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Japan - UNESCO - UNU INTERNATIONAL SYMPOSIUM

The Great East Japan Tsunami and Tsunami Warning Systems: Policy Perspectives

Summary Statement

ユネスコ・国連大学 国際シンポジウム

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東日本大震災と津波警報システムのあり方を問う

—政策の観点から

ウ・タント国際会議場、国連大学（東京都渋谷区神宮前）

16 - 17 February 2012

U Thant International Conference Hall

United Nations University Tokyo

Supported by:

Ministry of Foreign Affairs of Japan, Ministry of Education, Culture, Sports, Science and Technology Japan, Disaster Management, Cabinet Office of Government of Japan, Ministry of Land, Infrastructure, Transport and Tourism of Japan, Japan Meteorological Agency, Fire and Disaster Management Agency, Japanese National Commission for UNESCO, The University of Tokyo, Asian Disaster Reduction Center, Japan International Cooperation Agency, Japan Broadcasting Corporation (NHK), The Mainichi Newspapers

後援

外務省、文部科学省、内閣府政策統括官(防災担当)、国土交通省、気象庁、消防庁、
日本ユネスコ国内委員会、東京大学、アジア防災センター、国際協力機構、
日本放送協会、毎日新聞

This symposium is dedicated to all the victims of the Great East Japan Earthquake and Tsunami on 11 March 2011

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For bibliographic purposes this document should be cited as follows:
Summary Statement from the Japan – UNESCO – UNU Symposium on
The Great East Japan Tsunami on 11 March 2011 and Tsunami Warning Systems:
Policy Perspectives 16 – 17 February 2012 UNESCO/IOC 2012

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Photo: Thorkild Aarup

Printed in France
(IOC/BRO/2012/1)

The Symposium

Coming from 25 countries, 290 physical and social scientists, warning system operators, emergency and response managers, planners, journalists, policy- and decision makers attended the Japan – UNESCO – UNU Symposium on The Great East Japan Tsunami on 11 March 2011 and Tsunami Warning Systems: Policy Perspectives from 16 – 17 February 2012 in Tokyo. The symposium was organized by the Intergovernmental Oceanographic Commission of UNESCO and the United Nations University, in collaboration with the Government of Japan.

The Opening Session was moderated by Dr Wendy Watson-Wright, Executive Secretary of IOC and Assistant Director-General of UNESCO. Welcoming remarks were provided by His Imperial Highness Crown Prince Naruhito. The symposium was officially opened by Ms Irina Bokova (Director General of UNESCO) and Dr Konrad Osterwalder (Rector of the United Nations University). Closing remarks were provided by Mr Kōichirō Matsuura, Former Director General of UNESCO.

The Background

The Great East Japan Earthquake and Tsunami on 11 March 2011 resulted in the loss of about 19,000 lives. Major damage and destruction occurred to buildings and infrastructure in the flooded areas, with large societal impacts and social and economic consequences. The Japan Cabinet Office has estimated the losses to 16,9 Trillion Yen (approximately 220 Billion US \$).

Since the event many national and international post-tsunami field surveys have been carried out. Performance analyses of tsunami early warning systems in place at the time of this event have also been done (Ref 1).

The Facts (as of 29 February 2012)

- 15,844 people were killed and 3,276 people are missing.
- 128,753 houses were completely destroyed and 245,376 houses were partially destroyed.
- 92.4% of the deaths were caused by drowning (1.1% were burned, 4.4% crushed, and 2% unspecified).
- 65% of the dead were over 60 years old.
- The magnitude 9.0 earthquake and the associated gigantic tsunami were unforeseen.
- Maximum run-up heights greater than 10 m are distributed along 530 km of coast and maximum run-up heights greater than 20 m are distributed along 200 km of coast measured directly. The highest run up height was 40 m.
- 535km² of land area was inundated over a coast line of about 2400 km.
- Many coastal tsunami protecting structures were destroyed; 190 km of coastal dikes and sea walls (out of a total of 300 km of such structures) in the Tohoku region were fully or partly destroyed.
- Much of the critical infrastructure such as disaster management centers, city-government halls, fire stations, railways, ports, airports, hospitals, and schools was destroyed by the tsunami.
- Power outages occurred in wide geographic areas and over long time periods.
- A major tsunami warning was issued by the Japan Meteorological Agency (JMA) within 3 minutes, but the initial warning underestimated the size of the tsunami. JMA subsequently updated the warnings, however in some locations public communication systems were damaged by the earthquake hindering dissemination.
- According to the report by the Japan Central Disaster Management Council (28 September 2011) the underestimated tsunami warning delayed immediate evacuation in some cases. In other cases communities assumed they were safe due to the existence of tsunami sea walls and didn't evacuate.

