

THE PENNSYLVANIA STATE UNIVERSITY
SCHREYER HONORS COLLEGE

DEPARTMENT OF ARCHITECTURE

**DISASTER RELIEF:
A PSYCHOLOGICAL APPROACH TO TEMPORARY SHELTER**

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A thesis
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ABSTRACT

Many would say the Earth is not perfect. There are floods, mud slides, land slides, earthquakes, droughts, hurricanes, tornadoes, tsunamis, volcanic eruptions, and the list goes on when it comes to what are referred to as “natural disasters.” In the twenty-first century alone, natural disasters have killed over 600,000 people, and left even more homeless, but every single “disaster” has a scientific reason for happening.

The true threat of a natural disaster is the vulnerability of the area affected. The areas most prone to natural disasters are areas with the fastest growing and poorest populations. “The etiology and consequences of natural disasters often are affected by human beings. For example, the damage and loss of life caused by an earthquake can be magnified by poor construction practices and high-density occupation. Similarly, humans may cause or contribute to natural disasters through poor land-management practices that increase the probability of floods.”¹ According to Kofi Annan in 1999, “ninety percent of the disaster victims worldwide live in developing countries where poverty and population pressures force growing numbers of poor people to live in harm’s way on flood plains, in earthquake prone zones and on unstable hillsides. Unsafe buildings

¹ Carol S. Fullerton and Robert J. Ursano, “Psychological and Psychopathological Consequences of Disasters,” in *Disasters and Mental Health*, ed. Juan Jose Lopez-Ibor et al. (Hoboken: John Wiley & Sons Inc, 2005), 17.

compound the risks. The vulnerability of those living in risk prone areas is perhaps the single most important cause of disaster casualties and damage.”

This becomes even more evident when cleaning up after a disaster. Often, the resources are not there to completely rebuild an infrastructure that was unstable to begin with. “Often, post-disaster settlement and shelter processes address only disaster-related change, and do not consider pre-existing vulnerabilities. The reasons for this are principally funding, capacity issues for organizations and mandates, especially when organizations are officially invited by a host government to do post-disaster work. Yet disasters, even those involving a sudden-onset hazard, inevitably have multiple root causes, including poverty and conflict, which increase vulnerability to the hazard. If those root causes are not considered after the disaster, there is a danger that the same vulnerable state will be rebuilt, or that new vulnerabilities will be created. Planning and implementing transitional settlement and shelter within the wider context of long-term development, planning and housing activities can markedly reduce vulnerabilities, and mitigate the impact of future disasters. Transitional settlement and shelter can assist in eliminating factors which cause disasters and necessitate relief operations.”¹

¹ Jim Kennedy et al., “Post-tsunami transitional settlement and shelter: field experience from Aceh and Sri Lanka,” Humanitarian Exchange Magazine, (March 2007), <http://www.odihpn.org/report.asp?id=2879>.

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THESIS STATEMENT

There are many aid organizations in the world that provide post-disaster care. There are even more opinions on how the care should be administered. Food, clean water, and clothing are all non-negotiable, but the issue of shelter is often a great source of controversy. Part of the controversy is over what kind of shelter is best after a natural disaster. Often, people live in temporary housing: tents, trailers, etc., for a period of time longer than initially intended. The opinion of many non-government organizations (NGOs) is to skip the temporary housing phase of recovery, and go straight to building public infrastructure instead. This becomes problematic for the people stuck in less than adequate situations. Temporary housing after a disaster is something that is going to happen whether or not NGOs want it to.

What is needed is a type of temporary housing that can adapt with its inhabitants. A house that is able to arrive at the site of the disaster quickly. A house that isn't made of toxic materials. The psychological state of disaster victims at the time of temporary housing is very vulnerable. They are in the most difficult phase of recovery: depression and realizations are hitting them the hardest. They need a steadying experience to ground their daily routines. A comfortable temporary home could be the base they need. The home should only be usable for up to 5 years after the disaster, but it should be a home that the inhabitants have control over.

Through studying the juxtaposition between the stages of psychological disaster management and architectural disaster management, I have been trying to support my thesis. Unfortunately, there are two very prominent schools of thought, that cannot be easily compromised when it comes to temporary disaster relief in architecture.

The first idea is that disaster relief needs to be placed in the situation as soon as possible. The longer victims live without some kind of place to call their own “home,” the more psychological damage this could cause them.

The second idea is that disaster relief needs to be a community process. The community needs to be rebuilt in the best way possible to give residents a sense of closure and accomplishment.

The reason these two ideas haven’t worked well together in the past is because the solution to the first problem is often prefabricated housing, which is exactly the problem that the second solution is trying to solve.

I do, however, believe that a compromise can be forged between the two. The community does need immediate disaster relief, but they also need to be able to take some kind of hand in their own rebuilding.

The house will also utilize the principles of light, air, and good materials to help facilitate a healthier living experience.

RESEARCH

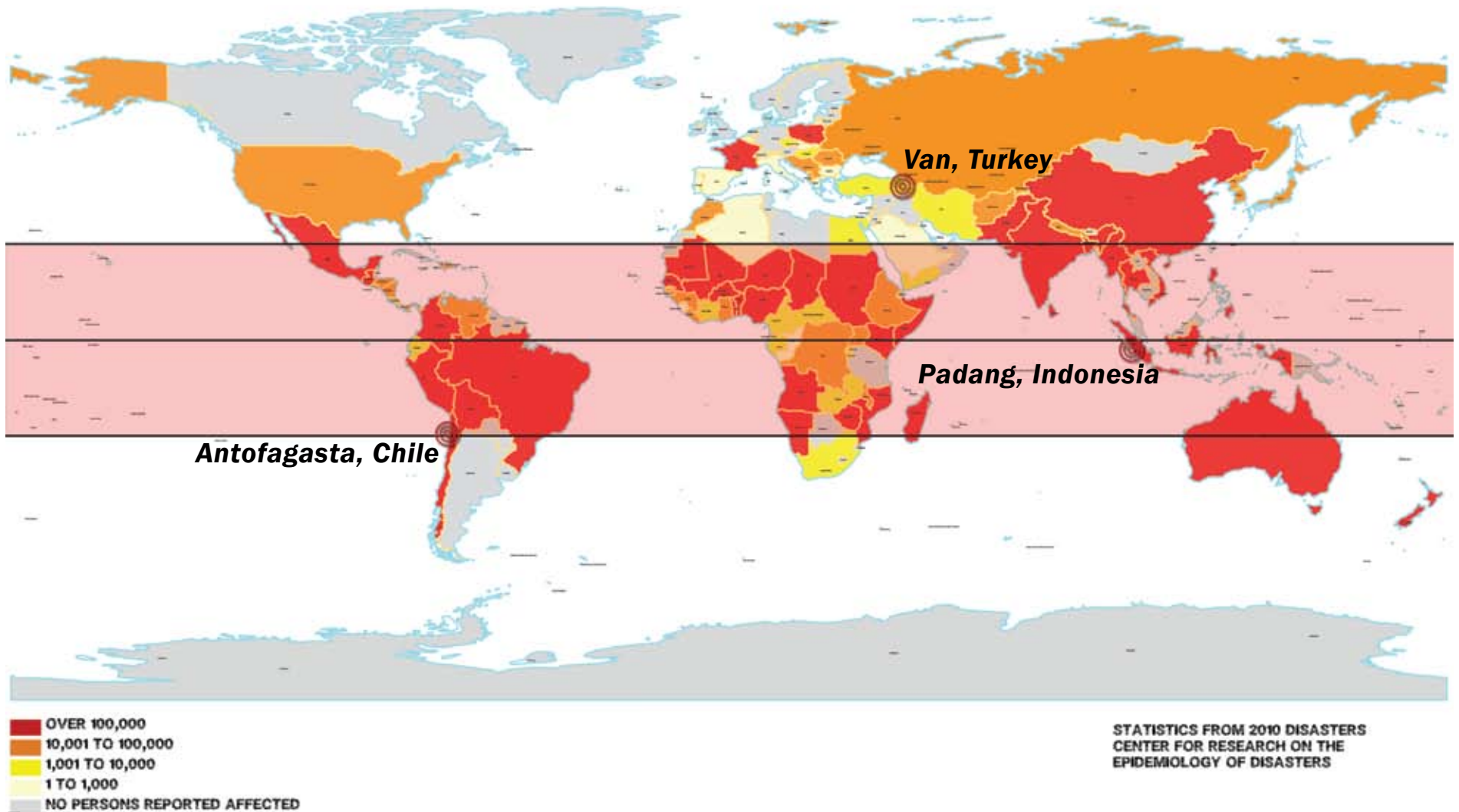
- 3.1. Area of Focus Summary**
- 3.2. Discussion of Findings from Literature Review**
- 3.3. Psychological Phases**
- 3.4. Architectural Phases**
- 3.5. Architectural Precedent Analysis**

3.1 AREA OF FOCUS SUMMARY

The parts of the world experiencing devastating natural disasters are quickly escalating. The areas that are most susceptible are those located between the tropics. These are also the areas that have the poorest and fastest growing populations. When disaster strikes in these countries, often there is little chance to rebuild before a new disaster, much less chance for everyone to receive relief.

I have chosen to study three different cities: Padang, Indonesia, Van Turkey, Antofagasta, Chile, all prone to different kinds of disaster in three very distinct parts of the world, culturally, economically, and climactically. This study is leading me towards the solution of a single design disaster relief unit that can be adapted for different peoples to provide near immediate relief, but then can be changed to fit the needs of the individual and the community.

Areas of the World Most Affected By Natural Disaster



3.2 DISCUSSION OF FINDINGS FROM LITERATURE REVIEW

The following passage outlines some of the things that can go wrong with temporary housing if the needs of the community are not taken into consideration:

“Together with the provisional community center, Uplink installed temporary shelters, made out of recycled materials, to replace the tents. These served as reliable protection and helped survivors move quickly from emergency aid to recovery. Their form and placement were chosen with community participation.

Many of the larger international organizations, such as the International Organization for Migration, provided prefabricated shelter units made outside the country. These were not only expensive, but prevented aid from being rooted in local investment. The prefabricated designs were ad hoc, and the units were time-consuming to assemble. It took the International Red Cross and Red Crescent societies six months to start distributing shelters. These prefabs were of two types: one, made from imported light steel frames and wood panels, cost \$4,500 each. The other, prefabricated concrete modules, were too brittle to be earthquake-safe. And neither model included instructions for post-emergency use or disposal. As a result abandoned temporary shelters all over Banda Aceh, Indonesia became common, sad reminders of how easy it is to waste money and resources.”¹

¹ Aquilino, Marie Jeannine. *Beyond Shelter: Architecture and Human Dignity*. New York, NY: Metropolis, 2010. pg. 31. Print.

3.3 PSYCHOLOGICAL PHASES AFTER A DISASTER

FIRST PHASE

FIRST FEW DAYS AFTER DISASTER
EVENT TO FIRST WEEK



"NORMAL RESPONSE TO ABNORMAL EVENTS"

PSYCHOLOGICAL RESPONSES INCLUDE:

COOPERATION AND HEROIC DEEDS, FAMILY AND NEIGHBORS USED AS SUPPORT SYSTEMS,
RELiance ON COMMUNITY
DISBELIEF, NUMBNESS, FEAR, AND CONFUSION OVER EVENTS BEGIN TO SET IN

SECOND PHASE

ONE WEEK AFTER DISASTER TO
THREE WEEKS



EXTERNAL ASSISTANCE ARRIVES, BRINGING HELP, STRANGERS, AND THE MEDIA
THE COMMUNITY BANDS TOGETHER AS CLEAN UP BEGINS

VICTIMS BEGIN TO SEARCH FOR PRIVACY AS THEY FOCUS IN ON THEIR NUCLEAR FAMILY

**INTRUSIVE SYMPTOMS OF PTSD BEGIN: HYPERVIGILANCE, INSOMNIA, NIGHTMARES, DENIAL
BEGINS AND BECOMES MORE PROMINENT**

THIRD PHASE

THREE WEEKS AFTER DISASTER
TO FIVE YEARS



DISAPPOINTMENT AND RESENTMENT AT SHORTCOMINGS OF PROMISED AID

HEIGHTENED SENSE OF DENIAL, ANGER, IRRITABILITY, APATHY, SOCIAL WITHDRAWALS

**STRONG SENSE OF COMMUNITY BEGINS TO BREAK DOWN: THERE NEEDS TO BE A DEFINED
SENSE OF PUBLIC AND PRIVATE**

EFFORTS NEED TO BE TAKEN TO COPE WITH PTSD: SOFT INTERIOR COLORING, INDIRECT
LIGHTING, AND ADAPTABILITY

**VICTIMS FOCUS ON PERSONAL PROBLEMS AND REBUILDING: ADAPTABILITY IN COMMUNITY
ALLOWING VICTIMS TO FEEL IN CONTROL AND COMFORTABLE IN THEIR TEMPORARY HOMES**

FOURTH PHASE

SEVERAL YEARS AFTER DISASTER
TO AN INDEFINITE AMOUNT OF
TIME



PERMANENT RECONSTRUCTION BEGINS BASED ON GOVERNMENT AND
COMMUNITY PREFERENCES

MAY LAST FOR YEARS OR INDEFINITELY AS WILL PSYCHOLOGICAL SYMPTOMS

REBUILD HOMES, LIVES, AND JOBS

DEALING WITH INSURANCE ADJUSTMENT

3.4 ARCHITECTURAL PHASES AFTER A DISASTER

In 1982, Henry Quarantelli “suggested that [a sequential, four-phase taxonomic model of the types of post disaster housing] is necessary to properly reflect the heterogeneous nature of post disaster shelter arrangements.”¹ He identified these to be: emergency shelter, temporary shelter, temporary housing, and permanent housing. The time frames for each phase of housing closely match up with the psychological phase that many disaster victims go through. It seems that the time frames of refuge and psychological behavior directly correlate to each other, and it is most likely that one affects the other, although the same psychological symptoms have been recorded in disaster victims who have not had to experience temporary shelter. This would include victims who had families to move in with, along with victims of terrorist attacks and other man-made disasters.

¹ Robert Bolin, “Post disaster Sheltering and Housing: Social Processes in Response and Recovery,” in *Disasters, Collective Behavior, and Social Organization*, ed. Russell R. Dynes et al. (Newark: University of Delaware Press, 1994), 116.

