CHILE AND ITS EARTHQUAKE

- Preparedness, response and lessons -

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Ambassador of Chile
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CHILE AND ITS EARTHQUAKE
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- First Impacts
- Government response
- What we have done
- Lessons learned
One of the Strongest Earthquakes on Record

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Magnitude</th>
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</thead>
<tbody>
<tr>
<td>Chile</td>
<td>5/22/1960</td>
<td>9.5</td>
</tr>
<tr>
<td>Alaska</td>
<td>3/28/1964</td>
<td>9.2</td>
</tr>
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<td>Northern Sumatra</td>
<td>12/26/2004</td>
<td>9.1</td>
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<td>Kamchatka</td>
<td>4/11/1952</td>
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<td>Chile</td>
<td>02/27/2010</td>
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</tr>
<tr>
<td>Ecuador</td>
<td>01/31/1906</td>
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<td>Alaska</td>
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<td>8.7</td>
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<td>Indonesia</td>
<td>03/28/2005</td>
<td>8.6</td>
</tr>
<tr>
<td>Assam-Tibet</td>
<td>08/15/1950</td>
<td>8.6</td>
</tr>
<tr>
<td>Alaska</td>
<td>09/03/1957</td>
<td>8.6</td>
</tr>
</tbody>
</table>

Source: USGS
First Impact of Earthquake

**Impact**

- At 3:34 a.m. on Saturday, February 27\(^{th}\), 2010, an earthquake of magnitude 8.8 on the Richter scale hit Chile.
- It lasted almost two minutes and altered Earth’s axis.
- The quake affected:
  - The central zone of Chile from the Region of Valparaiso to the Region of Araucanía (147,392 Km2)
  - 12,880,000 inhabitants (75% of the whole population).
  - 375 miles of linear coastal
- Hours later, successive tsunamis devastated wide coastal zones, cities and towns of Central Chile

**Actions**

The Government developed:

- A complete diagnosis of the damage and a financing program,
- A legislative agenda, and
- A reconstruction plan
Chile’s most Affected Area
CONSTITUCIÓN BEFORE AND AFTER
ILOCA BEFORE AND AFTER
SOUTH ROUTE 5  FROM CURICÓ TO MOLINA
Summary of Damages

Estimated cost of losses and damages

US$30 Billions

18% of GDP
Summary of Damages

- **370,000** Residences destroyed or damaged
- **525** Death toll
- **56** missing
- **4,133** Schools destroyed or damaged
- **79** Hospitals destroyed or damaged
- **212** Bridges destroyed or damaged
- **971** Miles of damaged roads
- **710** Lost boats
- **81** Presidential visits to zone affected
- **9** airports and aerodromes damaged
1,415 aftershocks above 4 degree on Richter Scale
The damages have three distinctive features:

- They affect a large geographical area;
- They are present in virtually all sectors of the economy; and
- They come in different levels of severity.
Macroeconomic Effects of the Earthquake

• The earthquake reduced economic growth in the first semester of 2010. By the second half of the year output exceeded the levels prior to the earthquake.

• Reconstruction efforts gave a strong boost to the economy later on.

• Most relevant reconstruction projects started in the second half of 2010 and will last until 2012.

• Inflationary effects have not been significant. The economy remained on a growth trend and inflation has been below expectations.
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Triple Response Plan by the Government

Immediate Emergency
- February 27 - March 31st
- The government declared Zone of Catastrophe in 5 regions
- On February 28th, it was declared State of Emergency Maule y Bío-Bío

Winter emergency
- March 29th - July
- The measures were related to:
  - Normalization of the school system
  - Emergency housing, (80,000)
  - Assurance of access to health care in time
  - Creation of 60,000 reconstruction jobs
  - Repairment of roads and bridges
  - Removal of debris in the streets

