14 TT TWO

TOWS XIV report (2021)

- **15. GLOBAL SERVICE DEFINITION DOCUMENT**
- … changes incorporated in section 4.7 (models), 4.8 (standard operating procedures), etc. of the Global Service Definition Document (GSSD). Other additions proposed to be incorporated by the IOC Secretariat are listed in the contents section of the revised GSDD. Any changes to the roles and responsibilities of NTWCs should take into careful consideration the status in different ICGs.

- **Action 2:** Update the Global Service Definition Document (GSDD) during the inter-sessional period and submit for approval at the 2022 TOWS-WG meeting.
- **Recommendation 5**: Review the GSDD at each TT TWO meeting with a view to publish a new version every 3 years, when necessary.

TT TWO Feb 2022

ITEM 14 GSDD – update

Global Service Definition Document

(F. Schindelé)

CONTENT¶

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ANNEXES¶

GSDD – update 1/5

4.7 → FORECASTING TECHNIQUES¶

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ICG-TSPs base their forecasts of tsunami characteristics either based on earthquake magnitude (qualitative) or based on numerical oceanographic models (quantitative). The size and spread of a tsunami depends on the location, length of rupture, and the orientation and amount of vertical motion in the sea floor caused by an earthquake, and the bathymetry over which the tsunami travels towards the shore. The numerical models must therefore be initialized with these earthquake rupture parameters and include bathymetry data. Because initial tsunami bulletins must be issued within minutes of an earthquake occurrence, real-time running of the TSPs' models is not currently practical. As a result, all TSPs have carried out large numbers of non-real time model runs, using a range of possible earthquake characteristics. These scenario databases can be quickly compared to observed earthquake characteristics, so that the best match can be selected as the basis for forecasts.¶

The models provide various results. Several models compute the inundation of the tsunami inland, other models compute the tsunami height/amplitude at the shoreline. The accuracy of results depend of the model use. The green law is a generic model use in most of the TWS. This system don't provide any accuracy on the results of tsunami height and is very rough because it don't take into account the fast local characteristics/behavior of the submarine topography that could be very different in various areas with islands, submarine canons or plateau, coral reef… Recently new adapted green laws have been developed and

GSDD – update 2/5

7. → ICG PRODUCTS

ICG-TSPs may generate two types of bulletins: Tsunami Public Bulletins and Tsunami Exchange Bulletins.

7.1 → PUBLIC BULLETINS AND PRODUCTS

These bulletins will be widely distributed in various formats and through public and private communication systems (GTS, Email, Fax, Web, SMS, etc.) necessary to facilitate a broad reception, including the global media. There will be the first bulletin, and in the case of a potential threat, updates will be issued.

a. → Bulletin°1. Will include earthquake parameters (latitude, longitude, depth, magnitude) and indicate if there is the potential for a destructive tsunami for a certain area. The potential for a destructive tsunami will be defined as potential, undetermined potential (for situations where the travel time is greater than 2 or 3 hours) or no potential. These bulletins will be issued within minutes of the earthquake.

b. → Bulletin°2, 3, 4… These bulletins will provide an update on the earthquake parameters (latitude, longitude, depth, magnitude, and origin time), the threat level as assessed by the TSPs or as reported by the national authorities to the TSPs as the case may be in different ICGs.

~~b.~~ → Remark : a particularity in the NEAM region, due to the small size of the Mediterranean and connected seas, the decision time by the authorities after the TSP and NTWC issuance of warning should be shorten as possible, with all necessary information needed related to the earthquake and to the expected tsunami. It is not recommended to issue a first bulletin to the NTWC and TWFP.

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7.2 → NON-PUBLIC EXCHANGE BULLETINS AND PRODUCTS

GSDD – update 3/5

9.4 → PROCEDURE FOR REPORTING OF ESTIMATED AND OBSERVED SEA LEVELS¶

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All sea level gage should record at 1 sample/s or higher in order to record relevant tsunami data from all seismic and non-seismic sources. ¶

Amplitude: TSPs should use amplitude relative to sea level as the common measure of a tsunami and this should be clearly defined in the message. All TSPs should report forecast and observations as amplitude relative to sea level at the time of the forecast or observation. Amplitude is measured as 1) the absolute value of the difference between a particular peak or trough of the tsunami and sea level at that time, or 2) half the difference between an adjacent trough and peak and can be corrected for the change of tide between that trough and peak. Each TSP will specify the methodology and the parameters used for producing forecast amplitudes in its Service Definition Document.¶

Commentaire [SF13]: Tide gage sampling should be reported. It should be avoided to report Tide gage amplituides with sampling larger than 1 min.¶

GSDD – update 4/5

12. → LIMITATIONS OF THE SYSTEMS/PROCEDURES

The science of rapidly and accurately forecasting tsunamis has made important strides in recent years but challenges remain. Limitations of warning systems should be known and understood in order to best plan for and execute an appropriate response. For example, the current tsunami warning systems are designed to provide tsunami forecast information for tsunamis caused by submarine and coastal earthquakes; not those caused by other sources such as submarine and coastal landslides, volcanoes, etc.

The greatest unknown about the tsunami in real-time (and even later) is the nature of earthquake. How did the seafloor deform? How much was it displaced up or down and over what areas? Models all make assumptions about the source based upon the seismic analysis or later upon nearby sea level gauge readings, but they only approximate the actual rupture geometry. The second greatest unknown is how the tsunami will interact with the coast. In most cases a general approximation must be used. Even when detailed coastal inundation models are available, properly capturing coastal resonances, trapped wave energy, and multiple wave interactions after even a few wave cycles is not possible. For these reasons, the forecast model information provided in the TSP products should be viewed with care, taking into consideration the limitations that are explained later in this document.

12.1 → EARTHQUAKE PARAMETERS

Earthquake parameters provide the earliest indication of a potential tsunami because seismic waves travel much faster around the earth than tsunami waves. Consequently, the fastest initial tsunami warnings are based entirely on the preliminary earthquake parameters. However, sometimes warnings based on large earthquakes with the potential to generate a widespread destructive tsunami are cancelled when significant tsunami waves are not observed. A number of factors contribute to this limitation, most importantly when the tsunami is generated by predominately strike-slip fault. In this case and where the seismic fault is located far from any coastlines, vertical seafloor displacement is usually very small, and generated tsunami can be small comparing to the magnitude. On the other hand, tsunami earthquakes with slow but large slip rupture may generate much larger tsunami than expected from magnitude.

Commentaire [SF14]: "tsunami earthquakes";; splay-fault....

Commentaire [SF15]: This paragraph should be completed by the Team of Atypical tsunami sources

GSDD – update 5/5

CONTENT¶

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ANNEXES¶

Add A new chapter on :

Interim Hunga Tonga
Hunga Ha'apai warning system