The Four Phases of Disaster Relief Shelter

EMERGENCY SHELTER

VICTIMS WILL TOLERATE PRIMITIVE CONDITIONS IN THOSE SHELTERING ARRANGEMENTS BECAUSE OF THE ASSUMED SHORT TERM NATURE OF THEIR STAY

TEMPORARY SHELTER

SEEKING SHELTER AWAY FROM PRE DISASTER RESIDENCE FOR A PERIOD EXTENDING BEYOND THE HEIGHT OF THE EMERGENCY PHASE

TEMPORARY HOUSING

THE REESTABLISHMENT OF HOUSEHOLD ROUTINES BUT WITH THE UNDERSTANDING THAT MORE PERMANENT QUARTERS WILL BE OBTAINED EVENTUALLY

PERMANENT HOUSING

THE RIGHTS OF THE INDIVIDUAL ARE OFTEN DWARFED BY THE SCALE OF THE EVENT AND OF THE COMMUNITY BUILDING MACHINE



UNPLANNED AND SPONTANEOUSLY SOUGHT PROVISIONAL SHELTER: CHURCHES, RED CROSS, LARGE PUBLIC GATHERING PLACES

AS EVERYONE BANDS TOGETHER IN TIME OF NEED, LIVING TOGETHER HELPS TO FOSTER A SENSE OF COMMUNITY

STAYS LONG ENOUGH TO REQUIRE THE PROVISION OF SUSTAINED FOOD AND SLEEPING FACILITIES

PEOPLE SEARCH FOR A SEMBLANCE OF PRIVACY, BUT THE CONFIGURATION STILL FOSTERS A SENSE OF THE COMMUNITY THAT DEVELOPED IMMEDIATELY POST DISASTER



TEMPORARY SHELTER RESPONDS TO THE LONG TERM NEEDS OF DISASTER VICTIMS

ABILITY TO CONTROL PRIVATE VS PUBLIC FUNCTION AS PEOPLE SEARCH TO REBUILD THEIR PRIVATE LIVES WHILE STILL BENEFITTING FROM THE SENSE OF COMMUNITY

THE HOUSE ITSELF NEEDS TO HELP RECOVERY WITH ADEQUATE LIGHTING, COLORING, AND MATERIALS TO PREVENT FURTHER RELAPSE WITH PTSD OR SICKNESS FROM TOXIC MATERIALS



PERMANENT RECONSTRUCTION SHOULD TAKE LOCAL VERNACULAR INTO ACCOUNT TO PROVIDE FOR CLIMATE CONCERNS

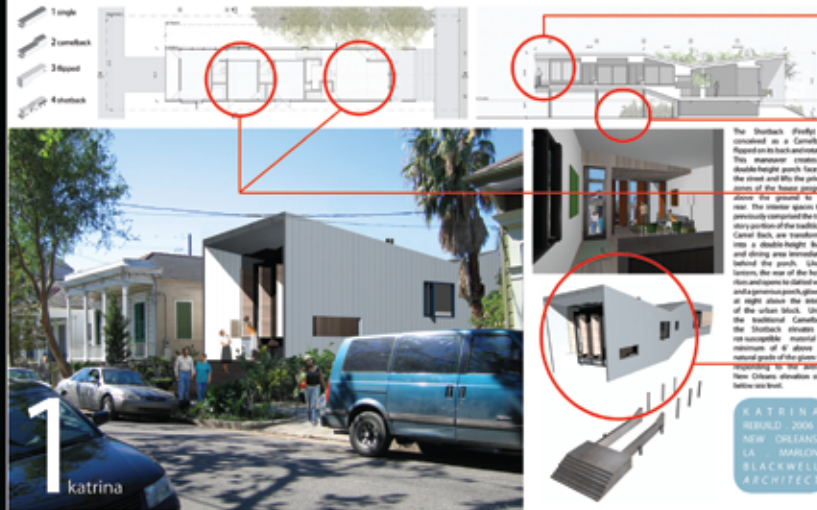
CONSULTATION BETWEEN COMMUNITY AND GOVERNMENT
THE BUILDINGS SHOULD LOOK TO THE FUTURE FOR PREVENTION AGAINST DISASTER EVENTS: I.E. EARTHQUAKE AND FLOOD PROOFING

3.5 ARCHITECTURAL PRECEDENT ANALYSIS

KATRINA REBUILD

MARLON BLACKWELL,
ARCHITECT, FAYETTEVILLE

DISASTER RELIEF
FOR NEW ORLEANS



SECTION: Exterior/interior porch area
Allows for natural light to be let in and controlled.

SECTION: Living portion is raised up to provide for future storm events.

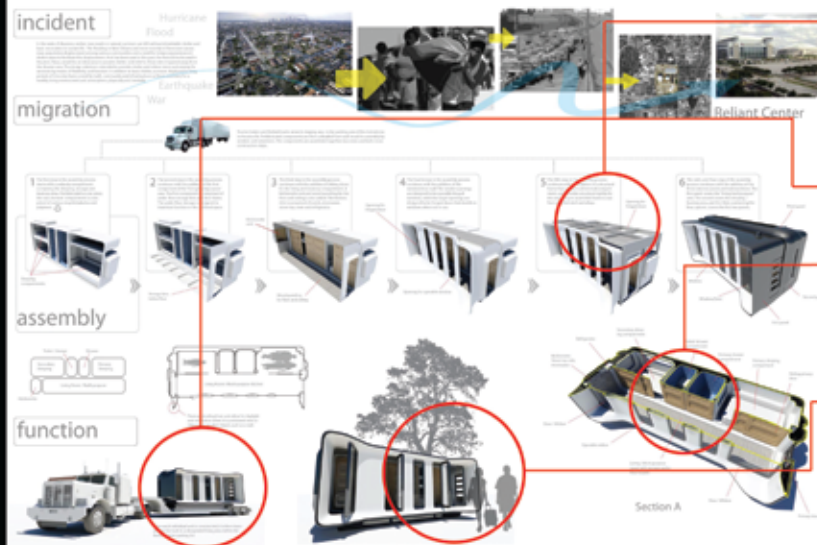
PLAN: Public space is provided for in the front, but transitions to more private spaces away from the street. This ability to have both is important in recovery: coping on one's own and with the community.

AXO: Safe materials are used to construct the home. FEMA trailers used several toxic materials that caused the inhabitants respiratory problems.

AIA YAF TEMPORARY PERMANENT RELIEF HOUSING

THE COMMUNITY UNIT

DISASTER RELIEF
FOR NEW ORLEANS



STRUCTURE: The prefabricated steel structure aids itself well to being prepared quickly with easily found materials, allowing relief to reach people as quickly as possible.

AXO: The dimensions allow the unit to be easily transported.

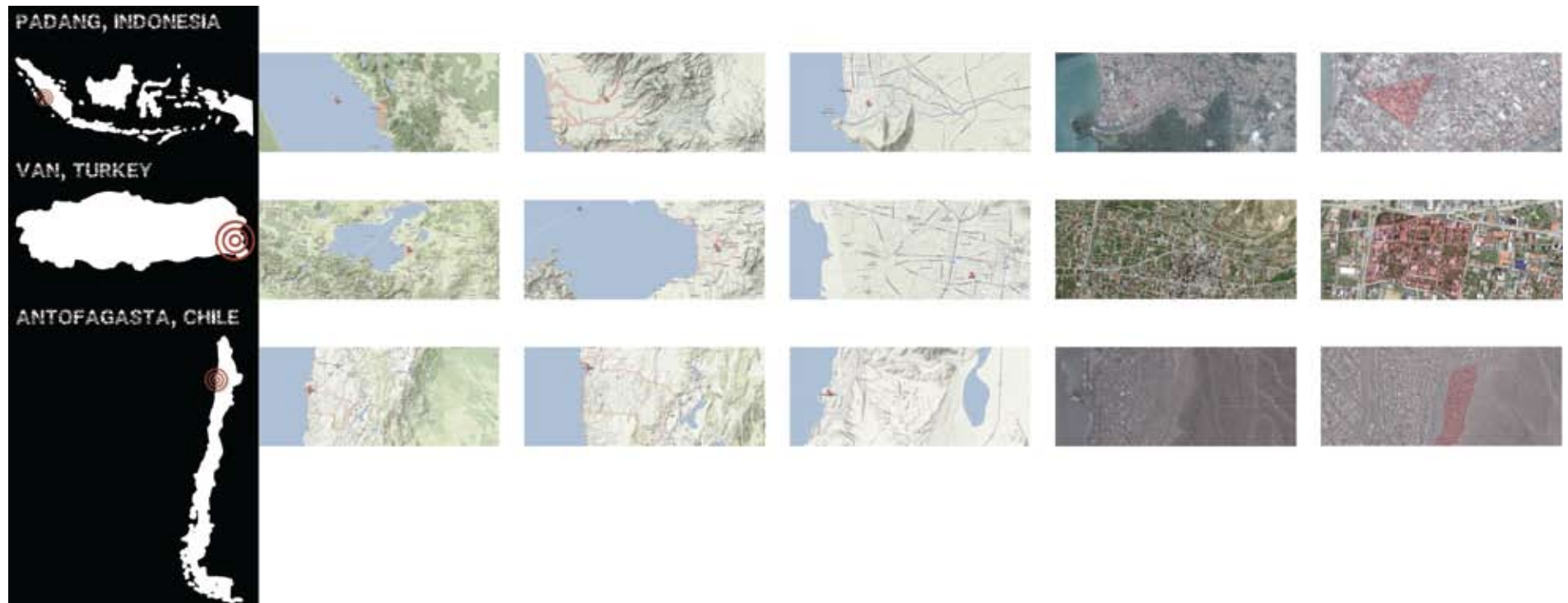
SECTION: Self contained unit makes it easy to set up on site, and private space is accounted for, but little space is allotted for community areas.

AXO: No room for family expansion. It is a one size fits some house with no local materials used. Good plan for community redevelopment.

SITE CONTEXT

- 4.1. Aerial Photos or Maps of Site**
- 4.2. Site Disaster Documentation**
- 4.3. Cultural Site Analysis**

4.1 AERIAL PHOTOS OR MAPS OF SITE



4.2 SITE DISASTER DOCUMENTATION

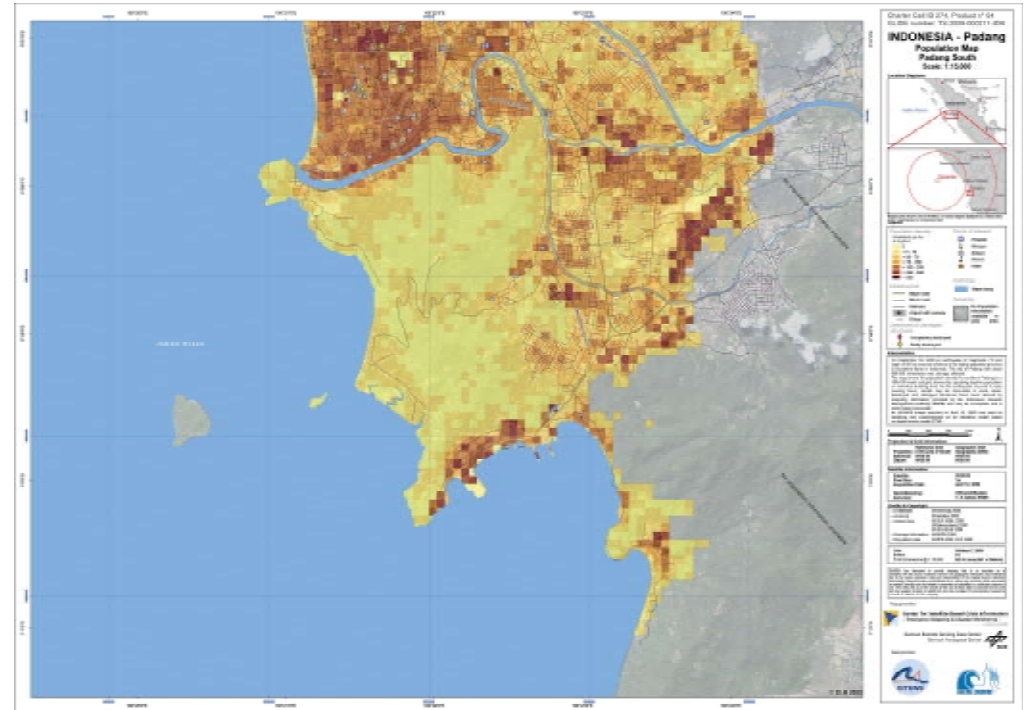
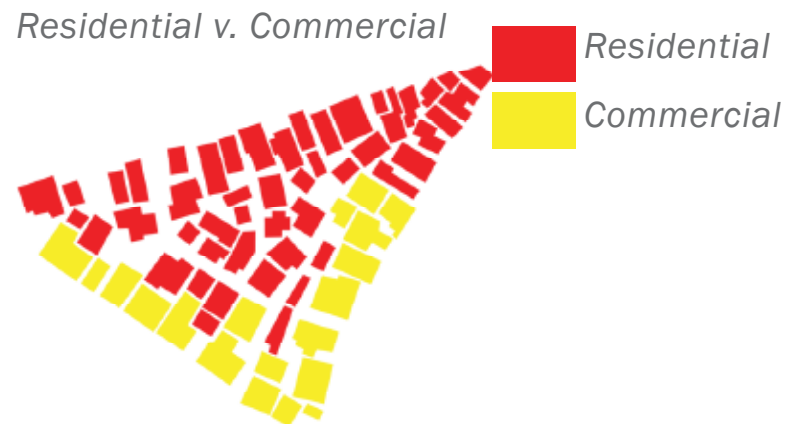
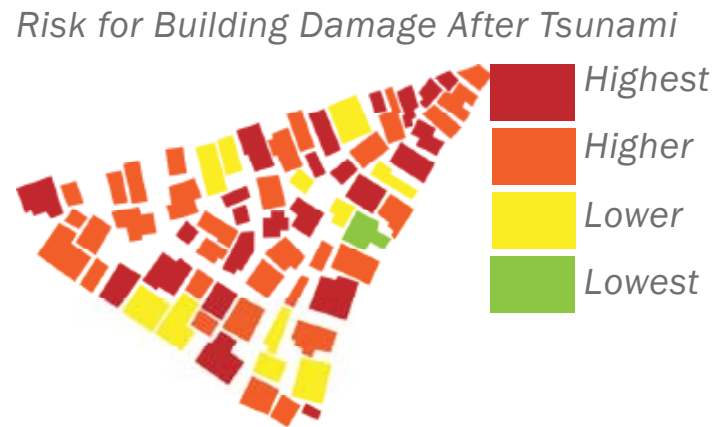
Padang, Indonesia: Houses affected 2004 Indian Ocean Tsunami



Kerry Sieh, a professor of geology in Singapore, says that the earthquake of 30 September [2009] is part of a cycle that began in 2007 along a 700 km off the coast of Sumatra called the “Mentawai trail”. In this cycle, over the next 10 years, there could be up to 8.8 magnitude earthquakes, which could generate tsunamis with waves up to 5-6 meters.¹

