TOHOKU TOPO-URBANISM
Oblique Community Form in Post-Tsunami Japan

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TOHOKU TOPO-URBANISM
Oblique Community Form in Post-Tsunami Japan

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ABSTRACT:

Tohoku Topo-Urbanism explores the potential inhabitation of the oblique as an alternative model of community form and resilient reconstruction in Post-Tsunami Japan.

In its wake, the 2011 Tsunami left a redefined landscape and enormous questions about the future of people and place. Since then, the Japanese Government’s plans for reconstruction put a moratorium on housing in lowland areas, necessitating a new residential geography. Because here, flat land is few and far between, the thesis proposes the notion that slopes become the new geography. Unfortunately, existing plans now result in mountain-top removal and extreme excavation in order to create flat ‘buildable’ land, and in other cases relocate entire communities far inland. The results can be detrimental to the natural and cultural landscape, and threaten to destroy already fragile communities.

Thus, this thesis is positioned as an alternate form of settlement that seeks a balance between productive and preserved landscape, and suggests that development emanate downslope from the hilltop; so that the oblique becomes a vital link between the highland and lowland nodes – a dual-datum reality of Post-Tsunami urban form.

The thesis sees the site as both abstract and specific; and asks how an understanding of ground conditions (such as slope, landform, vegetation, and orientation) can inform design. How might topography generate access, infrastructure, and public space? How can landscape experience foster interaction between people and nature? The thesis explores these questions while solving problems inherent in normative methods of slope construction (constraints of economy, constructability, hazards, and mobility) by leveraging gravity, natural energy, innovative material and construction systems, and the power of place.

Tohoku Topo-Urbanism lies at the intersections of architecture, human settlement, and landscape; and thus the response and scope of the thesis is both multi-scalar and multi-disciplinary. It operates through policy, an urban masterplan (Chapter 03), and a strategy for landscape management; and finally, explores how architectural building typologies (Chapter 04) might fit within this framework.

The hope is that the sensitive inhabitation of slopes will allow communities to remain integrated with existing lowland areas and infrastructure, ensure safety from future natural disasters, while making every effort to foster interaction between the human, cultural, and natural landscapes.

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<table>
<thead>
<tr>
<th>01</th>
<th>Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Tohoku Topo-Urbanism</td>
</tr>
<tr>
<td>16</td>
<td>Problem Statement</td>
</tr>
<tr>
<td>17</td>
<td>Thesis Response: Approach &amp; Scope</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>02</th>
<th>Site / Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Political / Geographical Context</td>
</tr>
<tr>
<td>24</td>
<td>Identity</td>
</tr>
<tr>
<td>28</td>
<td>Flows of People and Place</td>
</tr>
<tr>
<td>32</td>
<td>Hadenya: Existing Conditions</td>
</tr>
<tr>
<td>36</td>
<td>Design Implications: Assets &amp; Limits</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>03</th>
<th>Landscape / Settlement Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>Settlement Precedents</td>
</tr>
<tr>
<td>44</td>
<td>Principles / Guidelines for Development</td>
</tr>
<tr>
<td>50</td>
<td>Masterplan</td>
</tr>
<tr>
<td>52</td>
<td>Landscape Systems / Concepts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>04</th>
<th>Architectural Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>Precedents, Ground Conditions &amp; Concepts</td>
</tr>
<tr>
<td>64</td>
<td>Housing Unit Type 01: Bar / Terrace</td>
</tr>
<tr>
<td>70</td>
<td>Housing Unit Type 02: Ground / Sky</td>
</tr>
<tr>
<td>80</td>
<td>Landscape Sectors</td>
</tr>
<tr>
<td>84</td>
<td>Community Pavillions &amp; Housing Clusters</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>05</th>
<th>Appendix</th>
</tr>
</thead>
<tbody>
<tr>
<td>134</td>
<td>Slopes Research: August 31, 2012</td>
</tr>
<tr>
<td>136</td>
<td>Initial Proposal: May 18th, 2012</td>
</tr>
<tr>
<td>168</td>
<td>Bibliography</td>
</tr>
</tbody>
</table>
INTRODUCTION:
The 3/11 Disaster and a Post-Tsunami Japan
01.0 TOHOKU TOPO-URBANISM

THESIS.

Tohoku Topo-Urbanism explores the potential inhabitation of the oblique (the slopes) as an alternative model of community-form and resilient reconstruction in Post-Tsunami Japan.

PROBLEM STATEMENT.

On March 11th, 2011, a 9.0 mega-earthquake caused an enormous Tsunami – which was actually 14 tsunamis, with 40m high splash, 17m high waves, and 10m of total destruction – that in its wake left a redefined landscape; proof of a poor relationship between humans and nature; and enormous questions about the future of people and place.

Since then, the Japanese Government has put a total moratorium on all types of housing in the ‘lowland’ areas, and proposes the relocation of housing to safer ground; either to dispersed, space-constrained hilltops, or to larger valley floors, only found far inland.

Despite this shift away from the sea, the issue is that the relationship between people’s homes and the sea still exists, given that the dominant industry here – fishing / aquaculture – necessitates direct connection to the ocean. It begs the question: in this new multi-nodal urban form, what is the new geography for housing?

For obvious reasons, development seeks cheap, flat, ‘buildable’ land. But, in the ever-mountainous geography of coastal Japan, flat land is few and far between – it exists in small, isolated pockets on hilltops, or in alluvial plains far inland. Thus, the reality – the thesis proposes – is that the coastal slopes are the new residential geography. In part, this is because the slopes potentially form vital links between highland and lowland nodes, keep connection to existing infrastructure and place, can be activated for natural energy and escape routes, and can accommodate contiguous
development (which hilltops cannot), meaning that communities could remain intact.

Unfortunately, when proposing development on slopes, the Reconstruction Plans put forth by the Japanese government lead to problematic outcomes: On the slopes, they propose extreme excavation (thereby wiping away topography to create buildable land), which protects from one natural disaster (Tsunasms) only to allow vulnerability to another (mudslides). And, on hilltops, they propose mountain-top removal to increase the space of the hilltop. Both are detrimental to the natural and cultural landscape, and unfortunately, both are happening now. Thus, the thesis suggests an alternative approach.

SCOPE & APPROACH.

At its simplest, the thesis proposes the activation of the oblique as the new geography for housing, but suggests that slopes cannot be thought of in isolation. Any plans must take into account the hilltops, the lowlands, the physical, natural, cultural, and climatic context; and at all scales over time.

The response and scope of this thesis, then, is both multi-scalar and multi-disciplinary. At its broadest, the thesis proposes the notion that one should look at a site topologically – or as a complex, total ecosystem, comprised of disparate forces, flows, and systems, whether human, cultural, natural, or artificial.

SITE.

The chosen site is a landform called Hadenya, on the Southern coast of Shizugawa Bay. It lies in a settlement called Togura, one of four urban nodes within the newly combined municipality of Minamisanriku, which was one of the most affected towns from the 3/11 Tsunami.

Hadenya is a promontory headland that juts out
into the ocean, formed by the latent erosion of a once Pyroclastic landscape. The site was chosen because it represents the characteristics of the surrounding region—both for the natural features and vegetation, but also for the patterns of human development and program.

In its natural features, Hadenya—seen as an abstract agglomeration of landforms—contains ridges, valleys, hilltops, bowls, cliffs, and slopes both shallow and steep. It is home to a broad spectrum of flora that are also characteristic of the region. As far as human settlement, Hadenya has two culturally important structures (a small shrine and a temple) on its high points, with nearly 100% of development on the valley floor, which was nearly all destroyed on 3/11.

Beyond being the epitome of the surrounding region, Hadenya—and the rest of Minamisanriku for that matter—is a microcosm for so many larger issues that we face today: It faces an imbalance between man and nature, and commonly faces the threat of natural disasters. But it also faces slower, lesser visible disasters: it is a shrinking city (both its population is in decline, and the sea is reclaiming parts of the city); there are enormous political and social issues related to temporary housing and reconstruction efforts; and its young people are all but gone, leaving an aging population and communities on the verge of total disappearance.

It is this potent mixture, this microcosm, that is so relevant to the issues the world faces today. It is this, but also the fact that these problems are connected to a real place and real people, that draws me to undertake this thesis. And in the same sense, it is this relevance to the place but also to other places, that positions the thesis to be both site-specific but also generic and abstract. More on this later...

PRECEDENTS.

Analysis of Hadenya’s existing conditions in Chapter 02 leads to an inventory of its assets
and limits, where landscape is given the foremost importance in its power to metabolize community. But before the thesis delves into the larger scale design phase, it looks at local Urban and Architectural precedents, so as to further understand the profile of the area, and establish specific launching points for design.

LANDSCAPE / SETTLEMENT OPERATIONS.

The thesis proposes that—given the profile of these communities—the appropriate development here is a sensitive urbanism that aims to maximize resources by integrating existing infrastructure, inhabits the slopes to hold the bond between people and place, and sees the landscape as an enormous asset, and the most precious of resources that should be harnessed, not avoided or destroyed, because of its potential to bolster community, culture, and place.

In Chapter 03, the thesis first engages Policy to modify reconstruction plans and set guidelines for slope development. From this foundation, it recognizes the limits of policy, and begins to operate at the Planning scale to develop and spatialize a Masterplan. Finally, it explores landscape and systems strategies that seeks a balance between a preserved and productive landscape, and defines concepts and elements at all scales of the Masterplan.

ARCHITECTURAL OPERATIONS.

Finally, in Chapter 04, the thesis again reaches the limits of the broader picture, and zooms in to develop several Architectural typologies for both housing and community program.

CONCLUSION.

Tohoku Topo-Urbanism explores the idea that a kind of topological understanding of the site, might offer a viable vision for an alternative
community form in Post-Tsunami Japan.

It’s important to note that several major assumptions were made in the course of the investigation. A few of these were:

- The Single Family House was accepted as a given typology to work with, due to the intent to be relevant to the profile of the communities since the reality is, that it is and will be the predominant housing typology for some time.

- The Automobile, which is one of the major drivers of community form in the area, was in fact challenged (although still accommodated), with the intent of utilizing alternative mobility and encouraging a pedestrian, village-scale settlement.

