Probabilistic TSUnami Hazard MAPS for the NEAM Region (TSUMAPS-NEAM) ECHO/SUB/2015/718568/PREV26

Extended Progress Report

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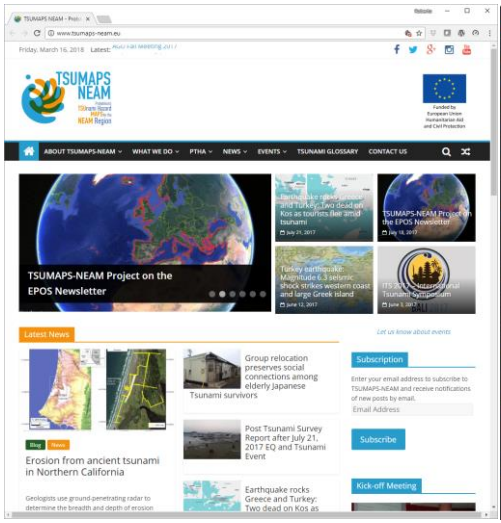

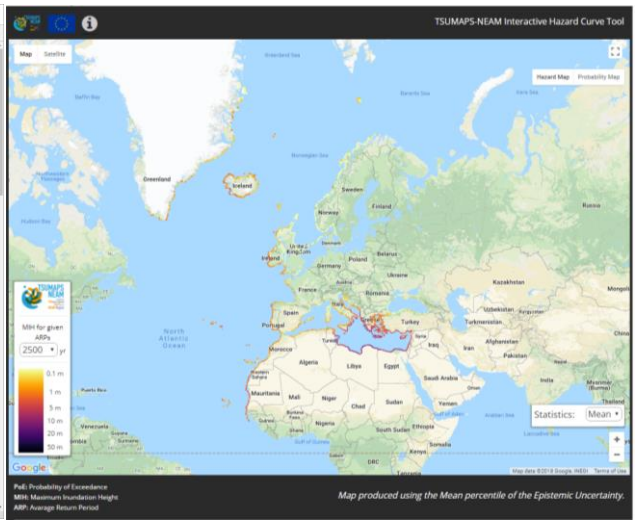

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1. Project objectives, partnership and expected deliverables.

Title of the project: Probabilistic **TSU**nami Hazard **MAPS** for the **NEAM** Region.
Acronym: **TSUMAPS-NEAM**.
TSUMAPS-NEAM is a Prevention Project, Priority 3, External Budget item. The total duration of the project is **21 months**.
This report considers activities carried out during the entire project duration, i.e. from **01/01/2016** to **30/09/2017**.
A region-wide long-term homogenous probabilistic tsunami hazard assessment (PTHA) from earthquake sources was not available before this project. TSUMAPS-NEAM's general objective was to fill this gap. This PTHA should serve as a basis for future national and local PTHAs and be the first step to include tsunamis in multi-hazard risk assessments. The specific objectives of the project were tackled by the following four consecutive actions: 1) designing the methodology and producing a state-of-the-art, standardized, and updatable PTHA with full uncertainty treatment; 2) reviewing the entire process with international experts; 3) producing the final PTHA, its online database and maps, and the documentation of the followed procedures; and 4) publicizing the results through an awareness raising and education phase, and a capacity building phase, particularly oriented toward Enlargement and Neighbourhood Policy countries.

Partnership:

INGV	NGI	IPMA	GFZ	METU	UB	NOA	CNRST	INM
Italy	Norway	Portugal	Germany	Turkey	Spain	Greece	Morocco	Tunisia
Member State	Participating State	Member State	Member State	Enlargement	Member State	Member State	Neighbourhood Policy	Neighbourhood Policy

The partnership of the project included research institutions established in EU countries, as well as in Enlargement and Neighbourhood Policy countries, spread all across the European continent with coastlines facing the NEAM Region, and bearing significant exposure to potential tsunami hazard. Further potentially threatened countries were included as end-users, or by involving key-advisors with roles in the Intergovernmental Oceanographic Commission (IOC/UNESCO) Tsunami Program and representative of the Tsunami Service Providers (TSPs) in the NEAMTWS.
Expected deliverables are listed below with month of delivery indicated in parenthesis.

- D1, First Progress Report (M9);
- D2, Second Progress Report (M16);
- D3, Final Progress Report (M23);
- D4, Online Tsunami Hazard Database (M14);
- D5, Tsunami Hazard and Probability Maps (M14);
- D6, Experts' Review and Sanity Check (M18);
- D7, Methods and Data Documentation (M18);
- D8, Project Website (M4);
- D9, Awareness and Education Materials (M16);
- D10, Guidelines and Training Tools (M19);
- D11, Layman's Report (M21).

