

LEARNING FROM EARTHQUAKES STUDY TRAVEL PROGRAM

Field Resilience Observatory Activity

Sunday, January 15th, 2017
Viña del Mar, Chile

Background

Due to its position within the Pacific Rim of Fire, Chile is one of the most seismic countries in the world. Within the OECD, Chile is the most exposed country to natural disasters, with 54% of its population and 12.9% of its surface exposed to three or more natural hazards¹. Because of its geography, several large cities in Chile are located on the coast, which makes them very vulnerable to tsunamis following large earthquakes. This is very critical especially during holidays and summer, when these coastal cities receive national and international tourists that are not necessarily familiarized with earthquakes, tsunamis, and evacuation. This was clearly evident after the 2010 Maule earthquake, when the tsunami killed 124 people, nearly a quarter of the earthquake-related fatalities.

One of the main learnings from the tsunami evacuation processes after 2010 was the importance of self-evacuation, especially considering the short distance between the Chilean coast and the Peru-Chile Trench in the Pacific Ocean (about 160 km/100 mi) and the short arrival times of tsunami waves, which are sometimes shorter than the span of time the authorities have to process the seismic information, determine whether the conditions are present to generate a tsunami, and trigger the alarms and corresponding evacuation protocols. The self-evacuation behavior proved to be very efficient, reducing tsunami-related casualties in the M_w 8.2 Pisagua earthquake in 2014, and the M_w 8.3 Illapel earthquake in 2015.

Viña del Mar is a city with nearly 300,000 inhabitants located 120 km from Santiago and next to Valparaiso, in Central Chile. With its thirteen beaches, Viña has been historically one of the most touristic cities in the country hosting thousands of tourists during holidays, mainly during summer and mostly from inland Chile and non-seismic countries such as Argentina and Brazil. Studying evacuation is highly relevant in such context, especially considering that there has not been a large earthquake in more than 20 years in the region.

Objective

The main objective of this activity is to assess the evacuation plan of the city of Viña del Mar by recognizing different elements that may obstruct an evacuation process taking place after an earthquake. In addition, the activity is intended to make participants aware of the impact of urban planning on the seismic risk of physical systems.

Design of the Activity

The participants will work together with their Resilience Reconnaissance Activity group. Each group will be assigned a coastal section of the city of Viña del Mar of approximately 4 x 11 blocks, to assess the official evacuation routes proposed by the Chilean National Emergency Office, ONEMI. For this purpose,

¹ M Dille, *Natural disaster hotspots: a global risk analysis*. World Bank Publications, 2015.

the groups will work with the official map provided by ONEMI, identifying the safe lines and the emergency meeting points for evacuation processes, and the inundation maps provided by the Chilean Navy Hydrographic and Oceanographic Service, SHOA.

The groups will have to simulate the evacuation process in their assigned section of the city, assess the distribution and capacity of the meeting points throughout the city, and identify and map the obstacles in the evacuation routes as well as the critical and strategic facilities, infrastructure, lifelines, and utilities (e.g., schools, healthcare facilities, firemen and policemen headquarters, public buildings, pharmacies, bridges) present within the inundation zone. Look for potential structures for vertical evacuation in case the wave is coming so fast that people don't have time to run or if people are old or disabled and need an alternative form of evacuation.

Specific Task and Assignments

- (1) Measure the time involved in the evacuation process from different critical points within the section of the city assigned to the group (e.g., the beach, a restaurant, a school). Taking videos of the process could provide better evidence for further later analysis.
- (2) Take geocoded photos of the obstacles and hurdles along the evacuation routes. These will be added to the resilience page on the EERI earthquake clearinghouse web site. Each group will classify the issues identified within the evacuation route into the following categories, based on their origin or cause:
 - Design (e.g., narrow sidewalks, stairs interrupting the flow, healthcare facilities within the tsunami inundation zone).
 - Usage (e.g., peddlers and informal commerce, restaurant tables, parking lots blocking the sidewalks).
 - Maintenance (e.g., deteriorated pavements, deteriorated evacuation signs).
- (3) Take photos of the evacuation signs and evacuation meeting points.
- (4) Prepare a short report with a critical analysis of the evacuation protocol, containing the following:
 - Identification and mapping of the critical points (e.g., critical infrastructure, tourist attractions, strategic and critical facilities) within the inundation zone in the studied section of the city. Be explicit of the criteria used to choose such points.
 - Characterization of the evacuation process for the studied section, including evacuation times, physical conditions (e.g., steep slopes, seismically vulnerable constructions that may produce debris after a large earthquake), evacuation signals and official routes, and main obstacles in the route as classified in (2). Is it *easy* to evacuate? Is it *obvious* or *natural* to follow that route?
 - Description of the evacuation meeting points. Are they adequate to host hundreds of people after a large earthquake? Is it possible to turn it into an emergency shelter?
 - At least one short interview with locals (e.g., restaurant owners, tourists) identifying the tsunami risk perception of the people for that specific region and their knowledge of the tsunami evacuation protocols. Do locals feel they are safe in that inundation zone? Do they think the authorities consider tsunami evacuation an important issue? Do they constantly receive information on the evacuation protocols? Do they organize locally (formally or informally) to address critical situations such as a tsunami evacuation? Do they think tourists get enough information to behave properly extreme critical events?
 - Proposal of mitigation measures for the different evacuation hurdles identified and analyzed.