# Global Tsunami Model (GTM)

## Draft objectives and recap from first scoping meeting

**F. Løvholt, C.B. Harbitz**

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**Second GTM scoping meeting, AECOM, Oakland 13.12.2015**

# Background

- Multi-institutional work on hazard and risk for the UN-ISDR (Global Assessment Report, GAR)
- **Idea:** Need to gather scientific community for
  - *Collective effort for improved understanding of global tsunami hazard and risk*
  - Improve methods, develop guidelines and standards, harmonize efforts
  - Non-exclusive initiative ↔ open for the community
- *Initiative from the tsunami community itself*
  - Proposers: NGI, GA, INGV, USGS, IPMA, GFZ
  - No owners or funding at present
- Yet GTM should ensure relevance towards external stakeholders
  - Societal relevance
  - Ambition will – to a considerable extent – depend on success in attracting external funding



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# The first GTM scoping meeting

- Held at IUGG in Prague 29.06.2015
- Objective – to discuss and define content to fill GTM
  - Short and long term
- Points from proponents introduced and accepted
- Additional points raised, discussed, and included
- Organizational issues were not discussed
  - The GTM organization structure is therefore presently open for discussion
  - GTM organization main topic for the present meeting

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# Broad interest in first scoping meeting

## Expressed interest or present at meeting

- NGI (Løvholt, Harbitz)
- INGV (Lorito, Selva, Basili, Tonini)
- Geoscience Australia (Cummins, Davies, Griffin)
- IPMA (Baptista, Matias, Omira)
- IRIDES (Imamura, Suppasri, Mas)
- GNS (Power)
- METU (Kanoglu, Yalciner)
- University of Malaga (Macias)
- AECOM (Thio)
- MMAF (Muhari)
- Univ Bologna (Tinti)
- KOERI (Özer, Necmioglu)
- MSI (Didenkulova)
- PARI (Takagawa)
- ICMMG (Giusiakov)
- Northwestern University (Okal)
- MRI/JMA (Tsushima)
- NOAA (Wei, Titov)

Total
27 organizations
45 scientists

## Non-present but expressed interest

- USGS (Geist)
- GFZ (Babeyko)
- USC (Lynett)
- ITB (Latief)
- CIMNE (Bernal, Cardona)
- Univ Hamburg (Behrens)
- Univ Cantabria (Gonzalez, Gonzalez-Riancho, Aguirre-Ayerbe)
- Univ Washington (Gonzalez, Leveque, Adams)
- AUTH (Pitilakis)

## “External participants” global models

- GEM (Pagani, Schneider)
- GVM (Jenkins)

# Outcomes from the first GTM meeting (1)

- Involving the full **tsunami hazard and risk community** may:
- Harmonize efforts and products
- Develop standardized and open source tools, guidelines and practices, for among others
  - Hazard and risk analysis
  - Probabilistic framework and uncertainty analysis
  - Underlying methods – source and tsunami models
  - Dissemination, mitigation measures, ethical perspectives
- Integrate datasets from other providers or compile databases where non-existent
- Validation of methods
  - Basic methods (e.g. simulation tools)
  - Towards hazard and risk data - improve our understanding of the risk drivers

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# Outcomes from the first GTM meeting (2)

- GTM should work on different regional scales
  - Become a term of reference for regional efforts
  - Ensure compatibility from regional to local scales
  - Methodology standard and global reference for hazard and risk maps
- Utilize ongoing activities or planned activities
  - GTM endorsement – compatible methods or results
- Harmonized efforts between institutions
  - e.g. – integrate national hazard maps to regional scale (TSUMAPS-NEAM – INGV++)
  - e.g. multifunctional tools for interfacing models (Tsunami API - GNS)
- Facilitate integration of results and tools from related organizations such as GEM and GVM – and assign borderlines

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# Scientific objectives from the first GTM meeting (1)

