

CHILE AFTER THE 2010 EARTHQUAKE & TSUNAMI: RECONSTRUCTION EFFORTS AND PATHS TO THE FUTURE

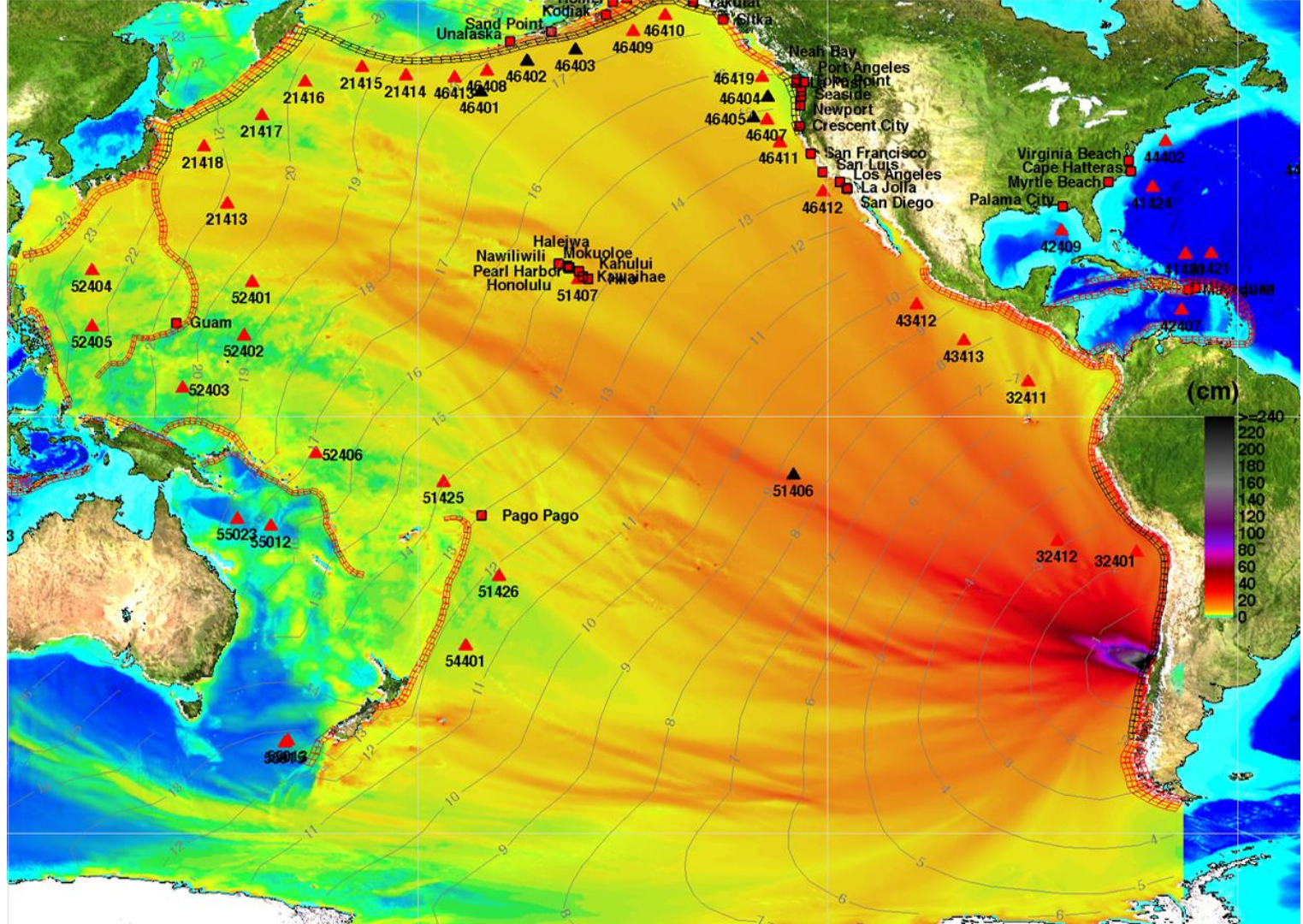
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1 Introduction

- On February 27, 2010 at 3:34 AM (local time) Chile was struck by a $M_w=8.8$ earthquake, the second strongest in its recorded history.
- The earthquake affected a population of roughly 8,000,000, provoked 375 deaths and damaged 370,000 dwellings.
- It also triggered a large tsunami (recorded run-up as large as 30 meters) that impacted on 800 km of the Chilean coast and produced 156 further deaths.



