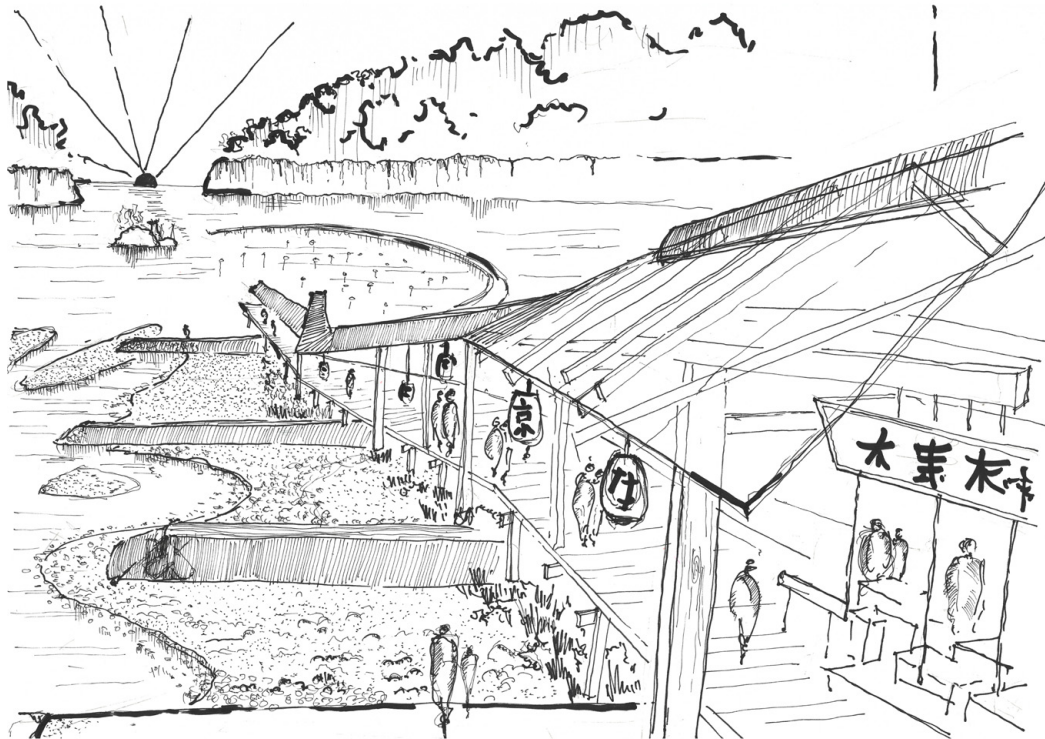


# Stitches

Blending landscape fabric through the golden threads of spatial identity in  
San Riku coastline, Otsuchi, Iwate, Japan.



*Aditya Athreya Rao*

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MSc Landscape Architecture I Flowscapes I Delta Urbanism I DIMI

July, 2019  
Delft, The Netherlands



Picture No.0 The art of repairing broken vessels with gold - Kintsugi (Wilson A., 2019)

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Redevelopment process, landscape architectonic structures, water structures, interdisciplinary approach



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*Most importantly I thank my parents, for without them none of this would be possible. They provide the backbone for all my work.*







# Prelude, March 2011

Friday March 2011, 14:46 Japan standard time, an earthquake of the magnitude of 9.0-9.1 hits the Japanese coastline. The epicenter lies off the coast approximately 70 km near the Oshika peninsula of Tohoku and the hypocenter at an approximate depth of 29 km under the surface water level.

This comes to be referred to as the Great east Japan earthquake of 2011, the most powerful earthquake recorded in Japan and the fourth most powerful earthquake in the world. Due to the movement of the fault lines of the continental plates, it causes one of the most devastating tsunamis in the world, with wave heights reaching 30/40m high!

The figures of damage caused were devastating. The tsunami swept the Japanese mainland and killed over ten thousand people, mainly through drowning, though blunt trauma also caused many deaths.

This is the backstory of one of the largest disasters the world witnessed.

The reports from the Japanese National Police Agency confirmed 15,897 deaths, 6,157 injured, and 2,533 people missing across twenty prefectures, and a report from 2015 indicated 2,28,863 people were still living away from their home in either temporary housing or due to permanent relocation.

More than 120,000 buildings were destroyed, 278,000 were half-destroyed and 726,000 were partially destroyed. The direct financial damage from the disaster is estimated to be about \$199 billion dollars (about 16.9 trillion yen), according to the Japanese government.

The total economic cost could reach up to \$235 billion, the World Bank estimated, making it the costliest natural disaster in world history.

The tsunami caused nuclear accidents, primarily the level 7 meltdowns at three reactors in the Fukushima Daiichi Nuclear Power Plant complex, and the associated evacuation zones affecting hundreds of thousands of residents.

Japan experienced over 1,000 aftershocks since the earthquake, with 80 registering over magnitude 6.0 Mw and several of which have been over magnitude 7.0 Mw

The effect of the earthquake and the tsunami in Japan are not a freak incident and are quite common due to the movement of fault lines along the coast of Japan. The Pacific plate frequently moves upwards against the North American plate causing typologies of tsunami waves in a frequency of a 1: 100 and 1: 1000 years, whose height depends on the magnitude of these quakes.

This incident led to various knee jerk reactions, studies and outputs that have changed the Japanese landscape.

Scientists from around the world descended on Japan following the earthquake and tsunami to study the same. Researchers sailed offshore and dropped sensors along the fault line to measure the forces that caused the earthquake.

Teams studied the tsunami deposits to better understand ancient records of the deadly waves. Earthquake engineers examined the damage, looking for ways to build buildings more resistant to quakes and tsunamis. Studies are ongoing today.

This report forms a continuation of studies of how humanity can look at this disaster and aid in disaster protection, in this case with the help of design and landscape architectural interventions in a multidisciplinary approach.

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# Abstract

*Disaster prevention and coastal protection of Otsuchi have affected the livelihood and the daily pattern of lifestyle of the regular Otsuchian. This work represents the alternative to a typical top down prefectural level demand for a line based infrastructural solution to disaster prevention and creates the required importance of livelihood, culture and identity of a place over the protection structure.*

*While in the design of such critical areas it is important to place protection of the citizens at a high level, it is also a necessity to understand the situation of each city as different from each other. In this way, the genius loci of a place is founded.*

*Along the San Riku coastline where the tsunami and earthquake hit the hardest due to the landscape features and the proximity to the epicenter the government has set a list of top down governed structures that have impacted the urban fabric of the city,*

*This document looks at one of these towns "Otsuchi" and how alternate solutions based on the historical and landscape features of the district can help create landscapes of livelihood for the citizens.*

*Otsuchi among many other Japanese cities faces the issue of a shrinking population due to a lack of economy, a lack of education in the rural areas and a lack of opportunities. The design document also looks at how*





*landscape can create a set of cyclical opportunities for the people to develop their town responsibly and sustainably as they see fit.*

*Landscape design seeks to provide opportunity to the stakeholders to further create, it provides the platform for this creation and the thesis looks at ideas and solutions on ways this can be done.*

*Keywords: Landscape Infrastructure, Identity, Contextual Design  
Genius Loci, Landscape Design, New landscapes*

*Picture No.2 A new Otsuchi under construction with a partly finished sea wall (Author, 2018)*





# 1.0 Introduction

## 1.1 Introduction to the Task

*Otsuchi and the coastline of Japan in the prefecture of Iwate is dealing with the issue of a loss of spatial identity in its beautiful, vast and varied rias coastline. This has happened through repetitive engineered solutions over the coast at a prefectural level irrespective of contextual differences between various locations in this coastline.*

*These solutions, though planned with a lot of thought, are consecutively not dealing well with the other problems these sites face including a loss of economy, lack of living environment and livelihood for the citizens and a lack of differentiating identity between towns. They are primarily defense mechanisms that seek to protect against future impending disasters.*

*Through landscape and environmental design and multidisciplinary analysis we search for spatial and strategic ecological solutions that revive the coastline and develop landscape structures that deal with this regional level.*

*To thoroughly research this, an example design elaboration is made for the village of Otsuchi*

Picture No.3 An area in Sendai City, in northeastern Japan, that had been swept by the tsunami (Kyodo News, via Reuters, 2011)





## 1.2 The research group and multidisciplinary approach

*The project was never an individual project. It was always an issue that was multifaceted in terms of the scope of the project, that dealt with a lot of specific scientific data and disciplines besides spatial quality of these regions.*

*Japan's Tohoku region is faced with complex geographical, social and natural problems due to its location, natural disasters, economy and engineering solutions.*

*Thus, the issue is best dealt with a wide team working together to think of solutions and willing to debate and work openly on idea from various disciplines. We were with a team of students and professional/faculty members from various departments.*

*The team comprised of urban designers, transport and planning specialists, building technologists, architects, hydraulic engineers, coastal engineers, geotechnical engineers, management in the built environment, structural engineers, sustainability studies, water management and landscape architecture students. In Japan we had the addition of students from the university of Tokyo and Tohoku university and it was a great pleasure to understand and add their views into the equation.*

*To come together with how these fields can collaborate, we worked with these fields to create a range of opinions from high to low on where the project would fall in a category.*

*The charette method was one of these methods where we decided to see where the project would fall in a range of values from people, planet, prosperity and the project itself. Having such a large team helped in seeing the values of where these fields come from but also to understand why or how a certain structure could deal with waves or how the intensity of the wave is affected by certain movements. Materials and processes are one of these characteristics I was then able to evolve into my design as a fundamental research and concepts.*

*With these disciplines came specific knowledge of using data to design. Examples included, for instance the meaning and possible use of the spring wells, their location and their importance from a water management point of view. The colleague in hydraulic engineering studied in his examination of the site, its geography and how it affected the volume of water of the tsunami that hit the town. Urbanists gave valuable advice on how the city can be improved socio-spatially.*

*The research group acts as a source for making the thesis a multidisciplinary project and issue creating a new layer of dynamic for this project.*

Picture No.4 The research team (Author, 2018)







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CATEDRA DE INGINERIE SI CONSTRUCII



### 1.3 Why here? Fascinations on the site

*Japan's top down quick reaction created a new urban form - the sea walls. The construction of sea walls was a large multimillion-yen investment that changes the coastline. Around 245 miles (395 km) of walls have been built at a cost of 1.35tn yen.*

*Many of the villages with the sea walls didn't even exist to many outsiders until this event and these great walls of Tohoku are something akin to the Great wall of China - they are the new landscape of the villages of Tohoku.*

*Irrespective of the size, type and economy of a village sea walls are being constructed to each one with the same specifications. The loss of identity is seen spatially in Tohoku and is the new urban fabric here. Should it be so?*



Picture No.5 Sea wall at Miyako (Rueters, n.d)

## 2.0 Fascinations on the location

*Japan is located at the far end of the eastern part of the world and for most westerners is easily recognized as one of the most technologically advanced, quirky country dealing with a multitude of natural disasters. This island is a survivor against a lot of threats!*

*Where the Dutch have had to deal with water level rise and the constant sea level rise around them the Japanese have had the additionally the sea constantly battering itself on to the land every 40-50 years, sometimes even more than once in 20 years. This event of the sea battering itself on to the land at high velocities and heights is called the Tsunami.*

*Japan lies at the west of the fault line between the Okhotsk plate, between the Philippine plate and the Pacific sea plate and they are in a constant friction because there is a constant downward movement of the Pacific plate causing the North American plate to move upwards. The Japan trench is in a subduction zone which constantly thrusts the North American plate upwards.*

*This is the reason for Japan's infamously large number of earthquakes. It is not unusual to have a frequency of a small tremor every month due to this movement.*

*The larger magnitude earthquakes happen at various frequencies. Every 1:100 years, earthquakes have the possibility of causing a Tsunami.*

*"The tsunami", a Japanese word which means a harbor wave occurs when this fault movement is so large that a wave is created by the movement which moves in all directions.*

*Japan has had to deal with tsunamis from a much prehistoric time almost. The first recorded tsunami dates to 856 AD and there were probably many before. It is that which makes the research interesting, on how the country chooses to deal with the impact of the tsunami and especially on its spatial impact.*

*Tohoku, a region in the northeast of Japan, retains a reputation as a remote, scenic region with a harsh climate filled with hills and a rias coastline formed by unglaciated river valleys slipping into the water that left these numerous bays along the surface towards the Pacific sea. This describes the 600km length of the San Riku jagged tooth coastline.*

*The area predominantly a fishing village coastline has been dealing with other issues before the tsunami, a problem which is not particular to Japan but to most countries now. A diminishing population and a shrinking economy which was then affected by the 2011 tsunami. This region has seen a knee jerk top down reaction to protect them against the tsunami that has affected the spatial quality of its urban and rural environment. The cities of this coastline have become characterized by spatial solutions totally blocked out from their context. Sea walls, land consolidation, massive breakwaters and urban fabrics that look more inward, these are just some of the aspects these cities are faced with, as challenges.*

*Numerous problems and opportunities present themselves in this beautiful landscape which provides for a wide range of tough design decisions on the future of this coastline and these form the fascinations in making an intervention academically in such an environment.*





Picture No 6  
 1 Tiger Dancers. Two dancers from the Ando Toramai Preservation Society posing in the Otsuchi bay on December 2014. This traditional performance dance is done every year to pray for a good fishing season. Otsuchi Town, Iwate Prefecture, Japan (Alejandro Chaskielberg, 2014)  
 2 Three Generations. Tomoko Hida, Sana Hida & Yoshimi Hida (mother, daughter and grandmother) posing in the remains of their home one and half years after it was destroyed by the 2011 tsunami. Otsuchi Town, Iwate Prefecture, Japan (Alejandro Chaskielberg, 2012)  
 3 A photograph that was swept away by the 2011 tsunami shows a woman and kid wearing traditional Japanese customs. Otsuchi Town, Iwate Prefecture, Japan (Alejandro Chaskielberg, 2012)



# 3.0 Problem Field

I herewith look at the 3 main factors I associate with the problem field in my site and region.

Disaster in Japan, its geography in the region of my site and how it affects our scope of disaster and the very neglected factor of economy and growth of this prefecture at large. It also must deal with the protection structures and their spatial effect on the city and its landscape.

## 3.1 Earthquakes and Tsunami's in Iwate

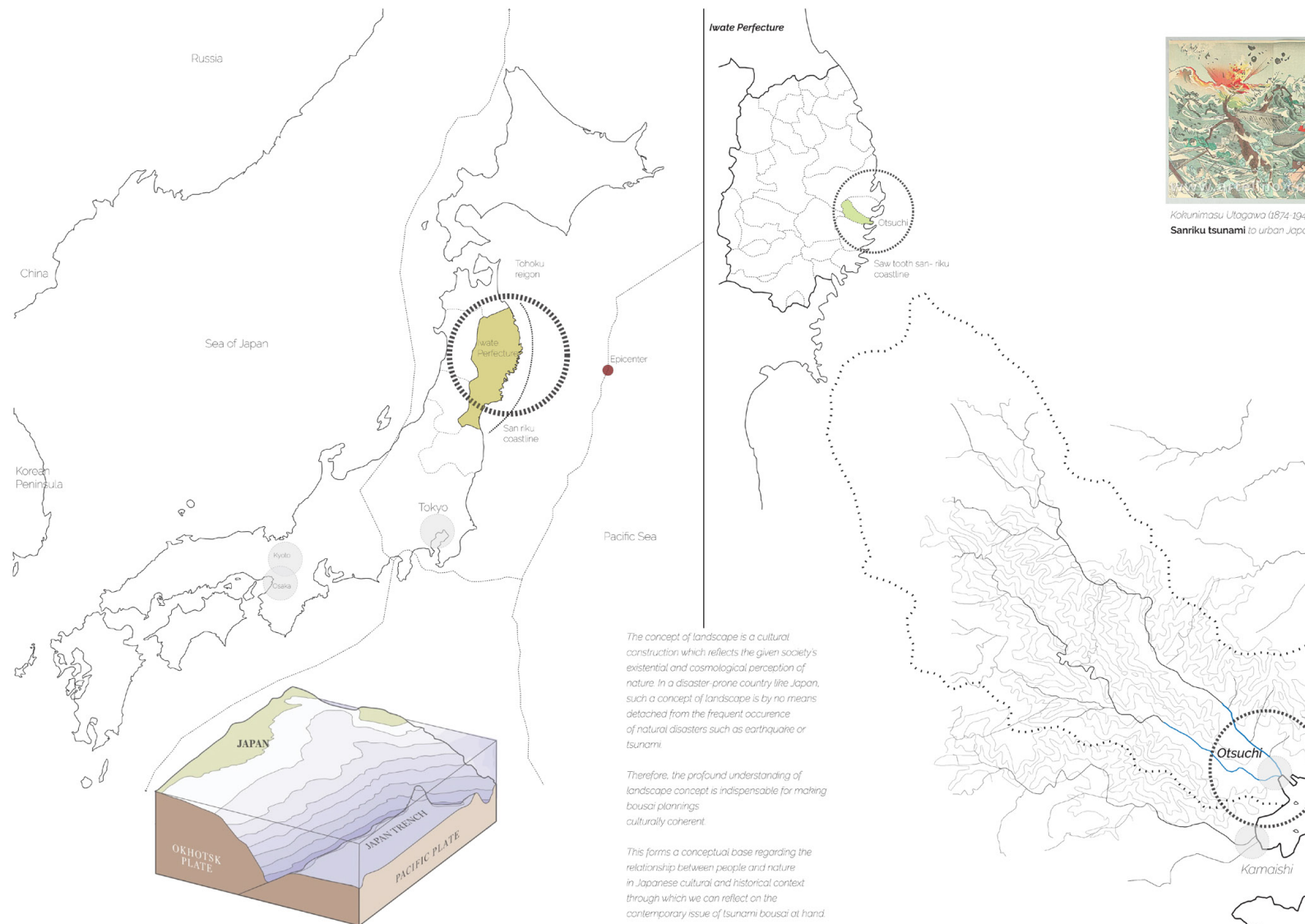
The effect of each of these tsunamis is followed by large scale loss of life. Especially in the 2011 Great East Japan earthquake a total of 15,897 lives were lost. Almost all villages lost an average of 15% of their citizens to this tsunami.

In the north east of Japan lies the prefecture of Iwate, Miyagi, Aomori, Fukushima and Hokkaido which were the most affected. Iwate and Miyagi form the Tohoku region of Japan which has a unique coastline (the San-Riku coastline).

Iwate prefecture which lay closest to the epicenter of the earthquake was affected badly. Much of its urban districts in the coastline were wiped out. It had one of the highest death tolls among all the surrounding prefectures. Miyagi prefecture was in fact the highest in the numbers of casualties followed by Iwate.

Importance to be aware of is, noticing how the coastline of this prefecture behaves as a landscape element in the case of a Tsunami. The rias projecting out into the pacific enhance the effect of a tsunami and acts as a totally different phenomenon from the flat beach coastline where a lower height wave at a higher velocity hits the coastline.