- Generic / Specific. The thesis is in parts both abstract and specific, and attempts have been made to be clear about both when and why the thesis methodology moves from one to the other.

- Topo-Urbanism... The notion of urbanism itself might be the wrong word. The term settlement is often used because the scale at which development operates (again, based on the profile of the place), is really towards a smaller scale, often comprising projects with 10-20 housing units, and rarely any more. The idea of abstraction, and the use of the ‘Cluster’ concept, is relevant because it operates at this level of 10-20 housing units. It is indeed micro, but as a small piece, it very much tries to fit within the context of larger patterns in the region, and thus hopes to be both scalable and relevant to regions in Tohoku and beyond.

What’s at stake here is the total disappearance of already fragmented communities. Thus, the aim is that the inhabitation of hillsides will allow communities to remain integrated with existing infrastructure and industry in lowland areas, ensure safety from future natural disasters, while making every effort to foster interaction between the human, cultural, and natural landscape.
APPENDIX.

Chapter 05 contains supplemental information, including documentation of the thesis defense; research that was completed during the summer; a sampling of the initial proposal; and a bibliography.
01.1 PROBLEM STATEMENT: ORIGINS/CAUSAL FLOWS

In the wake of 3/11, communities were confronted with issues such as whether to rebuild or not; how to deal with social issues related to temporary housing and the separation of communities; and when relocating, how to deal with development that is detrimental to the natural landscape. Lesser known but equally potent, are the existing ‘slow disasters’ of an aging population; rural to urban exodus of the youth population; and Japan’s national population decline.
01.2 CONCEPTUAL FRAMEWORK / SCOPE & APPROACH OF THESIS

The conceptual approach of the thesis is borne from an understanding of the relationship between urban form, landscape, and landform over time.

Urban form in Pre-3/11 Japan has—since the Post-War era—gravitated to valleys in search of flat, buildable land, and access to water for transport, etc. On 3/11, this meant that nearly 95% of the urban fabric was destroyed, leaving undamaged fabric on the high ground, as if nothing ever happened.

The government has since put a moratorium on housing in the lowland areas, though a relationship to the sea still exists. Reconstruction plans suggest that housing move onto space-constrained hilltops or onto slopes. Because development seeks *tabula rasa*, this results in problematic outcomes, such as extreme excavation and mountain-top removal; which are detrimental to both the natural and cultural landscape.

The thesis proposes an alternative that protects hilltops, and directs development to the upper slopes in a sensitive inhabitation that forms the vital link between highland and lowland nodes.

Tohoku Topo-Urbanism uses a methodology that is organized through the following investigations:

- Site and Context (Chapter 02)
- Policy, Planning, and Landscape (Chapter 03)
- Architectural Typologies (Chapter 04)
- Appendix of Supplemental Data (Chapter 05)
02 SITE / CONTEXT:
Minamisanriku and a place called Hadenya.
02.1 SITE CONTEXT: GEOGRAPHIC / POLITICAL

01: JAPAN / HONSHU

02: TOHOKU REGION

03: MIYAGI-KEN

04: MINAMISANRIKU-CHO
Hadenya (adjacent left) is the remainder of an eroded ridge that projects out into Shizugawa Bay in the Pacific Ocean. Less than a kilometer long and 37m at its peak, it affords 360° views of the sea and the surrounding landscape, and is populated with rich vegetation such as Beech, Camelia, Mulberry, Cedar, Maple, and Bamboo forests; along with several cleared agricultural landscapes.

Though unpopulated, a small Shrine sits on its apex under the shadow of an enormous, symbolic Beech tree; while a Temple sits on a projecting ridge on its south face. Prior to March 11, 2001, there were four dozen houses on the lower valley at the foot of its slopes. Now, there are zero.

Hadenya lies within the settlement known as Togura, which is one of four urban nodes in the municipality of Minamisanriku, in Miyagi Prefecture, Japan (opposite page).

It is accessed by the sea (via the existing harbor and boat launch on its Western side) or more commonly by a two-lane road, which leads back to the major coastal highway several kilometers to the Southwest.
02.2 **SITE CONTEXT**: TOGURA / INUNDATION AREAS

![Map of Shizugawa Bay with marked regions of Togura and Hadenya](image-url)
An image of a model showing inundation in the Togura area in the Southwest corner of Shizugawa Bay. Fishing areas are represented (by dashed gray boxes), as are existing temples (the dark dots), and the area of inundation on 3/11 (dark gray).

An analysis of the effects of the 3/11 tsunami quickly reveal that the difference between total destruction and zero damage, is topography.

In Togura (one of the four towns within the municipality of Minami Sanriku), the Tsunami wave reached a maximum height of about 17 meters, while just about everything below 10 meters has been completely destroyed. However, it was not merely the elevational datums of 10 and 17 meters that defined what was destroyed. Here, both the bathymetry (submarine topography) and the above land topography greatly affected the movement of the water.

For example, when an earthquake hits, fisherman immediately take their boats out to sea. They know that it is better to face off the tsunami in the open ocean when waves are near unnoticeable – otherwise any boats left in harbor would be destroyed. It is only on the coastline, when the seafloor ramps up towards the coast that the wave is thrust vertically. Additionally, several hourglass or funnel-like shapes in the topography here actually accelerated the speed of the Tsunami (via the Venturi effect, also known as the Run-Up effect in the case of tsunamis). In this sense, it was in the smaller bays and inlets (which Minami Sanriku is so known for) that the Tsunami waves were of the greatest force and amplitude - again, proof of the irony that the ocean is both life giver and life taker here.

Coincidentally, the 3/11 mega-earthquake – albeit a massive magnitude 9.0 on the Richter scale – caused nearly no damage in comparison.

In this image, the Tsunami approached from the upper right (ENE), in a series of 14 consecutive waves that caused just as much damage when receding back out to the ocean as they did on the approach.
IDENTITY: LIVELIHOOD / SENSE OF PLACE

01: TOHOKU LIVELIHOODS
- Fishing Industry
- Tourism Industry
- Forestry Industry

02: MIYAGI-KEN SANRIKU COAST
- Livelihoods defined by relationship between mountain and ocean, whether via industry (forestry and fishing) or ecosystems (flows of nutrients and water).

03: MINAMISANRIKU-CHO SHIZUGAWA BAY & INLETS
- Fishing settlements, and thus spatial and occupational based identities form groups tied to specific coastal inlets. Where each landscape and each aquaculture varies widely in diversity, sense of place is defined by both the smaller inlets, and also the larger sense of Shizugawa Bay and the presence of the ocean.
HADENYA LANDFORM

HADENYA

HADENYA'S SYMBOLIC AURA:
As a symbolic site, rich with natural and cultural history, the home of both an important temple and a shrine that was once used to deal with epidemics.

HADENYA'S NATURAL GRAVITY:
Enormous groves of beech trees serve as wayfarers for fishermen and reminders of the northernmost limit of this species of tree.

As a landform, it holds enormous weight as a visual and spatial presence in the landscape.

The main industries in the area are fishing, forestry, and tourism; which all have slowed to a snail's pace since the events on 3/11. In many ways, civic and cultural identity is defined by one's relationship to land and sea, be it an occupational, spiritual, or contextual connection.

In Tohoku, the coastline is comprised of a multi-scale fractal system of bays and inlets, which provide natural locations for harbors and habitat, each having a distinct aquacultural ecosystem, even over short distances.

As a result, the line between settlements is not just defined by distance (as in many places in Europe and the United States, where satellite towns formed in increments of one day's travel), but is instead defined by the relationship to a specific bay.
Below: The Hadenya landform (highlighted in green), seen from the West by way of the primary coastal highway. Centuries of Tsunami cycles have exposed shear cliffs (lower left) on Hadenya’s Northernmost tip, while age-old clumps of indigenous Beech trees hold visual prowess on the culturally important peaks of Hadenya: the Ridge, the hilltop Shrine, and the Southern Temple.

In the foreground, fishing nets float in Shizugawa Bay, where octopus, kelp, abalone, and urchin are just a small selection of the rich aquacultural ecosystem in the niche market that Minamisanriku provides.

To the left, an example of the effects of erosion and time on this Rias landscape, where what are now islands were once part of the same intact ridge.
02.5 SITE CONTEXT: HADENYA PROGRAM PAST, PRESENT, AND FUTURE

**PAST: XXXX - 2010**

**3/11: 2011**
CURRENT: 2012 - 2013

FUTURE: 2013-2050

Aerial Imagery from Google Earth, 2012.
### Site Context: Phasing of Program & People

**Past: XXXX - 2010**

- **Hadenta Past:** XXXX - 2010
- **Spatial Mapping**

**Human Population Groups**
- **100 People (Out of 164 in the Area)**
  - 51 Households
    - (65,993m² total / 165m² avg footprint)
- **Single Family Residential**
  - 51 Households
    - (65,993m² total / 165m² avg footprint)
  - 45 Detached Structures / Garages
    - (4,093m² total / 90m² avg footprint)

**Industrial / Commercial**
- **80 Structures**
  - (27,990m² total / 346m² avg footprint)
  - 4 Cluster Groups:
    - Misc.
    - Port Oriented
    - Shire Oriented

**Civic / Cultural**
- **3 Structures**
  - (27,990m² total / 346m² avg footprint)
  - 2 Cluster Groups:

**3/11: 2011**

- **Hadenta 3/11:** March 11th - 12th 2011
- **Spatial Mapping**

**Human Population**
- **100 People Take Immediate Shelter on Hadenta**
  - 51 Households
  - 62 People Take Immediate Shelter Elsewhere
  - 29 Households

**Single Family Residential**
- **51 Households**
  - (65,993m² total / 165m² avg footprint)
  - 45 Detached Structures / Garages
    - (4,093m² total / 90m² avg footprint)

**Industrial / Commercial**
- **80 Structures**
  - (27,990m² total / 346m² avg footprint)
  - 4 Cluster Groups:
    - Misc.
    - Shire Oriented

**Civic / Cultural**
- **3 Structures**
  - (27,990m² total / 346m² avg footprint)
  - 2 Cluster Groups:
02.7 SITE EXPERIENCE: AN 8 MINUTE WALK THROUGH HADENYA LOOP
02.8 SITE: HADENYA EXISTING SITE PLAN

- Fishing Grounds
- Tsunami Wall / Tetrapods
- Temple
- Meadow
- Destroyed Buildings
- Rice Paddies
- Harbor

Fishing Docks
Below and Opposite: Radial sections taken around Hadenya's hilltop show the varying landforms and landscapes. As an abstract site, Hadenya was chosen because it contains general conditions that are typical of the greater Minamisanriku landscape: Toes of slope that land in the sea and flat ground; hilltop; steep slope; shallow slope; convex landforms; concave landforms.
As a specific site, Hadenya contains cultural artifacts (temple, shrine), along with a rich palette of vegetation, that are all characteristic representatives of the surrounding region.