Maximum tsunami forecast heights in the deep ocean and the general direction of the tsunami's energy. Source: NOAA (2010)



2 Pre-2010 policies for tsunami risk mitigation

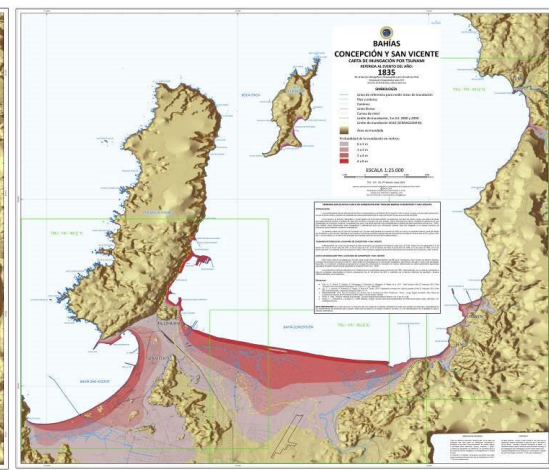
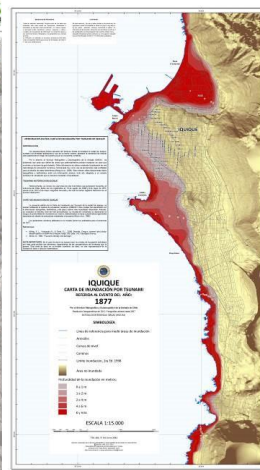
- Tsunami hazard was not included in national- or local-level planning schemes.
- In 1997 the Chilean Navy started developing tsunami flood maps (CITSU Project).
- There was not an integrated planning, regulation and management system for the coastal border.
- Coastal municipalities used their local planning schemes to designate land use through zoning plans, which may –or may not- include protection and hazard zones.
- Planning schemes without a clear definition about “risk” (exposure?), how to assess it and how to mainstream it into planning policies.

3 Reconstruction efforts after the 2010 tsunami

- In 2011 the national-level planning & building schemes (OGUC) were updated to include tsunami flood zones as risk areas in Chile.
- The Public Law 16282 (*Ley de Sismos y Catástrofes*) was applied to fast-track amendments to local planning schemes (although without requiring public participation and environmental impact assessments).
- A non-binding “Technical Norm of Structural Design for Buildings in Tsunami Flood Zones” (NTM 007-2010) was approved.
- 42 municipalities required to either update or modify their local planning schemes. They were supported by private consultants and universities.

3 Reconstruction efforts after the 2010 tsunami

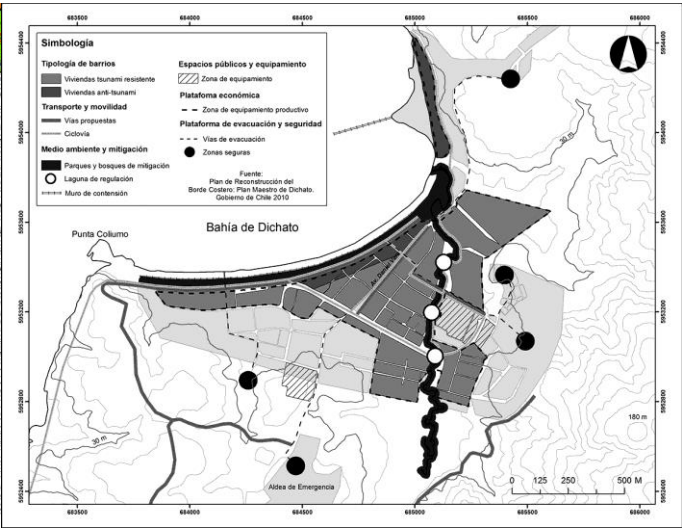
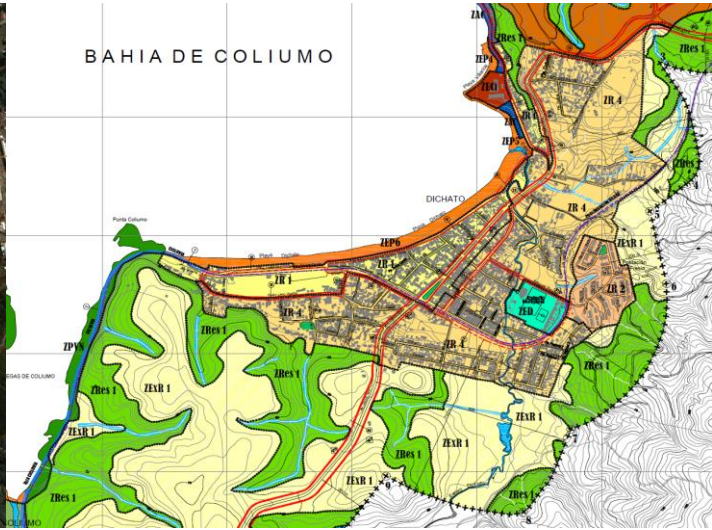
- Tsunami impact mitigation policies and actions proposed in these plans included:
 - New or updated tsunami flood maps
 - Evacuation systems (training, routes and shelters)
 - “Anti-tsunami” infrastructure and housing
 - Local planning schemes regarding tsunami-resistant construction standards
 - Tsunami risk zoning and land-use restrictions
 - Relocation of housing and critical infrastructure
 - Vertical evacuation
 - Mandatory insurance in tsunami risk zones