The site design in Otsuchi district consisted of 16,000 people before the tsunami. There were around 817 deaths, 416 missing people followed by around 3000 people leaving the town after the event. Currently the town is around 11000 people. There is a 25 % reduction in the population of the district. These are drastic numbers considering the population was already declining.



# 「死者は万人単位」

## 宮城県知事、見通し

### きょうから輪番停電

### 3号機も爆発の恐れ

### 鉄道、間引き、連休も

### M.9.0に修正

**朝日新聞**

3月14日 月曜日

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 栃木 4A 9A  
 群馬 6A  
 埼玉 3A

# NRC HANDELSBLAD

Morgen de compacte zaterdagkrant NRC Weekend, met daarin de nieuwe lifestylebijlage Lux, de vernieuwde katernen Economie en Wetenschap

Elke vrijdag schrijft en tekent Peter van Straaten op de Achterpagina

## Zware aardbeving noorden Japan, doden door tsunami en branden

Op zaterdag 11 maart 2011 werd op 1300 kilometer ten noorden van Tokio een aardbeving van 9,0 op de richtingschalen gemeten. De aardbeving werd gevolgd door een tsunami die oerweldigende golven naar de kust van Japan zond. In de noordelijke gebieden van Japan werden grote schade en doden veroorzaakt. In de noordelijke gebieden van Japan werden grote schade en doden veroorzaakt.

### Na vrijlating militairen in Libië vragen voor Hillen en Rosenthal

De Amerikaanse ambassade in Tripoli heeft de Amerikaanse ambassade in Tripoli gevraagd om informatie over de militairen die in Libië zijn vrijgelaten. De Amerikaanse ambassade in Tripoli heeft de Amerikaanse ambassade in Tripoli gevraagd om informatie over de militairen die in Libië zijn vrijgelaten.

Picture No.7 News clips from the day after the tsunami around the world. (Newspapers etc. various, 2011)

**Understanding the tsunami morphology**

**Otsuchi District**

**Coastal Plain**

**Rias**

**Dendritic Drainage pattern**

**Otsuchi District**

**Namita**

**Kiri-Irin**

**Otsuchi Bay**

**Higher Velocity 65-10m**

**Lower velocity, water run-up 14-40m**

Picture No.8 Site Location and understanding the terrain and its effect on the tsunami (Author,2018)



### 3.2 Tsunami and Iwate's Geography

Iwate faces the Pacific Ocean to the east with steep, rocky cliffs along most of the shoreline interrupted by a few sandy beaches. The border with Akita Prefecture on the west is generally formed by the highest points of the Ōu Mountains. Aomori Prefecture is to the north and Miyagi Prefecture is to the south.

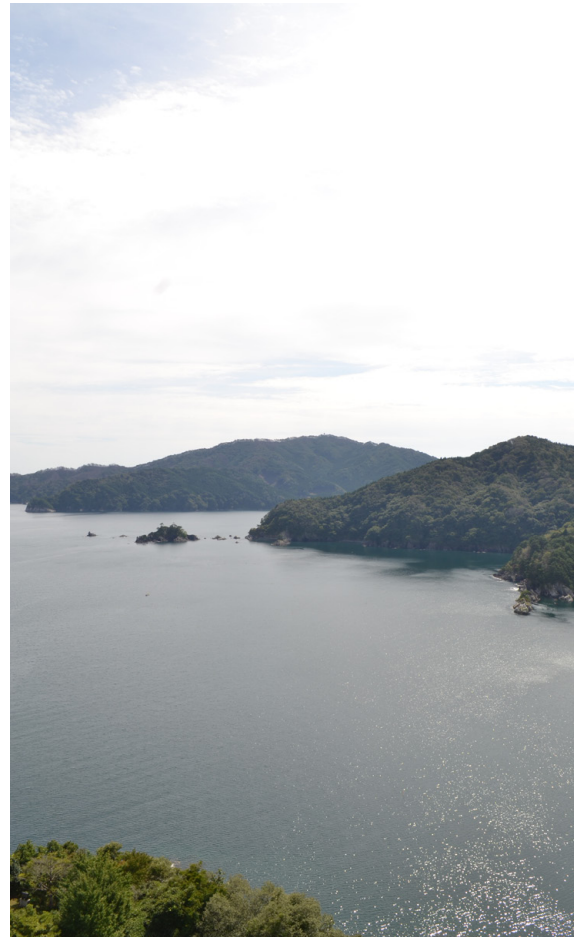
Besides these two mountain ranges and the rugged coastline, the prefecture is characterized by the Kitakami River which flows from north to south between the Ōu and Kitakami mountain ranges. It is the fourth longest river in Japan and the longest in Tōhoku. The basin of the Kitakami is large and fertile providing room for the prefecture's largest cities, industrial parks and farm. The other characteristic features are the rias which lie on the southern coastline of the prefecture. They are defined by rocky bays and giant granite cliffs jutting out of the ocean. The zigged-zagged coastline, with tons of inlets and bays protect a treasure trove of marine life.

The rias coastline is also defined by the dendritic pattern of river valleys which connect inwards. These river valleys go for long distances inwards almost into the Kitakami valley.

This geography is the cause of various effects on the wave as it differs from bay to bay and inlet to inlet. Seen in the picture on the right-hand side is a representation of how the wave height differs in each bay. Immediately the difference can be seen between the southern ria's coastline and the northern sheer cliffs. Due to the ria's, wave movement height is enhanced by the effect of bouncing off the sides of these rias walls and by the funneling effect.

At the same time one can notice the subtle differences between effects of different bays due to the change in the shape of it and this plays a big role in the understanding of how landscape design can help in the creation of protection measures.

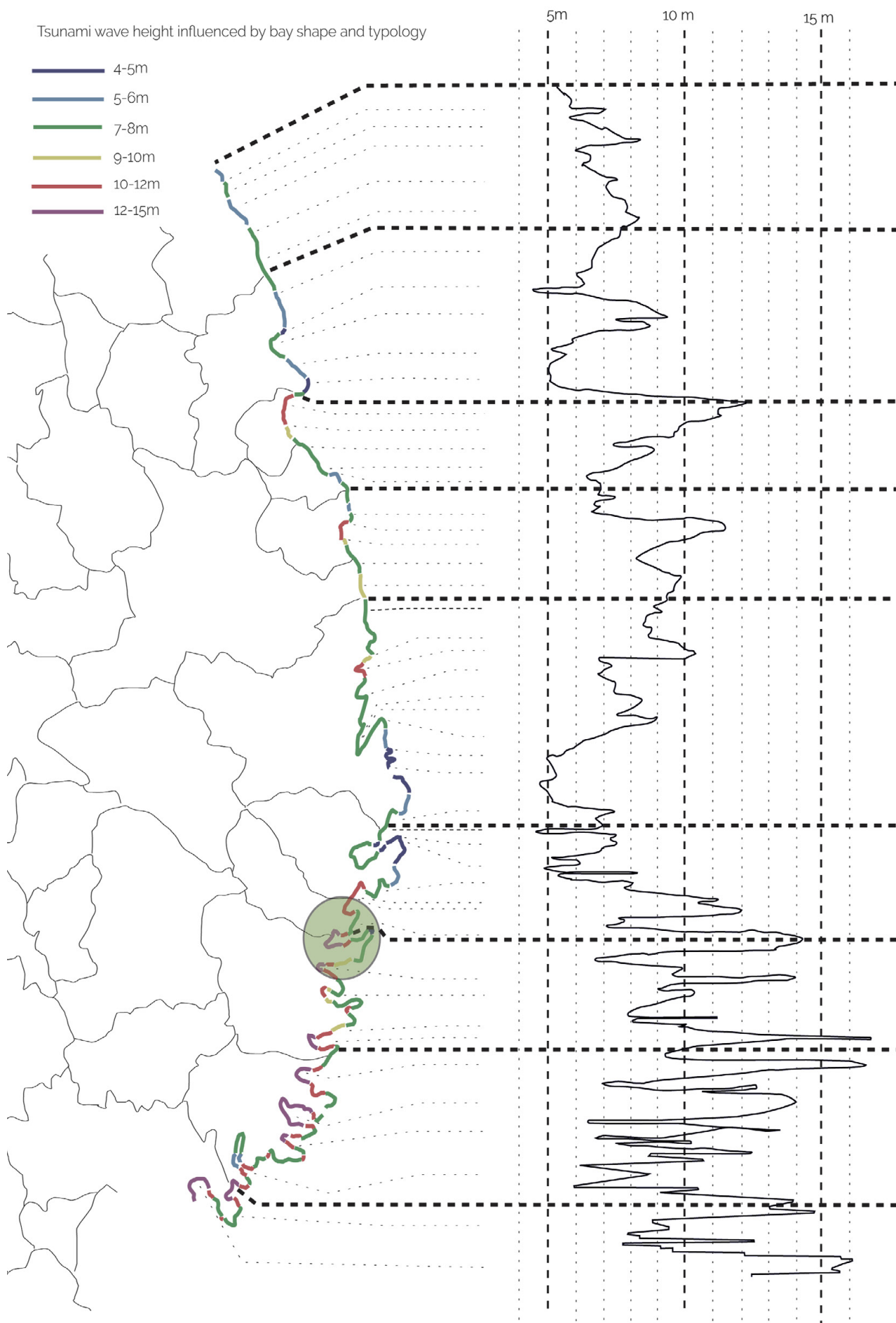
The bay of Otsuchi is one of the bays where the tsunami waves become higher, it has a run up effect of 14.5 m .



Picture No.9 Characteristic landscapes of the prefecture of Iwate (Google Image search)



Tsunami wave height influenced by bay shape and typology



Picture No.10 Comparison to see the shape of the bay's effect on the height of the tsunami. (Author, 2018)

### 3.3 Iwate and Growth

*Cities in Tohoku were shrinking rapidly much before the tsunami happened. The tsunami made it only more evident.*

*With mono-economies based solely off fishing, there lies very little future here, and due to the younger generation wanting to move to greener pastures it shows a strong decline. There are a few other industries, but they face similar problems.*

*The Nominal gross product of Iwate is 4.1797 trillion yen and the National share: 0.88%. Though the economy is in a general decline from the last few years the economy is growing due to a rise in public investment and private demand for recovery projects like building construction and the reconstruction effort.*

*You can break down the nominal prefectural gross product into the following industry structure: 3.4% of the products are from the primary industry (agriculture, forestry, and fisheries), 21.8% is gained from secondary industry (mining, manufacturing, construction), and 74.3% from tertiary industry.*

*Note: Taken from the economic activity breakdown from the Citizen's Economic Report*

*Shown in the image on the right-hand side are the statistics in area and yen to the damage of various primary industries that were anyways on a decline. Iwate had strength previously in these primary industries with much of the economy coming in from fishing. In fact, much of the south including Tokyo used to get its fishing material from Iwate until it started to decline.*

*Automotive industries, semiconductor industries and IT related industries are on the rise and could assist in this recovery of the economy but in small villages like Otsuchi design needs to provide a helping hand to the primary industries to first start the process.*

*Otsuchi in 2006 had around 24000 people. There was already a strong decline to 16000 people by 2011 before the effect of the tsunami. Currently there are around 11000 people projected to go down to 6000 people by 2024 and in most aspects this size constitutes the terminology of a "village".*

*At present, more than 60% of the number of people in the city are 65 and older. Otsuchi itself has a few shops, a failing fishing industry in which the youngsters of the city are not interested to work in. It has no universities at proximity or further education opportunities in the vicinity. All this contributes to the decline of the Tohoku region and the future is at stake.*

*With a falling growth rate in most developed countries around the world this is a problem that is not only significant to Japan. Iwate is a relevant example to understand and reason as to what we would like the growth rate to be in a town like Otsuchi.*

*The solutions must directly deal with what we need at various scales from a space like this to overturn decline rates of the population. It provides a light to further such situations in various parts of the world.*

*The government spent 26 trillion yen (\$220 billion) in recovery and rebuilding from 2011-2015, but is due to slash that to only 6.5 trillion yen in 2016-2020. Reconstruction has been hampered by a shortage of workers, and while much of the public housing planned to replace destroyed homes has been finished, about a fifth of the units stand empty.*

*Many of the seaside towns in the disaster zone relied heavily on fishing and aquaculture. Data from Iwate prefecture, one of the hardest-hit areas, shows harvests of salmon and oysters still only at 40 percent of the level when the tsunami hit. Other industries, such as sea urchin and abalone, have recovered to about 80 percent of normal. The region's fisheries still employ about 14,000 people, but that's down from about 18,000 in 2010.*

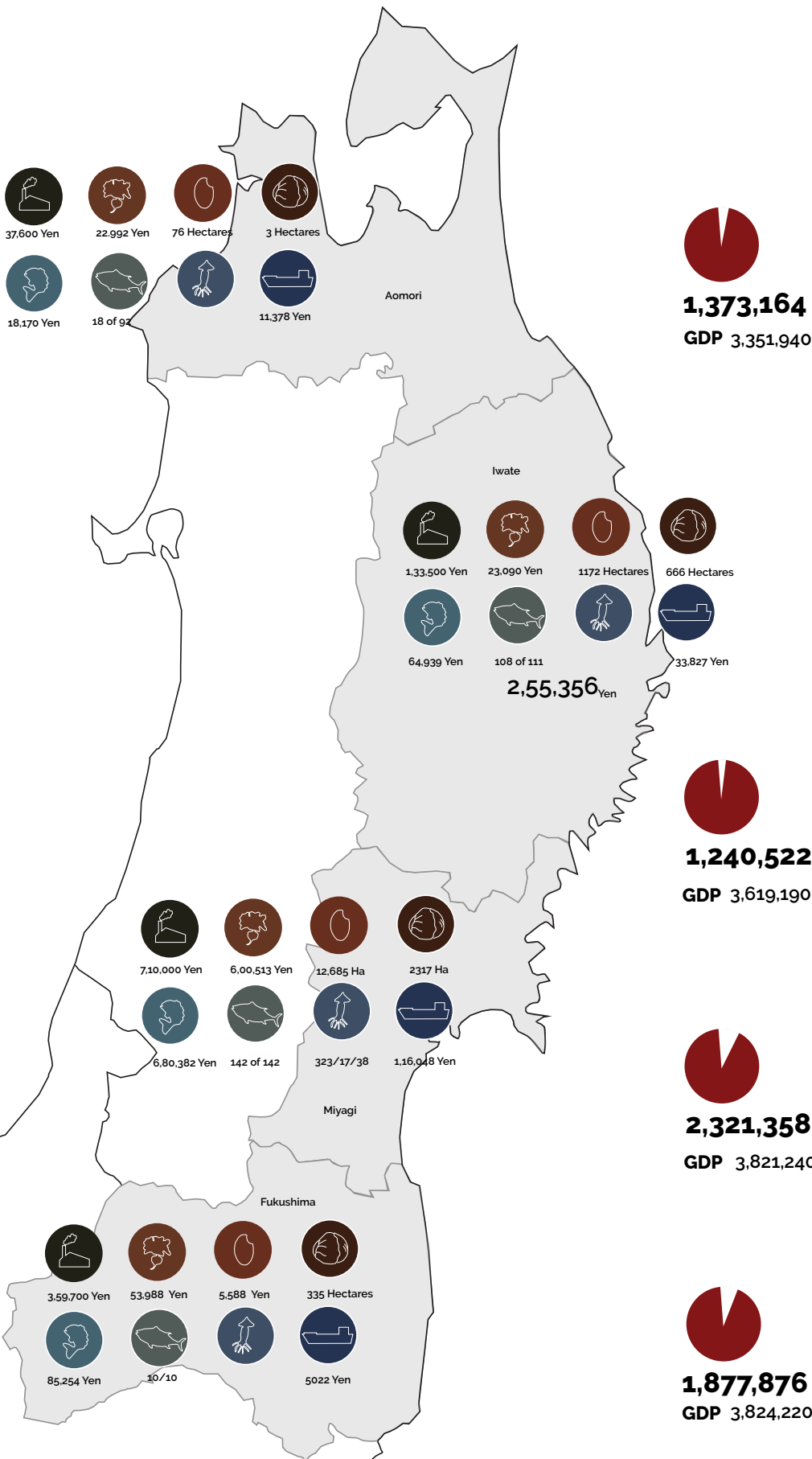
*As seen in the image on the right compares to the GDP of Tokyo these prefectures lie at just a fraction of it and these directly affect the population and growth of the region.*

*Design intervention must look at how space can create economy from the current strains of what remains and how from a prefectural level to the district level what can create these effects on economy*



# Economy, Industry and Population - Tohoku Reigon

-  Commercial Industries
-  Agricultural and Forestry Business
-  Area of Damage to Rice fields
-  Damage Area to Upland Fields
-  Water Related industries
-  Damage to fisheries industry
-  Water Production and processing facilities
-  Damage to fishing boats



**Tokyo**  
Population and GDP statistics  
**38,140,000**  
GDP 94,902,100

### 3.4 Large scale repetitive engineering solutions

Relevance for designing differently from the current solution can come in through the fact that Infrastructural solutions affect the spatial quality of both the landscape and the urban space around it.

These kinds of solutions have a scale not yet seen in any other parts of the world. Sea walls that go up to 25m high, Landfilling and consolidation of city levels up to 15m and other such structures, all which are creating a new spatial phenomenon in the cities.

The prefectural government describes the average requirement as a massive 20.5m wall when there is a run up for an L2 tsunami which is supposed to happen every one in thousand years, like in 2011. The run up and inundation area of this tsunami in Otsuchi was around 14m too and the cities new wall is a meager 0.5m higher than the run up.

These walls create a new environment not seen in other cities around the world. Having blocked off the sea completely most of these villages have an urban structure that blend around the wall and the hills. The sea is only visible at certain points. Also, at the same time the structure ends up changing the urban fabric behind the structure to create a characterless lifeless city.