Note: The two horizontal datums (shown in dash) represent the 10m and 17m inundation levels of the 3/11 Tsunami.
02.10 **SITE DESIGN IMPLICATIONS**: ASSETS & LIMITS

**SCALE COMPARISON - HADENYA / MIT (REFERENCE)**

**TOPOGRAPHY / LANDFORMS / DATUMS (LIMITS)**
Diagrams investigating the variables that define the primary limits and possibilities inherent in the site. Below, right: The rings represent 1, 2, & 3 minute walking distance from the Hilltop Shrine.
02.11 **SITE**: HADENYA EXISTING LANDSCAPES

**LANDSCAPES / LAND COVER (ASSETS)**

- **BAMBOO FOREST**
- **BEECH GROVES**
- **CEDAR FOREST**
- **BROADLEAF FOREST**
- **CLEARINGS**
- **AGRICULTURE / GARDENS**

**BAMBOO FOREST**

**BEECH GROVES**
Hadenya’s biggest assets are its powerful and unique landscapes. For example, the northernmost population of Beech forest—which was once abundant but is now all but gone—exists here. This rich palette of vegetation is representative of the surrounding region, and helps to define the specific landscapes. For the thesis, this is important because it helps to set the foundation for the site development strategies explored in the later design phases (Chapter 03).
LANDSCAPE / SETTLEMENT OPERATIONS:
Policy, Planning, and Place within
Generic / Specific Design
03.1 PRECEDENTS: EXISTING TOHOKU NEIGHBORHOODS

Before moving directly into a masterplan, the thesis looked at several existing settlements in the area in order to understand the profile of local communities. Chosen, were three neighborhoods located in Shizugawa, not far from Hadenya, that had survived the 3/11 tsunami. These were looked at through the lens of community form and building typologies in relation to the slopes; water management in relation to the slopes; lot sizes, and social space.

SUMMARY OF CONS:
- Housing units act individually
- Housing units run parallel to contours - loss of climatic orientation
- Open space given to vehicular infrastructure
- Most amenities exist within driving range outside neighborhood
- Extreme excavation & single use retaining walls

SUMMARY OF PROS:
- Presence of water flow in some cases
- Playground and small amenities exist within neighborhood
- Housing units run parallel to contours - minimize cut / fill
- Vehicular accessibility
Aerial Imagery from Google Earth, 2012.
03.2 **SITE DEVELOPMENT**: PROPOSED POLICY / GUIDELINES

**00 : EXISTING TOPOGRAPHY**
> 114,800m² SITE AREA

**01 : HAZARD MITIGATION & HOUSING**
> 55,157m² SITE AREA (Contiguous Area, Not islands)
> Avoid Sites Below 17m Elevation (500 yr Tsunami Datum)
> Avoid Sites on Extreme Slopes (Mudsides)
Diagrams intending to classify Hadenya's biggest assets — its landscapes.

02: IDENTIFY LANDSCAPES
- Beech Groves
- Bamboo Forest
- Broadleaf Forest
- Cedar Forest
- Meadows / Clearings

03: LANDCOVER / CLEARINGS
- Total Landcover: 42,576m²
- Total Clearings: 12,581m²
03.2 SITE DEVELOPMENT: PROPOSED POLICY / GUIDELINES

04: PRESERVED LANDSCAPE vs. PRODUCTIVE LANDSCAPE

- Full Protection of Beech Trees (Can Clear 0% on one’s Lot)
- Partial Protection of Bamboo Forest (Can Clear 15% on one’s Lot)
- Partial Protection of Broadleaf Forest (Can Clear 30% on one’s Lot)
- Existing Clearings Can Be Utilized for Development
- Cedar Forest is Abundant & Can Be Harvested For Lumber (Can clear 50% on one’s Lot)

05: ORGANIZE SITE INTO SECTORS

- Protect and Define Culturally important Hilltop
- Divide Site into (4) Sectors Based on Slope Variable
- Sectors Connect to Hilltop and Utilize Existing Roads
- Wholistic Site allows planning for typical community, access, infrastructure, and spatial relationships.
- Abstract Sectors allows generic understanding of how same program reconfigures based on slope variable, so that learning outcomes can be applied to sites elsewhere.
Far left: The thesis balances a preserved and productive landscape. The harvesting of the non-indigenous cedar forest (planted Post-1945) for building material, and its subsequent replanting with Camelia, is one example of this.

Rainwater collection separated into two categories:
1) Rainwater for Groundwater Recharge
2) Rainwater held in Reservoirs (for all other uses, i.e. drinking water, agriculture, etc).

Runoff should either infiltrate or be managed.
Rainwater should be stored on site (collective) and within each unit (individual).

07: BUILDABLE ZONES + 300m2 LOTS
> 300m2 Standard Lots
> Abstract Space Planning Exercise
> Assumes some units only have Ped. access
> Allows 46 lots
03.2 SITE DEVELOPMENT: PROPOSED POLICY / GUIDELINES

08: REGULARIZED LOTS / FOOTPRINTS
> 300m² Standard Lots
> Footprints Parallel to Lot Lines

09: REGULARIZED LOTS / FOOTPRINTS
> 300m² Standard Lots
> Footprints Parallel to Contours / Topography
LOCATE STANDARD LOTS IN BUILDABLE ZONES

- 300m² Standard Lots
- Abstract Space Planning Exercise
- Locate Lots in Existing Clearings, Buildable Slopes, and Unprotected Landscapes.
- Lots should agglomerate with each other (sharing infrastructure, transportation, and encouraging human to human and human to landscape interaction).
- Lots should be allotted in relation to existing and future mobility systems.
- Lots should be located near, but not on Hilltop.

Left: Using a standard 300m² lot size, along with setbacks and lot area coverage from the existing code, the thesis tested what the resulting form would be using only the suggested guidelines and the deployment of housing lots to minimize degradation to the landscape (both cut / fill, and deforestation).

As seen on the left, though still helpful, the results of this exercise—or any attempt to use guidelines or policy from the larger scale—would still produce a status quo development without additional intention from both a spatial and ground-level, smaller scale, experiential perspective.

Thus, the next phase of the thesis concerns Landscape and Settlement concepts, followed by Architectural typologies (Chapter 04) that aim to provide intention at the smaller scales and begin to give a sense of order, or an over-arching hand.

Lastly, the notion of the capacity of the land was discussed much at this phase. How can development and the landscape find a win-win balance? How much is too much? The thesis struggled with this question, and ended up landing on approximately 40-45 housing units in order to accommodate the total group of people that were relocated. To keep the entire population together? Or to keep the integrity of the landscape? This was one of the central questions of the design phase.
03.3 HADENYA: MASTERPLAN OVERVIEW

Below: A view of the Hadenya landform and symbolic Beech groves taken from a nature path running through the salt marsh in the lowlands.

Center and Right: A composite diagram showing circulation, figure / grounds, etc. The 17m elevation line (the high mark of the 3/11 tsunami) is etched in memory by a landscape path that rings the site and links secondary paths (which double as escape routes) between the highland and lowland nodes.

Across: Though the thesis does not directly engage the design of the lowlands, it assumes that much of this landscape is given back to the sea, reconnecting the isolated salt marsh as a tidal estuary and wildlife habitat.
03.5 HADENYA: MASTERPLAN / LANDSCAPE CONCEPTS

SLOPE MANAGEMENT

Existing 2m Contour Lines
Major Ridge Lines
Hazard Area: Extreme Incline
Hazard Area: Landform Complexity
Hazard Area: Slope Instability
Hazard Area: Adjacent Vertical Exposure
Hazard Area: Devolution
Hazard Area: Visible Deformations Below
Scalable Slopes

HOUSING PROGRAM

Units: Above Ground
Units: Below Ground
Units: Ishigaki Terraces
Units: In Ground
Unit Type 01
Unit Type 02
CIRCULATION NETWORKS

- **Primary Circulation** (Vehicular, Public, Medium Speed)
  - e.g. Roads, Driveways, Vehicular Parking Zones, etc.

- **Secondary Circulation** (Pedestrian, Public, Slow Speed)
  - e.g. Public Staircases, etc.

- **Tertiary Circulation** (Shared, Semi-Public, Slow Speed)
  - e.g. Footpaths, Porous Pavement, Pedestrian Areas, etc.

- **Quaternary Circulation** (Pedestrian, Semi-Private, Slow Speed)
  - e.g. Entry Paths, etc.

COMMUNITY PROGRAM

- **Overall Community Program**:
  - Collective Structures:
    - Parking / Charging Pavilion
    - Workshop
    - Guesthouse
    - Kitchen / Restaurant
    - Hilltop Gravity Reservoir
    - Community Center / Meeting Room

- **Azumaya Pavilions**:
  - Bamboo Forest Azumaya
  - Cedar Forest Azumaya
  - Broadleaf Forest Azumaya
  - Meadow Azumaya
  - Orchard Azumaya
  - Bird Blind

- **Existing Structures**:
  - Existing Jinja
  - Existing Temple (Spatially Accurate)
03.5 HADENYA: MASTERPLAN / LANDSCAPE CONCEPTS

LANDSCAPE PROGRAM

COMMUNITY PROGRAM - THEMATIC LINES

- Paths of Gathering (Outward, Person to Person)
  - Community Center / Meeting Room
  - Kitchen / Restaurant
- Paths of Seclusion (Inward, Individual, Reflective, Person to Landscape)
  - Guesthouse
  - Bird Blind
  - Cedar Forest Azumaya
- Paths of Reconnection (Outward, Person to Person in Landscape / Ocean)
  - Parking / Charging Pavilion
  - Workshop
  - Orchard Azumaya
  - Meadow Azumaya
WATER MANAGEMENT STRATEGY

Left: The thesis tries to see water as both life giver and life taker.