1 <http://www.asianews.it/news-en/Jakarta-seeks-international-aid-for-the-more-than-1000-dead-in-Sumatra-earthquake-16479.html>

Padang, Indonesia Population Density Study



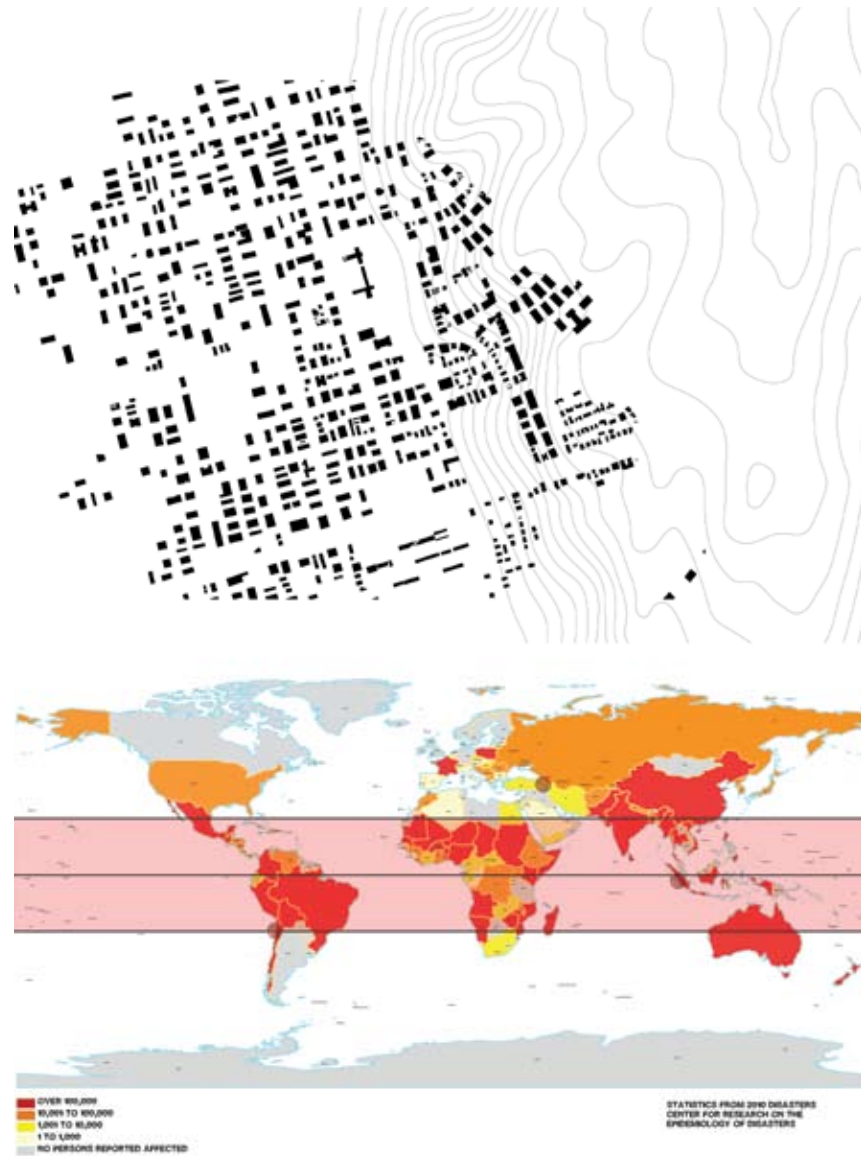
Van, Turkey: Seismic affects 2011 Van Earthquake



Due to its great intensity and shallow depth, the earthquake produced significant ground motions across a large area. Violent shaking measuring MM IX on the Mercalli scale occurred in Van, although widespread strong to severe (MM VI–VIII) shaking was observed in many smaller and less populated areas around the epicenter. [11] Lighter but well-felt ground motions (MM V–III) spread much farther across the region, extending into surrounding countries such as Armenia, Azerbaijan, Georgia, Iran, Iraq, Israel and Syria.¹

1 “Pager – M 7.2 – Eastern Turkey”. United States Geological Survey. 23 October 2011. Retrieved 23 October 2011.

Antofagasta, Chile: Houses affected 1991 Barrage of Antofagasta



A mud slide inundated hillside slums of this northern desert city early today, sweeping away scores of wooden shacks and killing at least 64 people, officials said... About 750 people were injured in the slide, which was caused by five hours of rare, torrential rains in this port in the Atacama desert region, considered one of the most arid areas of the world.¹

¹ <http://www.nytimes.com/1991/06/19/world/mudslide-in-chile-inundates-slums-in-desert-area-killing-at-least-64.html>

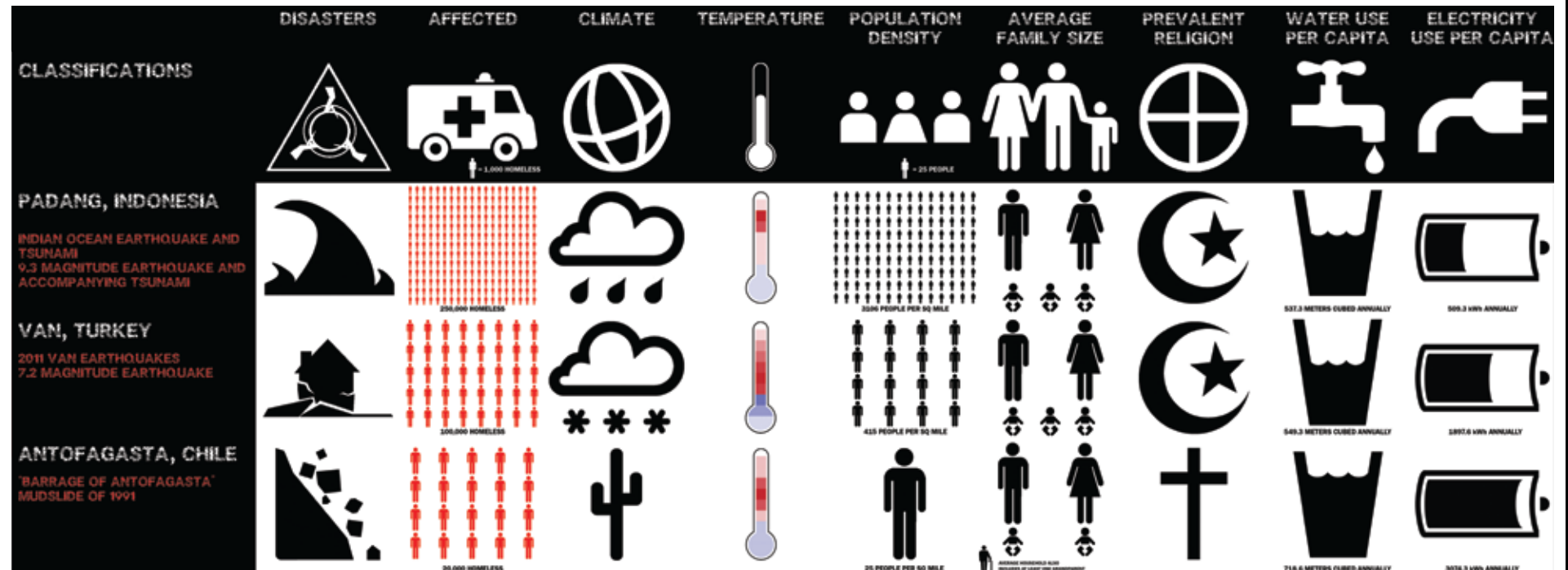
4.3 CULTURAL SITE ANALYSIS

Instead of a traditional site analysis, I choose to look into three different sites around the world to get an understanding of the different type of impact a disaster can have in a different place. Each place is different in respects to the culture, local materials, economy, resources, water usage, family size, and ideas about privacy and community.

This analysis helped me to determine design elements, theories on the dichotomy between public and private spaces in different communities, and the way different peoples deal with natural disaster depending on the amounts of amenities they are used to and the climactic conditions they would have to deal with during the course of their stay in the disaster relief houses.

I also looked into the amount of people that would possibly be utilizing the disaster relief shelters based on size of disasters in the past.

Culture Analysis Chart



PROGRAM

- 5.1. Prefabrication Description and Timeline**
- 5.2. Prefabrication Material Maps**
- 5.3. Shipping Methods**

5.1

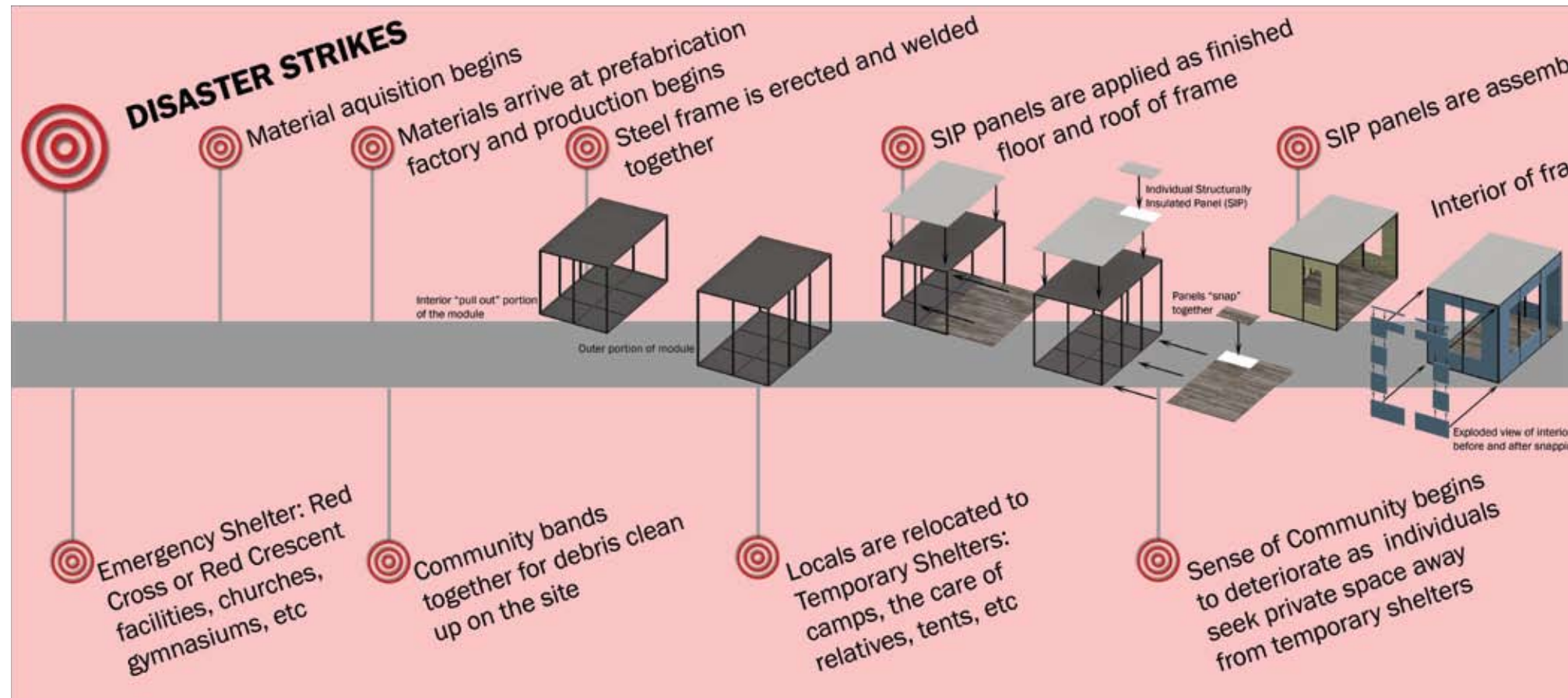
PREFABRICATION DESCRIPTION AND TIMELINE

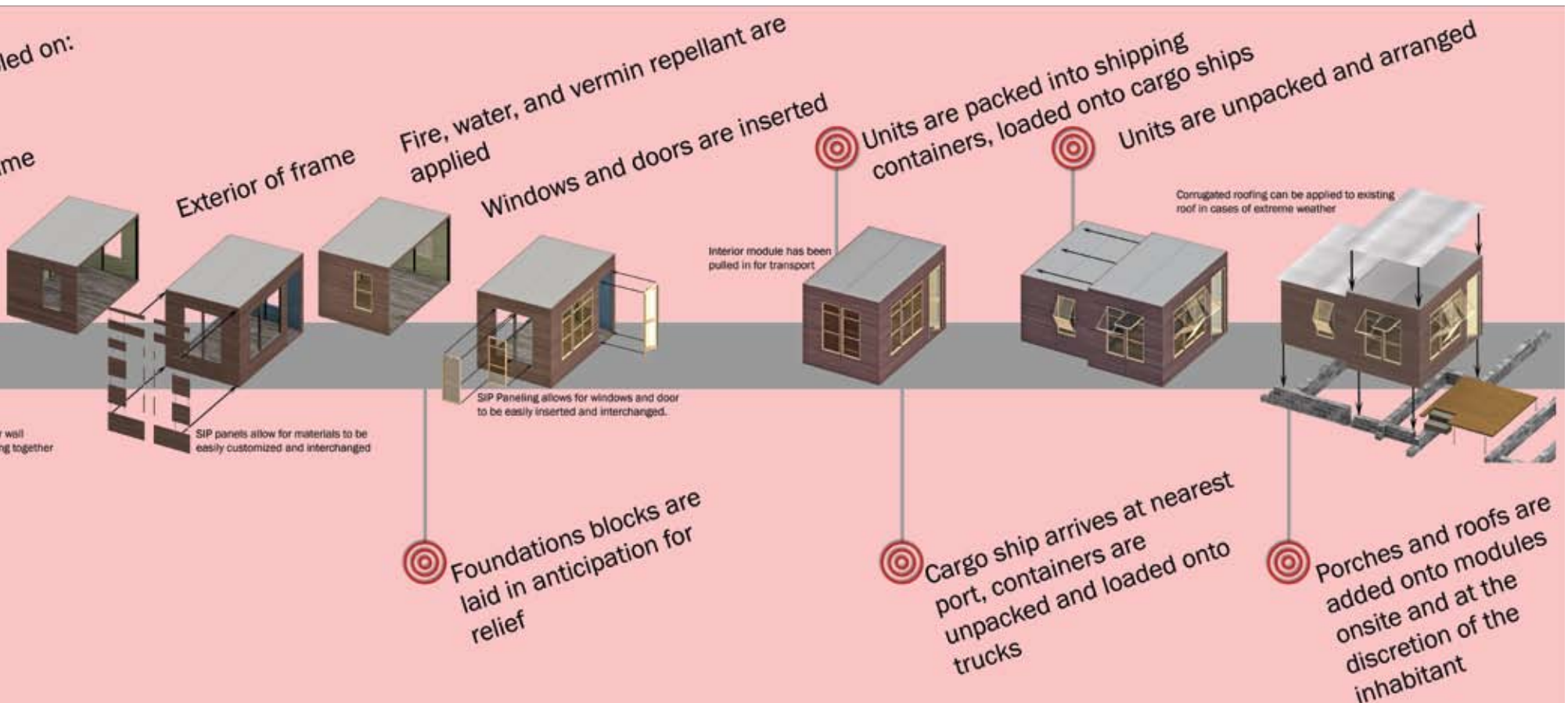
The Prefabrication Timeline breaks down the entire process from start to finish of acquiring the materials to build a module, creating the steel frame, placing the floor and roof Structurally Insulated Panels (SIPs), placing the interior and exterior wall SIPs, fitting in doors and windows, packing the unit up, and shipping it to the desired location.

