

COLLABORATING TO INTEGRATE TEMPORARY HOUSING' NEEDS AND EXPECTATIONS INTO OPERATIONAL PROCESSES

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1. About me: Miguel Mora

Ph.D. student at Carnegie Mellon University

Divisional Manager of Affordable Housing at Echeverría Izquierdo

Former Director of Operations at Fundación Vivienda

Civil Engineer

MSc. Architecture-Engineering-Construction Management

MSc. Advanced Infrastructure Systems

PhD (c) Advanced Infrastructure Systems

Experience on private, public and NGO sectors:

- Management
- Research
- Reconstruction
- Innovation

More details at <https://www.linkedin.com/in/miguel-mora-aguirre-948a8314/>

2. Introduction

- 11,647 natural disasters in the last 50 years
- 58,000 million-USD in damage
- 150 million of people affected
- 3 million people without home per year

(Centre for Research on the Epidemiology of Disasters - CRED, 2017)

2. Introduction

Estimations for the following years:

- Increment of rainfall, temperature and sea level
- Increment of natural disasters (landslides and floods)

(Intergovernmental Panel on Climate Change, 2012)

2. Introduction

→ Key areas for the following years:

- Climate change adaptation
- Disaster risk management
 - From preparedness to recovery

(Intergovernmental Panel on Climate Change, 2015)

3. Case study: Fundación Vivienda

FUNDACIÓN VIVIENDA

52 years-old-NGO fabricates and delivers temporary housing in Chile

NGO works as hybrid business organization:

SOCIAL	PRODUCTIVE	
Donates around 1,100 emergency houses per year	Fabricates around 1,800 emergency houses per year [*]	
	1,100 houses are donated [*]	700 houses are sold [*]

3. Case study: Fundación Vivienda

Several types of temporary housing do exist



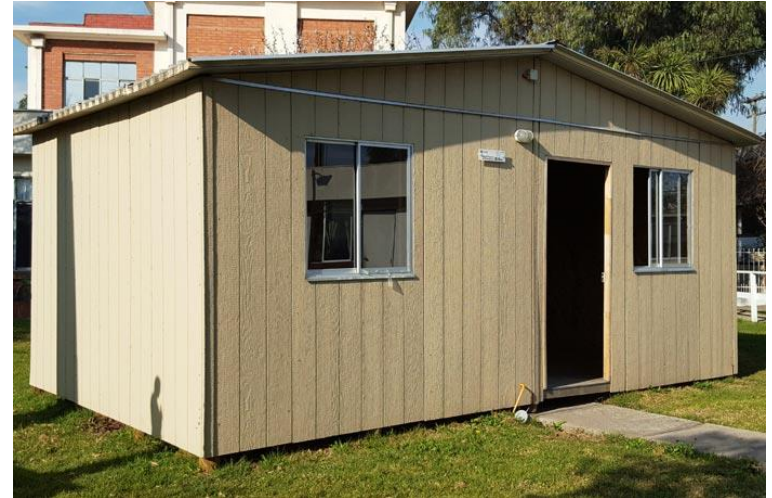
Jean Prouvé 1944 6x6 temporary house

<https://www.patrickseguin.com/en/designers/architect-jean-prouve/available-houses-jean-prouve/6x6-demountable-house-1944/>



Shigetzu Ban, 2011 Container temporary housing, Japan

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Current temporary housing used in Chile, regulated by a Governmental Office

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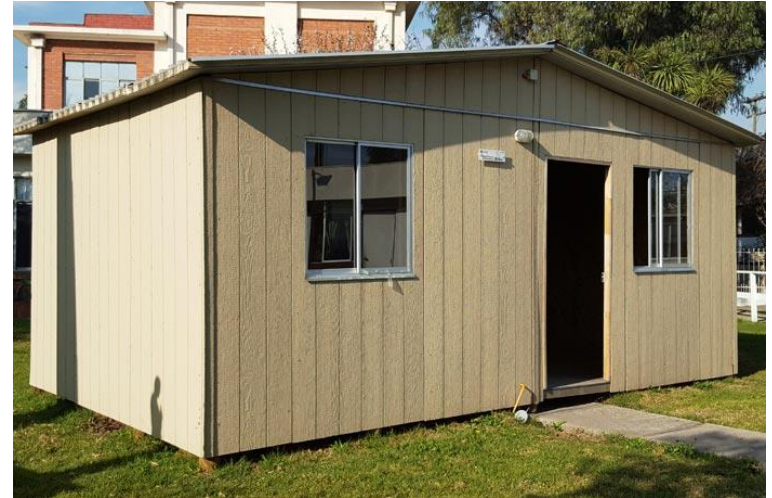
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3. Case study: Fundación Vivienda

