AKBARPOUR JANNAT	Academic Staff Iranian National Institute for Oceanography and Atmospheric Science No.3, EtemadZadeh St., Fatemi Ave., 1411813389 014155-4781 Tehran Iran (Islamic Republic of) Tel: +98 21 66944873-6 Fax: +98 21 66944873-6 Email: akbarpour@inio.ac.ir	Representative of Iran (Islamic Republic of)
10	Dr. Mohammad Hossein KAZEMINEZH AD	Iranian National Center for Ocean Hazards, Iranian National Institute for Oceanography and Atmospheric Science No.3, EtemadZadeh St., Fatemi Ave., Tehran , Iran (Islamic Republic of), 1411813389 014155-4781 Tehran Iran (Islamic Republic of) Tel: (098)2166944867 Email: mkazeminezhad@inio.ac.ir	Representative of Iran (Islamic Republic of)
12	Dr. Ali KHOSHKHOL G	Head of the Iranian National Centre for Ocean Hazards (INCOH), Iranian National Institute for Oceanography and Atmospheric Science No.3, EtemadZadeh St., Fatemi Ave., Tehran , Iran (Islamic Republic of), 1411813389 014155-4781 Tehran Iran (Islamic Republic of) Tel: (098)2166944867 Email: a_khosh@inio.ac.ir	Representative of Iran (Islamic Republic of)
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16	Srinivasa Kumar Tummala	Head, ICG/IOTWMS Secretariat, UNESCO-IOC, Level 3, 1 Ord Street, PO Box 1370, West Perth, WA 6872, Australia sk.tummala@unesco.org 61 8 9226 0191 61 0 447738540	UNESCO-IOC

A3: Results from UNESCAP Programme Approach Workshop in Tehran / Iran (Islamic Republic of)

PAKISTAN

- Seismic Network along the Coast
- GPS - 5 Station ≠ Real time
- Modeling MSZ (Forecasting Planning) Different magnitude SeaComp 3
- Gwadar most vulnerable area (5m) (Report 2012) URMARA PASNI
- * 5 Years Data GPS for the 3 areas
- SOP → monitor
- Warning chain to community of Risk Dissemination to community and IP to communication method
- * ADVOCACY for policy maker
- EVACUATION planning in Gwadar URMARA PASNI
- * A.I. to SELF PROTECTION

IRAN

- INVOLVEMENT WITH FLDHO on Tsunami Hazard
- Improvement of dissemination of warning / warning chain center
- Integration of SOP with the Stake holders
- Better Data - Bathymetry (only Chabahar) Revised Inundation map of other areas
- Increase awareness and preparedness of community
- Development of evacuation plan
- DRILLS AND EXERCISES
- Public Alert - pilot
- INTEGRATED TO EDUCATION SECTOR

