The Plan for Sustainable Reconstruction (PRES) of Constitución was developed after the 8.8 magnitude earthquake of February 27th, 2010. It was given 90 days to produce all the necessary studies and documents capable of determining the action of both public and private parties in the reconstruction of C. The Plan was part of the "RECONSTRUCTION BUDGET" and "RECONSTRUCTION ECONOMIC ACTIVITIES and INFRASTRUCTURE" of the city. The 8.8 Earthquake Crisis – Sustainable Reconstruction Master Plan was done with the interest of the entire community.

The main reasons that led to the development of the plan are:
1. The need to address the social, economic, and environmental challenges that the city faces. The plan aims to address these issues through a comprehensive approach that considers the needs of all stakeholders.
2. The need to create a sustainable city that can withstand future disasters. The plan includes measures to strengthen the city's infrastructure and improve its resilience.
3. The need to address the housing crisis. The plan proposes strategies to increase the availability of affordable housing and improve the quality of existing housing.

The plan is based on the principles of sustainability, resilience, and inclusivity. It includes a wide range of measures to address the city's needs, from infrastructure improvements to social programs. The plan is expected to have a significant impact on the city, improving its quality of life and reducing its vulnerability to future disasters.

The project is divided into three main phases:
1. First phase: the planning and design phase. This phase includes the development of detailed plans and designs for the various components of the project.
2. Second phase: the construction phase. This phase includes the actual construction of the various components of the project.
3. Third phase: the operation and maintenance phase. This phase includes the operation and maintenance of the various components of the project.

The project is expected to be completed within the next five years, with a total cost of $1 billion. The project is expected to create thousands of jobs and generate significant economic benefits for the city.
CONCLUSIONS

In addition to replacing public buildings and housing with designs seeking to maintain the character of the city, PRISS basically consists of:

1. Design a city with an anti-tsunami DNA through a mitigation park on the coastline.
2. With the new parks, the plan changes the orientation of the city to the river's edge, capitalizing its natural and foundational heritage.
3. Repair the historic debt of Constitution of urban green area per inhabitant standardizing from 2,500 m²/ha to 6,000 m²/ha.
4. Recover the tourism potential of the city, diversifying its productive structure.
5. Take control of the floodings of different water courses, a priority for the community.

IMPLEMENTATION SCHEME

Ministry of Internal Affairs

Regional Government

Maule Region

Local Advisory Council

led by the Municipality of Constitucion

PROJECT MANAGER

Regional Municipal Representative Management Team

Projects

Housing Infrastructure

Public Spaces

Productive Structure

Energy

Waste Management

Provider

Water and Sewage Company

Ministry of Housing

Ministry of Energy

Avances Company

Ministry of Housing

Ministry of Transportation and Telecommunications

Ministry of Public Works

Department of Post Infrastructure

Regional Government

Ministry of Housing

Private US$30 MM

Public Replenishment: US$54 MM

Total Cost PRISS: US$157 MM

PRISS: US$48 MM*

*Net of ongoing federal projects equivalent to TISS = US$32 MM

LESSONS AND ACTIONS

1. CITY BUILT TO RESIST NATURAL DISASTERS
   a. Alert System and Evacuation Plan.
   b. For severe intensity of a large magnitude, it is necessary to dissipate the energy of large waves through friction rather than trying to stop them. The construction of parks and artificial landscapes mitigates the energy created while allowing occupation to move slower to the coast.
   c. In areas adjacent to the mitigating park, from and materials of construction are constantly considered to withstand the force of water from tidal waves.

2. ADJUST NATIONAL STRUCTURAL CODE NOH 433
   SEISMIC ISOLATION FOR BASIC SERVICES

3. REPAIRURBAN DEBT

In normal circumstances, the lives of people do not improve at the same rate as the economy. Reconstruction with an emphasis in public spaces will make a natural geography is an opportunity to improve the quality of life.
Chile faces a new challenge after 2010 to design cities with an anti-tsunami urban DNA. scarce resources made heavy infrastructure unfeasible. So we thought that our privileged ecology might provide a solution: trees can grow and become resistant to 30 years. To mitigate a tsunami we propose the forest industry, a major development agent in the zone, was transferred to urban design.
COORDINATION BETWEEN PRIVATE AND PUBLIC ENTITIES

The PRES plan is validated by an active community participation in the process. The main key of it is an inclusive process based on the intervention of citizens facing real projects instead of creating an abstract diagnosis of the situation. We use our professional intuition to propose and test the proposals in the "hybrid forums" with the community, politicians, technical, services and public entities. The participation was transparent, not defined nor segmented, multichannel, multi-scale and binding.
In this region, there was the ecology and the knowledge to grow a forest as an urban protection against tsunami. But the introduction of the mitigation also responded to an existing demand of the community due to flooding from rains that were occurring every year. Thus, we proposed a retardant lagoon and lamination gap to mitigate fluvial impact on rising floodwaters. Finally, this project upgrades obsolete urban standards from 2.2 m² of green space/person to 6.6 m².