The Timeline also looks into unpacking the module and placing it on the site, and the stages of disaster relief, both architectural and psychological that the victims of the disaster are experiencing while all of this is going on.

The entire process covers about three weeks worth of time, and the timeline helps to delineate the necessary steps that need to be taken at the site of the disaster in order for the relief shelters to be ready to be received. These include: debris clean-up and readiness to move out of emergency and temporary shelters.

From Disaster to Site in 21 Days





5.2

PREFABRICATION MATERIAL MAPS

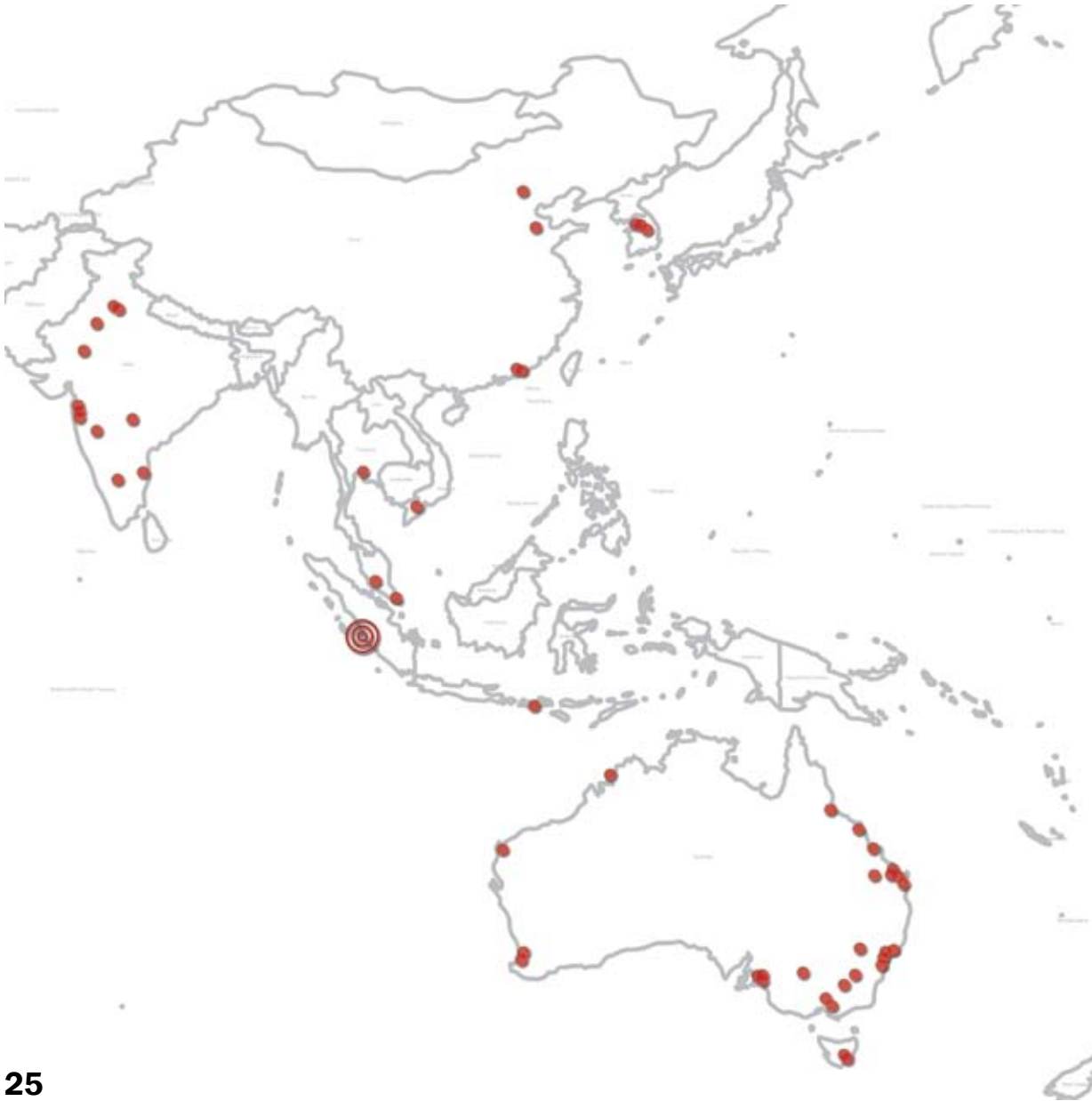
“The US represent the largest regional market for prefabricated housing worldwide. Japan remains the second largest market for prefabricated housing worldwide. However, the future growth in the market is expected to emanate from emerging markets such as Asia, The Pacific, and Latin America. Segment-wise, manufactured homes represent the largest segment, while panelized homes constitute the fastest growing segment.”

- The New Market Research Report on Prefabricated Housing

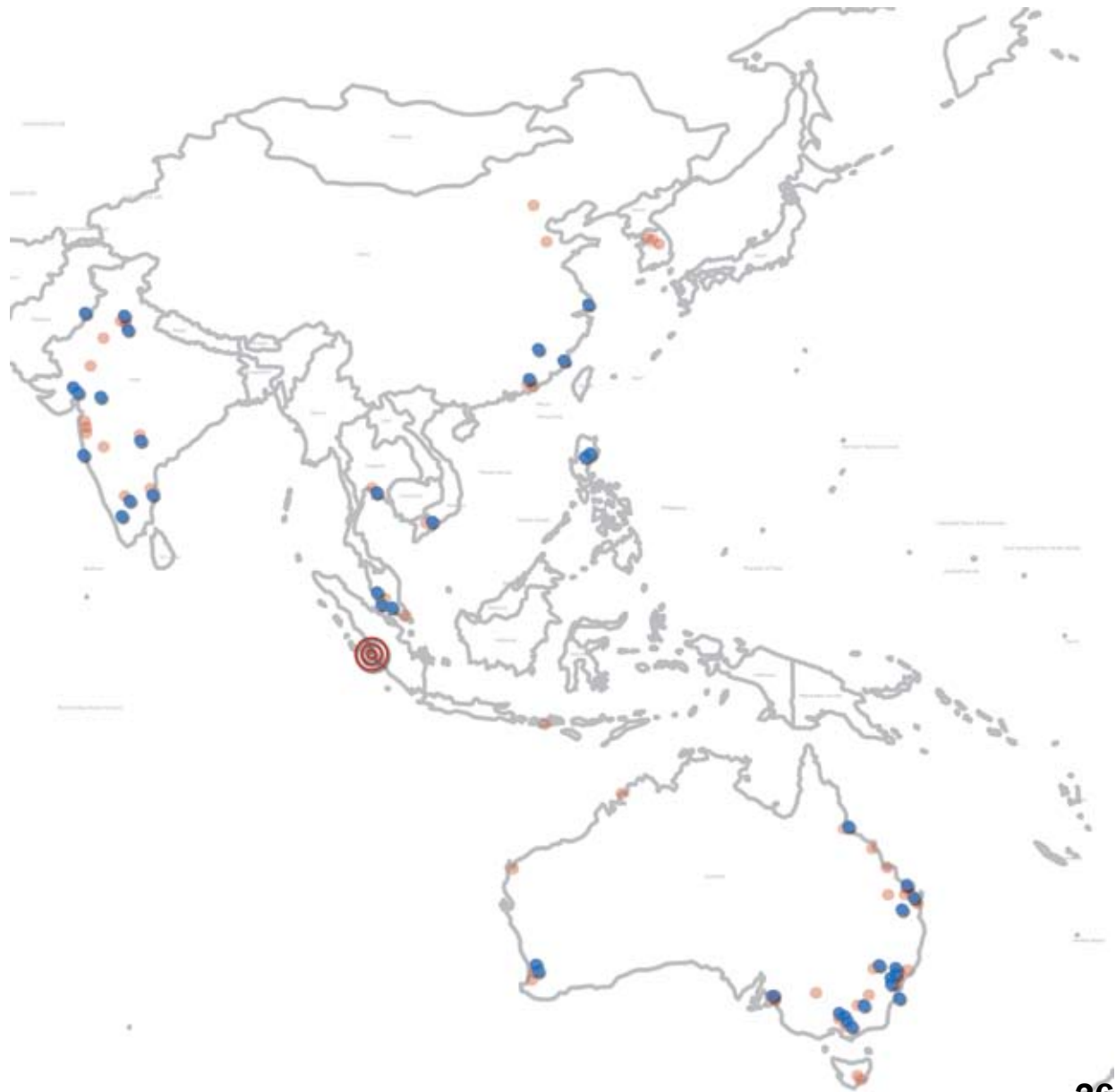
Location of Prefabrication Factories Around the World



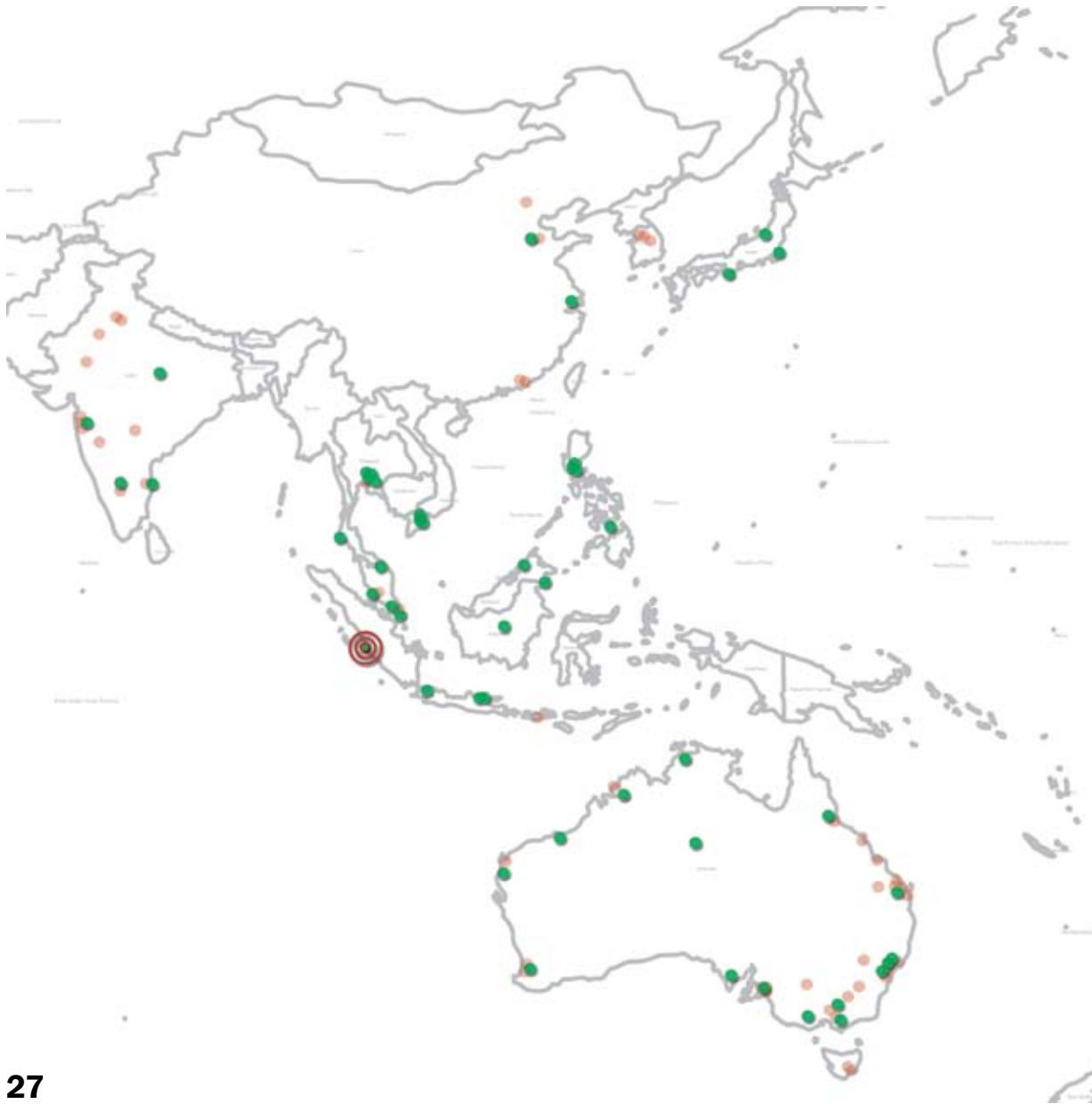
Prefabrication Factories and Manufacturers in the Pacific