Reconstruction Plan
- 4 years
- The Plan has three pillars:
  - Permanent replacement and improvement of buildings and infrastructure.
  - Recover the productive capacity in affected areas.
  - Make Chile a better prepared country for future disasters:
    - Early Warning System is being reformulated.
    - Buildings standards
Key Players during the Immediate Emergency

- **Government**
  - Creation of two committees. The first one to respond to the emergency and the second one to start working in the Reconstruction Plan
  - Coordinate the response with armed forces, ONEMI and regional governments

- **Armed Forces (Navy and Army)**
  - Key importance in three stages of the emergency:
    - Restoring the public order
    - Building emergency houses and removing debris from streets.
    - Channeling humanitarian aid

- **National Emergency Office (ONEMI)**

- **Civil Society**
  - Responsible for collecting and distributing basic necessities:
    - bottled water, non-perishable foods, medicines, batteries, matches, candles, flashlights, bedding, insulating plastic, coal, cardboard boxes, toilet articles, and building materials

- **Customs**
Humanitarian Relief Force belong to the Army.

In each region a “General Brigadier ” was in command of the Regional Military Command of Humanitarian Relief, which relied on a central military authority who coordinated this work.
Government Reaction to the Emergency:

- Emergency and reconstruction efforts started simultaneously.

- Two Committees were created:

  **Emergency Committee**: Appointed by the President, it operated under his supervision. The main objective was to give priority to the Reconstruction Plan giving the basic living conditions to the people.

  • This committee also recruited people from private sector to work temporarily in the management of part of the operations.

  **Reconstruction Committee**: Created to be the formal and permanent instance to lead and coordinate the Reconstruction process. It is lead by Minister of Public Works.

  • It works with regional governments in the design and implementation of the recovery program.
Emergency Alternatives: Housing

Source: www.lasegunda.cl
Reconstruction Financing

- The cost of the damages from the earthquake totaled US$30 billions
  - 10.6 billions were public infrastructure

- Finance Minister identified the following sources of financing:
  - Economic growth (US$2.5 billions per year)
  - Austerity measures and reallocations of $ 730 millions
  - Donation Act
  - Sales of dispensable assets
  - Issue of internal and external debt
  - Use of Economic and Social Stabilization Fund and use of Reserve Copper Law. U.S. $ 300 Millions (per year) in 2010 and 2011.
  - Tax increases
    - Transitory Corporate tax
    - Permanent increase in Tobacco tax to 62.3%
    - Transitory increase of real estate tax during 2011 and 2012
    - Royalty
Financing Sources

<table>
<thead>
<tr>
<th>Sources</th>
<th>U.S. billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donations Act (US$0.3 billions)</td>
<td>0.3</td>
</tr>
<tr>
<td>Use of the Armed Forces Fund (US$0.6 billions)</td>
<td>0.6</td>
</tr>
<tr>
<td>Reducing evasion and improving tax collection (US$1.3 billions)</td>
<td>1.3</td>
</tr>
<tr>
<td>Sovereign bond issuance (US$1.5 billions)</td>
<td>1.5</td>
</tr>
<tr>
<td>Transitory tax increases (US$2.6 billions)</td>
<td>2.6</td>
</tr>
<tr>
<td>Budget reallocations (US$2.9 billions)</td>
<td>2.9</td>
</tr>
<tr>
<td>Use of the ESSF, sale of dispensable assets and issuance of internal and external debt (US$3.2 billions)</td>
<td>3.2</td>
</tr>
<tr>
<td>Economic growth (US$7.5 billions)</td>
<td>7.5</td>
</tr>
</tbody>
</table>
Reconstruction Balance after a year:
International Aide: US$73 millions

Canada 2.1
United States 14
United Kingdom 11.4
Spain 1.9
Trinidad y Tobago 1.0
Argentina 0.4
Finland 0.4
Italy 6.2
Kuwait 2.0
India 5.2
Thayland 0.1
Vietnam 0.2
Indonesia 1.0
Japan 10.7
China 3.1 3.9
South Corea 3.9
Australia 5.6
New Zealand 5.6
UN donation US$10 millions
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What did work?