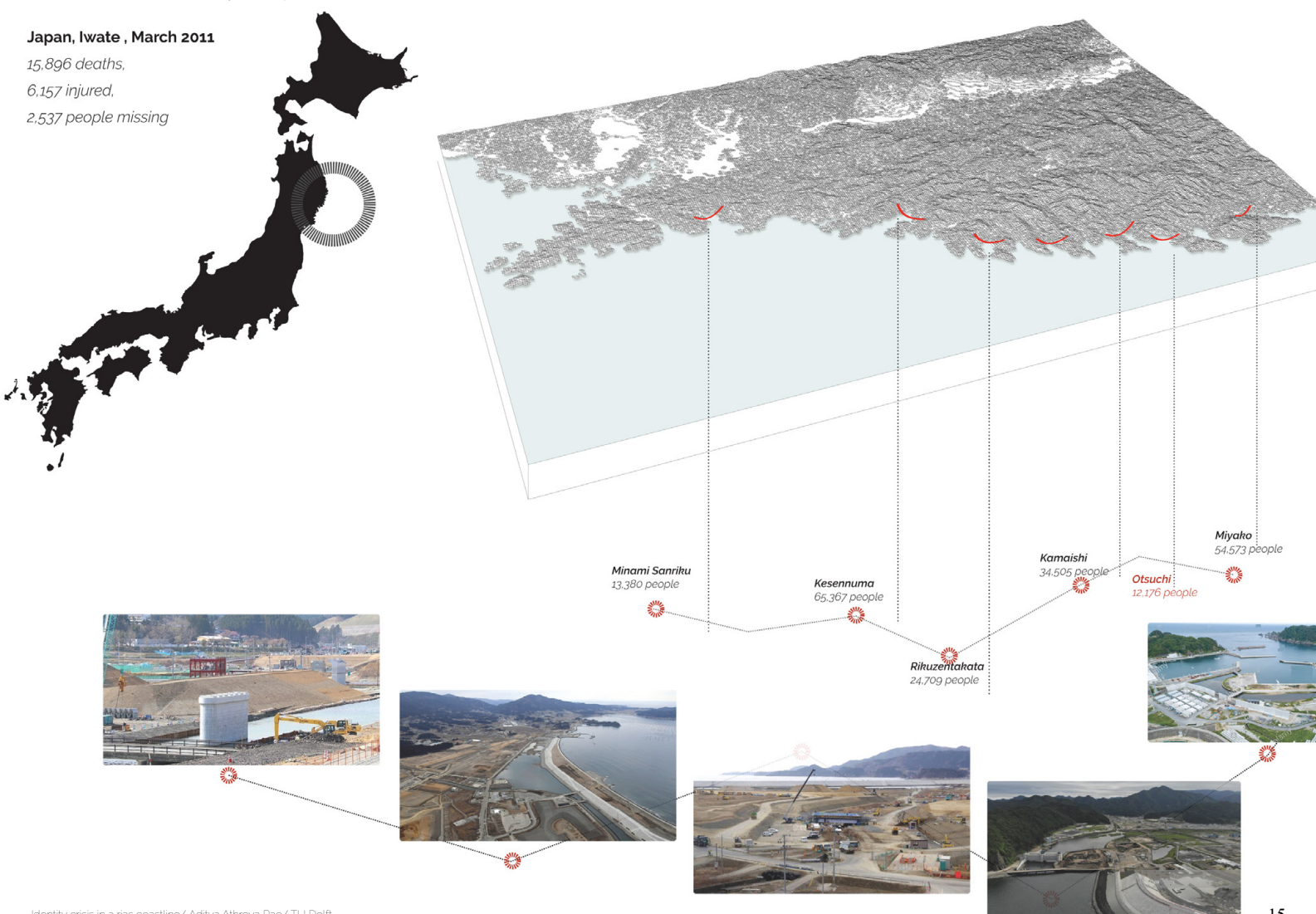
But life is generated in the transition between land and sea .Landscape dynamics work because of these connections between the mountains, the sea and the undersurface of these hills.

It is important to know the people were given a choice about the height of the sea wall and in many cities different heights and solutions were chosen. We noticed that one of the surrounding village choose to raise their height of the land compared to the sea walls. Another thing to consider is that in Otsuchi compared to most cities it was considered a "Bottom-up" process in a sense that citizens had a variety of meetings and discussions to consider the new city and what it would be like. Yet in reality, this solution of the sea wall didn't help the local community.

With all these things considered and the figures given by the government that 92% of public housing, 97% of medical facilities and 98% of schools have been built in the Tohoku region it is easy to believe these infrastructures were great solution for the r-urban situation of Tohoku. However, ground studies show that when the citizens were asked "How do you feel about the current state of the community after the disaster and about the reconstruction after the disaster? And only 2.5% agreed on the process in the affirmative while nearly 80% of the victim's answer "I somewhat disagree and I fully disagree" (Tsuda, 2018, p.39)

It is due to the fact that public reconstruction projects which were supposed to help the community start up their life did nothing of that sort and only promised to protect them against the next tsunami somewhere in the future.

Picture No.13 The Identity Crisis explained (Author,2018)







Picture No.12 Huge Concrete walls in Rikuzentakata (Author,2018)

### The coast of Iwate Prefecture

12 municipalities

(5 cities, 4 towns, 3 villages)

Area: **4,946 km<sup>2</sup>**

Population: **2,40,000**

Local Industries:

Along with a booming fishing industry thanks to an abundant sea, our coast is home to businesses focusing on precision machinery, steel, cement manufacturing, and connector-related industries.

The town faced problems before the tsunami which is important to recognise.



### Identity



### Diagrammatic Problem Statement



Before Tsunami

After Tsunami

L1/L2

#### Human Casualties

Deceased	1234
Related Deaths	47
Missing	437



Damage Districts	Estimated value of capital stock	Damage Cost	Damage percentage	GDP	% of damage cost to GDP
<b>Iwate</b>					
Inland	26,369	754	2.9%	4,255	1.0 year worth
Coastal	7,449	3,622	<b>47.3%</b>		
Total	33,818	4,376			
<b>Miyagi</b>					
Inland	31,443	1,595	5.1%	8,007	0.81 year worth
Coastal	23,182	4,997	<b>21.1%</b>		
Total	54,625	6,492			
<b>Fuku-shima</b>					
Inland	34,314	1,270	3.7%	7,228	0.43 year worth
Coastal	16,941	1,859	<b>11.7%</b>		
Grand Total	50,254	3,129			

Property damage	Change in Population
Houses destroyed - 3,092	-5,994 → -4,934
Damaged houses - 786	25% decrease in population
Inundated area - 431ha	
(Residential area - 52%)	
(Commercial area - 19%)	
<b>Population</b>	36,776
<85 yo	1,793 (85%)
Productive age	8,579 (85%)
>65 yo	4,987 (85%)

**Cost of building post tsunami -**  
1.5-2 times higher than pre-Tsunami

### Cost Benefit of Engineering solutions



Identity can be found in its landscape, streets, people and life and not in built works.

### Mono flow economy



**50%** population - working category  
Average income -  
**< \$5000** than Iwate average

### 7 Years (unfinished)

- 2 month Reconstruction Plan
- 2 year Recovery phase
- 3 year Revitalization phase
- 1 year Expansion phase (delayed)

### Time for Reconstruction



### Identity



- Depopulation
- Lack of Identity to Urban structure
- All amenities in place, but lack of citizens recognizing it as their structure
- No public, recreational and activist spaces

### Lack of an ecological overview



# 4.0 Research Statement

## 4.1 Research Statement

*The prefectural and central government set a standard policy for all cities in Tohoku-San Riku coastline region. It had similar spatial policy irrespective of the character, life or inner issues of the region. It led to a lack of identity and livelihood in these cities. The budgets were focused on certain aspects of the restoration of the city and not for example some of the things most necessary like economy and houses.*

*Cities in this region which are located inside beautiful bays filled with numerous pine trees, rocky outcrops and estuarine waters. They have all started to look the same with a white sea wall that dots across the sea line with gravel landfilling to raise the height and large areas just after the sea wall for water overtopping in case of a tsunami. This is irrespective of the size, major economy or general land use of the city. It has become the generic solution for the San Riku coastline.*

*This lack of identity is not an abstract but rather a spatial concept that has to deal with the livelihood, tradition, nature, context and economy of the citizens and the land. It also addresses the theme of protection. While protection of life is of utmost importance it is imperative that there is life to begin with and a future to look forward to.*

*The research looks at creating identity through space, creating economy, enhancing culture, new layers of growth and provide a future for this town. For the design to achieve this the designer needs to capture the essence of all the other professions this project works with, to use their resources in creating spatial design for the users.*

### **Identity -**

*Identity is an abstract concept that consists both of physical and mental aspects. Each place you know is associated with specific characteristics which differentiates it from another town/environment/space. This can be smells, sounds, textures, tastes or images or combinations of these sensorial experiences, or it might be the history of the place, its specific landscape architectural features etc. This is the genius loci of a place. With the generic design of the sea barrier and the massive landfill interventions, the genius loci of the villages is neglected and destroyed. And no future created for these inhabitants either.*

*While exploring these villages we noticed each of them had somewhat similar features, similar urban fabric and protection structures. All of these lacked in a connection to their immediate landscape as well. The tsunami made a tabula rasa of many of the areas, but we must try to bring back identity to these areas through what existed, in terms of culture, personality and space.*

## 4.2 Research Question

***How could a Landscape Architecture approach towards design have created a tsunami protection that respects the genius loci of the different places?***

***How can the protection line be redesigned to combine the functionality of protection with the possibilities for citizens, the local economy and thus restore or recreate the identity of the villages?***





### 4.3 Sub Questions

*Parallel questions that will help me answer the former main research question are as listed below -*

- A. What is a structure of a city that is not only modelled for protection of a once in 40-year event, as it is now, with the various defence zones, but one that also does this while making everyday life of the citizen of Otsuchi special?*
- B. How would a citizen of Otsuchi identify himself as compared to a citizen from another town as a spatial/cultural attribute?*
- C. What are the characteristics, personalities and cultural traits of the city that can be absorbed into landscape architecture of the city?*
- D. How can a landscape architectonic bring a change in the shrinking age of the city? What functional and spatial attributes will help in creating economies and life/lifestyle for the younger generation to stay back in Otsuchi?*
- E. How does one design extreme landscape interventions for safety measures, keeping in mind the attachment to ancestral land?*
- F. How can the landscape architectonic design of the safety measures to protect the area against tsunami effects, both stimulate and benefit from ecology? And could the ecological qualities also create a new economy?*
- G. How can reconstruction work benefit the local inhabitants through opportunities for business?*

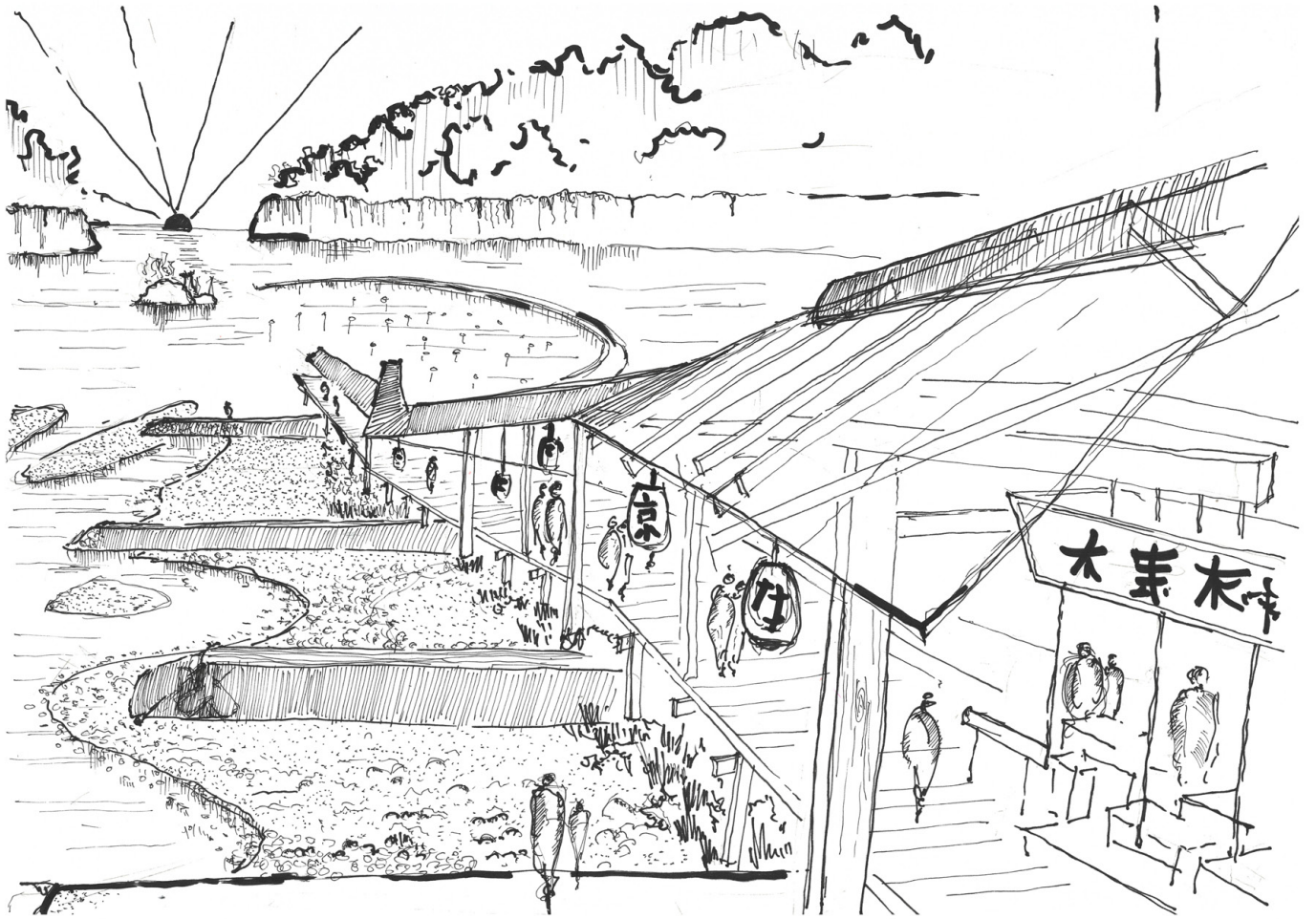
### 4.4 Hypothesis

*My hypothesis is a landscape architectonic design model of the city and its protection systems that can work with its natural rias landscape.*

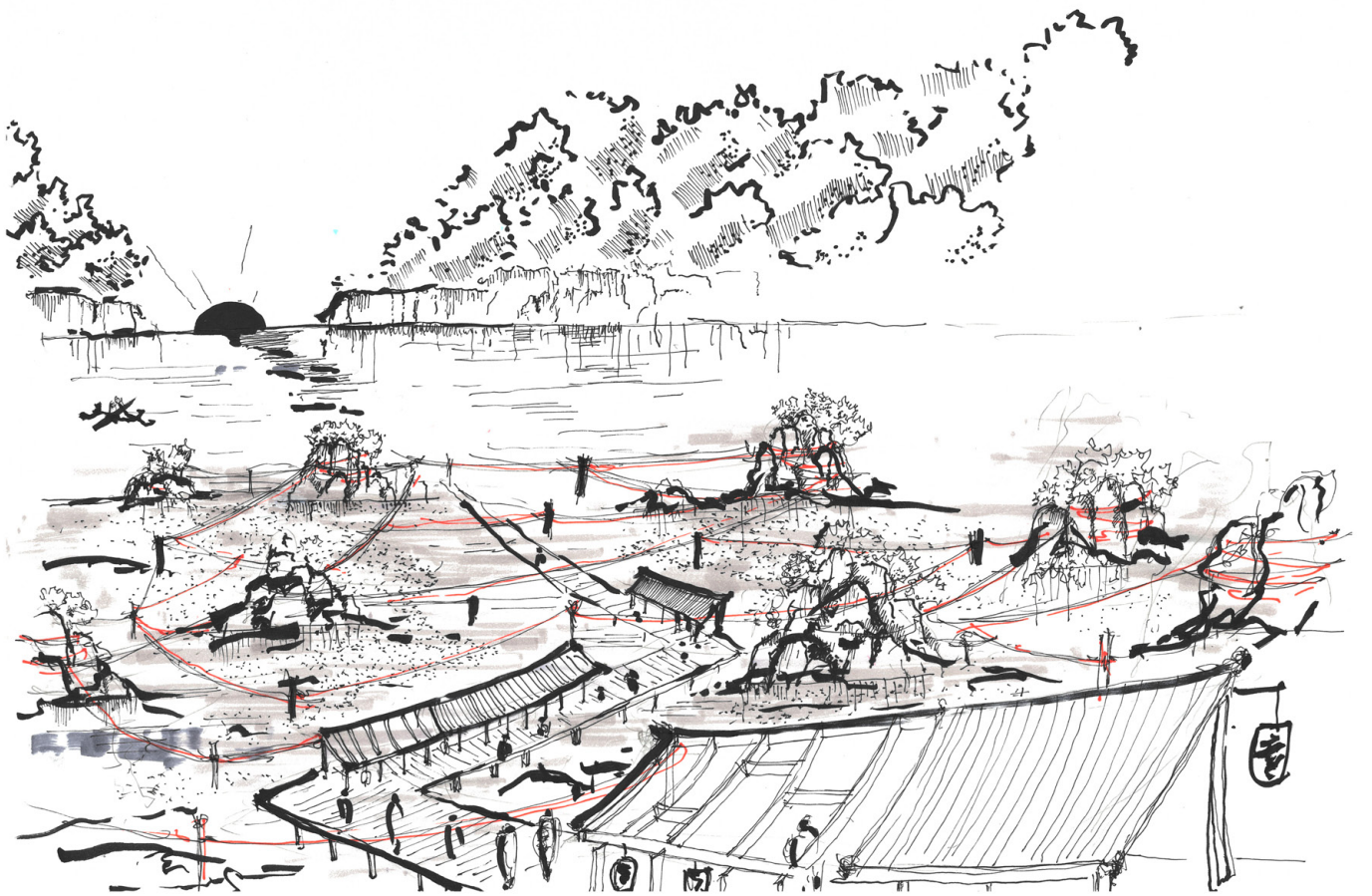
*The suggestion lies in usage of the bathymetry and the existing landscape of the sea contours to create a landscape that not only protects but creates life, opportunities and an urban structure that makes people believe in a city's identity through defined functional, spatial, economic and cultural reasons.*

*Spatial protection systems that caters to the landscape of the bay can help in generating functions that aid the city and in fact, the other towns in the bay also get affected by it to create a unified bay environment.*





Picture No. 15 Sketch of the village forefront on to the bay as relooked with a fishmarket connecting the landscapes (Author, 2018)



Picture No. 16 The fish market with islets made of debris and connected by the Japanese sacred ropes (shimenawa) (Author, 2018)

# 5.0 Methodology and Multidisciplinary fieldwork

The research framework and the project began with the first steps in many workshops interacting between various professions.

Since we were more than 8 different professionals, we had to understand what the research agenda of each profession was and find how we could help each other out.