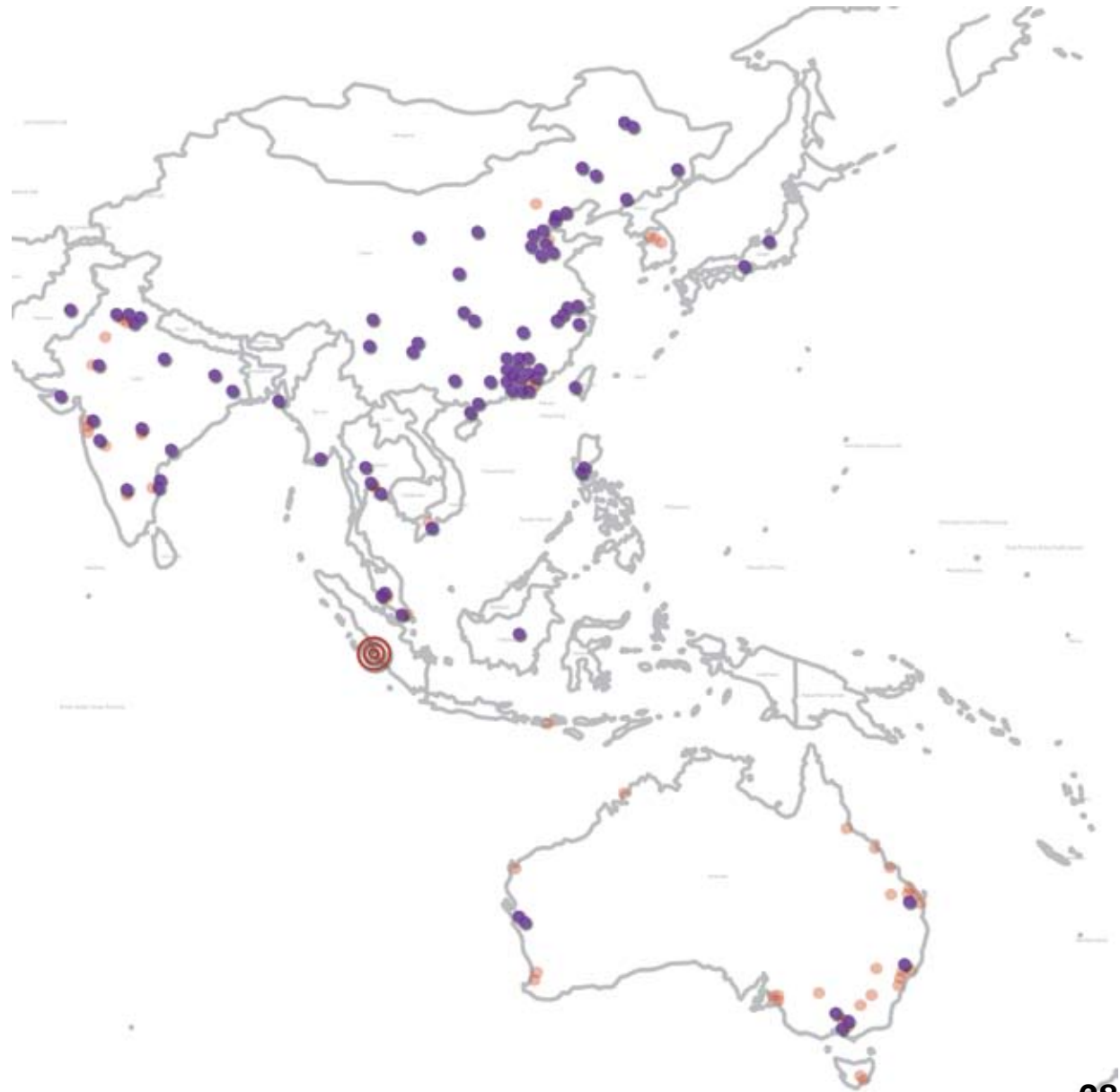
Location of Steel Factories and Manufacturers in the Pacific



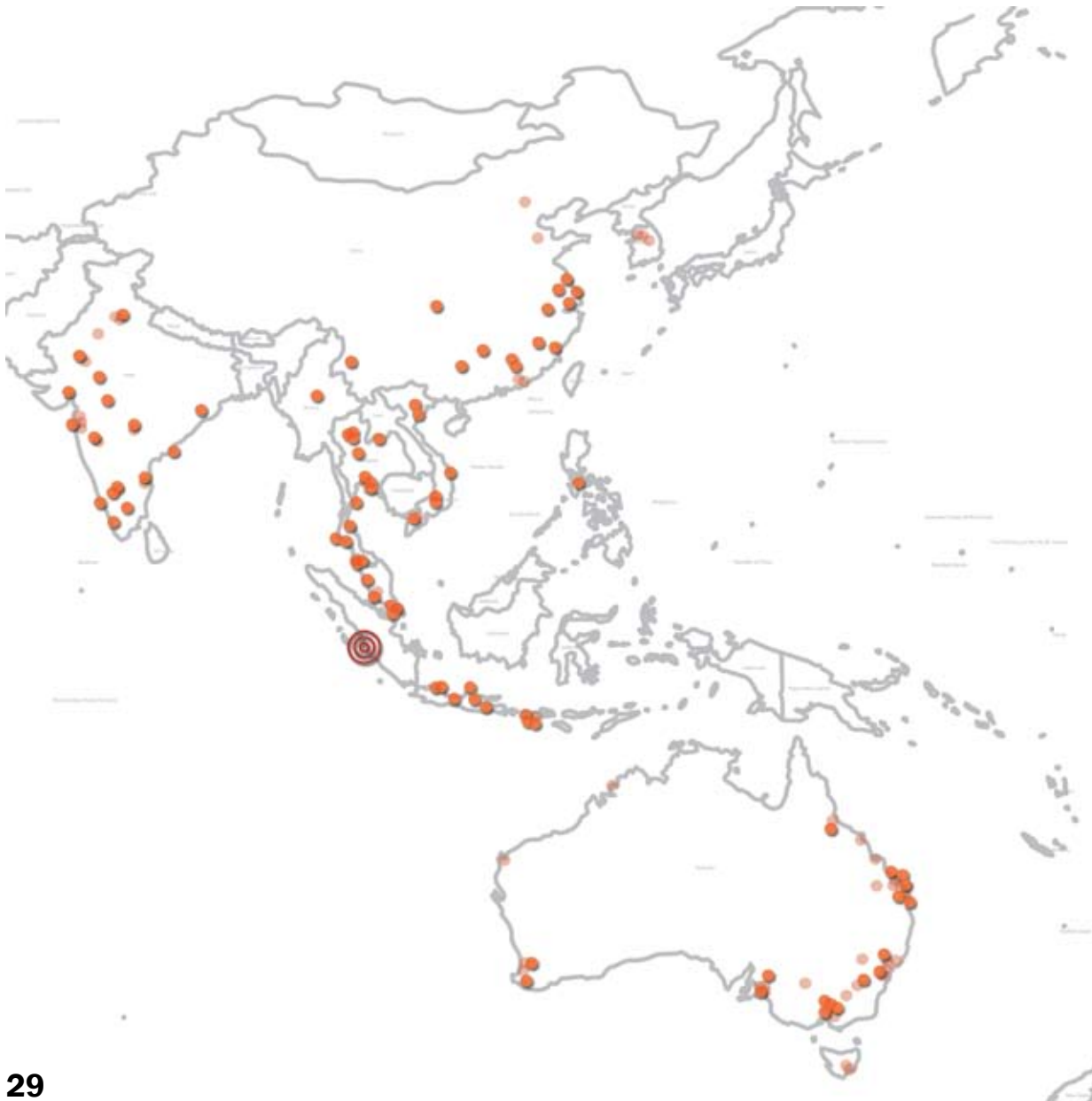
Location of Timber Factories and Manufacturers in the Pacific



Location of Glass Factories and Manufacturers in the Pacific



Bamboo and Teak Factories and Manufacturers in the Pacific



5.3

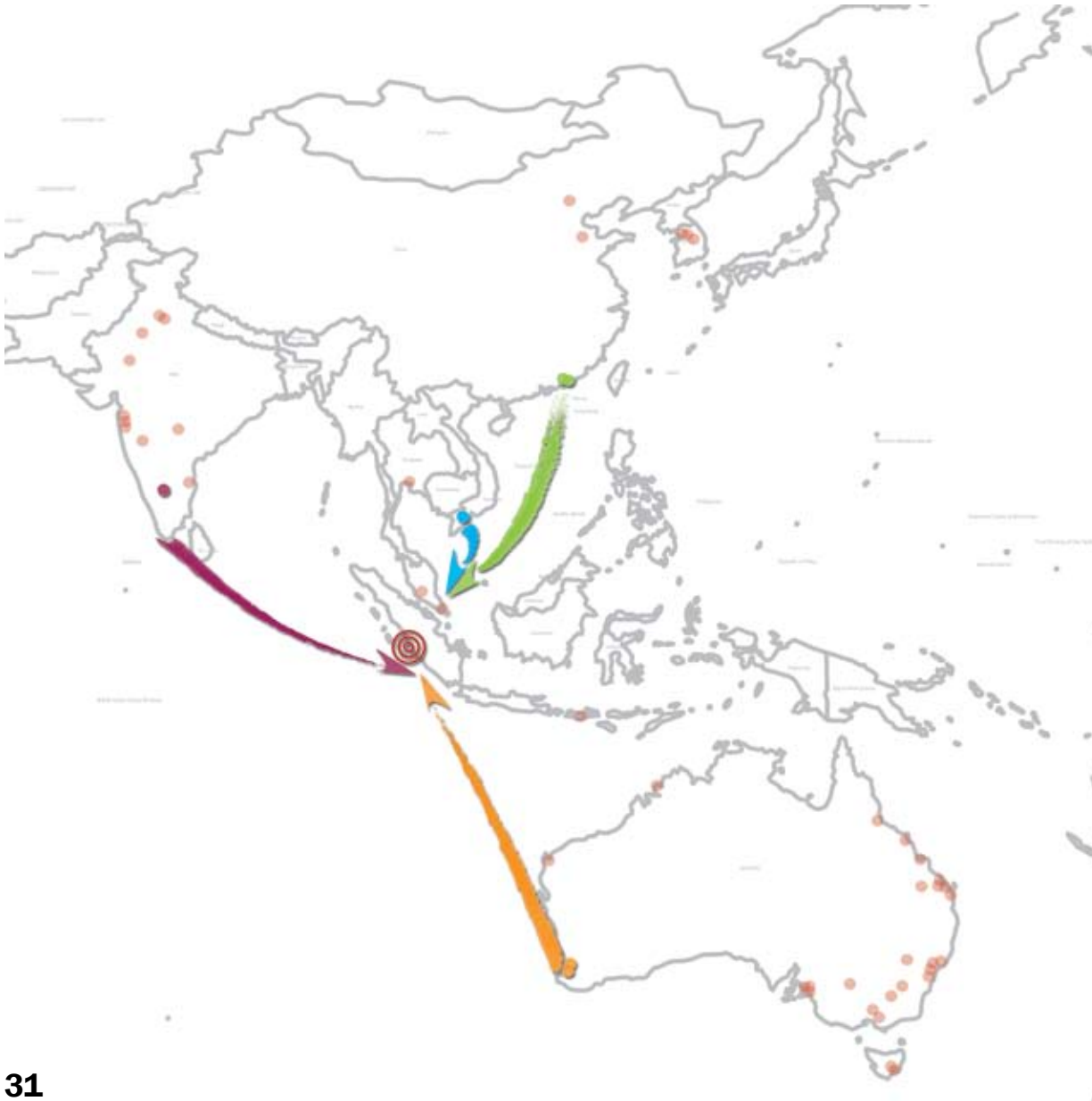
SHIPPING METHODS

“The average container ship can carry up to 7,500 forty foot long containers.” With three modules per container, that is approximately 22,500 modules arriving at the site from one ship.

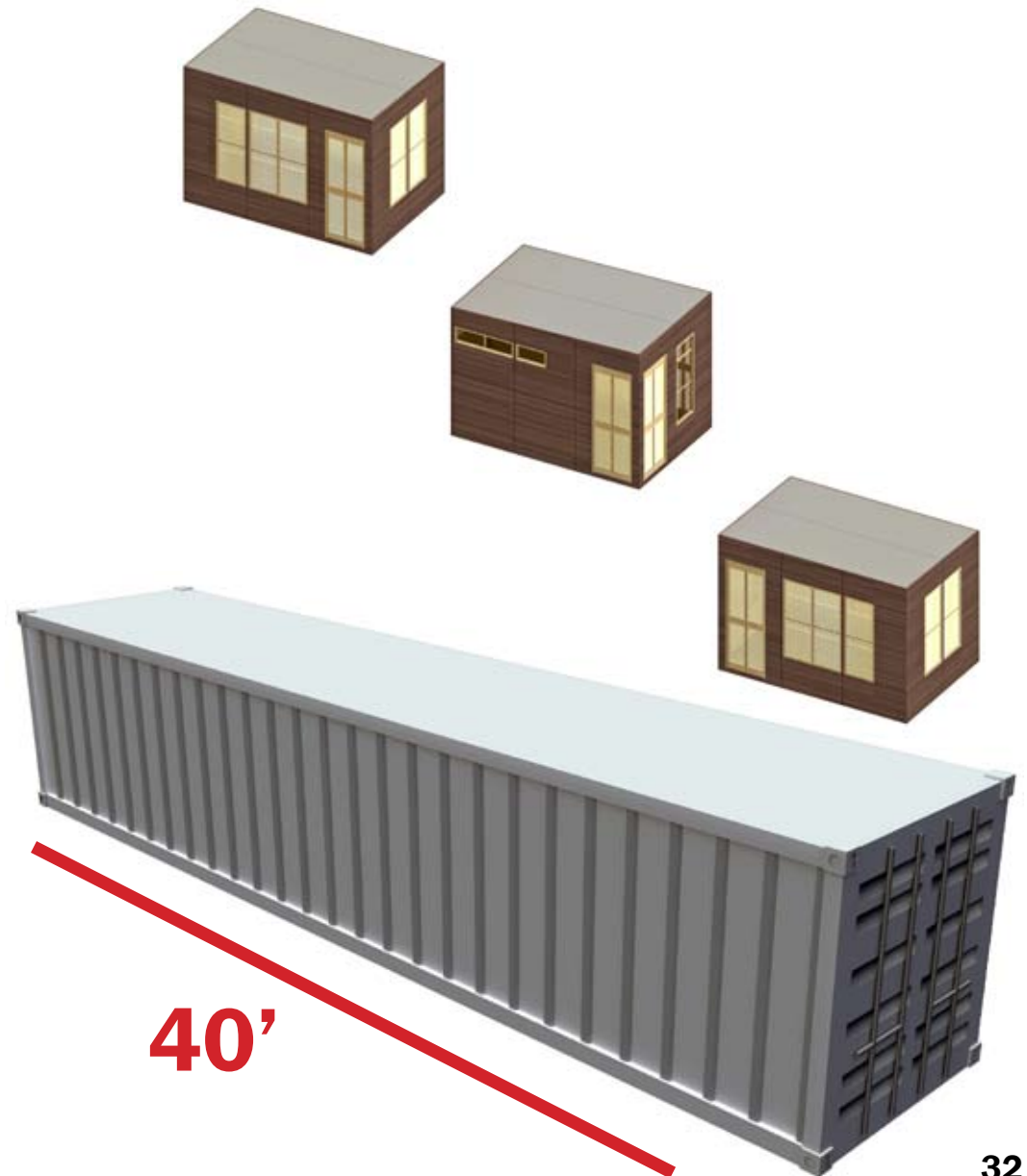
The size of the housing module is 8’ by 12’ which is based on the size that is used for shipping containers, cargo ships, semi-trucks, and cargo planes. Following this measure, the houses can be packed up and shipped or transported over a plethora of different landscapes by most common means of transportation. This enables the containers to reach their destination even if common means of transport has been ruined by the disaster.