2. General summary of project implementation process

The project was conceived as a cascade of activities, subdivided into four tasks (A-D). Task A was devoted to project management and reporting. Task B was devoted to the design and implementation of a probabilistic hazard assessment model for tsunamis of earthquake origin. This hazard assessment included: 1) an elicitation of experts (the "Pool of Experts", PoE, was formed by fifteen scientists, eight of which selected among the partners and seven from the international community) to make critical choices and to assign weights to alternative models; 2) a thorough peer-review process (performed by twelve "Internal Reviewers", IR, different from the PoE). Task C performed sanity checks and prepared the documentation of the hazard assessment. Task D carried out publicity and dissemination, and particularly, built the public interface with the results of Task B. At the beginning of the project implementation, the formalization of the consortium was slightly slower than expected so that several activities had a slightly delayed start with respect to the initial plans. Conversely, the Task C activities have started earlier than initially planned, together with other tasks. Apart from this late start, and although the four tasks were initially thought to be separated, their practical implementation was carried out collectively and with a high degree of internal collaboration.

In the second period, some important changes in the time schedule of few deliverables were deemed necessary for ensuring the quality of the products, or for improving them, with respect to the initial plans. In particular, we needed to postpone the final meeting, initially planned to be held in June 2017 in Tunisia, because the Ramadan in 2017 will start on May 27 and finish on June 25. We realized that this occurrence would have caused some inconveniences to the logistics of the meeting and decided to change plans. In the meanwhile, consultations were going on with IOC/UNESCO to organize a general tsunami information meeting back to back with TSUMAPS-NEAM. We thus agreed to have this meeting in Tunisia on occasion of the project final meeting. In so doing, we turned this change into an opportunity. This meeting was shaped up to become much like the IOC/UNESCO meeting held in Morocco in 2014 (http://unesdoc.unesco.org/images/0023/002305/230519m.pdf) and to also provide information about the NEAMWave17 exercise. A concept note about this meeting was prepared in February 2017, by both parties and was forwarded by INM to the Tunisia's local authorities in early spring 2017. INM also managed to involve the Arab League Educational Cultural and Scientific Organization (ALECSO) which was strategic for the dissemination and awareness raising in the Arab countries (see the Tunisia meeting minutes in the project repository).

On the technical side, most of the scientific framework, input data, and part of the technical platform for the hazard assessment were based on resources already acquired by partner institutions (including but not limited to EU-funded projects). Most importantly, part of the work was carried out in collaboration with the EU FP7 ASTARTE project. A significant part was also developed with the support of the Italian Civil Protection Authority in the framework of an agreement with INGV for tsunami hazard. Therefore, the efforts to pursue the project-specific objectives relied mainly on human resources (personnel) and the need of frequent meetings to ensure the collaboration of the various specialists and the coordination of activities.

3. Evaluation of project management/implementation process

The cooperation between and among the institutions forming the partnership was very fruitful and seamless in most occasions. A relatively small exception was the need to address the cooperation with some institutions and individuals that had only limited previous collaboration in EU projects. This was at once an issue and an opportunity, as it represented a chance to create a collaborative network in tsunami hazard assessment that did not exist before, and this network represent now an added value for enlargement and neighbourhood policy countries.

An administrative issue required much attention with CNRST because its leading scientist in charge, Prof. Aomar Iben Brahim, had to leave CNRST because he was reassigned by the Ministry of Higher Education to serve at the Mohamed V University in Rabat. Solutions were sought to minimize the impact onto technical results and quality of products. This administrative issue with CNRST was then solved when CNRST appointed Dr Sabah Benchekroun as the new responsible in charge (as of communication of 01/12/2016). The CNRST contribution to the project has been reconsidered and incorporated into ongoing activities with focus on Task D.

Face-to-face meetings were the privileged way to strengthen the collaborative attitude of all partners toward a common goal throughout the project duration. Several further meetings were held remotely, by teleconference, in order to save funding from travel to the benefit of personnel costs. This is particularly evident in the budget transfer between these two categories, and in the increased budget to GFZ for supporting more personnel.

The positive response of international experts (several of which participated to the technical review meeting held in Athens on 28/06-01/07/2016 and in the final meeting in Tunis on 11-14/09/2017) and of the Italian Civil Protection Authority (CPA) to participating in the elicitation procedure and in the technical/scientific review of the hazard assessment is a good indicator that the TSUMAPS-NEAM results may become a useful benchmark for future risk mitigation plans (a letter from the Italian CPA, following the Athens Meeting of 29 June-01 July 2016, was attached to the meeting minutes).

Likewise was the collaboration with other projects. It is to be noted that the ASTARTE EU FP7 project, from which much of the theoretical framework for TSUMAPS-NEAM is borrowed, was extended to April 2017 (six months). The extension and rescheduling of some activities have been better aligned with ASTARTE. TSUMAPS-NEAM contributed to some ASTARTE deliverables and participated in the final ASTARTE Meeting in April 2017 in Mallorca, Spain. This augmented collaboration between the two projects will produce mutual benefits.

A new opportunity that came along during the second period of the project, in addition to those already envisaged in the original project proposal, is the development of the Global Tsunami Model network (GTM; http://www.globaltsunamimodel.org/). It should be noted that GTM has been endorsed by UN-ISDR and GFDRR in the spirit of the Sendai Framework for Disaster Reduction (2015-2030). The collaboration with the GTM was pursued by participating at GTM meetings and promoting TSUMAPS-NEAM as an incubator for future initiatives, and make the EU being one of the main players in the international effort toward the creation of global standards and good practices for tsunami hazard assessment and risk mitigation.