- Seismic source (probability and modeling)
  - Interfacing the GEM, adaptation for tsunami sources and recurrence
- Non Seismic source (probability and modeling)
  - Interfacing GVM, ICL, submarine landslide community
- Tsunami modelling
- Development of methods and numerical tools
  - Models, unified code interfaces
  - Benchmark tests
  - Model and data repositories – licensing and / or open source
- PTHA (seismic and non-seismic→ landslides and volcanoes)
  - Different frameworks
  - Uncertainty treatment
  - Validation and testing
  - Mapping

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# Scientific objectives from the first GTM meeting (2)

- Vulnerability and fragility
  - Fragility and mortality
  - Uncertainty treatment
- Probabilistic Tsunami Risk Assessment
  - Framework and uncertainty
  - Validation, testing, mapping
- Dissemination
  - Geo-ethics, transparency
  - Risk and uncertainty communication, interfacing stakeholders
  - Questionnaires, training, data exchange

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# Proposed first objective for the GTM

- Need for a first project to spark GTM
- Initially - Focus on tsunami hazard
- Employ and develop PTHA
  - Beyond standard practice on subduction zone earthquakes (such as GAR)
  - Methods and guidelines
  - Focus on non-seismic sources
  - Focus on crustal earthquakes
- Pilot study – TSUMAPS-NEAM
- Also - knowhow from GAR and related projects should be entered into GTM and thus contribute to knowhow

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# Global Tsunami Model (GTM)

## Possible organisational structure

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**Second GTM scoping meeting, AECOM, Oakland 13.12.2015**

# Scope

- Present organizational structure of GEM and GVM (as we understand it) as a background
- Propose a structure for GTM
- Provide a basis for plenary discussion
  - Conclude as far as possible on the most suitable structure
  - Set up a working group based recommendations from this meeting

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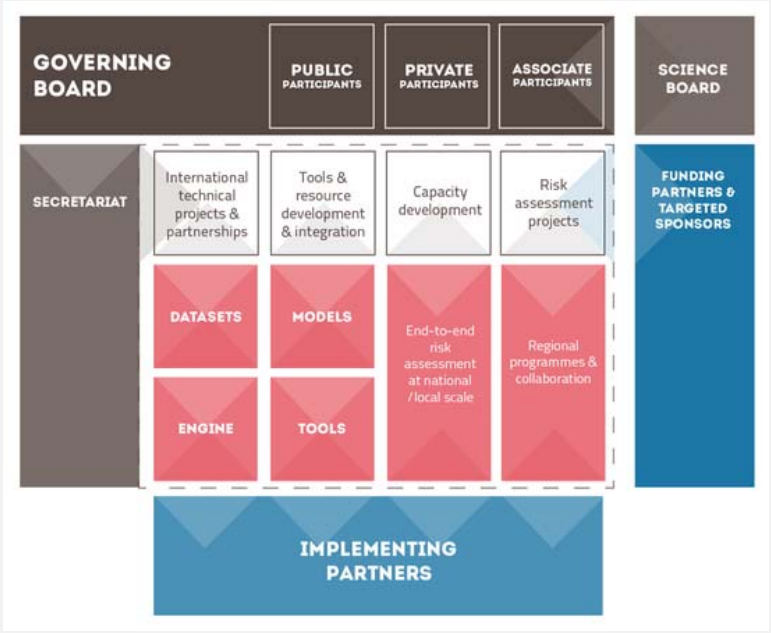
# GEM structure

- Proposal to OECD - large seed funding - realized in 2009
- Organization with a considerable permanent staff
- Secretariat in Pavia
- Broad international partnership
- Similar objectives as proposed for GTM
- Funding from national partners?