I developed a scheme of shipping for the Pacific demonstrating materials reaching a singular prefabrication factory, then after assembly of the disaster relief shelter, the path the houses take to the afflicted area.

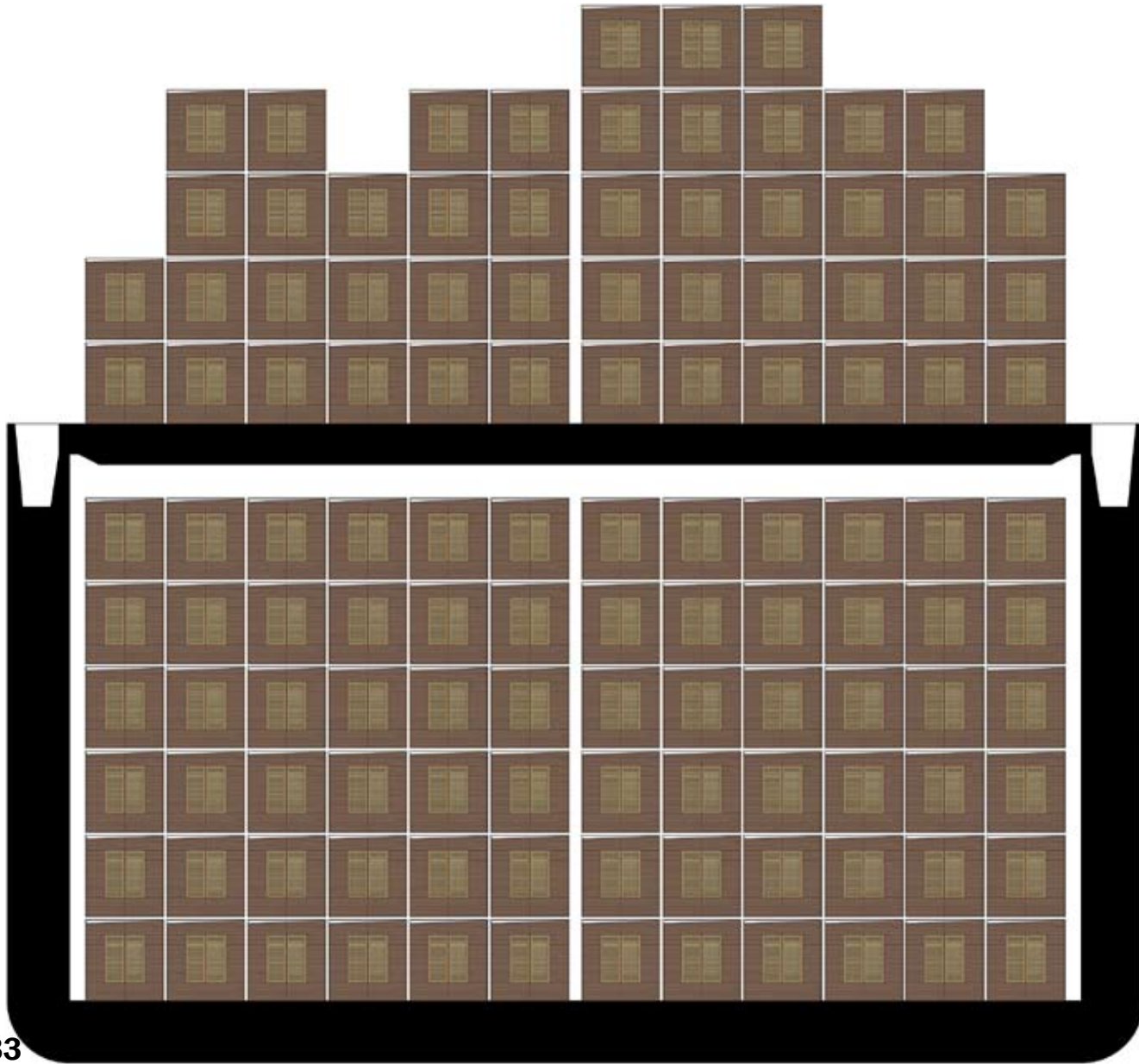
Possible Shipping Routes From Prefabrication Factories to Padang



From Factory to Site Shipping Method: 40' Shipping Container



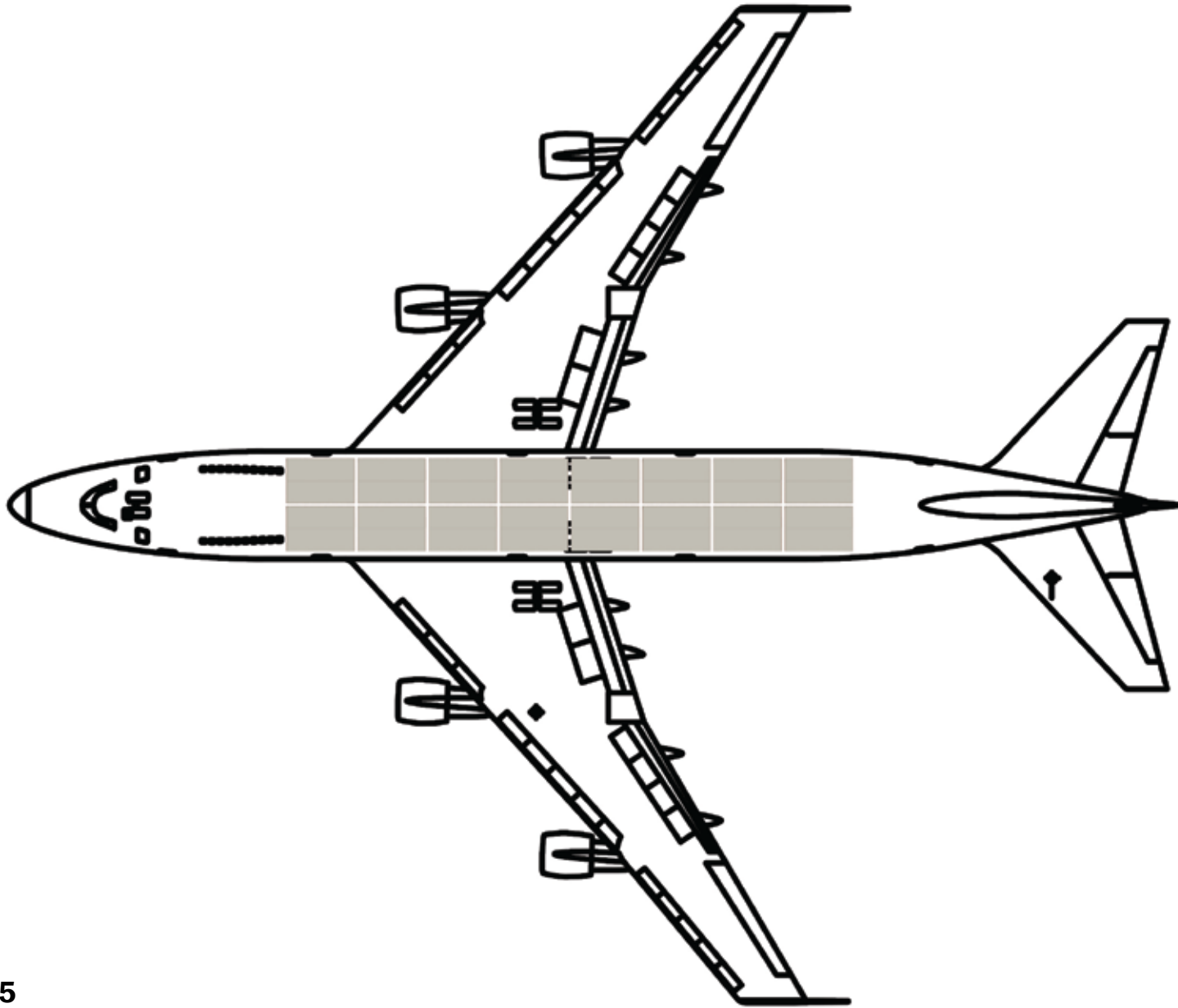
From Factory to Site Shipping Method: Cargo Ship



From Factory to Site Shipping Method: Semi Truck



From Factory to Site Shipping Method: Boeing Cargo Freight



FINAL DESIGN

6.1. Project parameters

6.1.1. Sun Study Analysis

6.2. Studies or Devices Revealing Architectonic Ideas

6.2.1. Interior Lighting Analysis

6.2.2. Interior Color Analysis

6.2.3. Plumbing Analysis

6.3. Building Plans

6.4. Building Sections

6.5. Wall Sections

6.6. Elevations and Façade Studies

6.7. Site

6.7.1. Site Plans

6.7.2. Service Modules

6.8. Sketch Model

6.1 PROJECT PARAMETERS

“An expert group organized under the auspices of UN-Habitat and the office of the High Commissioner for Human Rights has proposed a set of housing rights indicators that include such factors as: sufficient living area; percentage living in permanent structures in compliance with building codes and bye-laws; proportion of households with access to potable water; homeless persons per 100,000 population, over a five year period; and a number of other items. While housing indicators such as these - proposed for the assessment of general advances in housing rights - can shape our thinking, they are too generalized to apply directly in the context of disaster recovery, largely because they were not designed for that purpose. Unfortunately, the post-disaster housing response sector remains in its infancy, lacking globally endorsed policies and globally agreed-upon definitions. It has yet to produce its own indicators.”

6.1.1 SUN STUDY ANALYSIS

Padang, Indonesia

Winter Solstice

Summer Solstice



Van, Turkey



Antofagasta, Chile



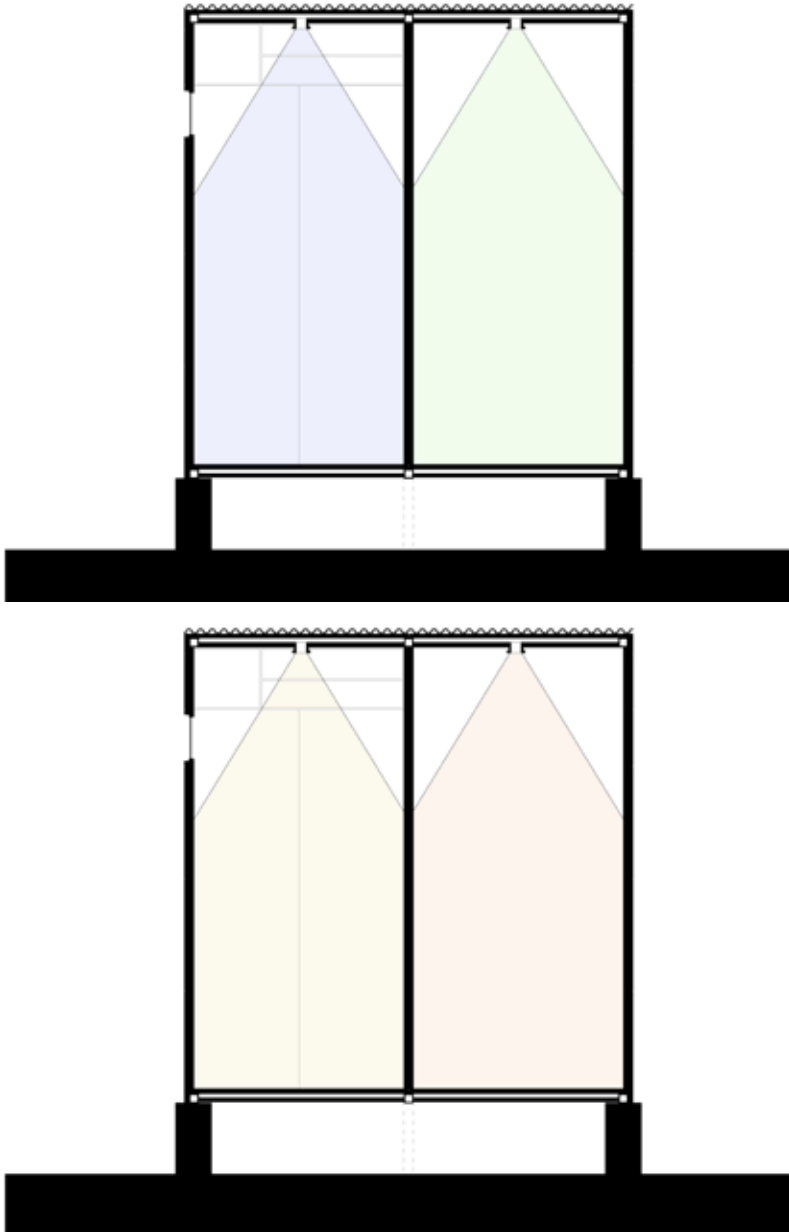
6.2

ARCHITECTONIC IDEAS

My idea to create a series of modules that could be placed together to create a temporary home, and then added onto in years to come to create something more permanent was reinforced by a local building technique used in Peru. The idea of semi permanence and growth over time is a Peruvian tradition of home building and disaster recovery: “starting out with semipermanent materials, which allows families to construct more formal homes over time. [In Peru], the 20-by-10-foot modules were designed to be dismantled and reassembled, enabling families to move or reuse them. Portability was also a means of permitting individuals without land tenure to participate in the program. Within two years the shelters had come a reliable source income for many families, who converted them into rental properties, turned them into small shops, or held onto them as storage space.”¹

¹ Aquilino, Marie Jeannine. *Beyond Shelter: Architecture and Human Dignity*. New York, NY: Metropolis, 2010.

6.2.1 INTERIOR LIGHTING ANALYSIS



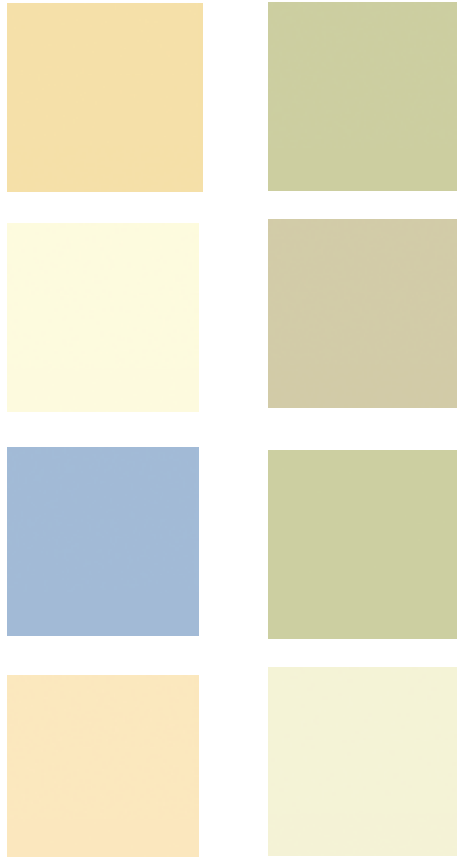
In cases of people suffering post-traumatic stress disorder, their surrounds are very important. The ability to control the natural and artificial lighting environment comes into play here:

The lighting cannot be harsh, and it should be indirect. The provided lighting would be similar to the Leucos Mira 2 Low Voltage Recessed Lighting with Housing which has the ability to have a variety of differently colored housings.