4. Activities

4.1. First reporting period (01/01/2016 – 31/07/2016)

The progress in each task has been checked and discussed in three major formalized meetings, and more informally by using the Google Groups and teleconferences at more frequent intervals:

1) Technical Kick-off Meeting, held in Rome, Italy, on 10-11 February 2016.
2) Splinter Meeting, held in Vienna, Austria, c/o EGU 2016, on 22 April 2016.
3) Technical Review Meeting, held in Athens, Greece, from 29 June to 1 July 2016.

Meeting 1) was held about two weeks later than the initially scheduled period. The other two meetings were held at the scheduled time.

In consideration of the willingness of the project partners to produce a more robust and complete hazard assessment, the engagement of the international panel of reviewers, and the opportunity to interface with other concurrent projects and research networks (e.g., ASTARTE, GTM), the coordinator proposes to align the deadlines of Deliverables D4, D5, D6 and D9 at the end of the second reporting period (M13). This will allow the project to better incorporate the external experts' evaluations and recommendations into the main technical data products of the project (i.e. hazard online database and maps, as well as the associated documentation and dissemination material) while leaving the Commission ample time to familiarize with these results well ahead of the project conclusion.

The new deadlines for these deliverable are listed below and reported in the updated T2 form.

- D4. Online Tsunami Hazard Database (M13)
- D5. Tsunami Hazard and Probability Maps (M13)
- D6. Experts' Review and Sanity Check (M13)
- D9. Awareness and Education Materials (M13)

More specifically, D4 and D5 have been initially published in the project website under password protection. The content of these deliverables has been disclosed to all project partners, the external reviewers, a selection of end users, and the Commission for examination. We expect to receive feedback from these actors, and then update these deliverables accordingly before final publication, open to anyone, at the end of the project.

As part of the monitoring of activities, the main milestone was Meeting 3) during which the practical implementation plan of the tsunami hazard assessment has been thoroughly revised.

The minutes of Meetings 1 and 3 are available in the project repository.

4.2. Second reporting period (01/08/2016 – 28/02/2017)

The progress in each task has been checked by reaching several milestones, which coincide with presentations of preliminary and intermediate results at five major meetings.

1) At the Dissemination Meeting, held in Oslo, Norway, on 31/08-03/09/2016, two key aspects for deliverables D4 and D5 were set: a) tsunami hazard metrics and amplification factors; b) technical aspects for displaying hazard curves and maps.
2) The EWS Experts Group Meeting, held in Brussels, on 22/09/2016, was an opportunity to present and discuss the potential interconnections with other organizations and projects of the EU civil protection system.

3) The ICG/NEAMTWS Meeting, held in Bucharest, Romania, on 26-28/09/2016, was the first dissemination meeting planned by the project. It was meant to establish a connection between the hazard products and the NEAMTWS activity.
4) The GTM Meeting, held in San Francisco, USA, on 10/12/2016, reinforced the connection with the networking activity of the GTM organization. In this respect, the TSUMAPS-NEAM project qualifies as a pilot program toward new standards of tsunami hazard assessment.
5) The AGU Fall Meeting, held in San Francisco, USA, on 11-16/12/2016, was the ideal venue for disseminating the project scientific products and interface with the scientific community at large. A poster with the project description and preliminary results was presented.

This period of the project was mainly dedicated to developing the preliminary hazard model and the preparation of deliverables D4 and D5. The content of these deliverables is disclosed to all project partners, and progressively to the reviewers, some end users, and the Commission. We expect feedback from all these actors, and then update these deliverables accordingly before their final publication, open to anyone, at the end of the project.

Activity has proceeded on all other tasks. Importantly, the data of the elicitation experiment carried out during the Athens meeting (29/06-01/07/2016) have been analysed. The results of this elaboration will serve to set the weights to the model alternatives. The documentation for the formal review is under preparation and will be distributed to the reviewers in the early spring 2017. The awareness and education materials related to the use of online maps is being drafted while the web site is developed.

As part of the monitoring of activities, the main milestone was the ICG Meeting in Bucharest for the start of the publicity activity. The good impact of the project results from the positive comments from the ICG and the proposal of IOC-UNESCO to organize together the meeting in Tunisia. As for the latter, a concept note of the meeting will be prepared in February 2017.

4.3. Third reporting period (01/03/2017 – 30/09/2017)

This reporting period was the most intense in terms of activities devoted to the actual PTHA implementation. Most of the deliverables concentrated in this period, including the interaction with PoE and IRs. The progress in each task was checked by reaching several milestones, which coincide with six major meetings.

1) ICG/NEAMTWS Task Team and Steering Committee Meetings, held on 20-21/03/ 2017 in Paris, France to check progressive interaction with the main stakeholder.
2) The ASTARTE project final meeting held on 06-07/04/2017 in Mallorca, Spain, allowed discussing critical elements in view of the preparation of the period's deliverables and strengthening the collaboration between the two projects in practical terms.
3) The EGU General Assembly 2017, held in Vienna, Austria, on 24-28/04/2017, was the ideal venue for presenting the project to the scientific community at large. A splinter meeting was held on 26/04/2017 to discuss the project progress. The participation at the GTM splinter meeting on 25/04/2017 reinforced the connection with the GTM network.