2017 FIRE IN CHILE

240,000 hectares affected

300 USD-million in damages

1,500 houses destroyed

National office of Emergency (ONEMI) signed an agreement with civil society organizations:

NGO Fundación Vivienda fabricated and delivered temporary houses

NGO TECHO-Chile built houses on-site with volunteers

4. Approach to integrate needs & expectations

NEEDS
&
EXPECTATIONS



SOCIAL IMPACT

Assessment of tangible and potential impacts to several stakeholders

4. Approach to integrate needs & expectations

1. **Adapt** well-known methodologies to measure the social impact of operational processes:

- a. **Social Life Cycle Assessment (S-LCA):** Guideline to measure the social impact of any given product or service.
- b. **Value Stream Mapping (VSM):** Lean methodology to analyze processes

4. Approach to integrate needs & expectations

2. **Apply** the methodology in a case study:

Who? Fundación Vivienda fabricating and delivering temporary housing

Where?

- 2017 fire in Chile
(most harmful fire in Chilean history)
- Innovations done to operational processes

4. Approach to integrate needs & expectations

S-LCA: SYSTEM DEFINITION

- i. Goal and scope
 - a. Stakeholders
 - b. Goal
 - c. Scope
 - d. Functional unit
 - e. System boundaries
 - f. Data collection
- ii. Life Cycle inventory analysis
- iii. Life Cycle impact analysis
- iv. Life Cycle interpretation

4. Approach to integrate needs & expectations

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4. Approach to integrate needs & expectations

S-LCA: SYSTEM DEFINITION

- i. Goal and scope
 - a. **Stakeholders**
 - b. **Goal:** To measure social impact of implemented process innovations
 - c. **Scope:** Emergency house fabricated by Fundación Vivienda and delivered from Jan 23rd, 2017 to April 9th, 2017
 - d. **Functional unit:** Emergency house with performance requirements defined by ONEMI
 - e. **System boundaries:** Everything purchased and delivered by Fundación Vivienda
 - f. **Data collection:** Provided by on-site teams

4. Approach to integrate needs & expectations

Identification of Stakeholders

INTERNAL STAKEHOLDERS

Fabrication and delivery:
NGO Fundación Vivienda



EXTERNAL STAKEHOLDERS

Funding:
NGO TECHO-Chile

On-site coordination:
Local Governments



On-site construction:
NGO TECHO-Chile

Final User:
Families that had lost
their house or
affected families

4. Approach to integrate needs & expectations

S-LCA SYSTEM DEFINITION: STAKEHOLDERS

NGO TECHO-CHILE

NGO that works with people in poverty situation; based on volunteers

Objective:

Build as much as possible with available volunteers

AFFECTED FAMILIES

Families and people that had lost their house

Objective:

Minimize its time without home

LOCAL GOVERNMENTS

Local counties' authority

Objective:

Deliver houses in fairness and equity way

NATIONAL LEVEL (ONEMI)

National office in charge of emergency

Objectives:

- Deliver houses in fairness and equity way
- Houses comply with all the requirements