In the diagrams shown, the lighting can be cool or warm depending on mood.

6.2.2

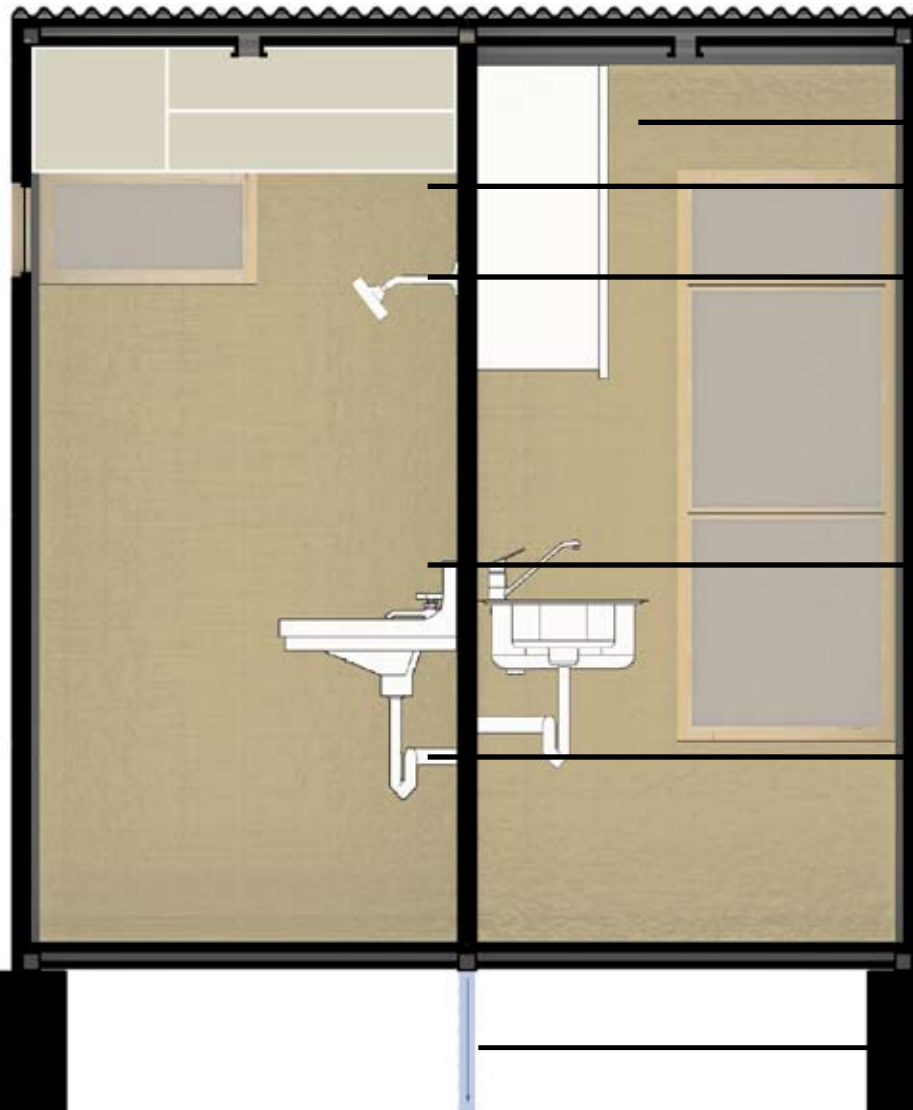
INTERIOR COLOR ANALYSIS



The color choices for the interior walls, or the SIP finishings were based on studies done of family/community centers and recovery centers for people who suffer PTSD.

In these spaces, the more open module features a bolder color, while the more private pull-out module features a softer shade of white or yellow. According to a study by Dunn-Edwards Corporation, “The right hue can connect us to the earth and make us feel more grounded, give us energy, or even help us sleep better.”

6.2.3 PLUMBING ANALYSIS



Overhead kitchen cabinets

Overhead bathroom storage

*Showerhead extends out of wall
over bathroom sink and toilet*

*Toilet can be used as an
accessible seat for the shower*

Water Tank

*Piping for kitchen and bathroom
sinks and shower go directly into
the wall*

*They are let out through a pipe
that travels into the ground to hook
up with set up infrastructure*

6.3 BUILDING PLANS

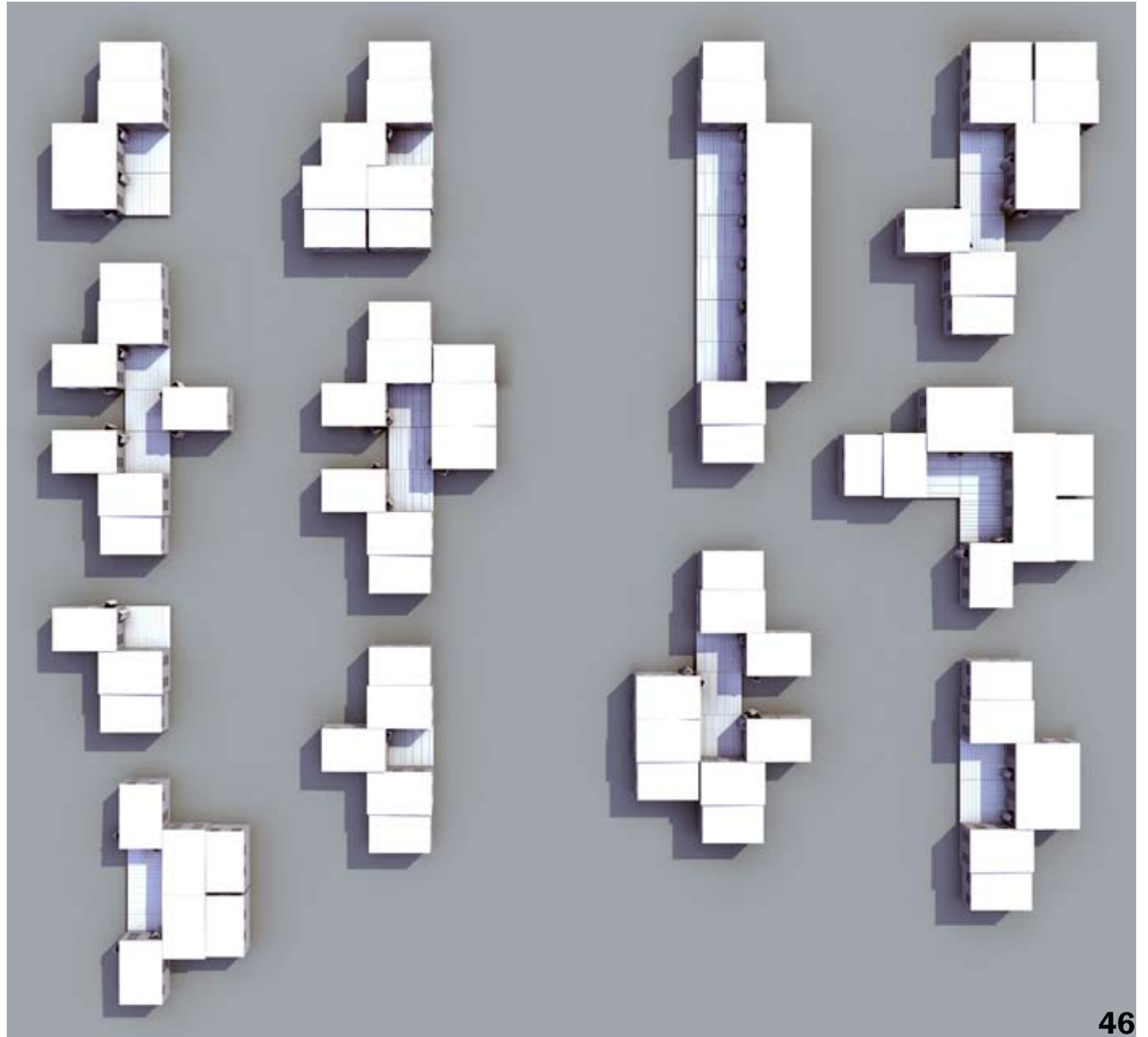
*Interior Water Tank, used for kitchen and bathroom needs
All plumbing functions are run through the plumbing module that comes with piping ready*

Self Composting Toilet, Sun-Mar's water-free toilet only takes up 19" x 22"

Garden Plot, provides inhabitants with an important part of recovery as people feel empowered



Organic Housing Redistributions



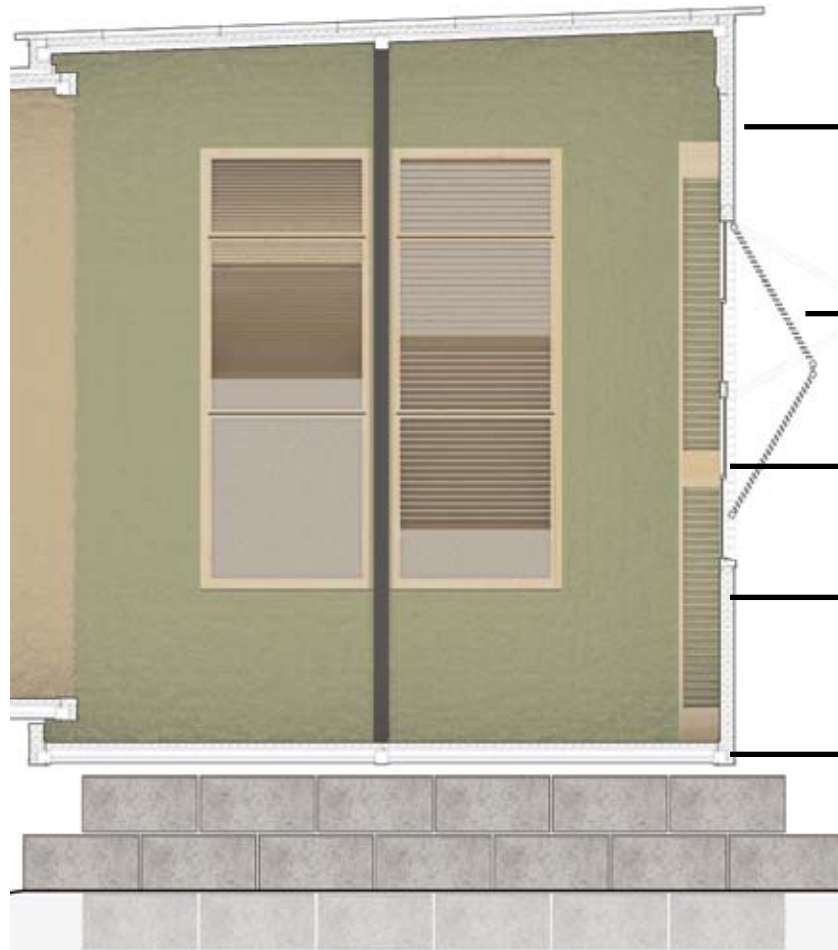
6.4

BUILDING SECTIONS



6.5

WALL SECTIONS



2" PermaTherm insulated SIP panel w/ Mineral Wool insulator

SIP grid snaps together

2" is used for Padang, Indonesia for better ventilation, but in cases of Turkey or Chile, issues of keeping in hot or cold can easily be remedied with 3" or higher panels

3/4" Thick Vertically Raising Window Shutter w/ 1/4" Louvers

*1/8" Window Glass in Double Hung Window
Double Hung Window are better for climates requiring more insulation.*

In the Indonesia Model, only screen is used

*Industrial Oragami fold out flashing
Flashing lays flat during transport and can be bent outward when it reaches the site*

SIP floor rests on top of 2"x2" tube steel

Outside corner trim

1/4" - 14 x 7/8" TEK 1

PTI 707 Butyl Caulk

6.6

ELEVATION AND FACADE STUDIES



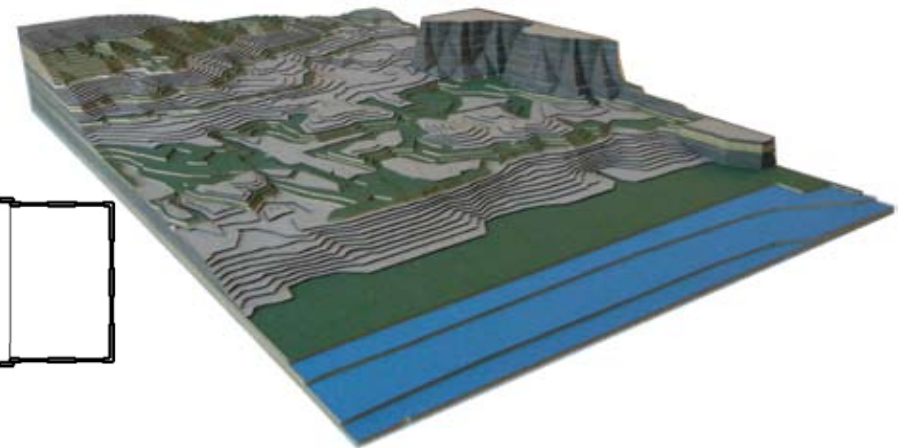
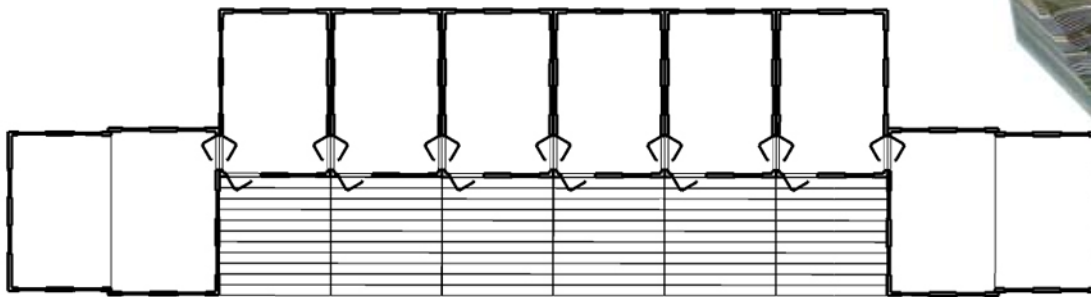
As each module is put in place, it needs to create a community pattern. The following are a series of proposed community solutions for each site based on the perceived atmosphere and dynamic of each place. They are only suggestions, though, because the true community layout could either spring organically as modules are distributed, it could follow the old community dynamics, or it could be a collaboration between local government, community leaders, and NGOs to find the best fit for the people of the community.