4) A technical meeting held in Rome, Italy, on 12-13/06/2017 to finalise the hazard model implementation, from calculations to output and display in Internet.
5) The International Tsunami Symposium, held in Bali-Flores, Indonesia, on 21-25/08/2017 where the ASTARTE coordinator presented to the wide tsunami science community an overview of tsunami research activities in Europe and the links between ASTARTE and TSUMAPS-NEAM.
6) The project final meeting held in Tunis, Tunisia, on 11-12/09/2017, to consolidate the project results, raising awareness and improving risk understanding in the NEAM Region by dissemination and building local capacity on the methodology, the interpretation, and the use of regional PTHA, with the involvement of ALECSO to improve knowledge transfer to neighbourhood-policy countries. Direct personal meetings with PoE members, IRs, end users, and stakeholders took place as well.
7) Participation at the IOC/UNESCO Information Meeting held in Tunis, Tunisia, on 13-14/09/2017 on NEAMTWS and Mitigation System, as well as the NEAMWave 17 Tsunami Exercise, emphasizing the complementarity between NEAMTWS and regional PTHA.
8) Participation at the IOC/UNESCO Information Workshop on NEAMTWS held in Madrid, Spain, on 25-26/09/2017 where the project results were presented.

This period of the project was mainly dedicated to consolidating the hazard assessment effort. This involved incorporating input through PoE's elicitation, from the IRs, and collecting feedback from end users and stakeholders. Activity has proceeded on all tasks. Importantly, the results of the elicitation, the documentation of the review, and sanity checks were extensively discussed in the Tunis Meeting of 11-12/09/2017, with the presence of several IRs and PoE members.
The minutes of Meetings 4 are available in the project repository.

5. Presentation of the technical results and deliverables

Below is a short description of each deliverable in order of completion. Notice that deliverables D4 and D5 are made accessible through an interactive graphical user interface on a dedicated web site. The website has remained password protected until the end of the project to prevent the misuse of preliminary results by occasional users. This has allowed for better incorporating the external experts' evaluations and recommendations into the final hazard model while leaving the Commission ample time to familiarize with these results well ahead of the project conclusion.

5.1. Deliverable D8

Project Website (M4). This deliverable is composed by three main items: website and included links to social media, Google Groups, and repository. The website was completed on April 4, 2016, and since then it has been used to present and advertise the project itself and its activities. Including, but not limited to, project meetings objectives and agenda. The website is open to the public and accessible through the URL: http://www.tsumaps-neam.eu/ and it will be maintained, also after the end of the project for accessing the Tsunami Hazard products (database and maps), distribute the hazard documentation, and dissemination and educational materials.

The Google Groups is a service from the Google Company that provides a platform for collaboration among people sharing common interests. We used it for internal organization, discussions, and preparation of project documents in combination with the Google Drive service.

The repository is a data-sharing environment (cloud server) with 4 TB storage capacity and auto backup system. The repository is accessible to all registered users, project partners, from anywhere through any device (Web Browser, Desktop app, Android, iOS). This repository is being used to store data, data products, and documentation as they are finalized. This repository will serve as a persistent storage of the project documentation and data.

A folder dedicated to store material to be shared with the Commission and other selected users can be accessed using login credentials distributed privately.

This folder contains the following material:

- Data Archive: input data and partial results of the hazard assessment;
- Deliverables D1-11 and updated T2 form;
- Presentations given at scientific meetings;
- Minutes of project meetings.

Relevant links to documentation in the project website point directly to items in this folder.

5.2. Deliverable D1

First Progress Report (M7) describing project progression of the first reporting period (M1-7), completed on 29/09/2016.

5.3. Deliverable D4

Online Tsunami Hazard Database (M14). This deliverable is composed by a database of tsunami hazard curves calculated at pre-defined Points of Interest (POIs). Each curve expresses the probability of exceeding a given level of Maximum Inundation Height (MIH) at the POI. For each POI, a suite of curves are calculated that represent the

distributions of all model alternatives. The database stores the mean, 2nd, 16th, 50th, 84th, and 98th percentiles.
POIs are distributed as follows: 137 in the Black Sea, 1130 in the Mediterranean Sea, and 1076 in the North-east Atlantic Sea. The average spacing between POIs is c. 20 km. The overall database is produced in XML format and can be queried by the tool in D10.

5.4. Deliverable D5

Tsunami Hazard and Probability Maps (M14) D5 is composed by:

- Hazard Maps for Average Return Periods of 500, 1000, 2500, 5000, 10000 years;
- Probability maps for Maximum Inundation Heights of 1, 2, 5, 10, 20 meters.

For each map values are extracted for the mean, the 16th, and the 84th percentiles, which makes an overall number of 30 maps.
These maps are prepared by using data of the hazard curves in D4 for all POIs. Hazard maps are obtained by selecting a design probability on the hazard curve and plotting the corresponding tsunami MIH level. Probability maps are obtained by selecting a tsunami MIH tolerance level on the hazard curve and plotting the corresponding probability of exceedance.
All maps are displayed by tool in D10.