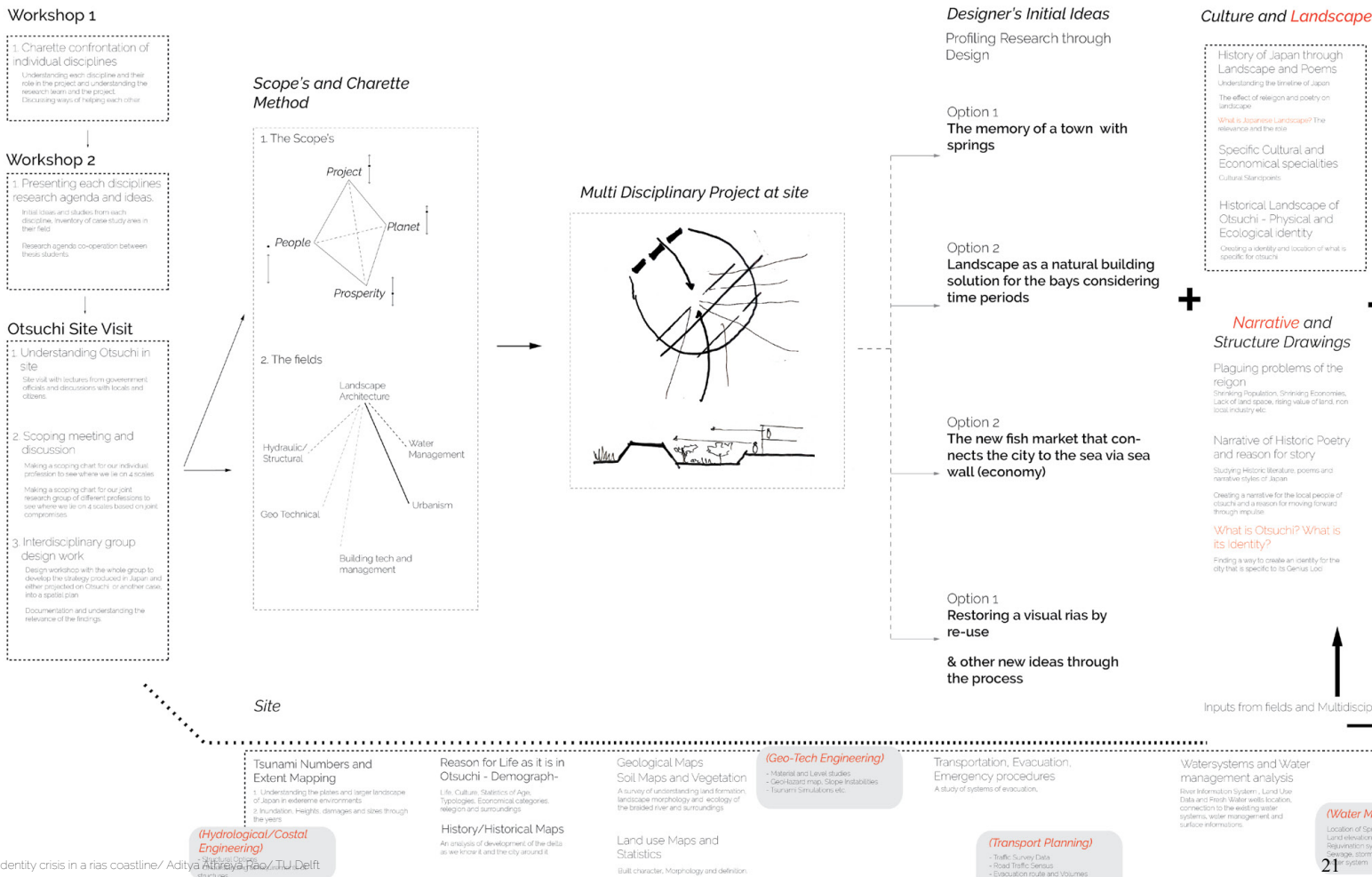
The further steps involved the site visit where we had the scoping meetings to understand the scope of each of our project.

The scoping and the charette method formed most of the next few steps which helped in developing a multidisciplinary project on the site through a quick understanding of it. The charette method is explained in detail in the following pages.

The constant that followed through as research through the whole of this process is trying to grasp the site through the lenses of the various professions we were working with.

After that the idea was to freely roam the mind through various sketches of what the utopian or ideal situation could be like for Otsuchi.

## Research Framework Analysis Otsuchi





Culture and landscape were examined to examine what landscape architecture and spatial design meant in Japan and Tohoku region, what was the history of the region and what does it mean to be a citizen of Otsuchi.

The first set of research drawings were structure drawings to show existing structures and issues exist together on a map while the desk analysis went more into each layer of knowledge from prefectural to district to city level to create a base of knowledge about the site.

The most important analysis however was the Tectonic, volume and process analysis of the site. A lot of materials, processes and techniques have gone into the construction of massive protection structures which have costed the budget of the village plus more. It was my intention to examine them to know how it could be repurposed for an alternative solution that was more specific to the case of Otsuchi compared to the general prefectural solution proposed for all towns.

The case study mentioned during the tectonic analysis gave an example of how such a project which repurposed materials and techniques could be successful in creating

an impact on the community

The theoretical framework namely of which there were three -

Signature based landscape design

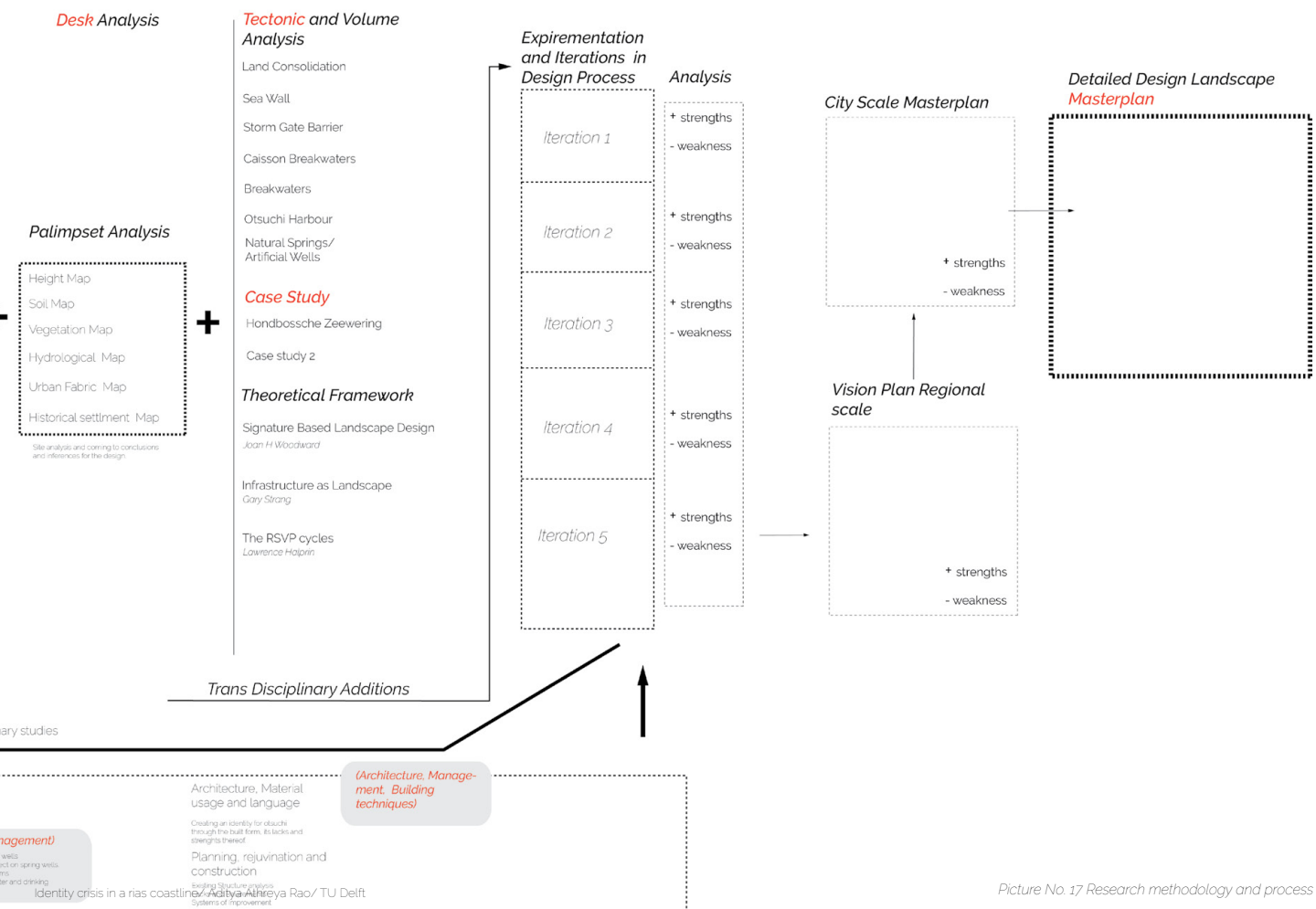
Infrastructure as landscape and the RSVP cycles which helped in creating a thought backbone for the project.

With these theories and research backing the process it was time for the next step to work with the concept that was created by the research to become a design.

This is where research by design comes in and multiple options(iterations) are looked at to see how to make the concept come to life based on a few tools and principles.

After examination of these then one can look at how to create the right details required to make the vision work. This is where design at various scales comes in.

The research by design process leads to a reflection on the outcome in the form of a masterplan which encapsulates the intervention in a drawing



## 5.1 Theoretical Framework

### 5.1.1 Signature Based Landscape Design (1997)

*Joan H. Woodward*

*Landscape Architecture and every region's unbuilt environments are built on relationships. Relationships that explain why these landscapes work and function in the way they do so. Beneath each appearance of an unbuilt environment is a massive range of processes that create these landscapes. It explains why these spaces function the way they do, why they have changed and how these may appear to be in the future..*

*Design acts as a moderator to function in creating a complex relationship between people, land and the place. The three actors on this space are what Joan H Woodward talks about, but in my opinion the place has a more than 3 actors, who have just as an important relationship to the space if not more. We are to function effectively here. We tend to use the space for our needs and also for many of the actors.*

*For example, in the case of Otsuchi Bay, fishing is a major commodity but also an ecological player in the landscape. If overfishing is done the bay could run dry of these players which in turn could affect the underwater ecology and the sessile and benthic species of the landscape. This will cause the industry itself to spiral. Thus, there is a complex relationship between the landscape, the people and the place.*

*Relations are both of Nature, people and their culture. Many landscapes represent these, for example in Kamaishi bay the hills surrounding the bay have a lot of coniferous forests, but in these hills, you notice a strange dendritic pattern in the tree filled hills (Picture no 18 )*

*These are in fact the boundaries of plots of various individual owner filled lined by birch trees which are the true indigenous trees of the region compared to coniferous trees and as they grow faster than the trees planted for economical reason these patterns are formed.*

*It is the similar case for the formation of these bays which are called Rias itself. These are described by the authors as patterns.*

*"We use these to understand the indicative relationships of a region, so we can determine how, and which relationships meet our current goals, so we*

*can artfully use these to create inspired, conscientious designs and plans." Joan H Woodward in Signature and Landscape Design*

*The author also describes four main regional processes that need to be analyzed to realise the patterns, systems and processes in a site to create a design that works with this site.*

*Geomorphic, Climatic , Biotic and cultural processes are responsible for creating the landscape as we see it, and any designs or plans that come through from a designer transform these either in a positive way or a negative way.*

*Geomorphic processes are activities induced by underlying parent materials and landforms.*

*Climate processes include precipitation, wind speeds, radiation, temperatures, lightning strikes and fire frequency, evaporation rates and overall periods of climatic change.*

*Studying biotic processes yields information about species colonization, adaptations and succession. Wildlife and Insect responses to plant growth also influence plant patterns.*

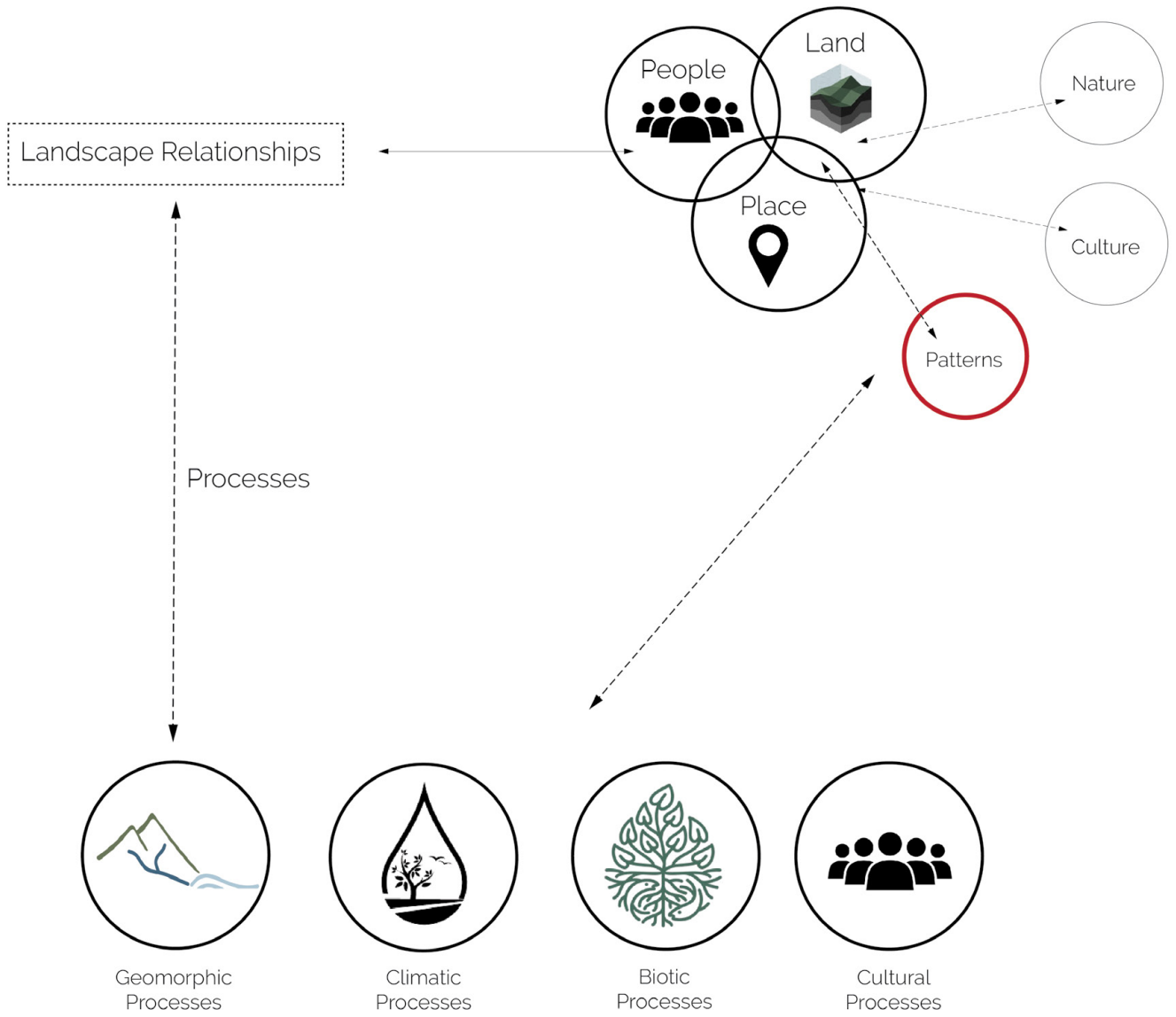
*Finally, cultural processes include three driving motivators behind creating, shaping or affecting vegetation patterns: The Human need for protection, production and meaning. Protective processes include efforts to provide protection from climatic influences. Productive strategies involve economics, making a living, efficiency in transportation, the desire for beauty, mystery and drama.*

*Political tools involve ordinances, plans and methods to institutionalize these cultural processes and ultimately reinforce these patterns*



# Signature based landscape design (1997)

Joan H Woodward



Picture No. 18

1. Graphic illustrating Signature based landscape design (Author 2018)

2. The tree pattern formed in the hills surrounding the bay in a rias coastline shows a pattern due to growth difference and plot markings between owners (Author, 2018)

## 5.1.2 Infrastructure as Landscape (1996)

*Gary Strang*

*Landscapes in the contemporary times have been replaced with centrally controlled systems that extract the resources necessary for life, food water, power and transport.*

*Mechanised systems are part of the landscape in the manner that they create the space, they control the space and as a matter of fact are the space. They have an inherent spatial and functional order that can serve as raw material of architectural design or to establish local identity that has a tangible relationship to society and create new urban landmarks, spaces and connections.*

*This highly depends on the way these spaces are designed.*

*Landscape Infrastructures are not only functional and help in creating space, they can create economy if designed right. Not designed properly, they can also end up creating problems on a larger time scale if done in a wrong manner.*

*For example the structure of Los Angeles river is indistinguishable from the urban and residential structure of the city. The concrete lined channel covered Los Angeles basin does not have a capacity to absorb rainwater and the runoff has overloaded the system.*

*To state another example, under cities like New York is a thick layer of concrete under which after a thin layer of clay which absorbs the pollutants and chemical run off, of the cities. At the same time, there are many layers of infrastructure, gas, electrical, water, internet pipelines. Below those layers are the transport lines, metros, trains and foundations which go even much further for these structures. These infrastructures make and define the city, they also create an artificial ecology. If one of the water pipelines burst, they respond in similar way to a flooded river creating basins in the streets.*

*In Otsuchi a whole new layer of infrastructure is coming in with the sea walls, land consolidations, breakwater and storm gate barriers that are transforming the city. We need to deal with this continuously and design keeping an eye on the machine.*

## 5.1.3 The RSVP cycles (1969)

*Lawrence Halprin*

*This book (RSVP cycles) explores the relation between dance scores and various forms of design practices. Lawrence Halprin found that score was a good way to describe design processes as a breakdown of the system of design. He was inspired by his wife, the dancer and choreographer Ann Halprin who was the director of the dancer's workshop in San Francisco.*

*What I find most relevant to our profession is that landscape architecture and the professions design discipline is non static, in the sense that a design is only a process to start something.*

*A design in the profession of landscape architecture is something that is constantly performing, processing and changing with the information around it. It is a living design in that sense, and like a score which is a moving performance and not a static art piece.*

*Any design in the site of Otsuchi will have to deal with future events, economies and lives of people set many years in the future of the bay which will include climate change and multiple set of policies by a lot of new actors over the years.*

*Lawrence Halprin broke down his RSVP cycles into these four main components-*

**R Resources** - which are what the designer must work with. These include human and physical resources and motivations and aims.