6.7.1 SITE PLANS

Padang, Indonesia

Padang, West Sumatra, Indonesia is home to the Minangkabau people. Their culture is matrilineal, and their religion is largely Islamic. Their society holds education in high esteem, and people from this area are often over-represented across Indonesia in the academic fields. The society also highly believes in incorporating their Muslim beliefs within contemporary culture.

The traditional home is the Rumah Gadang, which stands for big house, and is usually home to several families. This may not be as true, though, in large, organically growing cities, like Padang. The layout of the modular homes could either become gridded, or it could be allowed to develop organically as the old city was. I have shown accounts for how both ideas could turn out.



Padang Gridded Community Layout



Padang Organic Community Evolution



Perspective of Possible Padang, Indonesia Exterior

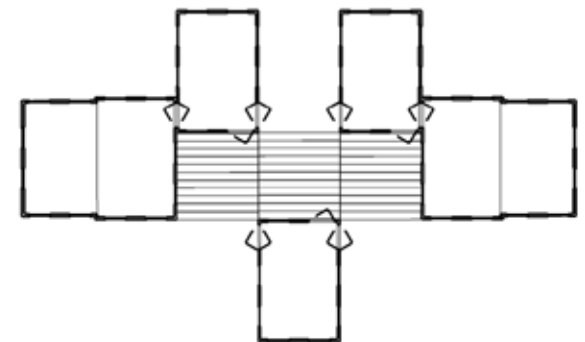


Van, Turkey

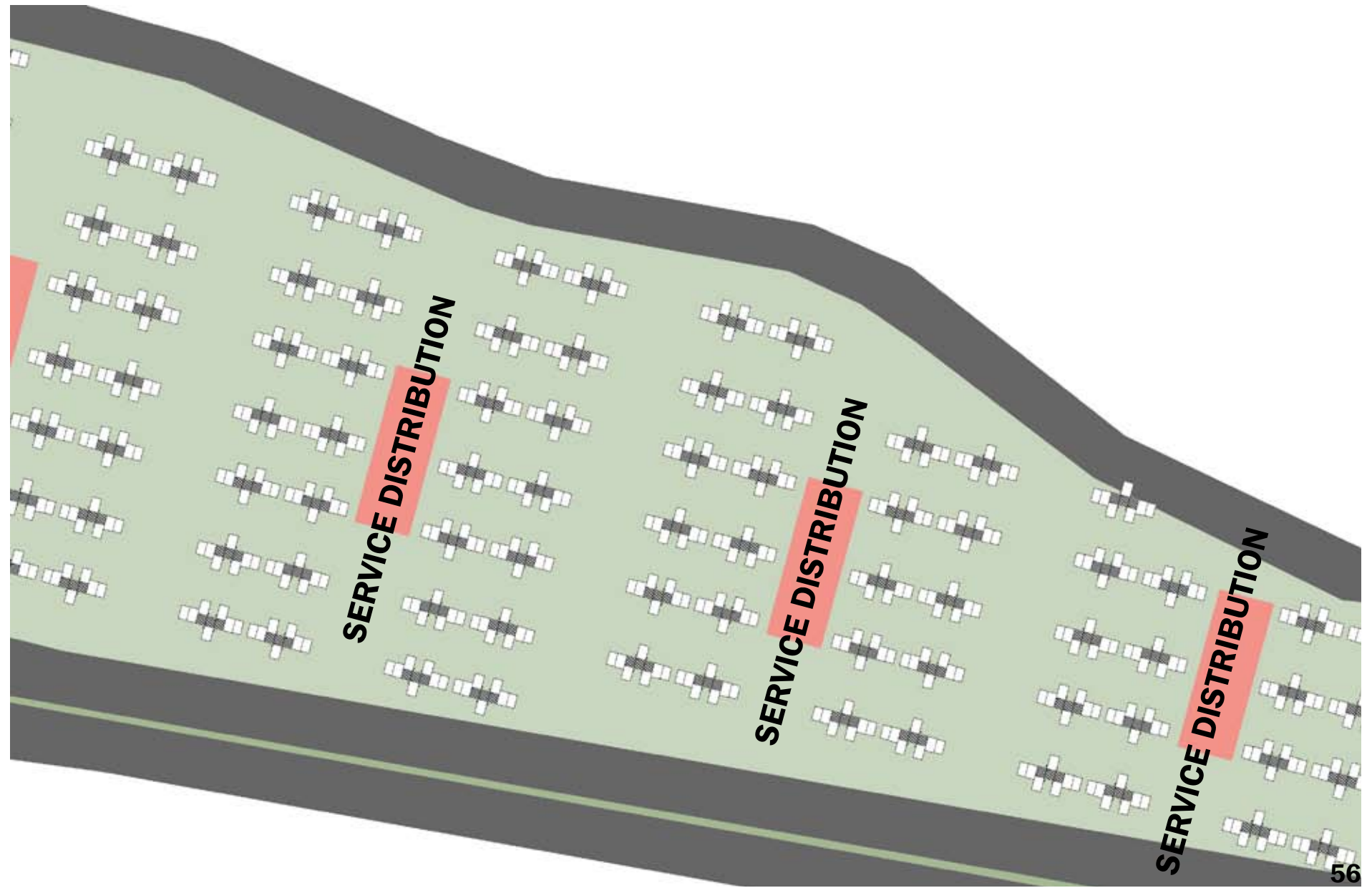
The modern city is located on the plain extending from the Lake Van, at a distance of 5 kilometers from the lake shore. Van has often been called “The Pearl of the East” because of the beauty of its surrounding landscape.

It is the cultural center of the area’s Kurdish majority. The city’s population is mostly Kurdish.¹ The residential portion of the city center is not very dense, which allows for relief housing to be placed at further intervals than it would be in other cities, although many of the main residential buildings are mid-level apartment buildings. Another area of focus for Van housing is separation of men and women’s sleeping quarters for the large Muslim portion of the population. This could be remedied by the below picture configuration of relief houses.

1 Özoğlu, Hakan (May 1996). “State–Tribe Relations: Kurdish Tribalism in the 16th-and 17th-Century Ottoman Empire”. *British Journal of Middle Eastern Studies* (Taylor & Francis) 23 (1): 5–27.



Van Community Layout



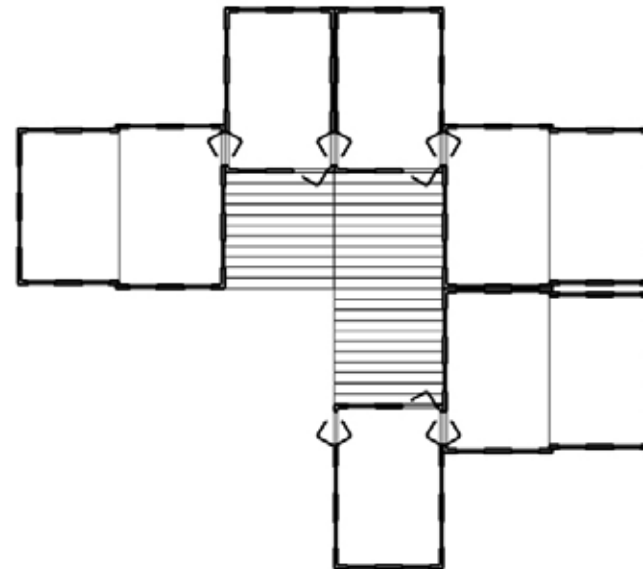
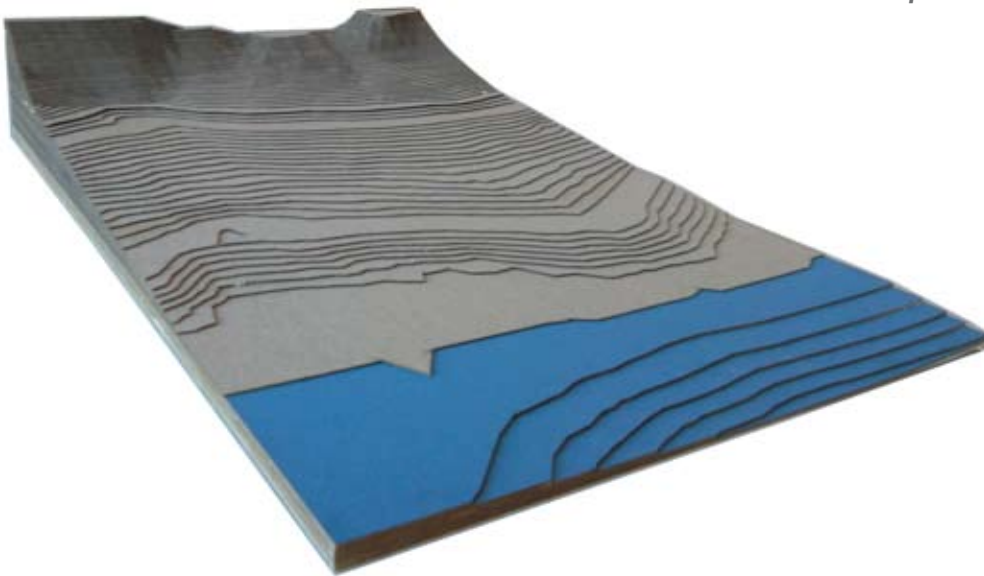
Perspective of Possible Van, Turkey Exterior



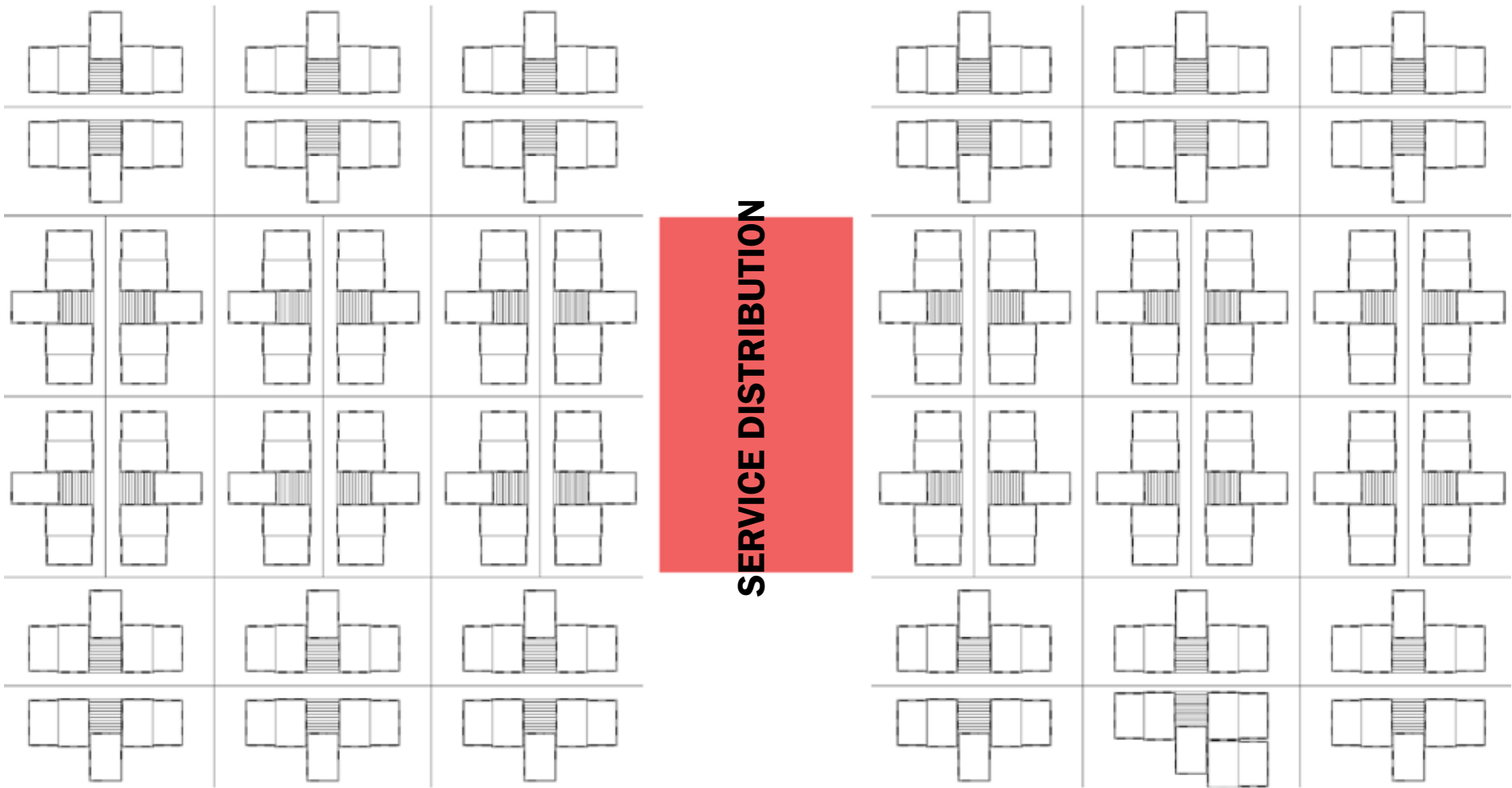
Antofagasta, Chile

The city of Antofagasta is along the coast of the Pacific Ocean, but it also abuts the Atacama Desert, which is the second driest region on the planet. Antofagasta is a very prosperous mining city. The city is organized in a very organized and gridded fashion.

In Chile, privacy is very important. Citizens are very formal in public, and consider their homes a private space where they do not have to be as formal as they would be otherwise. Family sizes are smaller to accommodate for older generations who generally move-in with their children instead of living by themselves or in assisted care facilities. The ideal set up would feature a more private layout.



Antofagasta Community Layout



Perspective of Possible Antofagasta, Chile Exterior



6.7.2 SERVICE MODULES



Community Aid Centers:

After the disaster, not only are homes destroyed, but so are businesses and amenities. These Community centers will be temporary support for people. They will help to provide everyday needs and recreation until infrastructure can begin again.

In the center of each group of disaster relief homes and buildings there will be an aid center. This center will provide the connections for solar and wind turbine energy, solar purified water, food and laundry services, and community medical aid. It will be another step in the community connection: the link between the larger community and the individual.

6.8

SKETCH MODEL



CONCLUSIONS

7.1 Reflections

7.1

REFLECTIONS

This project started out as an exercise in modular and prefabricated living, but it became more of an analysis of all of the systems that it take to move housing to disaster stricken areas.

If I were to attempt a project like this again, I might look more into the affects and benefits of flat-pack and assemble-on-site housing. I still believe it is important to have relief at the site of the disaster as soon as possible, and I think that if my design failed anywhere, it was in the lack of coordination with locals.

I believe that some form of flat-pack housing would enable local people with the help of aid contractors to build their new homes, which would provide them with a better sense of accomplishment for themselves. I also think it could make for more interesting ways to adapt the home.

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