OMAN

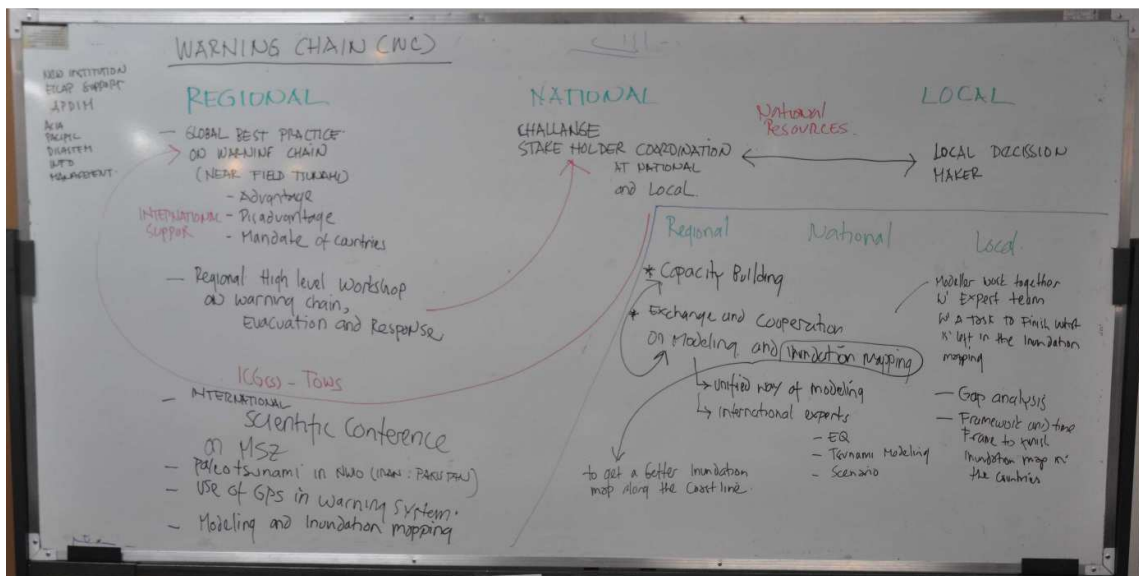
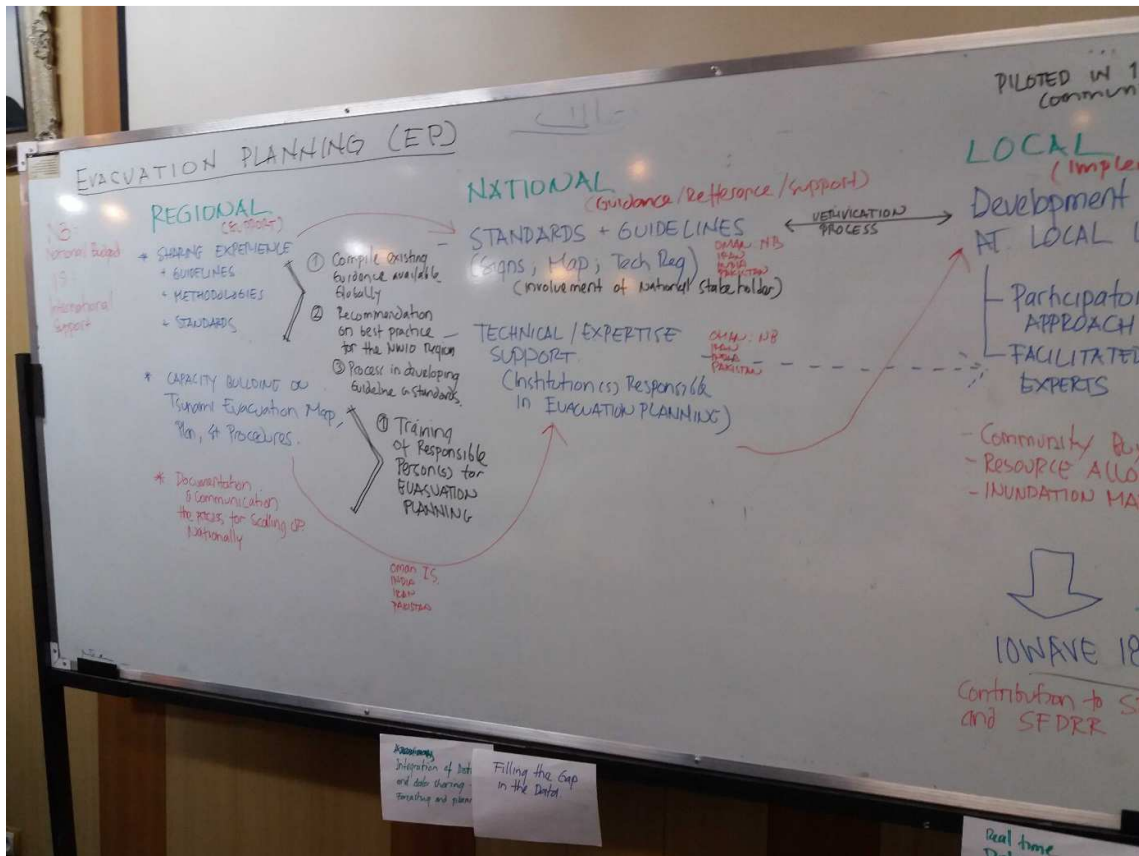
- Warning chain
- Dissemination → Faster to reach the coast + timely
- Risk analysis → High Resolution to be completed
- Evacuation Plan + Map
- Evacuation place
- Awareness + education (Self protection) → evacuation sector
- Regional
- Regional (coordinated) / Integrated Research on MSE
- Data sharing (Detection + Prediction)
- Sops = Warning chain
- Reviewing Hazard + Risk map
- Evacuation Plan