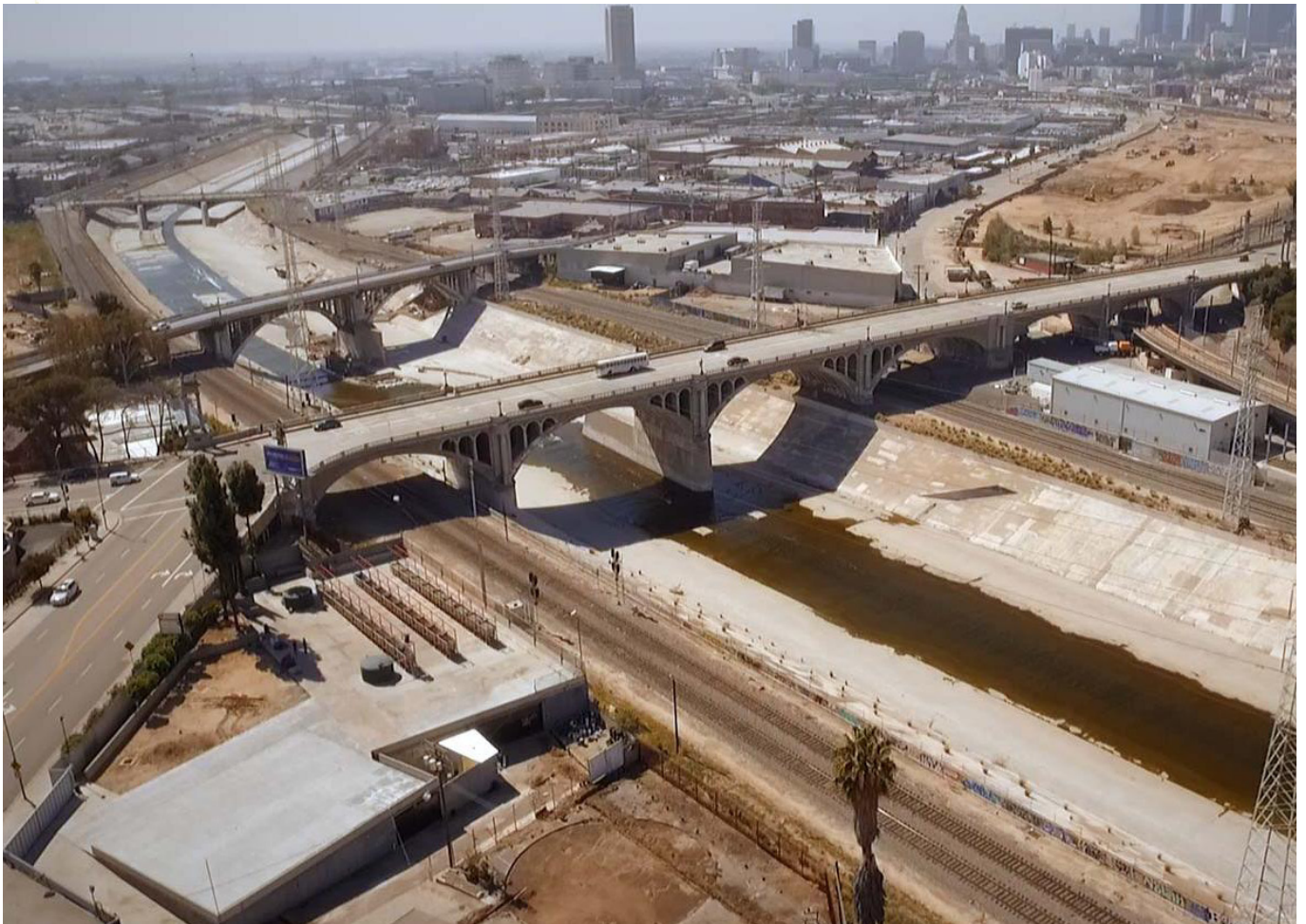
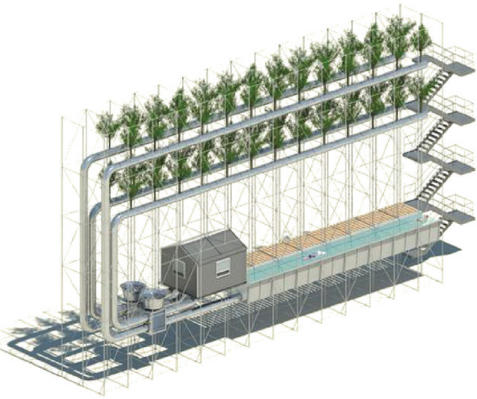
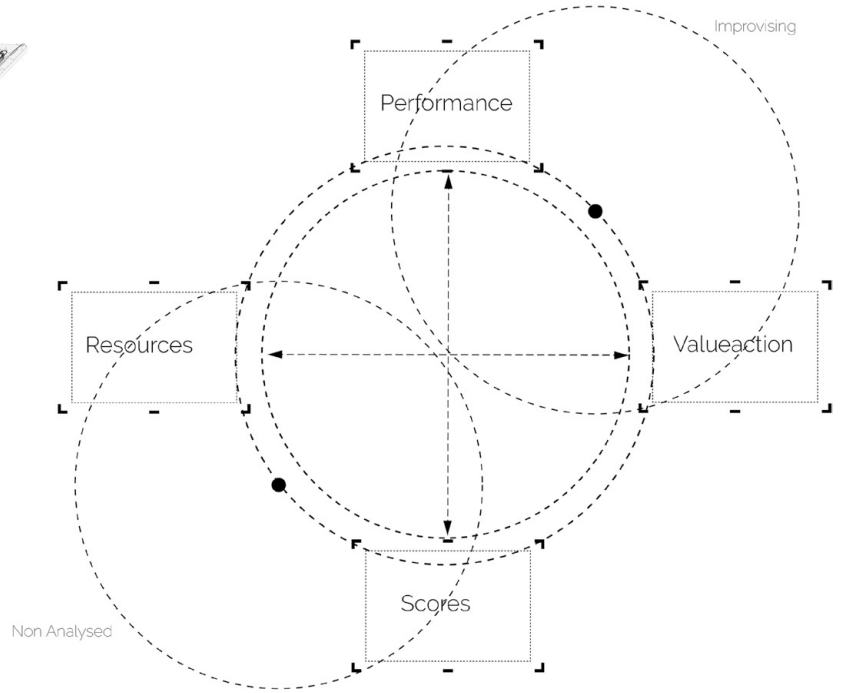
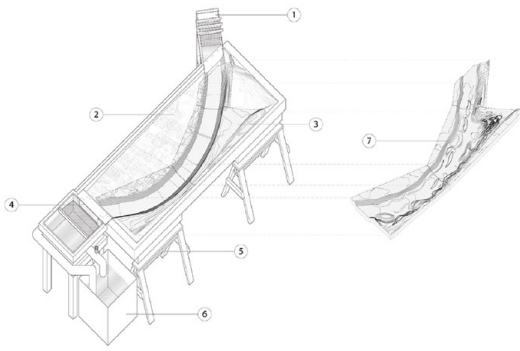
**S Scores** - which describe the process leading to the performance.

**V Valuation** - which analyzes the results of action and possible selectivity and decisions. The term valuation is one coined to suggest the action oriented as well as the decision-oriented aspects of the V in the cycle.

**P Performance** - which is the result of the scores and is the "style of the process".

*As relevance I find it a very useful way to study design processes and how a landscape structure that is built in Otsuchi, will act as a performance for this small town in generating a lot of things including protection, life, economy and an identity.*





Picture No.19

1. Graphic illustrating Infrastructure as landscape and the RSVP cycles. (Author, 2018)

2 Los Angeles has 470 miles of concrete lined channels and is almost indistinguishable from the urban and residential structure of the city. The land has lost its ability to absorb water and increased run off to overload the system. (KCET, n.d)

## 5.2 Research Framework

### 5.2.1 Culture and Landscape Study - Japan

*What is landscape identity in Japan? What does disaster mean to the culture?*

*Disasters such as earthquake and tsunami were not merely perceived as a physical phenomenon, but instead were linked to faith as well as the cultural perception of nature.*

*A lot of initial work was in understanding the culture of Japan with respect to disasters and landscape.*

*The concept of landscape is a cultural construction which reflects the given society's existential and cosmological perception of nature. In a disaster-prone country like Japan, such a concept of landscape is by no means detached from the frequent occurrence of natural disasters such as earthquake or tsunami. Therefore, the profound understanding of landscape concept is indispensable for making local scale planning culturally coherent.*

*This forms a conceptual base regarding the relationship between people and nature in Japanese cultural and historical context through which we can reflect on the contemporary issue of tsunami planning at hand. (Theorique.E, Tanigaki H. pg.15)*

*This spirituality and the relationship with nature were also associated with a concept of "disaster". We explore this and more in the further chapters of culture and landscape study.*



*Picture No.20 A photograph that was swept away by the March 2011 tsunami and partially destroyed, shows people in a roller coaster, Otsuchi Town, Iwate Prefecture, Japan. This photo was recovered by NPO Gurutto Otsuchi (Alejandro Chaskielberg, 2012)*





あら

嫁

大安日

ゆり

御成

千杖

清万歳

楽

新喜三

このころは、おもしろいことばかりで、なまづの

むすに、おもしろいことばかりで、なまづの

うらやま、おもしろいことばかりで、なまづの

けがれ、おもしろいことばかりで、なまづの

とが、おもしろいことばかりで、なまづの

か、おもしろいことばかりで、なまづの

い、おもしろいことばかりで、なまづの

う、おもしろいことばかりで、なまづの

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こ、おもしろいことばかりで、なまづの

さ、おもしろいことばかりで、なまづの

し、おもしろいことばかりで、なまづの



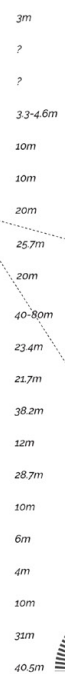
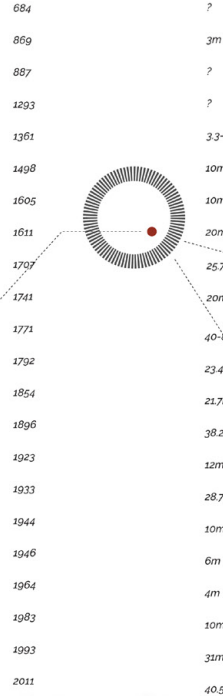


**Myth**  
The origin of Namazu dates back to 16th century, but it began to be associated with natural disasters only after the late 19th century. People began to see the arrangements of Namazu as a penalty to human greed since it was believed that Namazu, by inducing the disasters, forced people to redistribute their wealth.



¥

津波

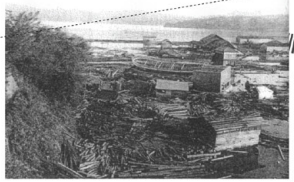


サンリク

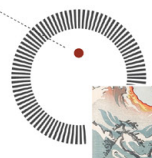


Character

*'The First Thing in the Morning'*  
by Takuboku Ishikawa  
An article about a homeless old man  
Moved me to tears  
Not long after I opened my eyes.



Showa Sanriku Earthquake 1933



History



1895 Sanriku tsunami

**Research Analysis**

Historical Timeline of Japan and its culture

**1000 B.C.**  
Neolithic cultures, ca. 10,000-200 B.C.  
Jōmon culture, Yayoi culture ca. 1000-300 B.C.

**500 A.D.**  
Asuka period, 538-710  
Nara period, 710-794  
Early Heian period, 794-ca. 900  
Late Heian period, ca. 900-1185

**1000 A.D.**  
Kamakura period, 1185-1333  
Nanbokuchō period, 1336-1392

**1400 A.D.**  
Muromachi period, 1392-1573  
Momoyama period, 1573-1615

**1600 A.D.**  
Shakkei scenery

**1000 B.C.**  
Dogū (Clay Figurines)  
Wet-rice agriculture from the swan continent.  
Yayoi potters, presumably women, began coiling method.

**500 A.D.**  
Haniwa Sculptures  
Clay Potteries from Korea  
Yamato Clan becomes head of Kyushu Area

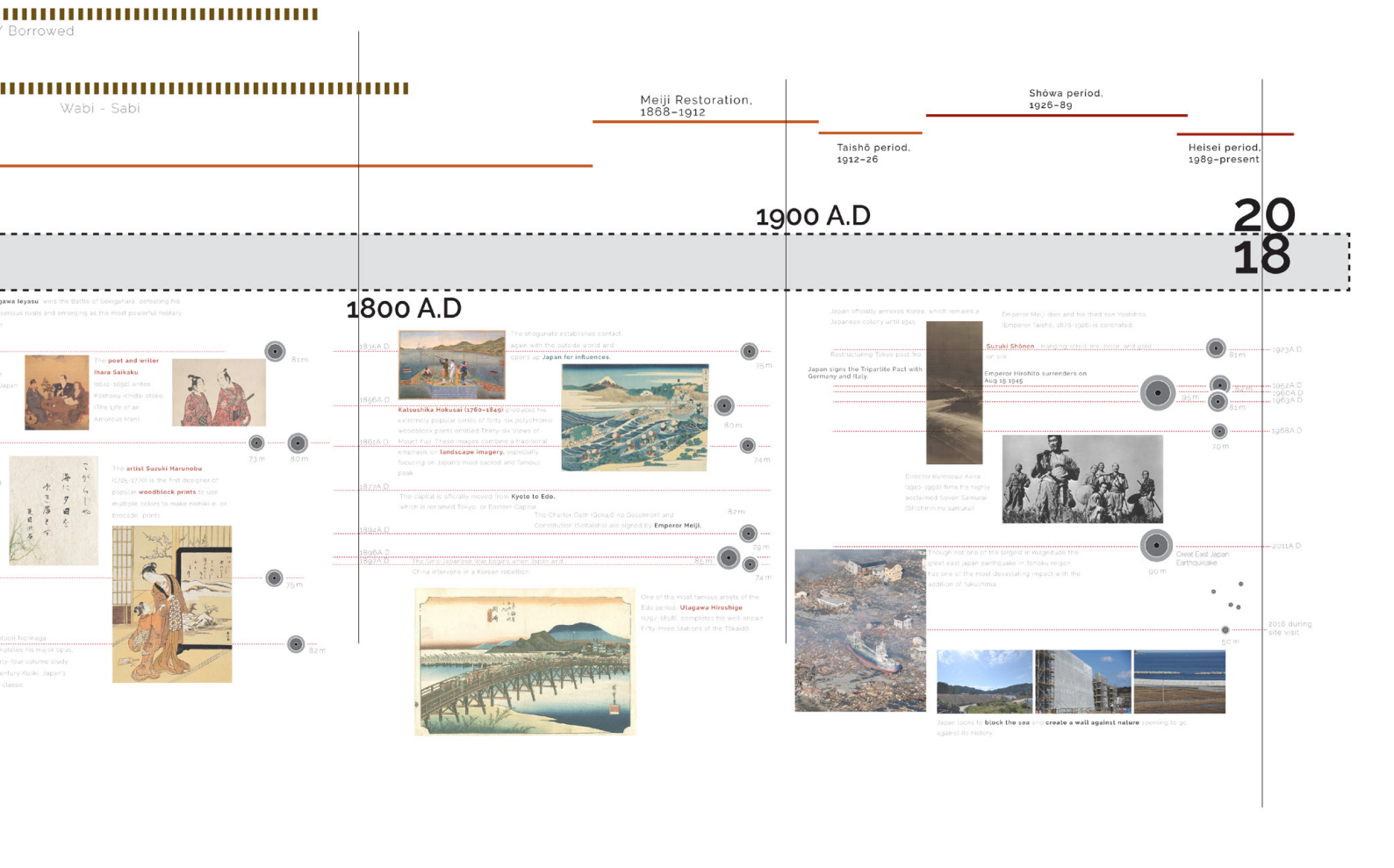
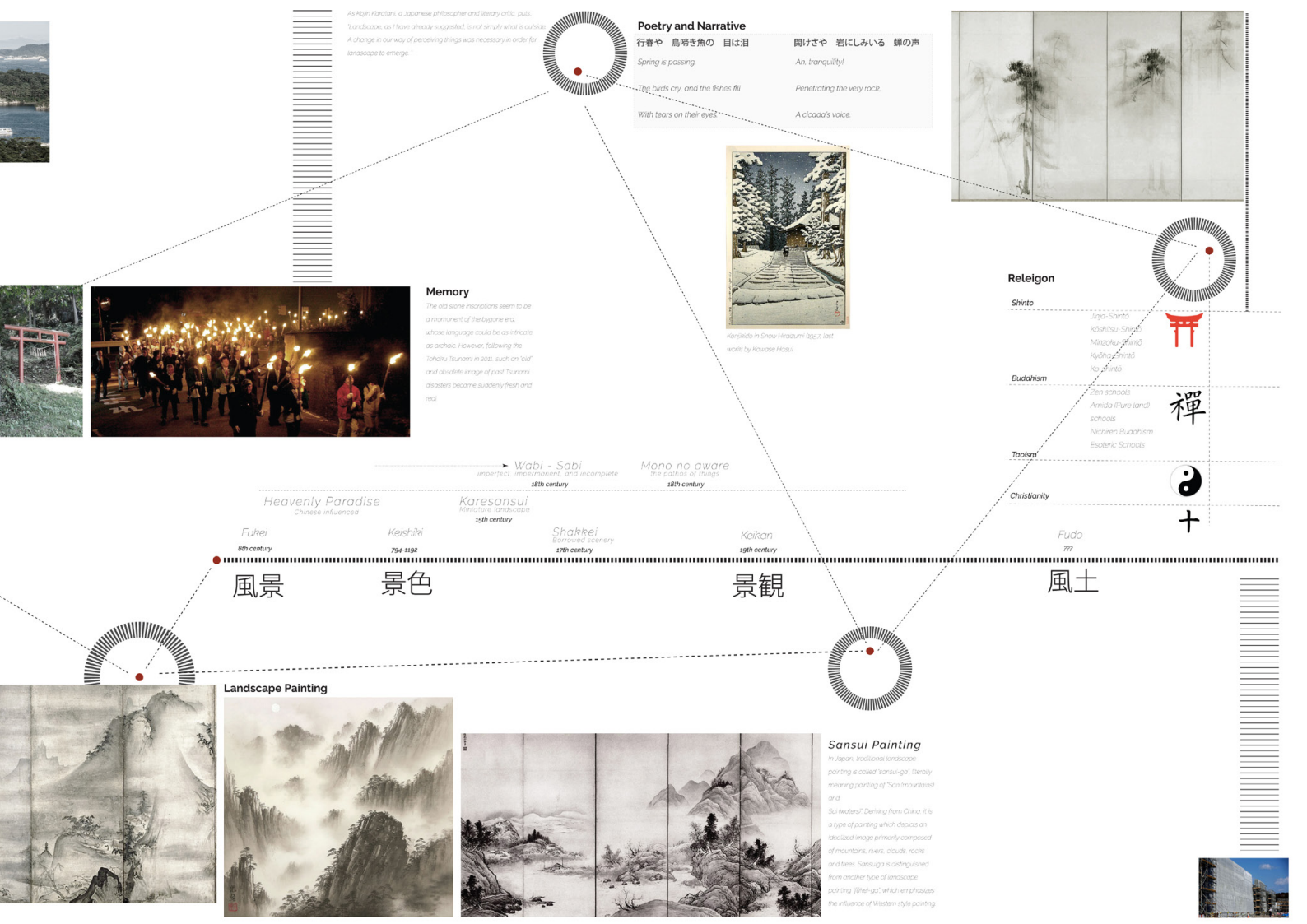
**600 A.D.**  
The king of Korean kingdom of Baekje, Jeonim, sends Buddhist faith to Japanese Emperor Kimmei.  
Japanese Sutra, including the highly influential Lotus Sutra.  
Buddhist temple Hōryū-ji, Japan's first Buddhist temple.  
Based on the Chinese system, all agricultural land becomes the property of the emperor and all inhabitants the subjects.  
Japan's first history and oldest surviving literary work, the Kojiki (Record of Ancient Times), is completed.  
The imperial headquarters are moved from Asuka to Nara, which becomes the country's first permanent capital.  
Manyōshū (Collection of Myriad Leaves).