Though in close proximity to the sea, Hadenya is an island with limited reserves of groundwater and water that can be used for drinking or irrigation.

In some parts of the year, water is scarce; while in others, it can be so abundant that it can cause flooding and landslides (especially during monsoons or typhoons).

Thus, a strategy of managing water is employed that stores water on the hilltop and in shared housing foundations; abates stormwater runoff; and uses the gravity inherent in the slope to distribute the water downslope.

The location of housing units doubles as a system of swales, so that areas of both capture and groundwater recharge are accounted for.
Right: A composite aerial rendering of upper Hadenya, taken from the West.

Living in Hadenya is to live in a designed landscape of built elements, within an existing natural landscape. Communal program clearly holds the space of the hilltop, but allows it to breath and for a sense of space and the natural landscape to roll through.

Housing clusters are landscapes in themselves, and emanate from the hilltop; traveling downslope with shared foundations that double as both water retention infrastructure and space for social interaction.

Primary vehicular circulation gains access to the most active areas, while secondary pedestrian circulation weaves its way into the housing clusters, leaving multiple routes to one’s front door, either across the slope or up/down slope.

Emphasis is made on preserving the natural landscape (or replanting what has been affected by development) so that the presence of the landscape is always foremost.

These overall landscape / settlement concepts seek to lay the foundation for further resolution of the Hadenya experience, through Architectural building typologies found in the next chapter.
ARCHITECTURAL OPERATIONS:
Building Typologies and Slope Experience

04
On the heels of the landscape / settlement studies, the thesis again, took a step back, looking at traditional Minka housing typologies (see adjacent images), and the inevitable progression towards the modern standard - the universal hermetic box. Precedent studies looked at the house through the lens of climatic response, flexibility, siting, access, aggregation, and social spaces.

It’s important to note that the thesis intentionally took the single family house typology as a given. Why? In Minamisanriku, the profile is the stand-alone, two-storey, single family house, and emphasis was placed on working within this constraint in order to be as relevant as possible to the specific problem.
TRADITIONAL JAPANESE HOUSE & CLIMATE RESPONSE

01

> ORIENTATION FLEXIBILITY, AND TAKING ADVANTAGE...

ORIENTED FOR PREVAILING WIND AND SOLAR
> LIGHTWEIGHT CONSTRUCTION, FLOATING FOUNDATION
> OPEN-AIR, TRANSFORMABLE, USE OF INT. / EXT. LAYERS
> UPPER VOLUME USED FOR ENERGY / STORAGE, NOT OCCUPIED.
> FLEXIBLE PARTITIONS / MULTIPLE CONFIGURATIONS

MODERN STANDARD & THE LOSS OF ENVIRONMENTAL RESPONSE

02

> ORIENTATION FLEXIBILITY, BUT NOT TAKING ADVANTAGE...

> ORIENTED FOR ECONOMY, STREET GRID
> LIMITED USABLE SPACE (BESIDES STREET) BETWEEN BUILDINGS
> UNIVERSAL CONCRETE SLAB FOUNDATION,
> SEALED ENVELOPE, SINGLE INT. / EXT. LAYER
> UPPER VOLUME INHABITED DUE TO SPACE REQUIREMENTS
> STATIC CONFIGURATIONS

PROBLEMS ON THE OBLIQUE

03

> NO ORIENTATION FLEXIBILITY,

WHAT UNIT TYPOLGY WOULD MAKE THIS WORK ON THE OBLIQUE?

> SINGLE ORIENTATION FOR ECONOMY (PARALLEL TO CONTOURS)
> LIMITED USABLE SPACE (BESIDES STREET) BETWEEN BUILDINGS
> 3 CUT RETENTION WALL FOUCUSED INDIVIDUALLY
> SEALED ENVELOPE, SINGLE INT. / EXT. LAYER
> UPPER VOLUME INHABITED DUE TO SPACE REQUIREMENTS
> STATIC CONFIGURATIONS

POTENTIALS OF THE OBLIQUE

04

> FLEXIBILITY THROUGH BISECTION

WHAT UNIT TYPOLGY WOULD MAKE THIS WORK ON THE OBLIQUE?

> GROUND FLOOR ALIGNS WITH CONTOURS FOR MINIMAL CUT / FILL
> UPPER FLOOR ALIGNS WITH CLIMATE (SOLAR / PREVAILING WIND)
> GROUND FLOOR BENEFITS FROM EARTH SHELTERING
> UPPER FLOOR BENEFITS FROM NATURAL VENTILATION AND SOUTHERN EXPOSURE FOR PASSIVE / SOLAR HEATING
> ROTATION CREATES USABLE ROOF SPACE
Previous page: After an investigation into the single-family house typologies in the area, and their implications when on the oblique - the thesis invests in understanding how two possible housing typologies could be made to operate successfully on the oblique:

- A unit where both storeys run parallel to the contours (inflexible in orientation);

- A unit where the lower storey runs parallel to the contours but the upper storey does not (flexible in orientation)

Opposite: Given the palette of potential slope experience, these two typologies attempt to magnify the experience of the slope, and celebrate the integration of water systems and infrastructure.
EXPERIENTIAL PALETTE

EXISTING SLOPE

UNIT TYPOLOGY 01: ON

 UNIT TYPOLOGY 02: IN / ABOVE

LINEAR TERRACES

CHAIN LINKS

RELATION TO WATER RITUAL AND WATER INFRASTRUCTURE
04.3 **HOUSING UNIT 01: ‘BAR / TERRACE’**

**OVERVIEW**

Born out of an interest in creating a unit type that respects the existing profile and housing typology, the Bar / Terrace typology is an aggregation of singular, carved wood volumes, which accept the two-storey, single-family rectangular footprints that are the profile in the area, but aims to collect them within a shared infrastructure that is both functional and experiential.

Here, the first move is an infrastructural abstraction of the ground in the form of a shared terrace. Incorporating the existing stone walls (or Ishigaki) on site, the terraces run along the lines of the contours and collect units together, so that otherwise independent volumes become infrastructurally and spatially linked.

From the ‘Experiential Palette’ diagram on the previous page, this unit type asks how the ‘On the Ground’ experience can be transformed into something that doesn’t just act individually, and isn’t just a hermetic box.

In instances of interaction with water — such as kitchens, baths, entries, gardens, and the like — the foundation protrudes into the space of the house, or is subtracted into the ground to create amplify these ritual experiences with water and the ground.
04.3 **HOUSING UNIT 01 : “BAR/TERRACE”**

**PLAN - UPPER LEVEL**
The two storey height of the typology allows views out to the ocean, but also accepts natural breezes coming in off the ocean. Terraces and rooflines both create acts of connection in a field of otherwise independent volumes, so that neighbors share a terrace, and a common ‘blade of light’ on the roof. In the traditional Japanese Minka, the upper storey was an uninhabitable volume used primarily for storage, and to release heat in the hot summer months. Here, the upper storey again takes on this function, and the shifting ridge beam creates the opportunity for volumetric variety in the upper storey.
04.3 HOUSING UNIT 01 : 'BAR/TERRACE'

PLAN - LOWER LEVEL
The Lower Level of the Bar / Terrace aggregates the entries to multiple units, so that the stone terrace forms a micro moment of activity and potential, yet subtle, social interaction. The slope creates a breach of privacy on the uphill side, and a natural vertical boundary on the downslope side. Thus, the uphill side of the unit (which also faces away from the ocean), is solid, while the downslope side is airy and much more porous.
OVERVIEW

The Ground / Sky Typology is a bi-polar magnification of the potential for slope experience.

Where the previous typology accepted the middle ground, and the experience of being 'On' the ground, this typology rejects the middle ground and satiates itself with the two extremes.

The lower volume is a sunken mass in a pumice sea. It responds to the world of the ground, torquing itself to conform with the contours. It employs an energy strategy of partial earth-sheltering, and beckons darkness, reflection, and inwardness. The experience is tied to the gravity of the retaining wall that bounds space on three sides, and embeds that which relates to ritual, water, and earth.

Conversely, the upper volume is a prefabricated, floating wood skeleton that belongs to the world of the sky and can take any orientation it likes.

It is outward, craves openness, lightness of being, and can be as idiosyncratic as necessary. Clean open spaces allow for maximum flexibility and views of the landscape. Its energy strategy utilizes passive solar, thermal mass (from the volume below), flexibility, and natural ventilation.
04.4 HOUSING UNIT 02: ‘GROUND / SKY’

PLAN - GROUND LEVEL
A picture window frames a view of a planted retaining wall garden, on the Lower Level. The angle of the wall allows ambient sunlight to wash the lower level with a soothing, green light.
04.4 HOUSING UNIT 02: 'GROUND / SKY'

PLAN - UPPER LEVEL
Left: A trapezoidal opening in the floor, guided by a vertical central pillar constructed of concrete and stone, allows elements of the upper and lower world to pierce that of the other.

View of Entry to ‘Ground/Sky’ Typology
Below: Building section, taken through the bedroom, bath, and exterior court on the lower level. An embedded, concrete volume supports a prefabricated wood volume above.

Right: A lower volume holds the horizon of the ground. A prefabricated, wood volume rests above. Exterior cladding on the wood box employs a traditional Japanese technique of using charred siding, helping to form a protective coating from insects and the environment.

Shown at right are two possible variations for the upper volume.
OVERVIEW

At the scale of the house, unit typologies begin with an infrastructural abstraction of the ground, with the aim of magnifying the experience of the landscape while running a perceived spatial and infrastructural common thread through otherwise individual volumes.

To an occupant living within the units, this manifests itself through human interaction with shared infrastructure.