4 Critical analysis

- The reconstruction plans were non-binding and only served as a reference for local planners.
- As a result of this, new or modified planning schemes for reconstruction varied greatly on their scopes and strategies across municipalities.
- There was not a standardized definition of “risk” and its assessment mechanisms.
- Reconstruction processes were strongly focused on housing.
- Tsunami flood maps lacked a standardized method.
- Evacuation strategies were focused on education & training, without updating of required infrastructure (e.g. unprepared safe areas, lack of lighting and signage on routes).
- Definition of tsunami-risk areas did not lead to general land use restrictions and mandatory relocation.
- Local governments had limited financial autonomy, coordination and professional resources to implement the plans.
- It was proven difficult to modify pre-2010 land ownership patterns, even within areas flooded by the tsunami.



Source: Mas et al. (2012).

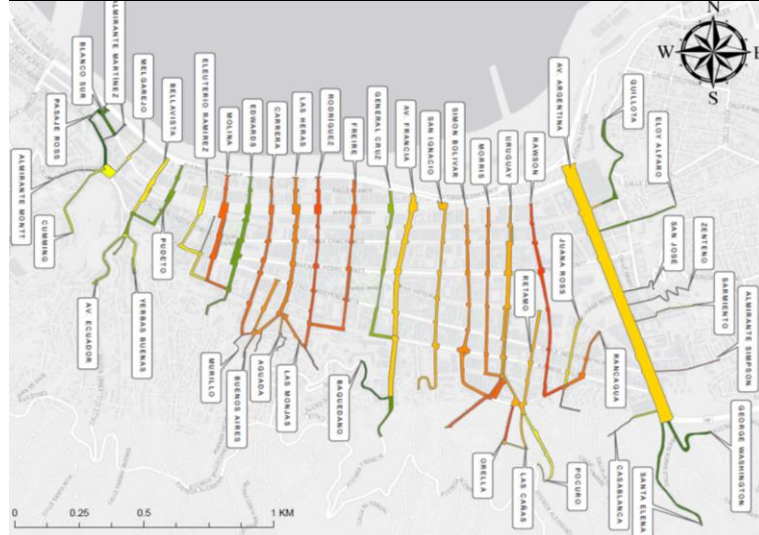
Source: Martínez (2014).



5 Paths to the future

- Bridge existing gaps between science, planning policies and the community.
- Mainstream a clear definition of the “risk” concept (and how to assess it & operationalize it) into the local and national planning schemes.
- Improve public participation in planning processes.
- Develop clear processes for relocation of housing and critical infrastructure, including mechanisms and funds for expropriation.
- Modify planning schemes to encompass a range of mandatory actions for supporting the disaster management process: mitigation, response and recovery.

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MANUAL PRÁCTICO DE PLANIFICACIÓN E IMPLEMENTACIÓN



Evacuación vertical como medida de mitigación del riesgo de tsunamis en Chile

Jorge León · Natalia Zamora · Sebastián Castro ·
Rósa Jirremann · Alejandra Gubler · Rodrigo Cerrolegos

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Community-based DRR in Cartagena, Chile

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Thank you.

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