Based on the information provided by the surveys and performance analyses, the symposium provided a number of high level perspectives that addressed:

- Event facts and analysis.
- Tsunami Warning Systems, tsunami preparedness and event experiences.
- Lessons learned from this event that have policy implications for improving tsunami detection, warning, community education, planning and response.

The Symposium: Lessons Learned and Policy Implications

The symposium was organized in five sessions, each including presentations and a subsequent panel discussion among presenters and invited panelists. For each of the sessions the main synthesis of the lessons learned and policy implications are provided below. Details about the programme, presenters and panelists are available in Ref 2.

Session 1:

What happened during the Tsunami of 11 March 2011? What was unexpected? What is a new strategy to prepare for the unexpected?

- Early self-evacuation is of major importance, particularly if a strong earthquake is felt or if the earthquake is weak but with slow tremors that continue for a long time. It is not necessary to wait for an official evacuation order.
- Tsunami drills and exercises should include worst-case scenarios; with due consideration of seasonal meteorological conditions and that primary evacuation routes may be blocked.
- Reliable and back-up communication systems for dissemination of tsunami warnings are essential for providing information to the public and the media.
- Breakwaters and seawalls can not always protect lives and property.

- Coastal structures and coastal planning should be implemented in a holistic manner that takes into consideration the capacity and capability of the warning system, land use planning and coastal mitigation measures in order to optimize protection of life and property from earthquakes and tsunamis.
- Tsunami “monuments” can be helpful in passing on the tsunami experience to coming generations.

Session 2:

Run away from the Tsunami! Education in schools and communities. Why do some people not evacuate?

- Awareness of the risk of tsunami disaster can reduce impacts and loss of lives. Psychological and sociological aspects should be taken into consideration in developing education and awareness materials.
- Continual tsunami disaster education in schools and at the community level is essential to facilitate effective community response.
- Underestimated tsunami warnings do have an impact on people’s reaction; the content of the national tsunami warnings must be examined from recipients’ point of view.
- Local tsunami hazard maps with detailed explanations should be developed in order to enhance the residents’ tsunami disaster awareness and response during an event.
- Evacuation by car may be the only option possible for people with limited mobility. In an evacuation situation clear prioritization of car usage is critical to avoid traffic congestion and this should be taken into consideration when developing evacuation route maps.
- There is an ongoing need to better educate communities about the tsunami threat and the associated risk to help manage expectations about what warning systems can do and what the communities themselves must take responsibility for.

Session 3:

Towards the improvement of standard operational procedure (SOP) of Tsunami warning centers. What is an understandable and effective Tsunami warning?

- All tsunami warnings need to be timely, as accurate as possible in the time available, brief and comprehensible to ensure appropriate community response.
- Every tsunami is different in character, with local tsunamis such as occurred on 11 March 2011 creating the greatest challenges due to the extremely short time available to detect and warn coastal communities.
- Enabling research and collaboration between the research and operational tsunami communities should continue to reduce the time for determining reliable earthquake magnitudes, as well as increase the accuracy and space resolution for forecasts of possible tsunami wave impacts, from local and distant earthquake sources.
- Broadband, high-dynamic range seismometer measurements are necessary for rapid and precise analysis of strong local tsunamigenic earthquakes (magnitude greater than 8.0).
- Analysis of real-time continuous GPS measurements is useful for determining earthquake dynamics; there is a need to develop this processing technique from research mode to operational mode.
- Offshore and coastal real-time sea level observations help to verify and modify warnings.