# GVM structure

- Emerged from UK “VOGRIPA” project
- Primary focus – a joint global volcano database
  - More recently also hazard and risk (also GAR contribution)
- Similar board structure as GEM
  - Management board
  - Science board
- Present secretariat at Univ Bristol
- Secretariat proposed to move / change cyclically
- Limited funding – efficient utilization from individual projects
- In kind contributions and human resources from partners

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# Way forward towards establishing a GTM

- Initiation phase
  - Compose a working group for determining the organization
  - Directions for working group from this meeting
- Elements that need to be discussed and planned for
  - Board (management and advisory / scientific board)
  - Physical location of secretariat (NGI not a likely candidate)
  - Composition of a limited number of topical working groups
  - Timeline for working groups
  - Commitment from partners - Letter of Intent
  - GTM endorsement mechanism for external projects
  - Webpage and repository

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# Proposed organizational structure for discussion (1)

## Possible boards:

- Recruit management and scientific board in a similar fashion as GEM and GVM
- Scientific / advisory board – gives recommendations to management board
- Management and scientific / advisory boards
  - Tsunami scientists within and outside GTM
  - Related scientists from e.g. GEM and GVM
  - External stakeholders (UN, WB, industry and possible funding agencies)

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# Proposed management model for discussion (2)

- Smaller group than GEM – likely more similar to GVM in size
  - Ambition must also reflect the amount of funding raised
- GTM Scientific objectives concern development of tools, standards, and guidelines, which is more similar to GEM
- This may imply that
  - We favor a flexible organization without permanent staff (like GVM)
  - We need a secretariat that could be permanent or circulating (preferred)
  - The secretariat could be placed at (governmental) organizations that are less dependent on the external funding (than private ones)?
  - We need a scientific organizational structure that looks more like GEM
  - The first-phase working groups should reflect this organizational structure
  - The first phase working groups should recommend targeted and harmonized GTM activities, and compile overview of existing initiatives that GTM may endorse and include

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# Webpage, repository and secretariat

- Establishment and efficient utilization of web-page and data and model repository a critical issue for success of GTM
  - For harmonized efforts
  - Need to efficiently utilize and link to decentralized and external resources
  - Efficient distribution and utilization of common resources (tools and data)
  - Dissemination purposes
- Secretariat and centralized web-page and resources do not necessarily need to be physically located in the same place
  - Locate web-page at organization that is likely to provide long-term maintenance
  - Enable circulation of secretariat

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# Suggested working groups (WGs)

- GTM organization WG
- Some other possible groups and volunteer participants listed below
- Funding and stakeholder WG (could be merged with the one above)
  - Anawat Suppasri (Univ Tohoku)
- Possible Scientific WGs
  - Source modeling
    - Andrey Babeyko (GFZ)
  - Modeling workflow and validation, numerical modeling
    - Jörn Behrens (UHam) Andrey Babeyko (GFZ)
  - Probabilistic hazard analysis
    - Mauricio Gonzalez (UC)
  - Probabilistic risk assessment
    - Ignacio Aguirre Ayerbe (UC) Pino Gonzalez-Riancho
  - Dissemination and geo-ethics

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# Global Tsunami Model (GTM)

## External stakeholders and possibilities for attracting funding

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# Needs to ensure external GTM relevance

- Need to integrate GTM objectives with external bodies for relevance and funding purposes
- National and international body stakeholders
  - UN organizations (UN-ISDR, IOC-UNESCO)
  - World Bank
  - National and regional governments (such as the EU)
  - These organizations are to some extent well aware of our initiative
- Industry
  - Re-insurance and risk assessment
- Mutual synergies with related disciplines
  - Volcanoes (e.g. GVM)
  - Landslides (e.g. ICL, submarine mass movement community)
  - Earthquakes (e.g. GEM)

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# Potential funding sources

- Who should we target for funding activities and secretariat?
  - Industry – such as re-insurance and risk?
  - Independent foundations?
  - National and international science councils?
- Some preliminary uncoordinated contacts have been made
  - Contact with industry on funding and scientific interaction
  - A more targeted and coordinated effort is needed
- Possible prerequisites for advertising the GTM
  - Written document, such as a white paper
  - Plans for GTM products and services
  - Dissemination and discussion with external stakeholders and industry
  - Working group concerning funding

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# Balancing funding and utilization of related activities