4. Approach to integrate needs & expectations

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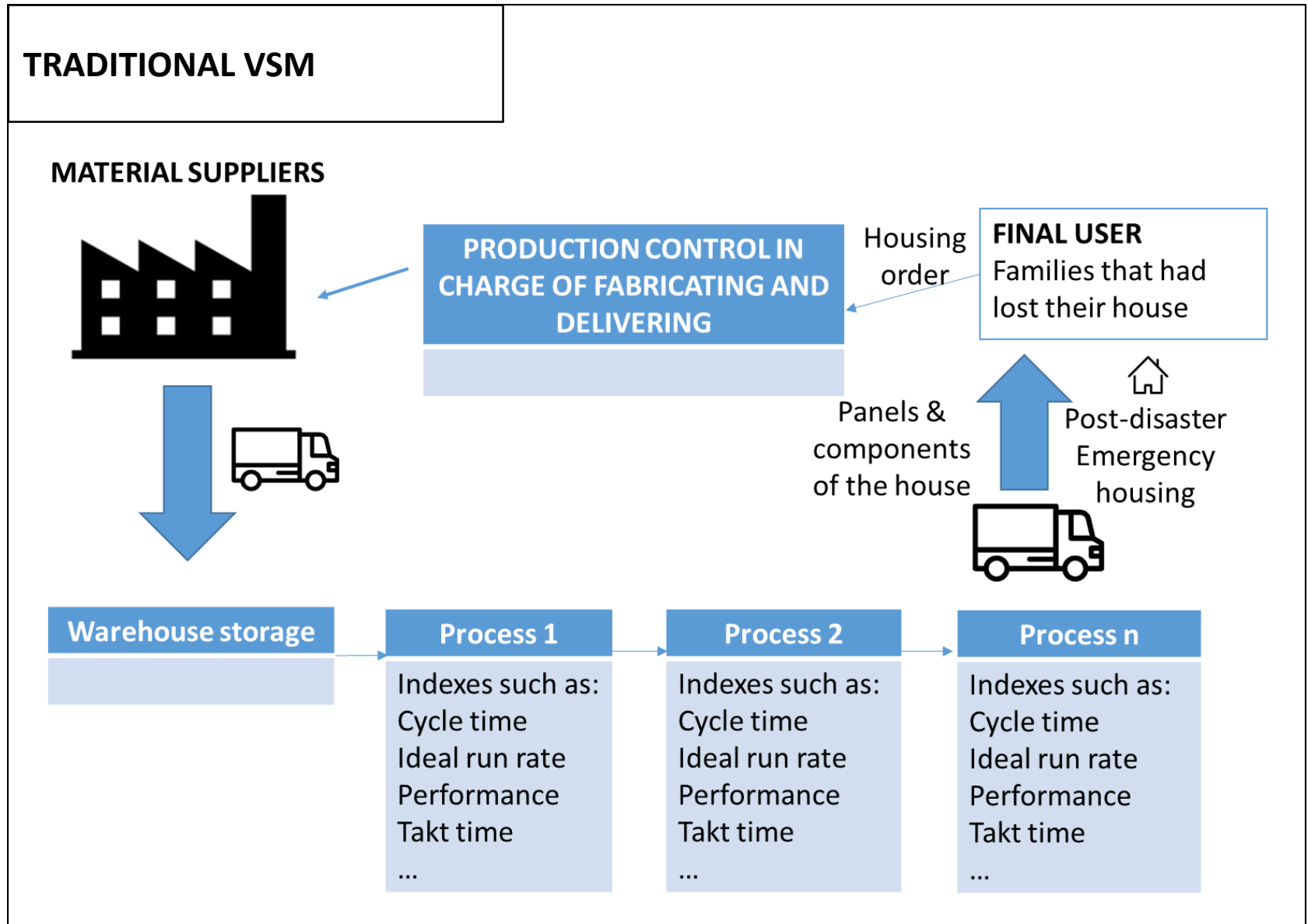
4. Approach to integrate needs & expectations