5.5. Deliverable D2

Second Progress Report (M14) describing project progression of the second reporting period (M8-14), completed on 29/04/2017.

5.6. Deliverable D9

Awareness and Education Materials (M16). This deliverable is composed by prototyped brochures, news posted on the website, and videos to be distributed/shown in occasions of meetings with the public, especially at the final meeting in Tunis.
A newsletter article addressing the status of the project and the potential for future collaborations between TSUMAPS-NEAM products and the EU project EPOS-IP was jointly published in the project website and in EPOS-IP website in July, 2017, and available at the following links:

- https://www.epos-ip.org/probabilistic-tsunami-hazard-maps-neam-region-tsumaps-neam-project
- http://www.tsumaps-neam.eu/news/blog/tsumaps-neam-project-on-the-epos-newsletter/

The reason for this choice is that EPOS-IP is envisage as an entity that can ensure the long-term preservation of the TSUMAPS-NEAM hazard results and its website reaches a very large audience.
The videos available at the link http://www.tsumaps-neam.eu/videos are:

- Tsunami Impact,
- Tsunami Timeline,
- Tsunami Dance.

A fourth video was only prototyped and is available only in the shared repository.
Interactions with mass media took place mostly during the Final Meeting in Tunis, see press release in the meeting minutes available in the project repository.

5.7. Deliverable D6

Experts' Review and Sanity Check (M18). This deliverable consists of the guidelines for reviewers (the IRs), the responses received from the reviewers, a rebuttal document discussed extensively in person with a delegation of reviewers who could participate in

the final meeting in Tunis, and a report on sanity checks. All these materials are made available through the project repository.

5.8. Deliverable D7

Methods and Data Documentation (M18). This deliverable is composed by the documentation sent to the reviewers in May-June 2017, including D6 and the results of the elicitation experiments. This material will be updated with more documentation arising from publications after the project's end.

5.9. Deliverable D10

Guidelines and Training Tools (M19). This deliverable consists of material
A document with guidelines oriented at instructing potential end users, how to use the hazard model in applications.
An Interactive Hazard Map and Curve Tool to display, navigate, and download the data (maps and curves) produced in D4 and D5. The tool features an interactive mapper window in which each POI is plotted and coloured according to a scalable colour legend that adapts automatically to the selected map display. By mouse clicking any point on the map, the nearest POI is queried and the hazard curve displays in a balloon. Users can also select/deselect hazard curve percentiles and download the selection as a raster image (PNG) or the data as a text file (CVS). More details are given in a user manual and two tutorial videos for instructing users on how to use the online material (Videos: Interactive Web Tool, Website).

5.10. Deliverable D11

Layman's Report (M21). This deliverable is a description of the project and its results for a non-technical audience to be distributed through the project website (http://www.tsumaps-neam.eu/documentation/) in a printable format.

5.11. Deliverable D3

Third Progress Report (M21) describing project progression of the third reporting period (M15-21), completed on 29/11/2017.

6. Evaluation of the technical results and deliverables

The project was conceived as a very ambitious challenge because a homogeneous tsunami hazard assessment for the entire NEAM was never attempted before. The feedback received from stakeholders and end users who participated at the organized meetings and those who had the opportunity to examine the hazard assessment procedures and preliminary results (e.g. attending oral and poster presentations at major scientific meetings, Appendix 1) were very supportive throughout the project development.

Although the hazard assessment is thought to be homogenous, this aspect has to be regarded as the application, as uniform as possible, of a methodology. The dearth of homogenous input datasets, such as seismic catalogues and seismogenic sources (e.g. crustal faults and subduction zones), prevents the hazard assessment to be thoroughly homogeneous and uncertainty of the results will reflect uncertainty of the input data.

One of the main strengths of this effort was the involvement of the international community in a participatory manner. We realize, though, that particular care should be devoted to clearly explain the adopted tsunami hazard metrics, the communication of the inherent limitations of the hazard maps, and the prevention of potential misuse of the hazard products.

The current hazard assessment results from multiple rounds of calculations performed after incorporating the input from the PoE, the IRs, and the end-users, and from running sanity checks and sensitivity tests on most parts of the workflow. The development of a flexible and robust platform for hazard calculations, in which the heaviest computational part is based on pre-calculated tsunami scenarios, facilitate the production of successive PTHA updates.

Activity on publicity and dissemination was carried out in two main forms: 1) meetings with key stakeholders, and 2) the website to reach a wider audience.

As regards the meetings, the privileged stakeholder was identified with the Intergovernmental Oceanographic Commission (IOC) of UNESCO (http://www.ioc-tsunami.org/) which has a mandate for the implementation of tsunami warning systems around the globe. TSUMAPS-NEAM delegates participated in several IOC NEAMTWS meetings. The dissemination activity culminated with the meeting organized in Tunis back to back with the IOC/UNESCO information meeting and the NEAMWAVE17 exercise. The involvement of ALECSO in the organization and hosting of this meeting gave the opportunity to make the project and its results widely known in most of the Arabian countries. See also the press coverage attached to the minutes of the meeting.