- Funding may be needed for
  - Organizing workshops and meetings
  - Personnel exchange?
  - Students and postdocs working under GTM umbrella
  - Hourly based salaries for private organizations
  - Secretariat / GTM host – webpage etc.
  - Target areas where GTM sees need
- Ongoing / in-kind activities needs to be utilized and endorsed by GTM
  - Related projects
  - Strategically founded activities in e.g. governmental organizations
  - Linked and disseminated via proposed GTM web page

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# Follow up activities on dissemination

- White paper – broad author list?
  - Describe state-of-the-art on tsunami hazard and risk community
  - Outline future tasks for GTM
  - Different levels (short document, scientific paper)?
  - Needed for dissemination purposes
- Dissemination meeting with stakeholders?
  - Possible contact – OASIS risk network (based on phone meeting)
  - Possible dissemination on insurance risk community meeting in Florida (winter / spring?)
  - Feedback on industry needs
- Other dissemination
  - UN-ISDR science meeting in Geneva, January
  - GTM poster presentation
    - Expected notification from UN-ISDR Tuesday 15 December
    - Poster submission deadline in case of acceptance, 31 December
  - Invite re-insurance industry? Other Stakeholders? Dedicated workshop (possibly in London?) was proposed by OASIS

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# WG Organization

- Setup secretariat/identify host
- Coordinate white paper (5 months, for Worldbank understanding Risk meeting)
  - What/Why/How?
  - Identify needs
- Commitment structure/letters of interest/MOU
  - Study internal financial contributions or in-kind
  - Study requirements for Formal/legal structure
- Timeframe of 1 yr for getting off the ground
- Independent reviewers in management board
- **WG members - NGI (C.B. Harbitz), IPMA (M.A. Baptista), GA (P. Cummins), UniBo (A. Armigliato), NOAA (V. Titov), INGV (?)**

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# WG Stakeholders and funding

- Contribute to goal and objectives of the whitepaper
- Collect info on national/regional initiatives
- Identify stakeholders/sponsors
  - Needs of stakeholders/funding opportunities
  - Link to products developed under GTM
  - Educational and capacity building aspects
- Present at meetings
  - ISDR meeting (Jan 2016)
  - Cat Risk Management meeting (Feb 16)
  - TOWS (Feb 22-26)
  - Worldbank (May 16-20) Istanbul
  - Workshop with OASIS and third parties
- Study issues with proprietary data/software
- Contact agencies working in developing countries
- **WG members: IRIDES (A. Suppasri), A. Yalciner (METU), NGI, (F. Løvholt), GA (?), INGV (?), Issa El Hussain (Oman), possibly more?**

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# WG methods (1)

- Summarize the different methodological portifolios and identify gaps
  - Source modeling, tsunami modeling, probability framework, hazard, vulnerability, risk …
- Identify overlaps with related groups (e.g. GEM, GVM, CSDMS)
- Identify topics for pilot projects
- Harmonization of outputs and intermediate data
- Interoperability – on methodological framework – basic model interfaces
- Determining the scope of software development
- Testing, validation, and benchmarking
- Available open source vs proprietary code for internal exchange
- Software engineering support

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# WG methods (2)

- Review other platforms such as GEM, SCEC
  - Development of joint tools for instance with GEM
- Aspect of multihazard earthquake-tsunami coupling
- Review possible hosting platforms such as OASIS and RMS
- Technical discussion forums
- Technical part of the white paper
- Data (topography, bathymetry, census data, ++) – interfacing external databases, feasibility and quality aspects
- **Work Group members: AECOM (H.K. Thio) Chair**
  **GNS (W. Power), UHam (J. Behrens), UC (M Gonzalez, IA Ayerbe, P Gonzalez-Riancho), GFZ (A. Babeyko), UMA (MJ Castro, JM Gonzalez-Vida, J Macias), METU (U. Kanoglu),, UW (R. Leveque), INGV (Basili, Lorito, Selva), IPMA (R. Omira), UniBo (A. Armigliato), NOAA (Y. Wei), CEA (A. Gailler), USGS (E. Geist)?, IRIDES (A. Suppasri)**

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