Social Life Cycle inventory analysis

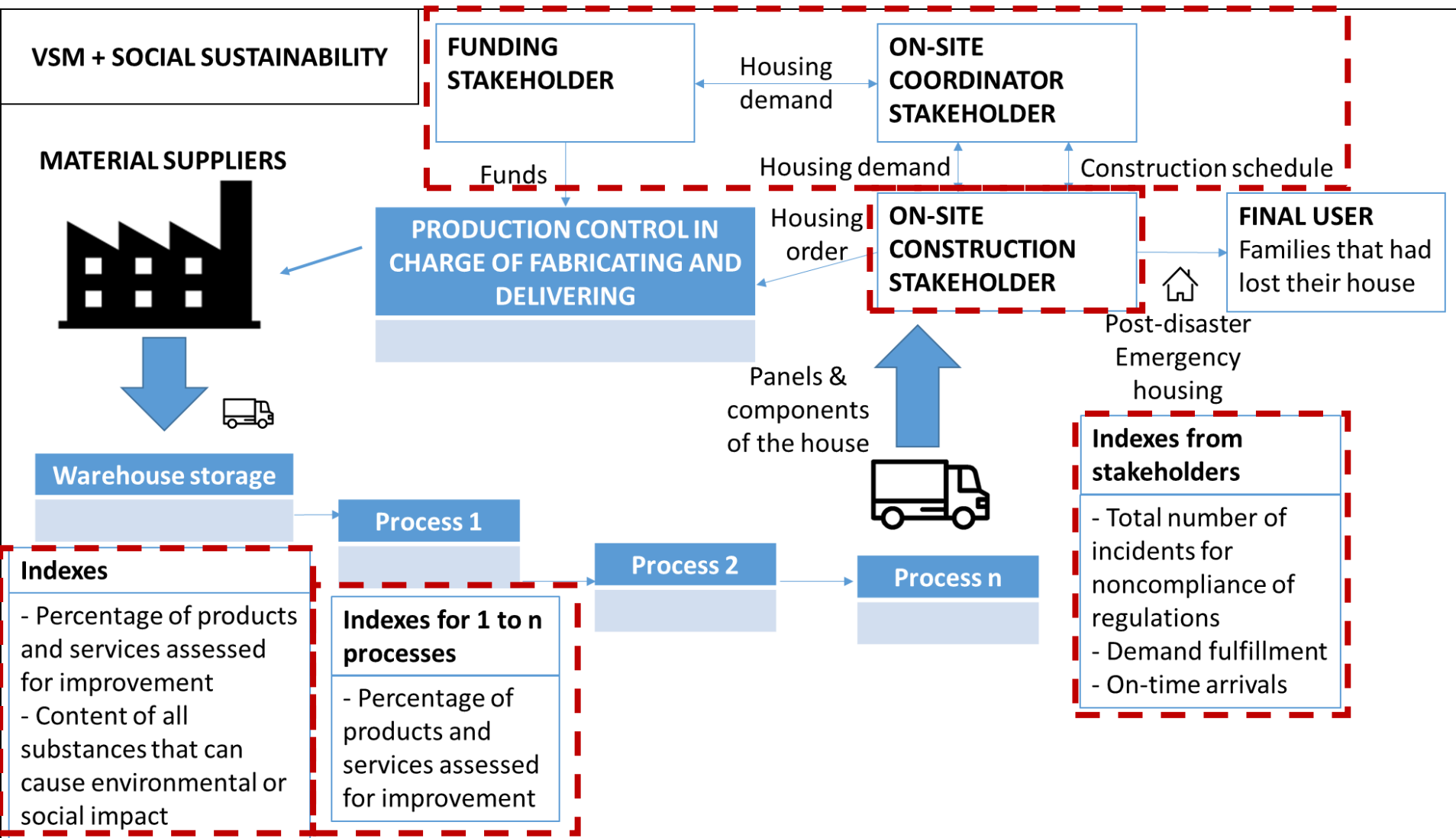
Identification of relevant social impact indexes

- 1. *Percentage of products and services assessed for improvement (GRI):*** It estimates the ratio of processes that have been re-designed towards social sustainability.
- 2. *Total number of incidents for noncompliance of regulations (GRI):*** It estimates how many stakeholder requirements have not been fulfilled towards social sustainability
- 3. *Content of substances that can cause environmental or social impact (GRI):*** It identifies how many fabricated product can negatively impact social sustainability of external stakeholders.
- 4. *Demand fulfilment (Handbook of Emergencies and Mora & Akinci):*** It assesses the speed of the delivery of the solution towards social sustainability.
- 5. *On-time arrivals (Handbook of Emergencies and Mora & Akinci):*** It assesses of the on-time arrival expectation of the stakeholders.