As regards the website, its usage started to be monitored through the Google Analytics tool on 31/10/2016. Since then, and until 10/03/2018, it was visited by over 3,000 users who totalled more than 10,000 pageviews. The number of visits increased over time, testifying the improved popularity of the project (Appendix 2). To be noted in the distribution of visits over time is the presence of two picks. One in coincidence with the the Bodrum/Kos (Turkey-Greece border), magnitude 6.6, earthquake of July 20, 2017 and ensued tsunami. Another on occasion of the Final Meeting in Tunis on 11-14 September 2017, which testifies the increased popularity of the project. After these picks the average number of visits remained systematically higher. The geographic distribution of users spans over all continents, with larger numbers in the USA, India, and almost all Euro-Mediterranean countries, notably Italy, Turkey, and Tunisia.

7. Follow-up

The follow-up measures envisaged in the project were pursued as originally planned, with additional efforts in attentively following the development of the Global Tsunami Model network (http://www.globaltsunamimodel.org/) and the EPOS-IP project (https://www.epos-ip.org).

Most of the time and resources of the project were dedicated to obtaining the probabilistic tsunami hazard assessment in a transparent and reproducible way. Dissemination activities were devoted at making the project known to a wide audience. The follow-up activities will thus be dedicated to consolidation, curation, and dissemination of the hazard results.

Starting on late December 2017, the online Interactive Hazard Curve Tool has been opened to the public for a three-month moratorium during which we expect to receive feedback from the designated reviewers (i.e. second review of the assessment workflow), and from our end users, stakeholders, and the general public. To this end, an *ad hoc* questionnaire (https://goo.gl/7f8LQM) will be sent to a pool of designated parties by e-mail and the results made available later on in the project website. After this moratorium period the hazard results and the online tool will be definitely fixed and protected from any changes. In the meanwhile, an additional effort will be made to ensure a proper distribution of the hazard results. The hazard files will be distributed using OGC standards through the "*tsunamidata.org*" platform set up at INGV (http://www.tsunamidata.org/), including the distribution of metadata in the INSPIRE compliant ISO 19139 standard, the minting of a DOI for traceability of usage and warranty of the integrity of files, and the attribution of a Creative Commons license. These additional steps are needed for seeking interoperability with other hazard and risk products, such as those in the European platform for seismic hazard EFEHR (http://www.efehr.org/), in view of multi-hazard developments.

Other initiatives for dissemination include: (i) Publication of the project results in scientific journals with at least one paper about the overall project and its results, and some other papers about specific aspects of the work done; (ii) Participation to meetings and dissemination of educational material, including the following events:

- 36th GNGTS annual meeting, in Trieste, Italy, 14-16/11/2017;
- 14th Session of the ICG/NEAMTWS, in Lisbon, Portugal, 21-23/11/2017;
- AGU fall meeting, 11-15/12/2017 in New Orleans, USA, to present an invited talk and posters;
- 6th Civil Protection Forum "Civil Protection in a Changing Risk Landscape" in Brussels on 05-06/03/2018;
- EGU General Assembly 2018; 8-13 April, 2018, Vienna, Austria, talk for the Session NH5.1/OS2.12/SM3.07: Tsunami.
- SSA-LACSC 2018, Seismology of the Americas is a joint conference of the Latin American and Caribbean Seismological Commission (LACSC) and the Seismological Society of America (SSA), 14-17 May, 2018, Miami, USA, invited talk for the Session: Tsunami Modeling and Hazard Assessment.

In addition, some project's by-products could also be shared with the tsunami community, such as, a large database (c. 30 Terabyte) of pre-calculated tsunami scenarios for over 120,000 elementary sources covering an area of c. 6x10^6 km^2; a

hazard calculation platform; and amplification factors for estimating the maximum inundation height.

Another follow-up action will consist in proposing the TSUMAPS-NEAM approach as a reference for PTHA to a wider audience. This goal can be pursued through the GTM (http://www.globaltsunamimodel.org/), which is endorsed by UN-ISDR and GFDRR in the spirit of the Sendai Framework for Disaster Reduction 2015-2030, and through the EPOS-IP community (https://www.epos-ip.org/). These initiatives will contribute to promote the EU as one of the main players in the international effort toward the creation of global standards and good practices for tsunami hazard assessment and risk mitigation.

Appendix 1: Oral and poster presentations at scientific meetings

2016

Selva J., Tonini R., Molinari I., Tiberti M.M., Romano F., Grezio A., Melini D., Piatanesi A., Basili R., Lorito S. (2016). Quantification of source uncertainties in Seismic Probabilistic Tsunami Hazard Analysis (SPTHA): towards PTHA assessment for the coasts of Italy. Geophysical Research Abstracts Vol. 18, EGU2016-16837, 2016 EGU General Assembly.

Selva J., Tonini R., Romano F., Volpe M., Brizuela B., Piatanesi A., Basili R., Lorito S. (2016). From regional to site specific SPTHA through inundation simulations: a case study for three test sites in Central Mediterranean. Geophysical Research Abstracts Vol. 18, EGU2016-16988, 2016 EGU General Assembly 2016.