The thesis celebrates the rituals of water at all scales. From the fleeting 20 seconds of washing of hands; to irrigation of a vegetable garden; to a bath or shower; to the larger seasonal or multi-year cycles of monsoons, typhoons, and tsunamis; the rituals of human experience with water tap into the larger cycles - and the important role - that water plays in this place. as both life giver and life taker.
01: EXTRUDED KITCHEN
02: RECESSED BATHS / GARDENS
03: SENSE OF SHARED FOUNDATIONS

01: SHOWER
02: VERTICAL GARDEN
03: CENTRAL PILLAR
04: PLUNGE BATH
SLOPE SECTORS: SITE AS A SERIES OF ABSTRACT LANDFORMS

SECTOR 00: HILLTOP

PARAMETERS
SLOPE: MAINLY FLAT, 0 - 5 DEGREES
LANDFORM: HILLTOP
LANDSCAPE: BEECH GROVE / OTHERWISE OPEN
MICROCLIMATE: NESP FACING, EXPOSED W/ EXCEPTION TO SHADE UNDER BEECH TREE
CIRCULATION: DIRECT LOOP ACCESS
ASSETS: CULTURALLY IMPORTANT SHRINE, VIEWS TO OCEAN
LIMITS: SHOULD BE PROTECTED, NOT DEVELOPED

KEY DESIGN CONSIDERATIONS: HILLTOP SHOULD BE PROTECTED AS A CULTURALLY IMPORTANT SITE. REFORESTATION/REVEGETATION FOR PROTECTION, AND CAN BE FURTHER DEFINED WITH A BOUNDARY OF BUILT STRUCTURES AND LANDSCAPE ELEMENTS. BUILDABLE SECTORS RADIATE AND CONNECT AROUND HILLTOP. COLLECTIVE PROGRAM LINKS TO EXISTING ROADS WHILE REINFORCING "ROOM" OF HILLTOP AND FOSTERING LINKS BETWEEN HOUSING DEVELOPMENTS AND HILLTOP.

SECTOR 01: COMPLEX RIDGE

PARAMETERS
SLOPE: STEEP/MODERATE (15-40 DEGREES)
LANDFORM: CONVEX/CONCAVE SLOPE & COMPLEX RIDGE
LANDSCAPE: MEADOW, CEDAR FOREST, BAMBOO FOREST, SOME MIXED DECIDUOUS, ONE SYMBOLIC BEECH TREE
MICROCLIMATE: SOUTH FACING, LIGHT BREEZE
CIRCULATION: DIRECT ACCESS TO EXISTING LOOP & PROPOSED ROAD
ASSETS: SEMI-CLEARED, BUILDABLE, POTENTIAL LINK TO EXISTING DEVELOPMENT BELOW. POTENTIAL FOR NEW ROAD, SOUTH FACING POTENTIAL FOR WINTER HEATING.
LIMITS: LIMITED VIEWS OF OCEAN

KEY DESIGN CONSIDERATIONS: UTILIZE EXISTING CLEARINGS AND SYMBOLIC BROADLEAF TREE. SOUTH FACING ORIENTATION SHOULD BE HARNESSS.
SECTOR 02: SIMPLE TERRACE

PARAMETERS
- SLOPE: MODERATE (10-35 DEGREES)
- LANDFORM: SIMPLE SLOPE / TERRACE
- LANDSCAPE: CLEARING / ORCHARD / GARDENS
- MICROCLIMATE: EAST FACING, STRONG BREEZES
- CIRCULATION: HILLTOP (2 ACCESS POINTS)
- ASSETS: ALREADY TERRACED, VIEWS OF OCEAN, BUILDABLE, ACCESS
- LIMITS: LITTLE LATE-DAY LIGHT, EXPOSURE DURING WINTER

KEY DESIGN CONSIDERATIONS: BUILT ENVIRONMENT SHOULD NOT HARM THE EXISTING VIEW CORRIDOR OR VALUE TO THE SITE. DESIGN SHOULD HARNESS EXISTING VIEWS AND FOSTER INTERACTION BETWEEN ORCHARD AND AGRICULTURAL LANDSCAPES WITH NEW DEVELOPMENT.

AXONOMETRIC

SECTOR 03: SIMPLE FAN

PARAMETERS
- SLOPE: MODERATE / STEEP (XX DEGREES)
- LANDFORM: CONVEX SLOPE
- LANDSCAPE: MIXED DECIDUOUS, SPARSE BEECH, BAMBOO
- MICROCLIMATE: NORTHEAST / EAST FACING, SOME BREEZES
- CIRCULATION: DIRECT ACCESS TO LOOP, ACCESS TO BEACH
- ASSETS: POTENTIAL VIEW OF OCEAN
- LIMITS: DENSE VEGETATION, NECESSARY SITE WORK

KEY DESIGN CONSIDERATIONS: EXISTING CLEARINGS CAN BE UTILIZED AS SITES FOR DEVELOPMENT. BAMBOO FOREST (AND DENSE ROOT SYSTEM) SHOULD BE AVOIDED, THOUGH SEEN AS AN ADJACENT ASSET FOR LANDSCAPE EXPERIENCE.

AXONOMETRIC

SECTOR 04: STEEP SLOPE

PARAMETERS
- SLOPE: STEEP (XX DEGREES)
- LANDFORM: SIMPLE / CONVEX / CONCAVE SLOPE
- LANDSCAPE: DENSE CEDAR FOREST, MIXED FOREST, BEECH
- MICROCLIMATE: WEST FACING, STRONG BREEZES
- CIRCULATION: LIMITED ACCESS TO VEHICULAR (BUT POSSIBLE)
- ASSETS: POTENTIAL LINK / ESCAPE ROUTE TO BELOW
- LIMITS: DENSE VEGETATION, STEEP SLOPE, LIMITED MORNING LIGHT

KEY DESIGN CONSIDERATIONS: KEEP SITE PREP TO A MINIMUM BY CONCENTRATING DEVELOPMENT. SPACES OF UNDER / MID / OVERSTORY COULD BE HARNESSSED FOR LANDSCAPE EXPERIENCE OF VERTICAL FIELD.

AXONOMETRIC
Beyond communal program, which operates on the peripheral space of the hilltop; the housing unit typologies are deployed to specific areas in response to environmental, climatic, and ground conditions to which they are most suitable.

The Bar / Terrace typology uses formal, linear bars that run parallel to the contours. The limits of this typology arise when complex landforms occur (simply the inability of the geometry to turn sharp corners), or when the orientation of the footprint must take a different orientation than that of the contours. Thus, this typology is deployed to:

- The steep, West Slope because of its simple, linear landform and lack of sun exposure.
- The Terrace Orchard, where the existing terraces are magnified and the orientation of the footprints (though not south facing for passive solar benefits) are oriented to capture natural breezes and offer views of the ocean.

The Ground / Sky typology forms a linked chain of embedded volumes that run parallel to contours with an upper volume that orients to the South. This typology is thus deployed to the South Slope and the North Ridge because of:

- The need to respond to a complex landform
- The availability of southern exposure.
Aerial view of Masterplan from the West.
04.08 MASTERPLAN / CLUSTERS : FOCUS AREAS

Below: Selected working sketches to develop the relationships between the landscape sectors, the hilltop, the landscape pavillions, and the housing clusters.

01: Dec. 12th, 2012
02: Nov. 23rd, 2012
03: Nov. 20th, 2012
After a design phase focused on looking at the overall site as an integrated masterplan, the thesis steps back from the realities of site specificity and selects three of the abstract landscape sectors for further design development of architectural clusters.

The term cluster refers to an aggregation of the same unit typology (whether housing or collective program) in order to understand how the units can interact with each other to become more than the sum of their parts.

The three clusters chosen, are the **Hilltop**, the **South Ridge**, and the **Terrace Orchard**; because of their distinct landscape and programmatic characteristics, and the potential feasibility of their future development (given buildability, access to existing infrastructure, preparedness of the areas for development, etc).

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<td>01</td>
<td>Hilltop</td>
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<td>02</td>
<td>South Ridge</td>
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<td>03</td>
<td>Terrace Orchard</td>
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04.09 CLUSTER 01: HILLTOP SHRINE & COMMUNAL PROGRAM

PARAMETERS

SLOPE: MAINLY FLAT, 0 - 5 DEGREES
LANDFORM: HILLTOP
LANDSCAPE: BEECH GROVE / OTHERWISE OPEN
MICROCLOCIMATE: NESW FACING, EXPOSED W/ EXCEPTION TO SHADE UNDER BEECH TREE
CIRCULATION ACCESS: DIRECT LOOP ACCESS
ASSETS: CULTURALLY IMPORTANT SHRINE, VIEWS TO OCEAN
LIMITS: SHOULD BE PROTECTED, NOT DEVELOPED

KEY DESIGN CONSIDERATIONS: HILLTOP SHOULD BE PROTECTED AS A CULTURALLY IMPORTANT SITE. REFORESTATION / REVEGETATION FOR PROTECTION, AND CAN BE FURTHER DEFINED WITH A BOUNDARY OF BUILT STRUCTURES AND LANDSCAPE ELEMENTS. BUILDABLE SECTORS RADIATE AND CONNECT AROUND HILLTOP: COLLECTIVE PROGRAM LINKS TO EXISTING ROADS WHILE REINFORCING 'ROOM' OF HILLTOP AND FOSTERING LINKS BETWEEN HOUSING DEVELOPMENTS AND HILLTOP.

AXONOMETRIC & LANDFORM

1 WATER RETENTION - GRAVITY TANKS (SUBSURFACE VAULTS)
2 GUESTHOUSE / BATHS
3 WORKSHOP
4 CAR PARK / CHARGING STATION
5 KITCHEN / CAFE
6 GATHERING / MEETING ROOMS
The design of the Hilltop cluster aims to achieve the following:

- Defining and ‘holding’ the space of the hilltop
- At the same time, allowing for maximum porosity, and allowing the sense of the existing landscape and ridge to flow through.

Effort is made to locate the communal pavilions so that they:

- Act as both a buffer between, but also a connection to the adjacent housing clusters downslope.
- Link the type and activity of program with identity of the housing cluster (formal, connected, secluded, active informal, etc).

The hilltop can be accessed directly by vehicle, by parking at one of the several vehicle nodes and walking, or directly by foot.