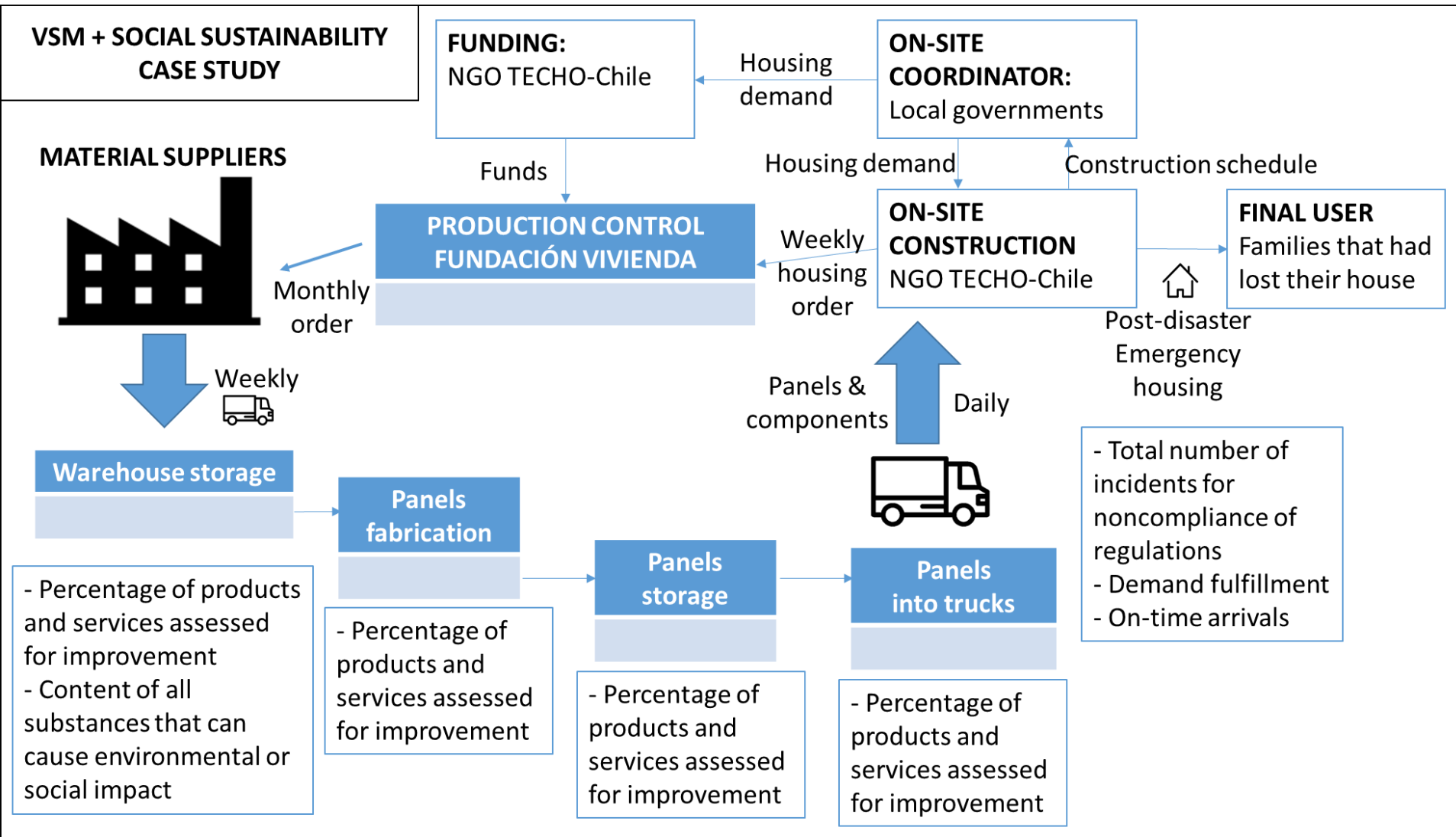
4. Approach to integrate needs & expectations



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4. Approach to integrate needs & expectations

Results

INDEX	INITIAL STATE	FINAL STATE
Percentage of products and services assessed for improvement	0%	100%
Total number of incidents for noncompliance of regulations	0%	9.8%
Content of substances that can cause environmental or social impact	0	0
Demand fulfillment	75%	84%
On-time arrivals	66%	92%

4. Approach to integrate needs & expectations

Results

INDEX	INITIAL STATE	FINAL STATE
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These indexes represent the social impact of the outcome. A 100% index means that changes done to the fabrication and delivery processes did fulfilled social impact expectation of external stakeholders.

In this case, the indexes grown up, therefore changes (innovations) done to the processes did maximized social impact of processes on external stakeholders.

In this case, more houses were fabricated and arrived on time.

Demand fulfillment	75%	84%
On-time arrivals	66%	92%

5. Conclusions

The model **allows the integration of different stakeholders' points of view** that
“use” the outcome of the fabrication and delivery

The case study demonstrated that the proposed model and indexes **can be used
and are useful** within a subsidiary approach to fabricate and deliver post-disaster
emergency housing

→ **Process managers can use the model to analyze processes towards maximize
its social impact**

6. Perspectives & future work

Only one type of product in one context was analyzed

→ The model has to be tested in other scenarios/contexts

Proposed indexes are based only on researched literature

→ Surveys with statistical validity are needed to validate indexes

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