**700 A.D.**  
The Tale of Genji.  
The monk Enryō returns to Japan from China and brings Zen Buddhism.  
The monk Eisai returns to Japan from China and brings Zen Buddhism.  
The monk Nichiren returns to Japan from China and brings Nichiren Buddhism.  
The Tale of the Heike!

**1400 A.D.**  
The Buddhist monk Saichō (posthumous title, Dengyō Daishi, 1073-1122) is sent to China on an official mission.  
1. Tendai school, which is centered around the teachings of the Lotus Sutra.  
2. Shingon, a school of Esoteric Buddhism.  
Emperor Saga (r. 809-823) is the first Japanese sovereign to drink tea, imported from China by monks.  
Genji monogatari (The Tale of Genji). This lengthy, elegant observation of court life, cinema, and intrigue, frequently interspersed with poetry, is often considered the world's first novel.  
The Battle of the Heiji Era.  
Buddhist monk Hōnen (1133-1212) and Pure Land school (Jōdo-shū).  
Sankashū (The Mountain Hermitage) by Saigyō, 1000 of poems celebrating nature and emotion.

**1600 A.D.**  
originally, the Age of the Country at War.  
Teshō Shūbon, 15th-century portrait of the Muromachi period ceases atmospheric and expressive ink-monochrome landscapes.  
Zen Temple Ryōan-ji, 15th-century example of karesansui (a reborn tea ceremony).  
The poets Sōgi (1421-1502), Shōhaku (1443-1528), and Sōchō (1448-1532) lived in the village of Minato, south of Kyoto, and composed what is considered one of the finest compositions of linked verse: *tengai*.  
Waka poems linked by related words and images and composed of alternating verses of 5-7-5 and 7-7 syllables.  
Sesshū Tōyō (1420-1506), one of the greatest ink-monochrome landscape painters of the Muromachi period, visits the Splashed-ink Landscape (Habakusansui zui).  
Kano Motonobu is the second in a long line of painters known as the Kano School of Painting.  
The scholar Matsuo Bashō (1644-1710) makes on a journey to northern Honshū, recorded in a travel journal containing his first renga haiku.  
The Jesuit priest Francis Xavier arrives in Kagoshima and introduces Christianity to Japan.  
rakuchū-rakugai zu (paintings of inside and outside the capital).  
Teppōshi (1840-1860) writes Japan, and suddenly orders the expulsion of Jesuit missionaries.  
Arrival of a Japanese style called Wabi-Sabi through Tea master Sen no Rikyū.





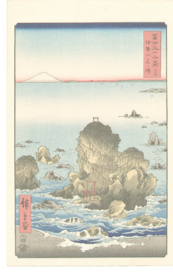
Picture No.22 Cultural, Historic and disaster timeline's influence over art forms, landscape poetry and nature.





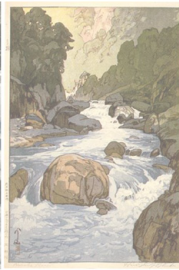
Otsuchi : A spatial Transformation

Osachi? Natural Spring or public park?



Matsushima Bay

Black Pines and Shrines on rocks



Otsuchi River

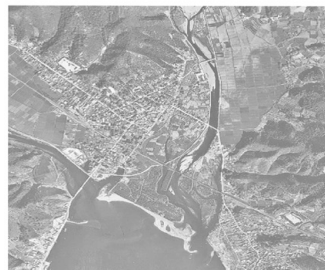
The Sea at Night



Japanese Fish Markets



Streets and Alley



A braided river?

Picture No.23 Pictures etc. various of elements of identity in otsuchi. (sources in list)



## What is Identity in Otsuchi and its Bay?

*Japanese culture and people plus their social aspects are intangible elements that exist within their society, like invisible threads that make them a certain character. In a certain way we differentiate from each other human to human through social or individual characters.*

*It is certain that this can exist in space also. It is because space acts as a character or a personal aspect for everyone. For example, a classroom is different for a student than it is for a teacher.*

*For me as a researcher it was important to see what among the societal Japanese cultures of Otsuchi for a citizen, I could imbibe into the design. As I studied about Otsuchi not only through the site visit but through historical research and understanding what separates it from other cities it was easy to find various examples.*

*It lay in their specific food coming from the valuable fishes breeding in these ecologically rich bays. It was in their spring wells, it was in their rivers, it was in the elements they use for worship, the streets, the tiger dance of the region, the music, their economy and livelihood.*

*These are things that exist in a specific way for this town and its surroundings. As a designer we must focus on this for solutions. A designer must seek a way to convert this into physical spaces so that the citizens can use them to make themselves feel more at home. How does one convert an intangible element of not a spatial quality like say "food" into space? That is the important work as a landscape architectural designer to make it part of the spatial structure.*



Picture No.24 Woman preparing for annual tiger dance (Source unknown)

## 5.2.2 Charette Method on site.

Our theoretical and research method at site was the charrette method.

A Charette is a multidisciplinary meeting where people from different subgroups of society come together to deal with certain policy issues until consensus is reached. Another designation for Charette is design workshop.

While the structure of a charrette varies, depending on the design problem and the individuals in the group, charrettes often take place in multiple sessions in which the group divides into sub-groups. Each sub-group then presents its work to the full group as material for further dialogue. Such charrettes serve as a way of quickly generating a design solution while integrating the aptitudes and interests of a diverse group of people.

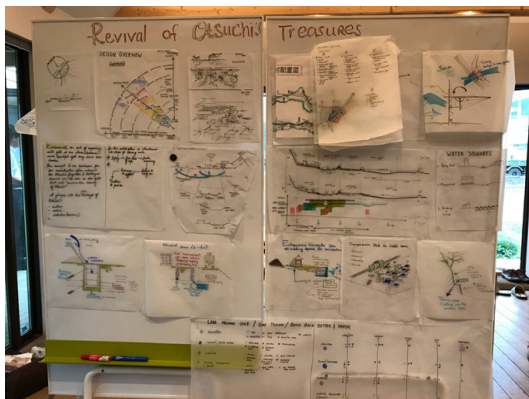
Here we used four pillars to value our projects and the individual disciplines help/work. The main tenets of this system were Project, Planet, People, Prosperity. By project we looked at the larger picture. In planet we looked at sustainability as a goal for the project. By people we meant to investigate the social aspect and prosperity meant economy and livelihood of the people.

In each tenet we put a high level of expectation, a few options in between and a low level of expectation. Then we graded each discipline into what expectation we wish to fall into and why.

It was a method to know where the project stood for us individually as a discipline according to these four tenets.

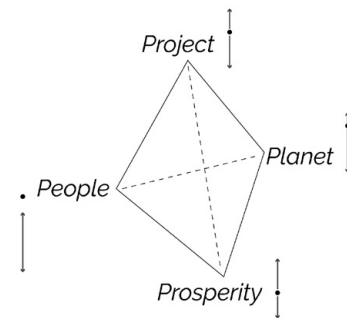
We then had to debate as groups of two disciplines to come to a modicum of a solution. Then we increased this to a larger group which would work together.

This led to a lot of debate and solutions and finally we came up with a group solution which was based on the concept of stitching the city together with its local aspects while creating short term physical and long-term natural solutions.

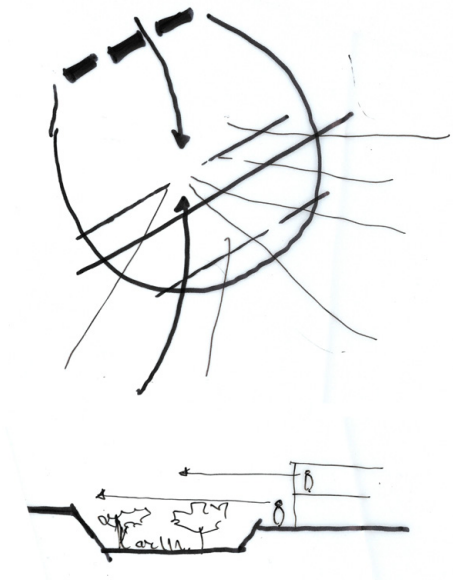
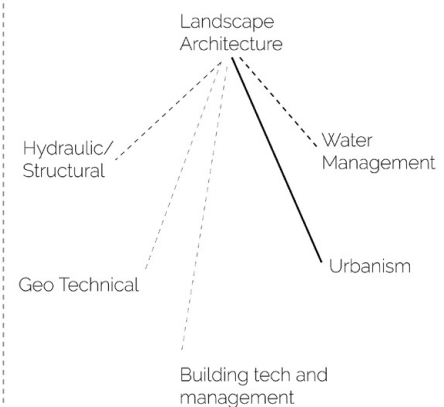


Picture No.25  
1. Research group (Author,2018)  
2. Products of the workshop on site (Author,2018)

### 1. The Scope's



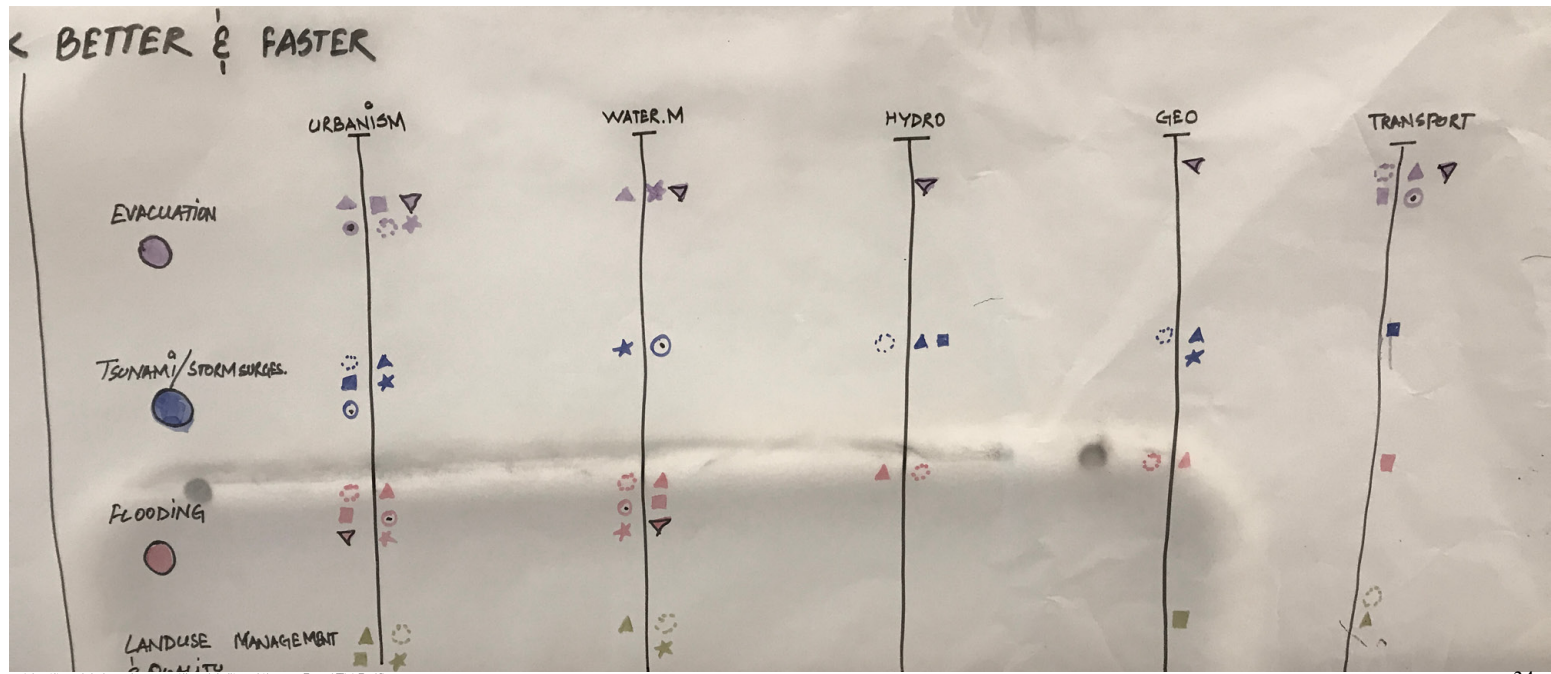
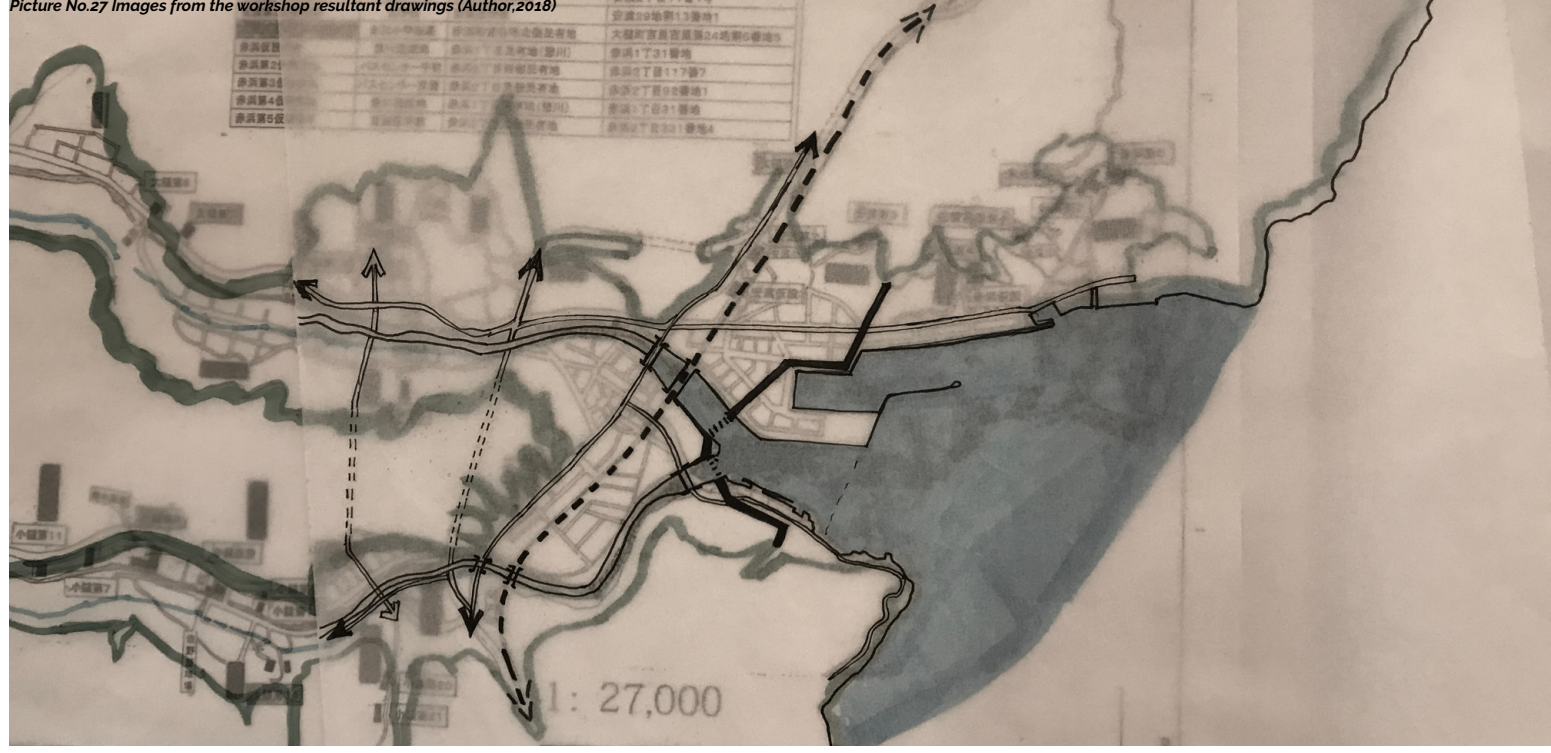
### 2. The fields



Picture No.26 The scope's and tenets plus concept drawing as in the workshop of the charrette method (research team,2018)



Picture No.27 Images from the workshop resultant drawings (Author,2018)



## 5.3 Palimpsest Analysis/Desk Study

### 5.3.1 Iwate Prefecture Scale

*Why start at this scale? What are we analysing?*

*Well for one I never saw Otsuchi as an example city for a pilot innovative project in the prefecture of Iwate. It is not the most populated city/ district in the prefecture/ province, nor is it one of the most devastated by the tsunami.*

*It is not a characteristic city for Iwate in terms of culture/food even though it has its own specific identity.*

*There is not a thing that one can pinpoint to Otsuchi and say that this is the place for a project that goes outside the limits of the governmental regulations to create a design specific to the place.*

*Also, realising that Japan is in general an aging population and prefecture's outside the central district zones are more so like this, with a largely aging population, lack of growing economies, lack of large further educational faculties and industries.*

*Thus, this requires an understanding on basis of various data's that can be mapped out to create a spatial plannable understanding on what is happening in this prefecture.*

*This would then help in creating conclusions to work on at this scale and take to the design in Otsuchi then.*

*The maps that were used to analyse the prefecture was -*

*Land Use*

*Dense urban tissue , fishing ports and harbors*

*Agricultural Area Underpopulated Areas Infrastructure and transport Forest regions of Iwate Geological formations*

*Soil type*

*Drinking water systems River systems*

*The basis of this is the idea of layer analysis, a stratified model that distinguishes spatial planning tasks based on differing spatial dynamics of the substratum.*

*It identifies networks and patterns of various data that helps in identifying what is the structure and opportunities in a certain area considering various factors to help create an informed design.*