Architecture here is subtle, and intentionally respects and recedes to the power of the landscape. Everything from the broken footprints (which disperse building form), to the continuity of the roofplanes (which form a continuous horizon), to the structural system (that utilizes cedar harvested on-site and aims to create an implied, blurred boundary), seeks a balance between creating civic scale space while relenting to the scale of the landscape.
04.11 CLUSTER 03: SOUTH RIDGE
04.10 **CLUSTER 02: TERRACED ORCHARD**

**SECTOR 01 - SIMPLE TERRACE: PARAMETERS**

SLOPE: MODERATE (10-35 DEGREES)  
LANDFORM: SIMPLE SLOPE / TERRACE  
LANDSCAPE: CLEARING / ORCHARD / GARDENS  
MICROCLIMATE: EAST FACING, STRONG BREEZES  
CIRCULATION: HILLTOP (2 ACCESS POINTS)  
ASSETS: ALREADY TERRACED, VIEWS OF OCEAN, BUILDABLE, ACCESS  
LIMITS: LITTLE LATE-DAY LIGHT, EXPOSURE DURING WINTER

**KEY DESIGN CONSIDERATIONS:** BUILT ENVIRONMENT SHOULD NOT HARM THE EXISTING VIEW CORRIDOR OR VALUE TO THE SITE. DESIGN SHOULD HARNESSED EXISTING VIEWS AND FOSTER INTERACTION BETWEEN ORCHARD AND AGRICULTURAL LANDSCAPES WITH NEW DEVELOPMENT.

**EARLY SKETCH**

**AXONOMETRIC & LANDFORM**
The design of the Terrace Orchard cluster responds to two primary variables:

- Magnifying the existing terraced landscape
- The Potential to harness strong breezes from the West and views to the ocean.

Effort is made to locate the cluster of housing units so that it:

- Takes advantage of the proximity to existing vehicular circulation
- Utilizes the existing clearings and terraces to minimize devegetation and cut / fill.
- Emphasizes the fluid porosity of landscape along the grain of the slope (parallel with the contours), while aiming to create specific ‘contained’ views of the ocean against the grain of the slope.

The circulation system utilizes a simple primary, secondary, tertiary relationship like the branching structures of a leaf. This aims to provide the option to circulate directly up and down slope (via public staircase), while ensuring easy access across the slope (especially important for an aging population).

The first act is of an infrastructural abstraction of landscape via stone and concrete terraces that gather housing units together and embed water infrastructure. Units are subtracted to create landscape rooms, where an existing Mulberry / Sakura orchard is replenished as a space of interaction.
04.10 CLUSTER 02: TERRACED ORCHARD
04.11 CLUSTER 03: SOUTH RIDGE

SECTOR 01 - COMPLEX RIDGE: PARAMETERS

SLOPE: STEEP / MODERATE (15-40 DEGREES)
LANDFORM: CONVEX / CONCAVE SLOPE & COMPLEX RIDGE
LANDSCAPE: MEADOW, CEDAR FOREST, BAMBOO FOREST, SOME MIXED DECIDUOUS, ONE SYMBOLIC BEECH TREE
MICROCLIMATE: SOUTH FACING, LIGHT BREEZE
CIRCULATION: DIRECT ACCESS TO EXISTING LOOP & PROPOSED ROAD
ASSETS: SEMI-CLEARED, BUILDABLE, POTENTIAL LINK TO EXISTING DEVELOPMENT BELOW, POTENTIAL FOR NEW ROAD, SOUTH FACING POTENTIAL FOR WINTER HEATING
LIMITS: LIMITED VIEWS OF OCEAN

KEY DESIGN CONSIDERATIONS: UTILIZE EXISTING CLEARINGS AND SYMBOLIC BROADLEAF TREE. SOUTH FACING ORIENTATION SHOULD BE HARNESSED.

WORKING SKETCH:
SHOWING FOOTPRINTS, CIRCULATION, AND RETAINING WALLS

LANDSCAPE ICON
The design of the South Ridge cluster responds to two primary variables:

- The Complex Terrain of the Ridge
- The Potential to take advantage of a South facing orientation.

Attention was focused on locating the cluster of housing units so that it:

- Took advantage of proximity to existing vehicular circulation
- Utilized the existing clearings to minimize devegetation and maximized Southern exposure.

The design of the circulation system attempted to respond to the curving landform of the ridge, using a fractal geometry of 'vees' that aimed to respond to the housing footprints while generating shared social spaces in the intersections.

Housing footprints of the lower volumes orient themselves to be parallel with the contours, utilizing a chain-linked series of retaining walls with common infrastructure. This infrastructural abstraction of the ground embeds water infrastructure and unifies each tier of units. Upper volumes orient themselves to face south, while avoiding tree shadows and casting shadows on adjacent units.
Left: The South Ridge’s embedded lower-level volumes, along with the fractal circulation system that follows the curvature of the ridge.

Right: The landform of the ridge can be seen, generating lower level volumes that orient to the ground while a singular grain of South-facing volumes rest above, allowing orientation to the sky to give order to the built landscape.
04.12 SITE SECTION: OVERALL
Though Hadenya sometimes can be perceived as an island, it is anything but. In this East / West site section, one is reminded of the water cycles and impact on the natural and artificial landscape.

At its broadest, the thesis proposes the notion that one should look at the site topologically -- or as a complex, total ecosystem comprised of disparate human, cultural, natural, and artificial forces, flows, and systems.

Water, and the sense of above and below, are forefront of the Hadenya experience.
Above: Water emanates from the clouds and travels back down to Hadenya via rainfall or mist. It is managed to mitigate stormwater flooding, collected at the hilltop and in gravity tanks in shared foundations, or allowed to infiltrate the ground and recharge groundwater as it flows downslope.

Above Left: Water, carrying vital nutrients, sediments, and harmful toxins, re-enters the sea after traveling from the headlands above.
Above: Water (either from rainfall, or from sub-surface storage tanks), flows downslope with gravity. In the housing clusters, it is used to irrigate vegetable gardens and the camelia orchard; for drinking water and gray water in the housing units themselves, or allowed to continue flowing down to the lowlands.

Center: Water that bypasses sub-surface storage is allowed to continue flowing downslope. It is either slowly infiltrated into the ground, or manifested as surface runoff that travels at higher speed down to the lowlands below.

Attention is taken to manage this flow in relation to the slopes in order to mitigate erosion and landform inundation which could cause mudslides or other forms of slope destabilization.

Right: Water, carrying vital nutrients, sediments, and harmful toxins, re-enters the sea after traveling from the headlands above. Over time, it evaporates and forms into clouds that are carried by ocean breezes back towards land.
Upon entering Hadena, one gradually travels uphill through the vehicular loop road. As the road veers to the right and glimpses of the hilltop are had, the out-stretched arm of the shared car park and charging staging reaches out to accept the user into the civic domain.

One can achieve glimpses of the other community structures, the huge symbolic beech grove, and the small shrine that is tucked away under its canopy.

Built out of cedar that is harvested on site, these skeletal / infill pavillions define the space of the hilltop and create a buffer / threshold between the housing clusters and the forested highpoint of Hadena.

Beyond housing community program within, and defining space on the outside; these light structures brush the edge of the hilltop landscape, vary their elevation on the ground plane, but hold a common horizon at their roof line.

Here, the emphasis is a balance between the protection of the hilltop, but crucially, not overpowering it or exceeding the capacity of the land, and a willingness to concede to the power of the landscape.
View of Entry to Hilltop (Carpark in foreground on left, Workshop in focus)
After entry into the space of the hilltop, one is overwhelmingly within the presence of the small Shrine and the enormous Beech overhead. But, nestled just downslope and along its forested edges, is the ring of community pavillons with shared programs. Here, are the:

- Carpark and charging station
- Guesthouse and community bath (Right, Opposite))
- Embedded water storage structure
- Common kitchen and noodle restaurant
- Community gathering space and meeting rooms

Right: The structure of the community pavillons is made of cedar harvested from the slopes of Hadenya. As an assembly, it intentionally forms an ambiguous, implied line, aiming to soften the sense of boundary between the hilltop and the surrounding landscape.

The geometry of these pavillons are occasionally skewed to respond to the language of the adjacent housing units that are downslope. When this occurs, slender columns are shifted inward to align with the floorplate, and cantilevers form at the ceiling plane, further reinforcing the ambiguity of the line between hilltop and the surrounding landscape.

Structurally, the cantilevers alternative direction, counter balancing themselves with the next, and utilizing a seemingly random, though very specific, pattern of interior columns to handle the structural loads and form a forest-like spatial field.
View of Guesthouse and Outdoor Bath at Hilltop.
Opposite: Pictured, is one of the secondary circulation staircases in the Terrace Orchard cluster.

Below, inset: Options to circulate across (level) with the slope, and the ability to move directly up and down the slope are encouraged, so as to have maximum range of movement and multiple routes to one’s front door, and through one’s neighborhood.

Moving amidst two fields — the first of an orchard of Camellia trees and the other a field of wooden houses — one feels the openness of the landscape but also the sense of boundary and definition. This sense is important because of the need to maintain privacy within a neighborhood, but also because it fortifies the presence of nature interacting with the built landscape.

Moving further up the staircase along a run of rough stone steps, there is another larger cadence of moving from terrace, to soil, to terrace, to soil.

The wooden housing volumes, locked into their shared terraces, are carved at their opposite corners to create covered porches and shaded, more intimate points of entry. Every so often, three houses are pulled together by a common gravity, as the carves in the wooden volumes come to face one another.
View uphill at staircase (secondary circulation) towards the Hilltop.
In the heart of the Terrace Orchard cluster, a void is formed by the subtraction of two housing units. Here, the remnants of an existing Camellia orchard are brought back to life with the replanting of Camellia and Sakura trees, which give identity to this room in the landscape, filling it with sounds, scents, and life.

Below inset: The subtraction of housing units is visible from above.

Opposite: The collection of housing units on linear terraces that run parallel to the contours offers many things. First, the otherwise individual volumes achieve an infrastructural and spatial connection.

Secondly, by collecting built fabric into concentrated lines, natural corridors are freed up on either side. With the housing footprints only 7-8 meters wide, the sense of nature (manifested in the landscape corridors) on either side is powerfully apparent (along with the benefit to natural cross ventilation).

The sense of fluidity along the direction of the slope is paramount, like sinuous bands of ground that weave their way through a field of houses; while the opposite exists in the up / down slope direction, as layer after layer holds one back.