Basili R., Babeyko A.Y., Hoechner A., Baptista M.A., Ben Abdallah S., Canals M., El Mouraouah A., Harbitz C.B., Ibenbrahim A., Lastras G., Lorito S., Løvholt F., Matias L.M., Omira R., Papadopoulos G.A., Pekcan O., Nmiri A., Selva J., Yalciner A.C., and the TSUMAPS-NEAM Working Group (2016). Probabilistic TSUnami Hazard MAPS for the NEAM Region: The TSUMAPS-NEAM Project. Poster presented at the AGU, Fall Meeting, San Francisco 12-16 Dec. 2016, NH43A-1805.

2017

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Selva J. on behalf of the TSUMAPS-NEAM's TI team (J. Selva, A. Hoechner, S.M. Iqbal, S. Lorito, H.K. Thio) (2017). Managing subjectivity & elicitations in the TSUMAPS-NEAM project. Oral presentation at the 36° Convegno Nazionale GNGTS, Trieste, 14-16 Nov. 2017.

Basili R. and the TSUMAPS-NEAM Team (2017). The Making of a Tsunami Hazard Map: Lessons Learned from the TSUMAPS-NEAM Project. Oral presentation (invited) at the AGU, Fall Meeting, New Orleans 11-15 Dec. 2017, NH21D-01.

Scala A., Murphy S., Herrero A., Maesano F.E., Lorito S., Romano F., Tiberti M.M., Tonini R., Volpe M., Basili R. (2017). How the Slip Distribution Complexities Control the Tsunami Scenarios: a Sensitivity Analysis for the Hellenic and Calabrian Subduction Interfaces. Poster presented at AGU, Fall Meeting, New Orleans 11-15 Dec. 2017, NH23A-0242.

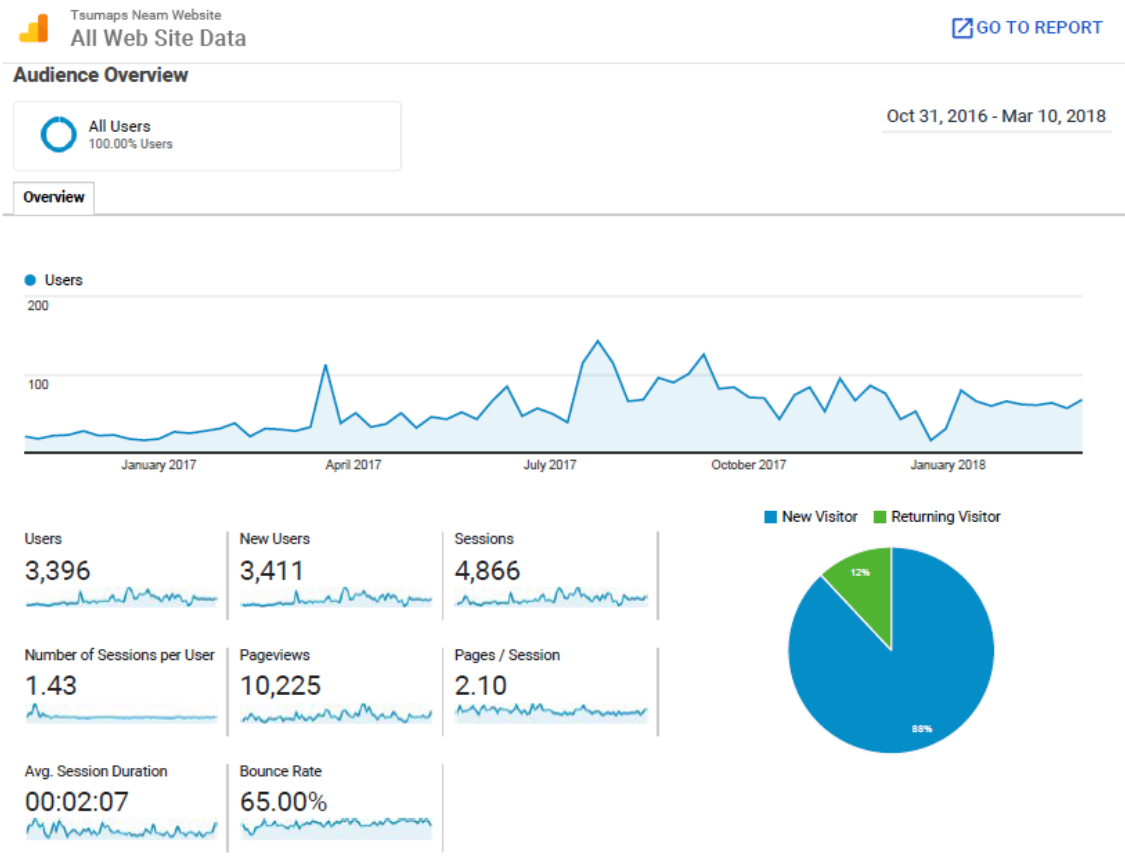
Forthcoming presentations in 2018 (abstracts only)

Scala A., Murphy S., Herrero A., Maesano F.E., Lorito S., Romano F., Tiberti M.M., Tonini R., Volpe M., Basili R. Selva J., Perfetti P., Hoechner A., Babeyko A., Festa G. (2018). Balanced modelling of shallow slip amplification along subduction zones and its effects on near-field tsunami hazard. Oral presentation EGU2018-14680 at the 2018 EGU General Assembly, 8-13 April, 2018, Vienna, Austria.