INDIA

- Seismic, GPS Strong motion data (later prediction of warning)
- Tsunami Risk Map become accessible to legislator and public
- Inundation map → for public and worked with public
- Tsunami Evacuation map for Planning - w/ errors
- Local EOC 2015 Sri District level
- SOP workshop
- EXERCISES
- * Mitigation
- Integrating to education sector speak to school (tsunami)

Additional notes on sticky paper:

- Assessing Integration of data and data sharing + forecasting and plans
- Filling the Gap in the Data
- Real time Data sharing Regionally
- Real time inundation map for warning



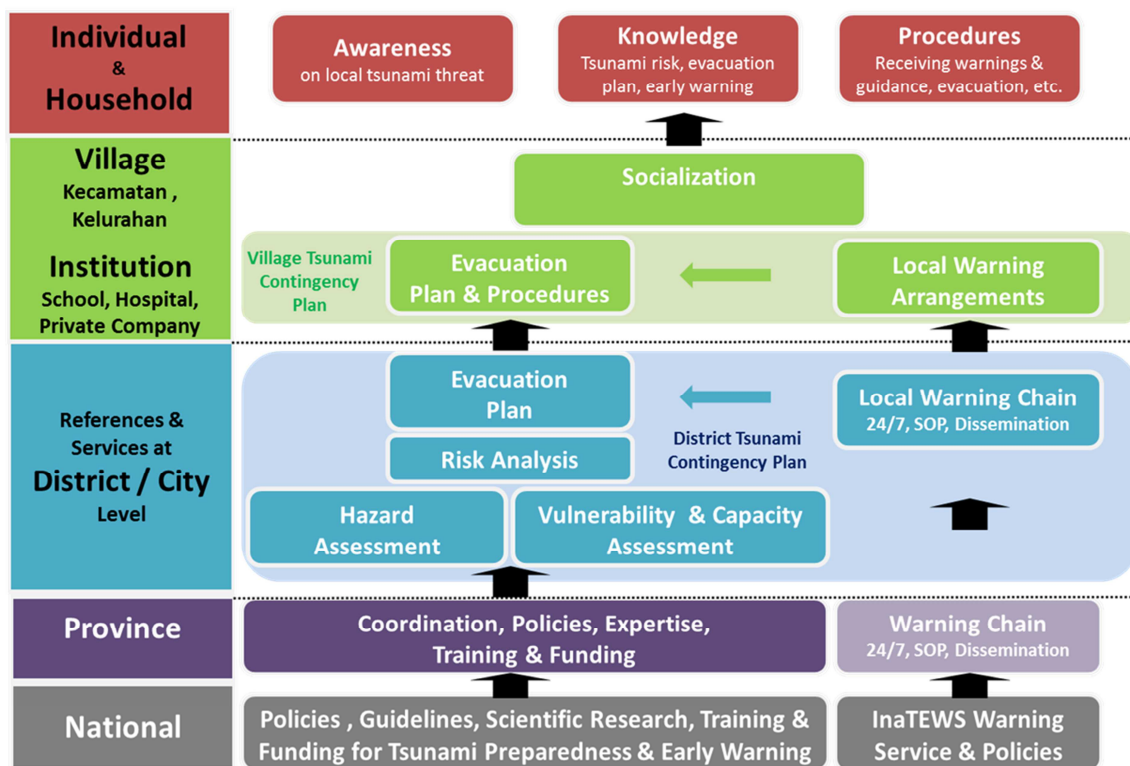
A4: Tsunami Preparedness in Local Communities - A Structured Approach

The rationale for this approach is based on the assumption that the chances to survive a near-field tsunami depend very much on the capacities of the affected people to quickly assess the situation and take the right decisions and actions based on basic but solid knowledge of local tsunami risks and preparedness plans, even in the case of the failure of warning services or in the absence of guidance from local authorities during an emergency.

Therefore people in risk areas need to be aware about tsunami hazard and risks and understand local warning and evacuation procedures. Furthermore, individuals and families should be encouraged to discuss and agree on own emergency procedures within their families or households (Red Level).

To provide people in communities at risk with more than thumb rules or general instructions on how to react to a tsunami threat, it is necessary to develop specific local evacuation maps and procedures as well as warning arrangements in a participatory way and communicate them to all community members (Green Level).

Developing such plans at village or institutional level usually requires references regarding hazard and safe zones and recommended evacuation strategies, as well as the development of local warning services.



Source: http://www.gitews.org/tsunami-kit/en/id_structured_approach.html