**WASTE MANAGEMENT**

**PASSIVE SOLAR HOUSING**

**INVESTMENT**

<table>
<thead>
<tr>
<th>US$1300 x House</th>
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</thead>
<tbody>
<tr>
<td>RETURN INVESTMENT 7 YEARS</td>
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**SOLUTION:**
Collection of garbage (solid) Production of biogas, compost, and recyclable – 25% of waste transported to landfill (Talca)
Given that public money was going to be scarce, one of the
five courses of action considered was economic reactiva-
tion of the city so that people themselves could begin to add
to the reconstruction efforts. Our scarce resource though
was not money, but time. So, to buy time, we developed
adequate emergency shelters. And knowing that speed and
quality need to be incompatible, we applied the incremental
approach of our housing projects to the entire city.

EMERGENCY SHELTER

CONSTITUCIÓN HOUSING “VILLA VERDE” PROJECT - UNDER CONSTRUCTION

The housing project is part of the strategy developed
for the city after the 8.8 magnitude earthquake and tsunami
on February 27th, 2010, giving housing for the local community
and for families affected by the earthquake and tsunami.

This 484 units housing project is located in collective
courtyards conforming by around 20 families with two dif-
f erent typologies houses. Designed with very low bud-
get subsidies, the houses provide an incremental growth
ability, with an initial 2 bedroom and 2 living rooms on the first floor and 2 bathrooms. The
house is capable of growing to a final stage, almost dup-
licating the initial area of 45m².

The plan includes the local production of wooden manu-
f actured materials, in this case provided by the compa-
n y Asucon (based in Constitución city). In Chile visually
graded lumber is often used for structural framing in
housing. For the entire framing structure of the house,
we worked with C16 and C24 strength classes. These
timber is machine graded, kiln dried and pressure-im-
pregnated with a borate (SBK) preservative, offering sev-
eral environmental benefits and providing excellent last-
ing performance over time.

The result is, a more precise calculation of the strength of
each piece of lumber than what is possible with visually
graded timber, allowing to use full-design strength and
avoiding overbuilding. This fact allows the structure to
reduce the size of the elements for the structural framing,
reducing the final volume of wood used for the project.

Finally, this structural innovation enables the project to
compete in terms of costs with the final volume of wood
used in a visually graded lumber structure and afford a
better structural framing for the project.

HOUSING STANDARD

1. INCREMENTALITY
   Emergency and quality tend to be mutually exclusive terms.
   If you can't do it quickly, don't do it fast and upgradeable.
   Provide structure to the final stage of growth.
   Consider the expansions in the design to avoid structural damage.

2. DENSIFY WITHOUT OVERCROWDING
   Capitalize on the good location in the most devastated part of city.
   The land is the most important asset.

3. URBAN INTENSITY, NOT ONLY DENSITY
   Mix of uses, incorporating commercial activities on the ground floor level.

DESIGNING HOUSING LIKE INVESTMENT, NOT AS A SOCIAL SPEND

OTHER TYPOLOGIES THAT WERE DESIGNED
The plan includes the local production of wooden manufactured materials. The aesthetic approach goes directly on the hand of local productive development. So there are no arbitrary decisions of design. The community itself is endorsing the reconstruction of its buildings.

**SECRET SQUARE**
Located next to the old train station new regional action area, the new square is the first approach to the city connected to the new network of pedestrian streets and the civic center. The project's design process is completed and is currently applying for construction public funds.

**CIVIC CENTER REPLACEMENT**
The design for the reconstruction and modernization of the civic center and Main Square is completed and the project is currently at bidding process, sponsored by Banco de Chile.

**ZÓCALOS TURÍSTICOS**
**TOURISTIC PROMENADES**
The project includes a bicentennial set of prefabricated wood frames that extend over the 4,5 km long coastal road and they transform informal lookout points of emblematic geographic and cultural edges of Constitución. This project is currently under design-development stage and sponsored by Santander Bank with USD 440,000.

**PUBLIC LIBRARY**
The new Public Library is located next to the main square of the city. It's currently under design development stage and is sponsored by Iqau Bank with USD 370,000.

**BOAT DOCK**
This dock is the replacement of the old river dock destroyed by the tsunami. It moves with the tide and allows practicing boating and rowing sports as well as recreational uses. This project is currently under design development stage and is sponsored by Security Bank with USD 440,000.

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*"Set of projects funded by five banks raise the city"*
El Mercurio newspaper, December 16th 2011.