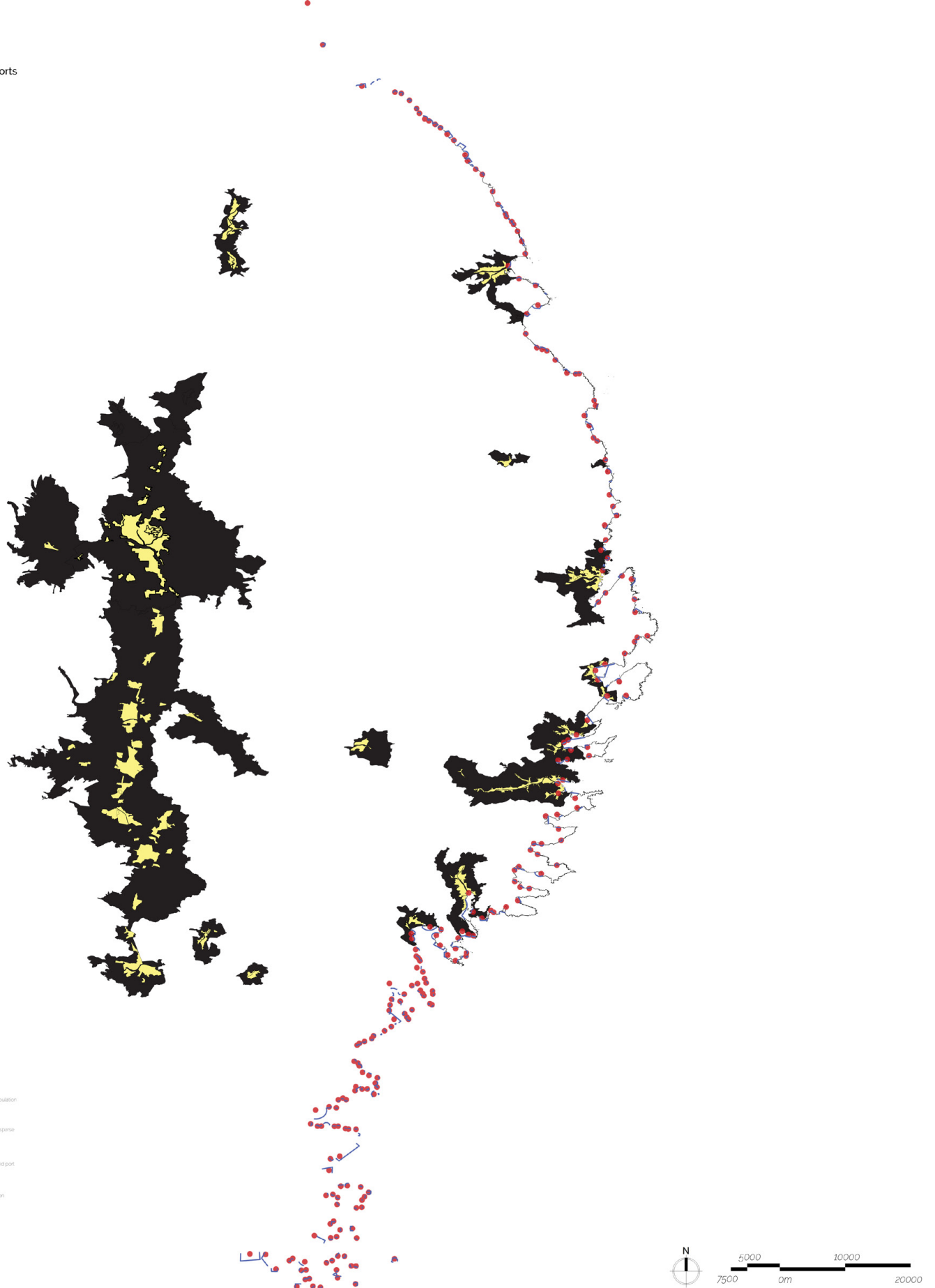
*The layers stand for aspects of concern in the domain of urban and regional design and planning and act to create something which many other professions including architecture doesn't look at which is "the larger picture".*

*While they usually don't act as a method to get information directly off each map when placed on top of each other things are decoded or seen in a different light as seeing a relation between one layer and the other.*

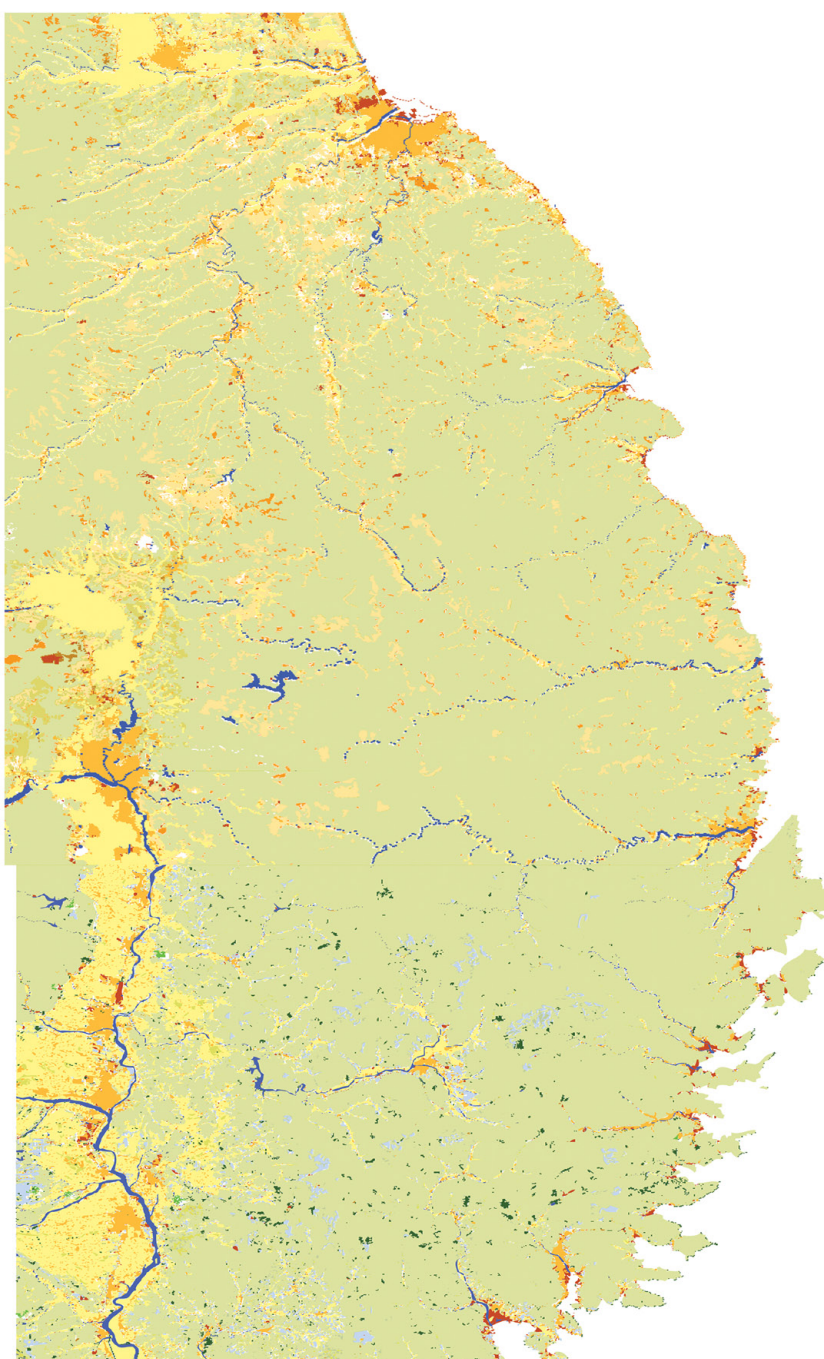
*This is the start of a layer analysis and to begin with at the prefectural level and then zoom in to understand specific associations in more detail.*

*I used this as a starting point to understand the site technically for creating an urban framework to design in.*





Picture No.28 Desk study drawings (Dense Urban regions and fishing ports) (Author,2018 - Sourced from GIS data, Japan)



Trend of Land Use of Prefecture Land (Unit: km2)

Use classification	Heisei 20 (Base year)	Heisei 25 years	Heisei 26 years
Farmland	1,520	1,515	1,506
Forest	11,722	11,720	11,718
Wild field etc.	84	84	84
Water surface- river- waterway	344	344	347
Road	452	452	475
Residential land	354	358	350
Residential Areas	235	233	237
Industrial Site	19	21	21
Other Housing Lots	99	99	102
Other	803	802	788
Total	15,279	15,275	15,279
Number of concentrated districts	84	84	84

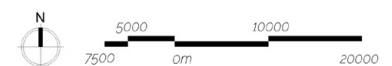


Picture No. 29 Desk study maps - Land use maps (Author,2018 - Sourced from GIS data, Japan)

The prefecture is largely a forest natural land with a few small cities spread mostly in two areas. In the central area to the west is the kitakami river valley formed by the very important kitakami river. The alluvial soil deposit of this river creates a large valley that is very important for industry and commerce creating the densest populated part of the prefecture.

If a section is drawn across the prefecture this would be the lowest safest and most fertile area. On the east of this lies a range of hills separating this valley from the Pacific Ocean.

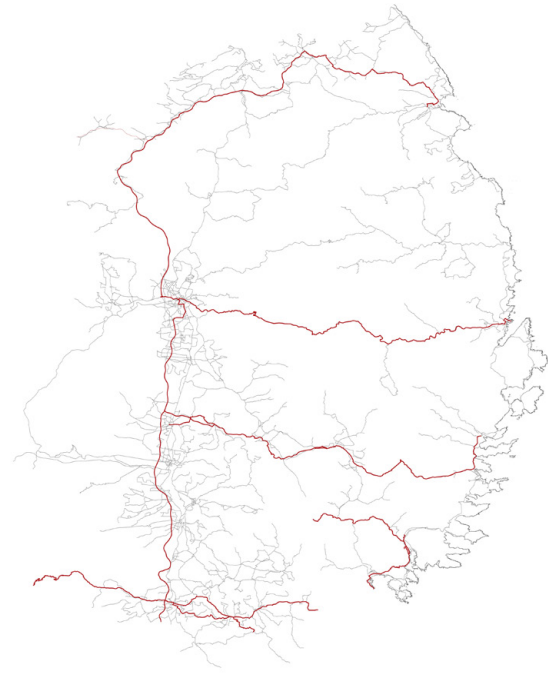
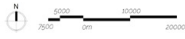
This is a set of dendritic patterned hills that go down to the coastline where glaciers pulled the coast down to form rias. The valleys are at some areas connected through infrastructure and transport routes to the coastline where there is totally different environment supported by a fishing economy that is fast dwindling.



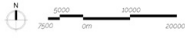




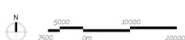
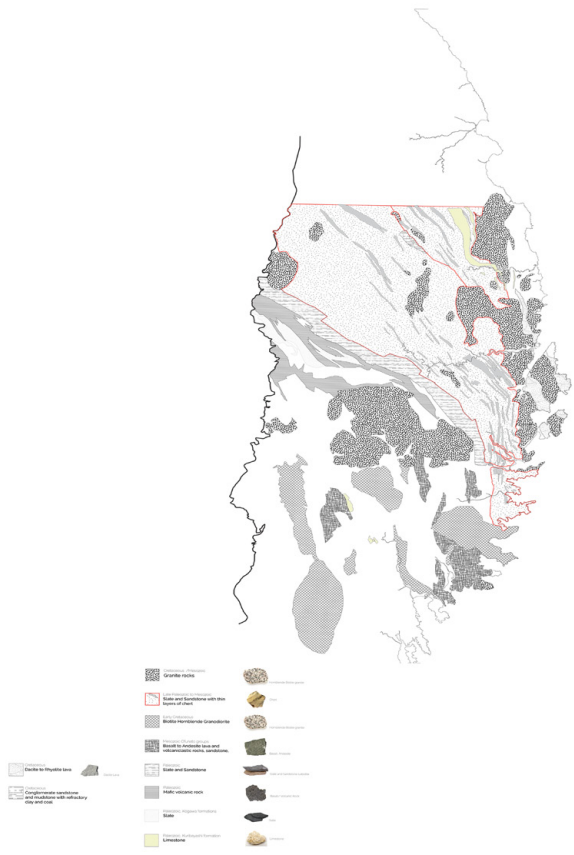
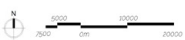
■ Agricultural Area  
■ Forest for Agricultural Use  
■ Forest for Agricultural Use



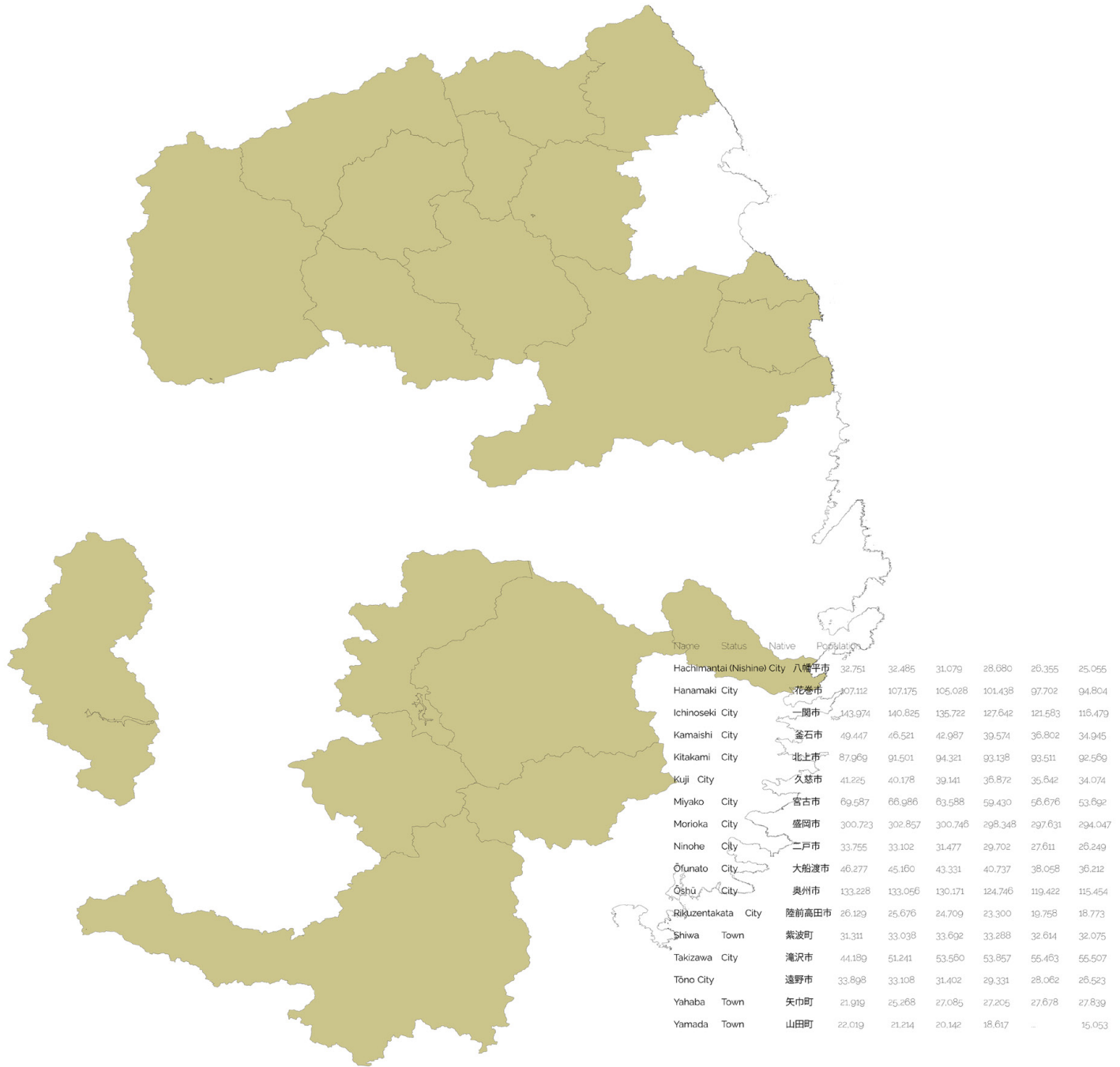
— Main Roads  
— Secondary Roads



■ Broadleaf Forest  
■ Conifer Forest  
■ Mixed Forest



Picture No. 30 Desk study maps - Forest regions, Transportation Networks, Agricultural Areas, Geological zones (Author, 2018 - Sourced from GIS data, Japan)



Name	Abbr.	Status	Native	Capital	Area A-L (km <sup>2</sup> )	Population Census (C) 1995-10-01	Population Census (C) 2000-10-01	Population Census (C) 2005-10-01	Population Census (C) 2010-10-01	Population Census (C) 2015-10-01	Population Census (C) 2018-10-01
Iwate	03	Pref	岩手県	Morioka	15,275	1,419,505	1,416,180	1,385,041	1,330,147	1,279,594	1,240,522

The map above shows the radical transformation and decline of this prefecture over the years to create one of the most underpopulated prefectures in the country.

This was something that existed much before the tsunami but was highlighted by the disaster. It is in fact a Japanese culture shift in population that it is slowly moving towards a more aged population.

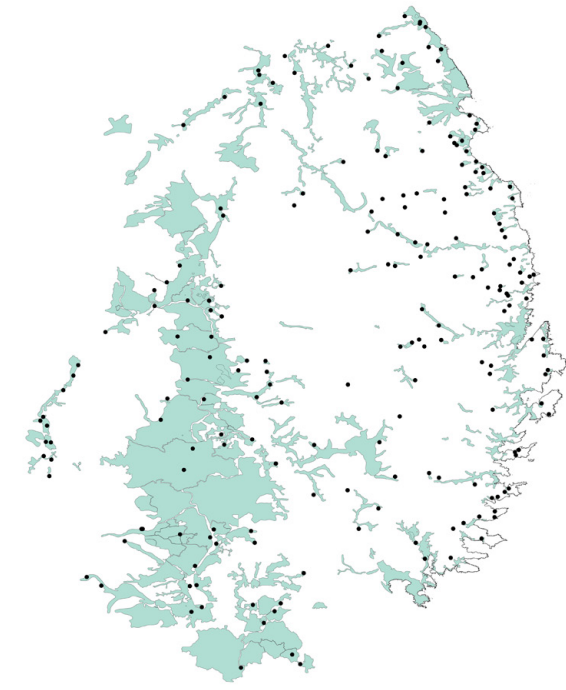


Picture No.31 Desk Study Maps - Zones in the prefecture where there is a low population (Author, 2018 - Sourced from GIS data, Japan)

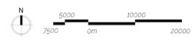
The current set of top down governmental solutions have no impact or outlook on this as it looks mainly at protection. But what do these structures protect when there is none left to live in the smallest areas of the prefecture, like Otsuchi. Otsuchi will go down to a population of less than 4000 people in the next 15 years.