Session 4:

What is the role of mass media: Global media collaboration in response to natural hazards and preparedness?

- The essential role that mass media play during a disaster event is the broadcasting of reliable information for the safety of the public.
- Information can save lives. Therefore cooperation among media and between media and tsunami warning and emergency authorities

for broadcasting timely, reliable and accurate information is essential.

- Social media have a role in the collection and distribution of information to/from the public, but the information requires the same verification as any other source of information used by journalists in order to be credible and reliable.
- For disaster related information two essential keywords are reliability and accuracy. All journalists are looking for reliable sources and for authoritative information provided by experts. The cooperation established over the years between JMA and Japan Broadcasting Cooperation (NHK) on tsunami warning dissemination and response is exemplary and is a model for others to follow.

Session 5:

Strengthening international cooperation: What is the role of international organizations?

IOC/UNESCO with partner organizations must continue to lead the coordination of global tsunami warning systems, based on its experience and responsibility over more than five decades. This includes:

- Ensuring the robust, efficient and effective performance, and global coverage of end-to-end, interoperable warning systems for coastal hazards, operated by mandated national agencies, requires intergovernmental coordination in norm- and standard setting.
- Continuing to raise awareness about the tsunami threat and to advocate why nations need to invest in early warning systems.
- Facilitating the exchange and sharing of information on all facets of end-to-end tsunami warning systems, from tsunami detection to community education response.
- Continuing to provide for networking and stimulation of education and multi-disciplinary science and enabling research in support of tsunami warning systems and mitigation efforts.
- Facilitating the provision of data and information to all countries.

References

- (1) Report of the Committee for the Technical Investigation on Countermeasures for Earthquakes and Tsunamis Based on the Lessons Learned from the “2011 off the Pacific coast of Tohoku Earthquake” published by the Cabinet Office of the Government of Japan 28 September 2011, <http://www.bousai.go.jp/jishin/chubou/higashinihon/Report.pdf>
- (2) <http://ioc-tsunami.org/tohokusymposium>

Speakers and Panelists

Kouji Ikeuchi, Fumihiko Imamura, Takayoshi Iwata, Osamu Kamigaichi, Shunichi Koshimura, Takehiko Kusaba, Yutaka Michida, Kiyoshi Natori, Shigeo Ochi, Isoo Sasaki, Kenji Satake, Naoya Sekiya, Masashi Suenaga, Kazuhiko Takeuchi, Shinya Ejima, Hideki Yamaguchi, Hiroshi Yarai

Régis Arnaud, Rick Bailey, Eddie Bernard, Maria Ana Baptista, David Coetzee, Marsha Cooke, Lori Dengler, Martin Fackler, Hélène Hébert, Akira Ikegami, Lorna Inniss, Daniel Jaks, Karl Kim, Ardito Kodijat, Peter Koltermann, Charles McCreery, Megumi Nishikawa, Gerassimos Papadopoulos, Denis Peter, Irina Rafliana, Fadi Salameh, François Schindelé, David Tappin, Wendy Watson-Wright, Noboru Yamazaki

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Acknowledgements

Cornelia Hauke, Srikantha Herath, Kaori Masuda, Hideyuki Mohri, Yuki Nakano, Julie Saito, Yoshie Sawada, Kazuko Yamamoto, Mari Yamamoto



Tsunami monument at Unosumai-chou near Kamaishi (Iwate Prefecture) commemorating the Great East Japan Earthquake and Tsunami of 11 March 2011. The inscription at the bottom of the monument reads: *"Memorial Stone of the Tsunami! Just run. Run Uphill! Don't worry about the others. Save yourself first. And tell the future generations that a Tsunami once reached this point. And that those who survived were those who ran. Uphill. So run! Run uphill!"*.



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