In the opposite image, the secondary circulation (staircases) can be seen running up and down the slope, while a more organic network of paths (tertiary circulation allows a more free form of movement for pedestrians, bicycles, scooters, golf carts, or small cars.

In the left foreground, porous pavers are visible that allow emergency vehicle (or service) access to the heart of the housing cluster, while still giving the sense of fluid landscape and allowing rain or stormwater to infiltrate the ground.
View of Sakura / Mulberry Orchard in Terrace Sector (Spring)
Opposite: Upon arrival at the hilltop, one finally regains the lost vista to the ocean. It is not a culminating experience, though, and the view is not what is most important.

In a place where livelihood is dependent on the sea, it is the landscape and nature that is life giver and life taker.

The presence of the ocean is framed, composed, and borne from pieces of the community. The view is its own landscape, but it is an integral part of the built landscape as well, and vice versa.

Though Hadenya sometimes can be perceived as an island, it is anything but. Here, one is constantly reminded of the potent power of nature, and of the water cycle and its impact on the natural and artificial landscape.

As was stated at the outset; at its broadest, the thesis proposes the notion that one should look at the site topologically -- or as a complex, total ecosystem comprised of disparate human, cultural, natural, and artificial forces, flows, and systems.

Water, and the sense of above and below, are at the forefront of the Hadenya experience.

We are not just talking about the tsunami, or monsoons, or typhoons; but about the way of life here in general, and the interdependence of all aspects of a system.

There is a saying in Minamisanriku that the fisherman, more than anyone, understand the interrelation of the sea and the mountains and the natural cycle here. It is said that the fisherman, in an act to ensure the future survival of his catch, will go up to the mountains and plant a tree, because he knows that the tree will grow, will create nutrients, and that those will end up affecting the ecosystem in the sea.

This sense of the sea and mountains, of above and below, are integral to the way of life in Minamisanriku, and in some small way, the thesis hopes that it is tapping into that.

The aim is that the sensitive inhabitation of slopes will allow communities to remain integrated with existing lowland areas and infrastructure, ensure safety from future natural disasters, while making every effort to foster interaction between the human, cultural, and natural landscapes.
View to the Ocean from Hilltop; views are composed by pieces of the community.
05 Appendix:
Supplemental Material, Bibliography, etc.

134 Slopes Research: August 31, 2012
136 Initial Proposal: May 18th, 2012
168 Bibliography
Massachusetts Institute of Technology
Master of Architecture Final Thesis Review 2012

Thursday, December 20th, 2012
9am-5pm, MIT Media Lab, Building E14, 6th Floor

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Final Model 1:200 (6'-0" x 4'6")
Final Model 1:200 (6'-0" x 4'6")
Final Model 1:200 (6'-0" x 4'6")
Site Model 1:1000 (2'-0" x 3'0")
The 1/4" plexi sheet represents the ~17m datum of inundation from the 3/11 Tsunami.
Site Model 1:1000 (2'-0" x 3'0")
The 1/4" plexi sheet represents the ~17m datum of inundation from the 3/11 Tsunami.
05.01 APPENDIX A: THESIS DEFENSE @ MIT MEDIA LAB - 2012 12 20

Photo by Sunnie Lau
10: SLOPE SYSTEMS RESEARCH

SLOPE SYSTEMS: GEO MORPHOLOGY / DEFORMATIONS

SLOPE SYSTEMS: WATER MANAGEMENT / LANDSCAPE

SLOPE SYSTEMS: VISUAL / SPATIAL EXPERIENCE

SLOPE SYSTEMS: INHABITATION / EXPERIENCE

01: OBLIQUE URBANISM IN JAPAN
FEUDAL / EDOKAN / INDUSTRIAL / POST WAR / POST 3/11 / PROPOSED

FEUDAL PERIOD (1185-1603)

EDO PERIOD (1603-1868)

INDUSTRIAL (1868-1945)

POST-WAR (1945-2011)

POST 3/11 (2011-2012)

PROPOSED (2012-FUTURE)
M.Arch. THESIS: TOHOKU TOPO-URBANISM

Matthew Bunza
M Arch ADV Candidate '13

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ABSTRACT

THESIS STATEMENT & CENTRAL RESEARCH QUESTION

This thesis explores the potential inhabitation of slopes1 in the aim of developing a catalogue of slope-urbanism typologies as means for post-disaster reconstruction in Tohoku, Japan. It asks how architecture and ecology could be hybridized with civil engineering technology by making use of both new and existing slope stabilization infrastructure. By integrating multidisciplinary knowledge into multifunctional systems, the hope is that new models of disaster-resilient, ecological urban form could emerge that provide relevant solutions to problems faced on the ground in Japan and elsewhere.

1 or the uncivil sublime, to borrow a term coined by the French architect and thinker Claude Parent and Paul Virilio.
# METHODOLOGY

## STATION OF INTENDED METHODS

**OVERALL: MULTIDISCIPLINARY AND SUSTAINABLE RESOURCES.** Because this thesis deals with two distinct, yet interwoven themes — centred around slopes on one hand and the post-disaster context of coastal communities in Japan on the other — any investigation necessitates a multidisciplinary methodology that oscillates between the sublime (slopes) and the sordid (Japan). Using the former to work towards the latter, in the aim of developing a more broad catalogue of strategies to draw from that find resolution in a specific project in a specific place.

**PHASE 01: The Strand or a Place.** First, a clear assessment of the physical, political, and cultural context in post-disaster Japan — along with existing plans for reconstruction — is required for understanding how to approach any potential application of this idea. Necessary investigations will be analyses of existing damage to buildings, infrastructure, and slopes; an understanding of who the community will be in the future and what program will need to remain; along with an understanding of specific hazards in the area (related to future tsunamis, mudslides, flooding, etc.) and evacuation systems.

**PHASE 02: ENVIRONMENTAL AND BUILDING TECHNOLOGY RESOURCES.** The research into slopes requires a broad understanding of both existing construction systems and civil engineering technology, along with a clear picture of the geomorphology and ecological systems associated with slopes. These investigations will be looked at in general terms, and together will comprise a catalogue of independent strategies that could be selected from for various design projects, depending on the specifics of project, place, type of slope and specific programmatic need.

**PHASE 03: HISTORICAL AND THEORETICAL PERSPECTIVES.** Other investigations will look into precedents and historical examples of topographic urbanism, and will seek to understand the ways in which slopes have been inhabited in the past, how they could be inhabited in the future, and what ideas in the discourse of architecture and urbanism (and beyond) specifically relate to this topic.

**PHASE 04: Design Process.** Finally, the above mentioned analytical investigations and analyses will shift towards a more intuitive design process, with the goal of translating these ideas into a site-specific design. Initial steps will be to hybridize the civil engineering, architectural, and ecological elements in a combined system. Specific selection of a site will be based on such things as the potential reuse of existing infrastructure, proximity to existing urban fabric, and the existing need for slope stabilization, etc. It is hoped that the processes of design inquiry will culminate in a larger-scale strategy or masterplan for reconstruction, along with a more focused example of a site-specific project.

## OVERVIEW: Contents

| MIT 4.189 M.Arch Thesis Prep / Matthew Bunza / Spring 2012 |
|-------------|-------------|
| SP011 | S0es Research at MIT 3/11 Earthquake and Tsunami occurs | Cambridge, USA |
| SUMMER 2011 | MIT Japan Design Workshop 2011 Research w/ MIT Japan 3/11 Initiative | Minami Sanriku, Japan |
| FALL 2011 | Research w/ MIT Japan 3/11 Initiative | Cambridge, USA |
| SPR012 | M.Arch Thesis Prep Research w/ MIT Japan 3/11 Initiative Teaching Assistant w/ Jegan Vincent de Paul | Cambridge, USA |
| SUMMER 2012 | S0es Research Disaster-Resilience Research TA, MIT Japan Design Workshop 2012 Stages Research | Kunming, China Bandung, Indonesia Minami Sanriku, Japan Portland, USA |
| FALL 2012 | M.Arch Thesis Research w/ MIT Japan 3/11 Initiative | Cambridge, USA |
3/11: GREAT TOHOKU EARTHQUAKE

At 2:47pm on March 11th, 2011, an earthquake that measured 9.0 on the Richter scale struck 75km off the eastern coast of Tohoku, Japan.
14 CONSECUTIVE TSUNAMI WAVES STRUCK THE COASTS OF TOHOKU, KILLING 23,000 PEOPLE, DISPLACING 300,000, AND DESTROYING OVER 150,000 BUILDINGS.

WAVES THAT WERE THOUGHT TO BE 6M HIGH WERE IN SOME CASES AS MUCH AS 40.2 METERS HIGH.
CONTENTS

part 01 CONTEXT / PROBLEM STATEMENT.
A11 Materials:
Japan / Tokyo / Shibuya / Minami-Senju / Utata (Diagram)
Utata Pre-3/11 Character of Urban Fabric (Photograph)
Utata Pre-3/11 (Aerial Photograph)
Utata Post-3/11 (Aerial Photograph)
Utata 3/11 Tsunami Damage (Diagram)
Utata Critical Areas 12m & 17m (Diagram)
Issues of Relocation & Reconstruction.
Diagram of Relocating Phase
Reconstruction Committee's Plan for Total / Distant Relocation
Why Government Proposes Distant Relocation
Metrics of Total Relocation

part 02 ANALYSIS.
Site Analysis.
Utata Topography & Figure / Ground (Plan Drawing)
Utata Demolition / Destroyed Buildings & Infrastructure (Plan Drawing)
Utata Longitudinal & Cross Sections (Section Drawings)
Utata Geomorphology (what's changed, what will change)
Utata Slope Makeup (soil sections, vegetation, etc.)
Program / People
What was damaged / destroyed.
What needs relocation / what must stay in locals
Additional Crime / Social Space
Additional Energy Infrastructure / Ecological Systems
What were patterns of living?
What were jobs / industries?
What would affect tourism (attract people) and activate industries?
Potential Project Sites
Grades that require stability (Diagram)
Grades that are not level (Diagram)
Grades that are already deteriorated (Diagram)
Grades that already have infrastructure (Diagram)
Potential Reusable Infrastructure.
JRT Lines, Highways, Energy, Communications, etc. (Plan Diagram)
Route of Tsunami Damage (millions of tons)
What to do with the locals.
Critical Safety / Hazards Considerations.
Evacuation Routes / Yards (Plan)
Landslide Risk Factors?