Basili R. and the TSUMAPS-NEAM Team (2018). Probabilistic Tsunami Hazard Mapping in the NEAM Region: results of the TSUMAPS-NEAM Project. Oral presentation EGU2018-12162 at the 2018 EGU General Assembly, 8-13 April, 2018, Vienna, Austria.

Basili R. and the TSUMAPS-NEAM Team (2018). The Probabilistic Tsunami Hazard Assessment Map for the NEAM Region: Results of the TSUMAPS-NEAM Project. Oral presentation (invited) at the Seismological Society of America, SSA-LACSC 2018, 14-17 May, 2018, Miami, USA.

Appendix 2: Website usage statistics



	Language	Users	% Users
1.	en-us	1,491	43.78%
2.	en-gb	422	12.39%
3.	fr	155	4.55%
4.	it	150	4.40%
5.	tr-tr	109	3.20%
6.	it-it	105	3.08%
7.	tr	90	2.64%
8.	es	81	2.38%
9.	ru	77	2.26%
10.	pt-pt	55	1.61%

Tsumaps Neam Website
All Web Site Data

GO TO REPORT

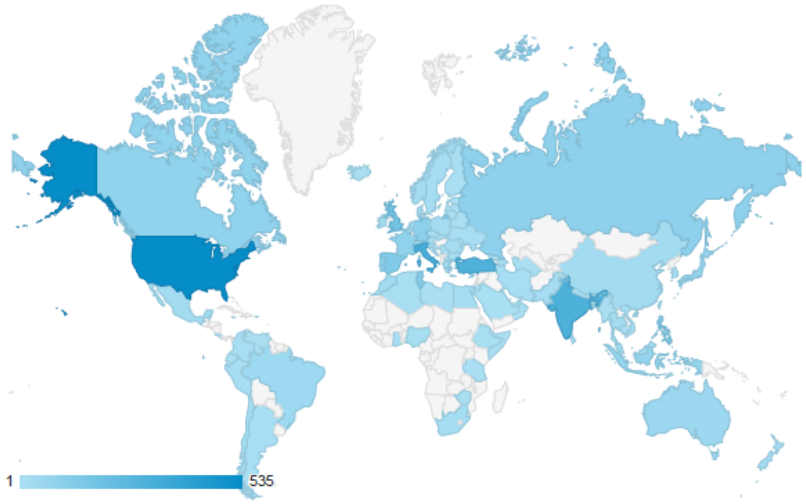
Location

All Users
100.00% Users

Oct 31, 2016 - Mar 10, 2018

Map Overlay

Summary



Country	Acquisition			Behavior			Conversions		
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Goal Conversion Rate	Goal Completions	Goal Value
	3,396 % of Total: 100.00% (3,396)	3,413 % of Total: 100.06% (3,411)	4,866 % of Total: 100.00% (4,866)	65.00% Avg for View: 65.00% (0.00%)	2.10 Avg for View: 2.10 (0.00%)	00:02:07 Avg for View: 00:02:07 (0.00%)	0.00% Avg for View: 0.00% (0.00%)	0 % of Total: 0.00% (0)	$0.00 % of Total: 0.00% ($0.00)
1. United States	535 (15.56%)	533 (15.62%)	604 (12.41%)	82.62%	1.49	00:01:04	0.00%	0 (0.00%)	$0.00 (0.00%)
2. Italy	318 (9.25%)	324 (9.49%)	726 (14.92%)	53.58%	2.56	00:02:40	0.00%	0 (0.00%)	$0.00 (0.00%)
3. India	299 (8.70%)	298 (8.73%)	320 (6.58%)	81.25%	1.29	00:00:35	0.00%	0 (0.00%)	$0.00 (0.00%)
4. Turkey	291 (8.46%)	292 (8.56%)	492 (10.11%)	60.77%	2.73	00:03:51	0.00%	0 (0.00%)	$0.00 (0.00%)
5. United Kingdom	177 (5.15%)	175 (5.13%)	187 (3.84%)	63.64%	2.15	00:02:02	0.00%	0 (0.00%)	$0.00 (0.00%)
6. Philippines	136 (3.96%)	136 (3.98%)	142 (2.92%)	83.80%	1.40	00:00:54	0.00%	0 (0.00%)	$0.00 (0.00%)
7. Spain	129 (3.75%)	128 (3.75%)	164 (3.37%)	50.00%	2.88	00:02:27	0.00%	0 (0.00%)	$0.00 (0.00%)
8. Tunisia	117 (3.40%)	112 (3.28%)	242 (4.97%)	43.80%	3.66	00:04:36	0.00%	0 (0.00%)	$0.00 (0.00%)
9. Germany	97 (2.82%)	97 (2.84%)	162 (3.33%)	62.96%	1.81	00:01:36	0.00%	0 (0.00%)	$0.00 (0.00%)
10. Portugal	92 (2.68%)	91 (2.67%)	114 (2.34%)	56.14%	2.53	00:01:17	0.00%	0 (0.00%)	$0.00 (0.00%)