- **Building regulations**
  - Chile has had a strict Seismic Code since 1972, so that all high-risk buildings are made from seismically sound materials such as concrete, steel and reinforced concrete.
  - Chile’s construction codes required developers to face a 10 year liability that proved to be an incentive to build civil infrastructure that was able to resist earthquakes.

- **Population knowledge**
  - Chile’s coastal population have a very good understanding of the need to evacuate lower zones, close to the beach, in the event of any big earthquake.

- **Lack of fires**
  - Chile’s energy network shuts down automatically in the event of any major earthquake.
Modernization of National Emergency Office

- **Letter of intent to Collaborate between the Government of Chile and The US Federal Emergency Management Agency (April 12, 2010)**
  - Establish a process for information sharing and exchange of expertise.

- **Memorandum of Understanding between the US Department of Homeland Security and the Ministry of Interior of Chile**
  - To assist in strengthening disaster resilience and reducing disaster risk in American and Chilean communities, bearing in mind the need for continuous improvement in emergency management; and
  - To enhance response and recovery capability in both the United States and Chile through information sharing and knowledge exchange.
Reconstruction Balance after a year

- **Residential**
  - 135,000 subsidies will have been paid out (61% of the total number to be awarded) by February 27th, 2011,
  - 74,000 works are under way or have already been completed
  - 47 out of 100 Reconstruction Master Plans are considered completed with an investment portfolio

- **Health**
  - 84% of the operating theaters which were destroyed are now working
  - 90% of medical and industrial equipment is operative
  - 19 field hospital were set up to deal with the emergency. 14 of them were dismantled on December 2010.
  - 100% hospitals bed are been restored using temporary and permanent solutions.
Reconstruction Balance after a year

- **Public Infrastructure**
  - 99.1% of the public infrastructure has been partially or wholly restored:
    - 100% of 1,554 kilometers
    - 100% of ports infrastructure
    - 98.6% bridges that were damaged
    - 100% airports and aerodromes
    - 98.9% of hydraulic facilities
    - 100% rural drinking water systems

- **Education**
  - School system normalized after 45 days.
  - 100% of students came back to the school.
  - The rebuilding and repairs of the 70% of the buildings affected by the earthquake have been supported through different programs:
    - Earthquake Program 1 and 2: 594 schools and colleges were repaired
    - Minor Repairs Plan 1: US$166,666 benefit 601 buildings and 300,000 students. Finished by February 2011
    - Minor Repairs Plan 2: US$125,000 benefit 333 buildings and 167,680 students. Finished by April 2011
    - Repairs Plan for 12 traditional schools
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Lessons Learned

Problems observed

- Communications were down for more than 12 hours.
- Sensors took more than 2 hours to provide information
- Alert System:
  - Unclear communications protocols,
  - Multiple unnecessary decisions points, and
  - No use of mass communication channels.
- No special force in place for helping in early evaluation of damages and not specialized in emergency procedures

What we are working on

- Investment in real-time monitoring process and robust telecommunications systems with multiple backups.
- Streamlined process with:
  - Clear communication protocols,
  - Single responsibility for decision, and
  - Use of mass communication channels.
- Development of an army emergency task force specialized in emergency procedures
Lessons Learned

Problems observed

- No clear chain of command in place:
  - Too many direct reports
  - Organized by institution instead of roll in the emergency.
  - Leadership duplicity
- Unrestricted access,
- Everybody sitting around the same table randomly, and
- Press with direct access to everything.
- Heavy looting began 18 hours after the earthquake.

What we are working on

- Creating a clear chain of command:
  - No more than 8 direct reports
  - Organized by functions and
  - Single leadership
- Restricted area access.
- Decision makers in one table separated from support staff in separate tables grouped by functions.
- Procedures to deploy armed forces to ensure safety in the first hours of the emergency
Chile is Better Prepared

Suffered, managed, reacted and learned