part 03 PRECEDENTS.
Diagram / Concepts of the Japanese House.
Spatial Organization (Plan / Section Diagrams)
Zones / Plan of Plan Diagrams
Tohoku (Diagram)
Open Air Living / Inside Outside
Concepts of Japanese Civic / Social Space.
Gated Temples vs. "Urban Parks" or Places

part 04 DESIGN STUDIES.
Stage Inhabitation Catalogue.
Resistance / Anchor, Platform, Cut, Fill, Curb/Fill.
Stage Deformation Catalogue.
Upper / Mid / Lower / Trench Deformation
Stamp / Deep Deformation
Stage Retention Catalogue.
Retaining Walls
Ground Anchors
Soil Nails
Geotextiles
Pressure Plates
Stage Circulation Catalogue.
Direct / Diagonal / Switchback / Elevator / Ramp / Gravity / Helicopter
Stage Natural Systems Catalogue.
Water / Gravity Flow / Hydroelectric Potential Energy / Micro Hydro / Natural Filtration
Wind
Solar / Passive Solar
Geothermal

part 05 ANTICIPATED RESULTS / POSSIBLE VISION.
Urban Scale.
Regional Masterplan / Local Masterplan
Architectural Hybridizations.
Overlays Option A
Overlays Option B
Detailed Design.
Slapped Housing Models
Infrastructure
Privacy
Lowlands

OVERVIEW: Contents
CRITICAL DATUMS
≥10 m Elev
CRITICAL DATUMS:
≥17 m Elev
EXISTING PROGRAM: Destroyed Program

UTATSU

TRADITIONAL MACHIYA
(Two-Story, Mixed Single-Family Residential / Storefront Commercial)

COMMERCIAL AND INDUSTRIAL STRUCTURES
(Mostly One or Two-Story)

SINGLE-FAMILY RESIDENTIAL BUILDINGS
(Mostly One or Two-Story)

CONTEXT: Utatsu
EXISTING PROGRAM: Destroyed Program

UTATSU

49 TRADITIONAL MACHIYA
(Two-Storey, Mixed Single-Family Residential / Storefront Commercial)

179 COMMERCIAL AND INDUSTRIAL STRUCTURES
(Mostly One or Two-Storeys)

95 SINGLE-FAMILY RESIDENTIAL BUILDINGS
(Mostly One or Two-Storey)
GEOGRAPHY: Utatsu Topography

LONGITUDINAL SECTION

The East Valley Road transect runs SE to NW on the East Side of the Ishotome Area of the town of Utatsu, Japan. About 600m long (though the entire length is ~2000m) and fluctuating between ~40-60m wide, the road is essentially a shallow valley (with a ~1-5 degree incline) bounded by ~30-45 degree slopes with scalable walls of ~40m on either side, heavily forested with ~20m tall Cedar and other various deciduous trees, and small scale underbrush.

Eight single/double storey residential (?) building foundations remain on this transect. All structures above foundations have been completely destroyed. Two single/double storey commercial (?) building foundations remain. All structures above foundations have been completely destroyed.

Man-made concrete drainage infrastructure. ~3m tall x 2m wide cross section, with smaller tributaries from hills above. Drainage is all intact.

Above-ground power lines remain with minimal damage.

Possibilities:
(5) Vital Future Link... (Dependent on hillside activation)
(7) Current Support Viaduct... (Moving both people and water)
(5) Secluded Forest... (Ecosystem)

Limits:
Limited buildable land
Vulnerability from Monsoon flooding?

CONTEXT: Utatsu
GEOGRAPHY: Utatsu Topography

CROSS SECTION A

The East Valley Road transect runs SE to NW on the East Side of the Ishotomae Area of the town of Utatsu, Japan. About 600m long (though the entire length is ~2000m) and fluctuating between ~40-60m wide, the road is essentially a shallow valley (with a ~1-5 degree incline) flanked by ~30-45 degree slopes with scalable walls of ~40m on either side, heavily forested with ~20m tall Cedar and other various deciduous trees, and small scale underbrush.

Eight single/double story residential (?) building foundations remain on this transect. All structures above foundations have been completely destroyed. Two single/double story commercial (?) building foundations remain. All structures above foundations have been completely destroyed.

Man-made concrete drainage infrastructure. ~3m tall x 2m wide cross section, with smaller tributaries from hills above. Drainage is all intact. Above-ground power lines remain with minimal damage.

Possibilities:
(5) Vital Future Link... (Dependent on landslide activation)
(7) Current Support Viaduct... (Moving both people and water)
(5) Secluded Forest... (Ecosystem)

Limits:
Limited buildable land
Vulnerability from monsoon flooding?

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GEOGRAPHY: Utatsu Topography

The East Valley Road transect runs SE to NW on the East Side of the Ishotomae Area of the town of Utatsu, Japan. About 600m long (though the entire length is ~2000m) and fluctuating between ~40-60m wide, the road is essentially a shallow valley with a ~1-5 degree incline flanked by ~30-45 degree slopes with scalable walls of ~40m on either side, heavily forested with ~30m tall Cedar and other various deciduous trees, and small scale underbrush.

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Limited buildable land
Vulnerability from Monsoon flooding?

SECTION C: THE RESIDENTIAL PLANE
LOOKING NORTHWEST

Debris Fields
3/11 Tsunami High Mark
X Building Damage Related
X Water / Nature Related
X Infrastructure Related

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The East Valley Road transect runs SE to NW on the East Side of the Ishotomee Area of the town of Utatsu, Japan. About 600m long (though the entire length is ~2000m) and fluctuating between ~40-60m wide, the road is essentially a shallow valley (with a ~1-5 degree incline) flanked by ~30-45 degree slopes with scalable walls of ~40m on either side, heavily forested with ~20m tall Cedar and other various deciduous trees, and small scale underbrush.

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(7) Current Support Viaduct... (Moving both people and water)
(5) Secluded Forest... (Ecosystem)

Limits:
Limited buildable land
Vulnerability from Monsoon flooding?
EXISTING GEOMORPHOLOGY: Minami Sanriku

SOIL MAKEUP

ORGANIC HORIZONS
- Litter Layer
- Moderately Decomposed Humus Layer

TOPSOIL
- Organic Matter
- Leached Horizon

SUBSOIL
- AB Transitional Horizon
- BA Transitional Horizon of Illuviation
- Clay & Sesquioxide Accumulation
- BC Transitional Horizon
- Parent Material

BEDROCK
- Pumice Tuff (Pyroclastic / Igneous)
- Welded Tuff (Pyroclastic / Igneous)

Context: Utsu

Sources: Fundamentals of Soil Science
EXISTING GEOMORPHOLOGY: Minami Sanriku

SLOPE UNITS

01_THREE FORM ELEMENTS OF SLOPES
Litter Layer

02_SLOPE ELEMENTS
Litter Layer

TOPSOIL
Organic Matter

CONVEX
AB Transitional

CONTEXT: Utatsu
SLOPE URBANISM THEORY: Christopher Alexander’s *Pattern Language*

**CITY COUNTRY FINGERS AGRICULTURAL VALLEYS**

Keep interlocking fingers of farmland and urban land, even at the center of the metropolis. The urban fingers should never be more than 1 mile wide, while the farmland fingers should never be less than 1 mile wide.

Keep town and city development along the hills and hilly sides—CITY COUNTRY FINGERS (3). And in the valleys, treat the ownership of the land as a form of stewardship, embracing basic ecological responsibilities—THE COUNTRYSIDE (7) . . .
SLOPE + CONSTRUCTION: Macchu Picchu, Peru - Water & Agriculture
SLOPE URBANISM THEORY: Claude Parent & Paul Virilio’s *Oblique*
SLOPE URBANISM THEORY: MIT Structural Engineer Waclaw Zalewski's Z-Slope

RESEARCH: precedents
SLOPE + CONSTRUCTION: Japan Slope Engineering - Pros & Cons

RESEARCH: precedents
SLOPE + CONSTRUCTION: Japan Slope Circulation

RESEARCH: precedents

Matthew Bunza / MIT 4.189 M.Arch Thesis Prep / SP12
CATALOGUE: Slope Deformations

00_BASE_CONDITION
01_TOE_UNDERCUT
02_MID-CUT
03_UPPER-CUT
04_SLUMPED
05_DE-VEGETATED

RESEARCH: precedents
CATALOGUE: Slope Inhabitation

06 BASE CONDITION: RESISTANCE
01 PLATFORM: ADDITION
02 FILL: ADDITION
03 CUT: SUBTRACTION

04 CUT/FILL: SUBTRACTION/ADDITION
05 ANCHOR: SUSPEND
06 SUPPORT: BRACE
07 SUPERNATURAL FORCE: REPULSION

RESEARCH: precedents
CATALOGUE: Slope Existing Retention Strategies [Japan]

01_GROUND ANCHORS / CONCRETE

02_GEO TEXTILES / CONCRETE

03_?

04_WEDGE RETENTION / CONCRETE

05_TERRACE RETENTION / CONCRETE

06_INFILLED GROUND ANCHORS / CONCRETE

RESEARCH: precedents
SUMMARY

INGREDIENTS:

SITE
PEOPLE AND PLACE

DISASTER CONTEXT
PHASES OF RECONSTRUCTION
JAPANESE GOVT.'S TOTAL RELOCATION PLAN

RELEVANT ELEVATION DATUMS
SAFETY / ESCAPE ROUTES

EXISTING TOPOGRAPHY / VEGETATION
POTENTIAL SITES
POTENTIAL PROGRAM
REPROGRAMMING THE LOWLANDS

SLOPE URBANISM THEORY
CIVIL ENGINEERING PRECEDENTS
SLOPE CIRCULATION & MOBILITY
NATURAL SLOPE ENERGY
CONNECTION TO REMAINING COMMUNITY
APPENDIX D: BIBLIOGRAPHY


Sandler, Ronald and Phaedra C. Pezzullo, eds. Environmental Justice: Achieving Livable Communities, Environmental Justice, and Regional Equity.