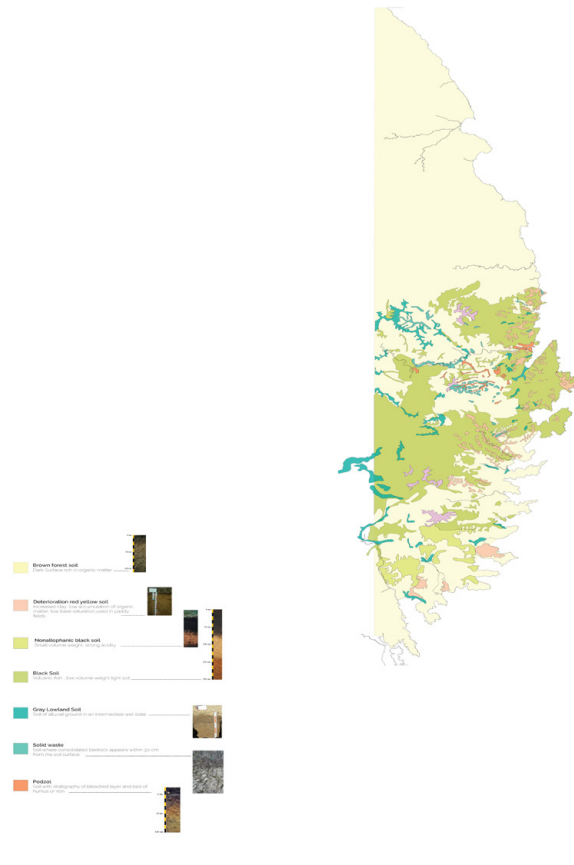
Water supply system



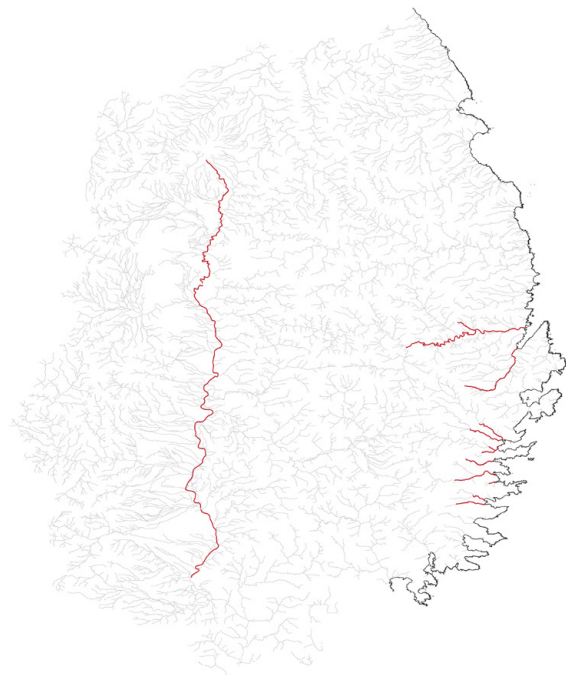
● Water supply facility  
 Water supply channel



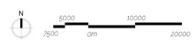
Soils of Iwate regional scale



Water System



Primary drainage lines  
 Secondary and tertiary drainage lines



Forest Region of Iwate



Picture No.32 Desk Study Maps - Water supply, Soil Maps,River system, Forest region overall. (Author,2018 - Sourced from GIS data, Japan)

## 5.3 Palimpsest Analysis/Desk Study

### 5.3.2 Otsuchi District Scale

*The district scale looks at Otsuchi District which comprises the areas of Machikata, Ando, Akahama, Komakura, Sawyama, Kiri-Kiri, the inner valleys and forests and the pacific sea ahead.*

*In terms of categorization I wished to create a recognition of the broad variety of typologies of landscape and urban characters, plus effects they have on each other at this scale.*

*The Otsuchi city is supplied by two rivers Otsuchi and Kosuchi river which have its own basins. The vegetation, soil type, geology and land use varies through the section of the district. It was crucial to use this information to create an informed design.*

*The layers were selected based on a theoretical framework data of urban and environmental positioning of certain elements. Aspects like types of*

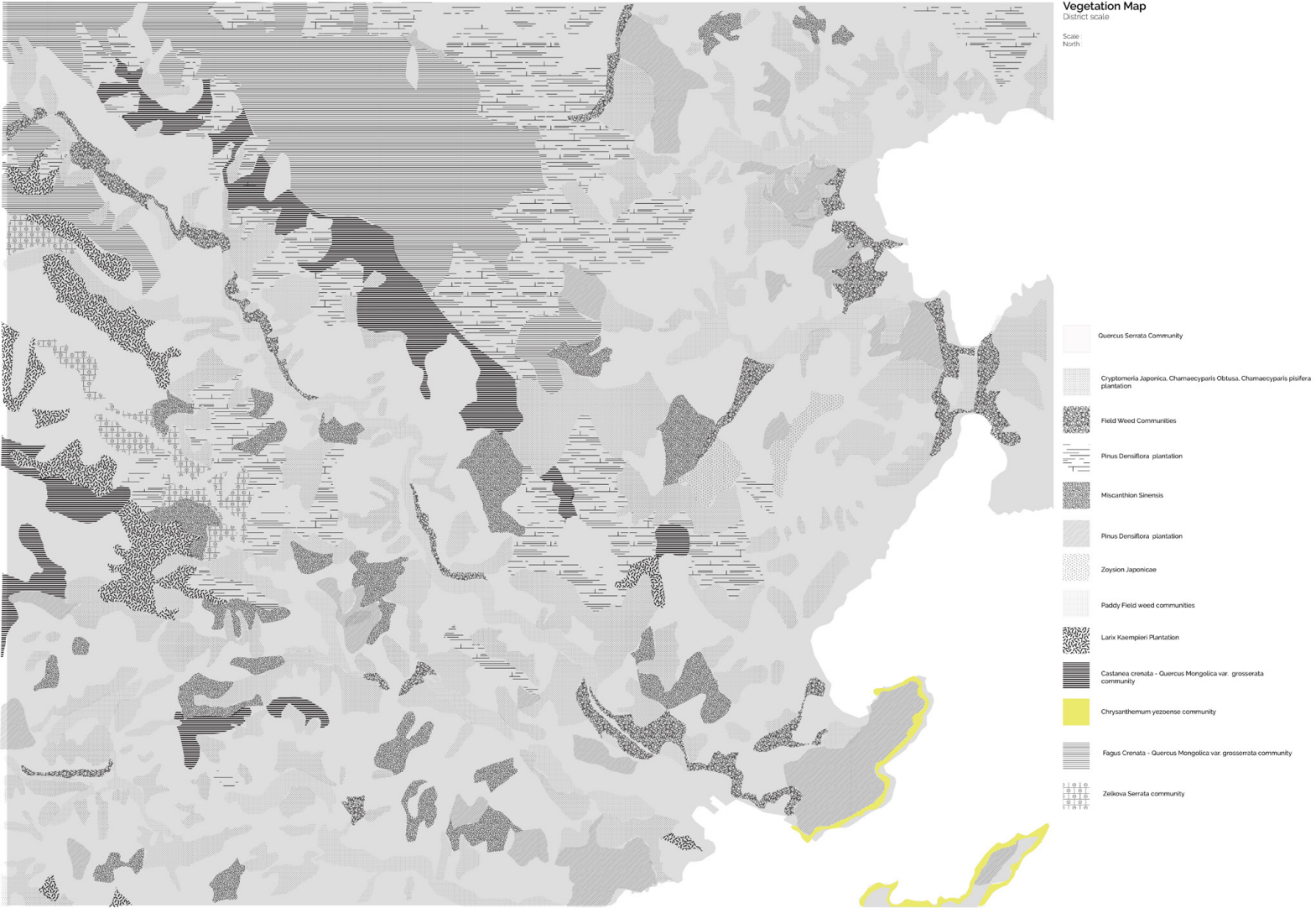
*ecology, water basins, soil type, geology influences land use.*

*To state an example that influenced design was the soil map and the basins showed that strong alluvial deposit around the river and at the seafront created fertile lands for rice farming and agriculture.*

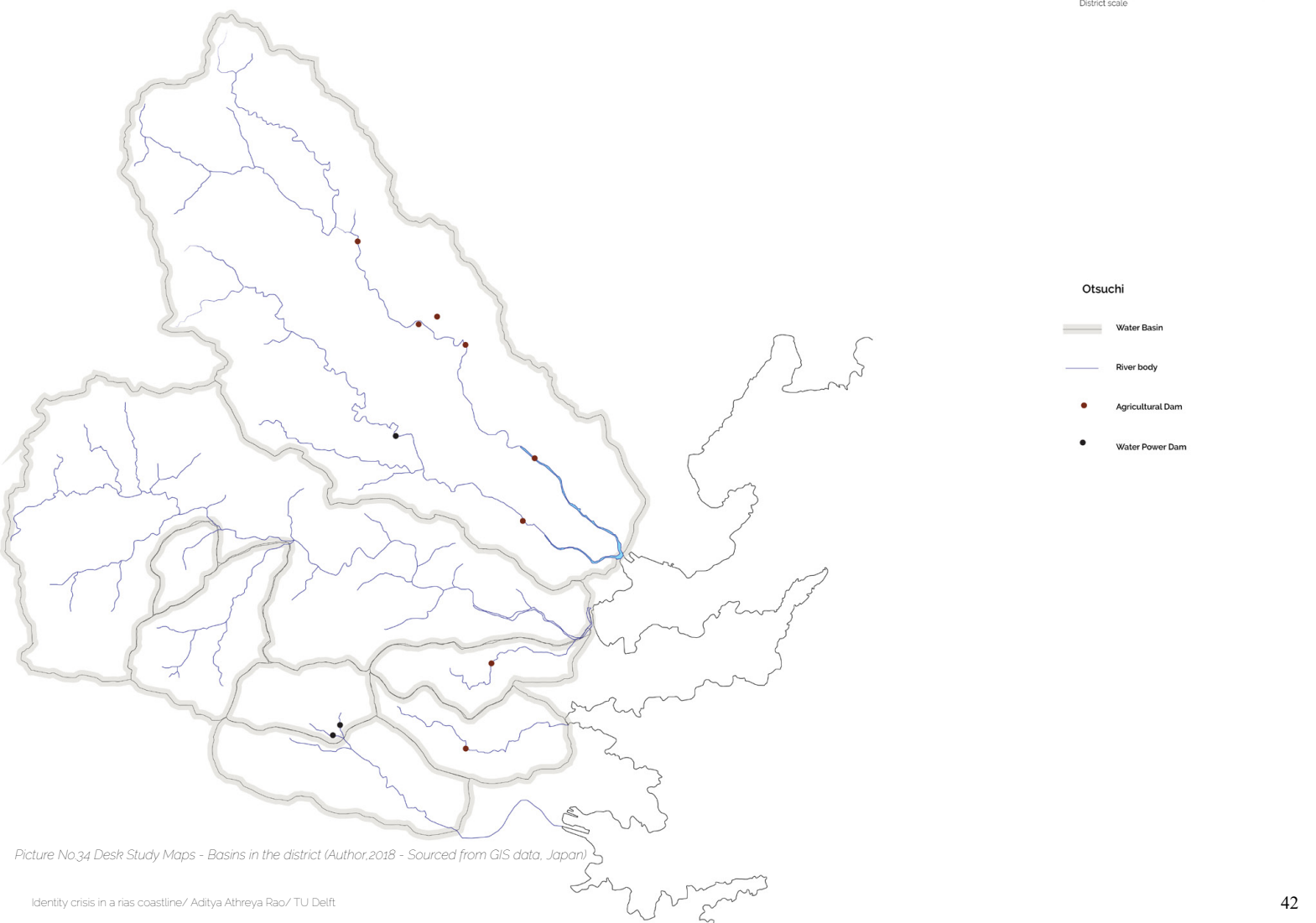
*It would seem naturally highly unlikely that there would be freshwater farming at the edge of the city facing the pacific waters but historically this was the area where there was a large-scale rice farming which also acted as a buffer for saltwater entering the town area.*

*This then influenced the design of the Machikata district to have a rice field aspect to the design which spatially creates this beautiful forefront to the pacific sea and the bay.*



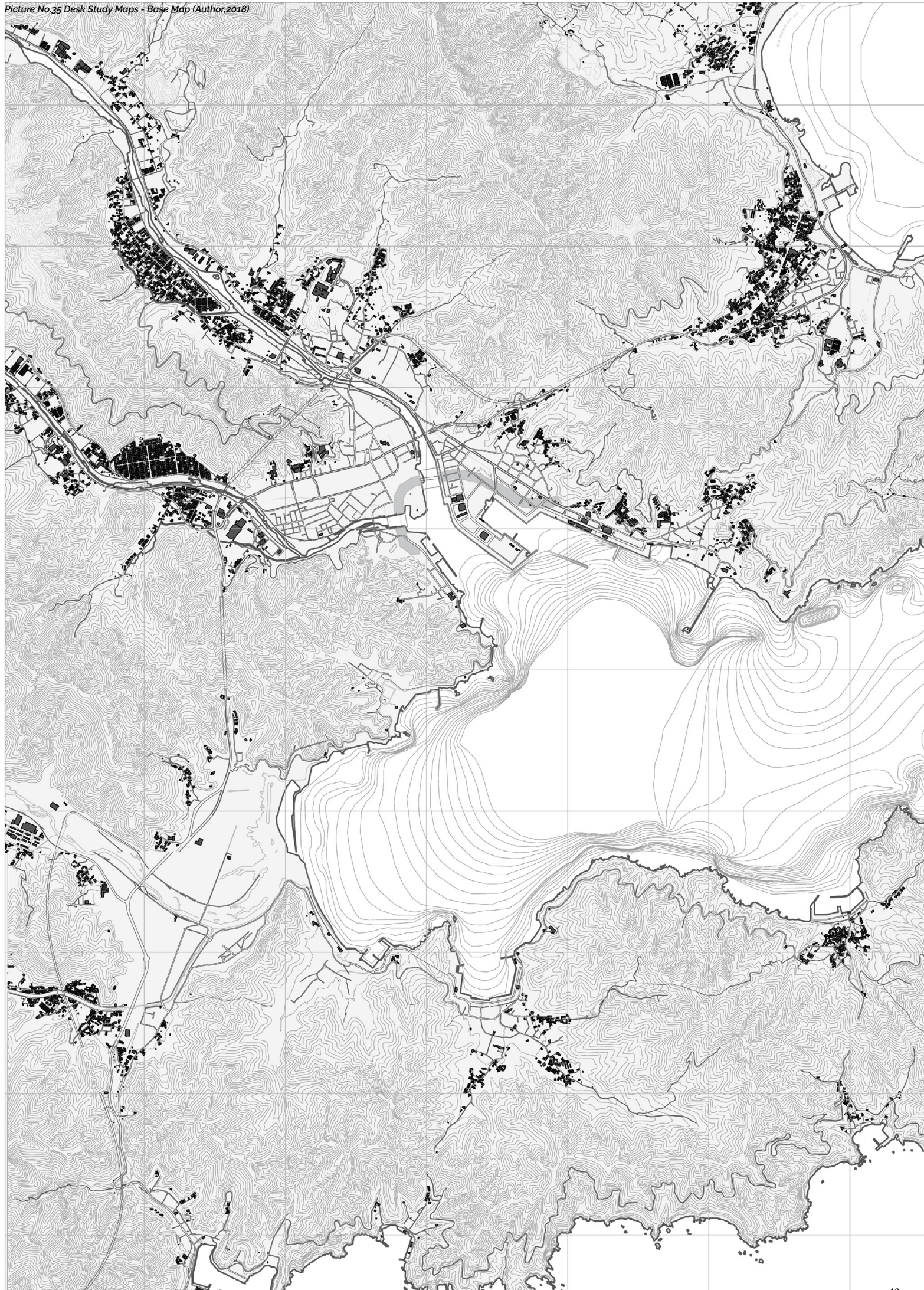


Picture No.33 Desk Study Maps - Types of trees in the district (Author,2018 - Sourced from GIS data, Japan)



Picture No.34 Desk Study Maps - Basins in the district (Author,2018 - Sourced from GIS data, Japan)





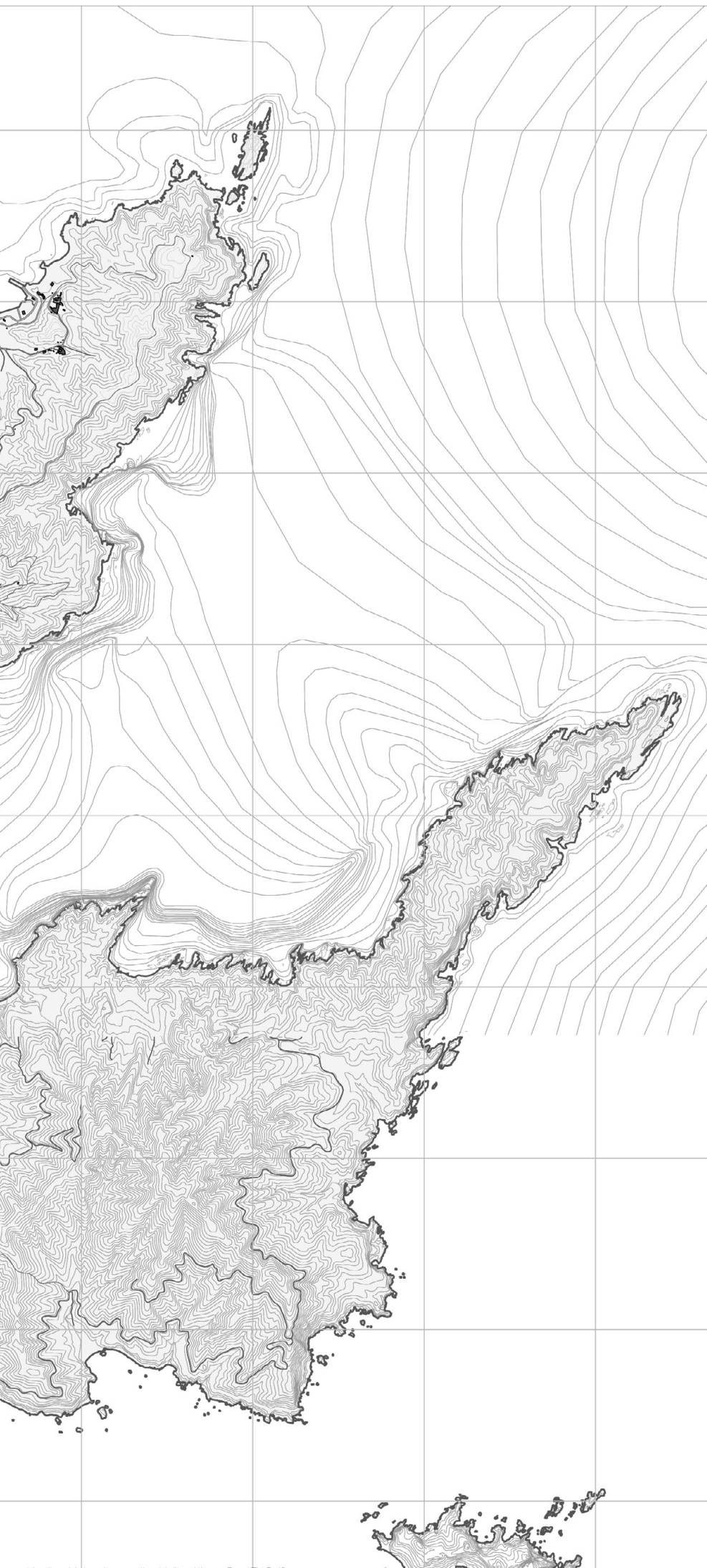


## Base Map- Otsuchi Bay District scale

Shown here is the base map of Otsuchi with all the surrounding areas. One of the most important spatial and planning features I noticed was that there is a large area beyond the Machikata district which is not being considered.

The bay itself is much larger than just a blocked-off Machikata district and when you consider the larger bay environment you notice there are 5 villages which lie isolated from this bay also. While the district line considers Kiri Kiri the village on the north, the bay seems more like one entity that could be cohesive.

This is where the analysis of this district plays a role in the product





## 5.3 Palimpsest Analysis/Desk Study

### 5.3.3 District scale

A cross section along the bay shows how this district is segregated in typologies.

There are 6 typologies of landscape -

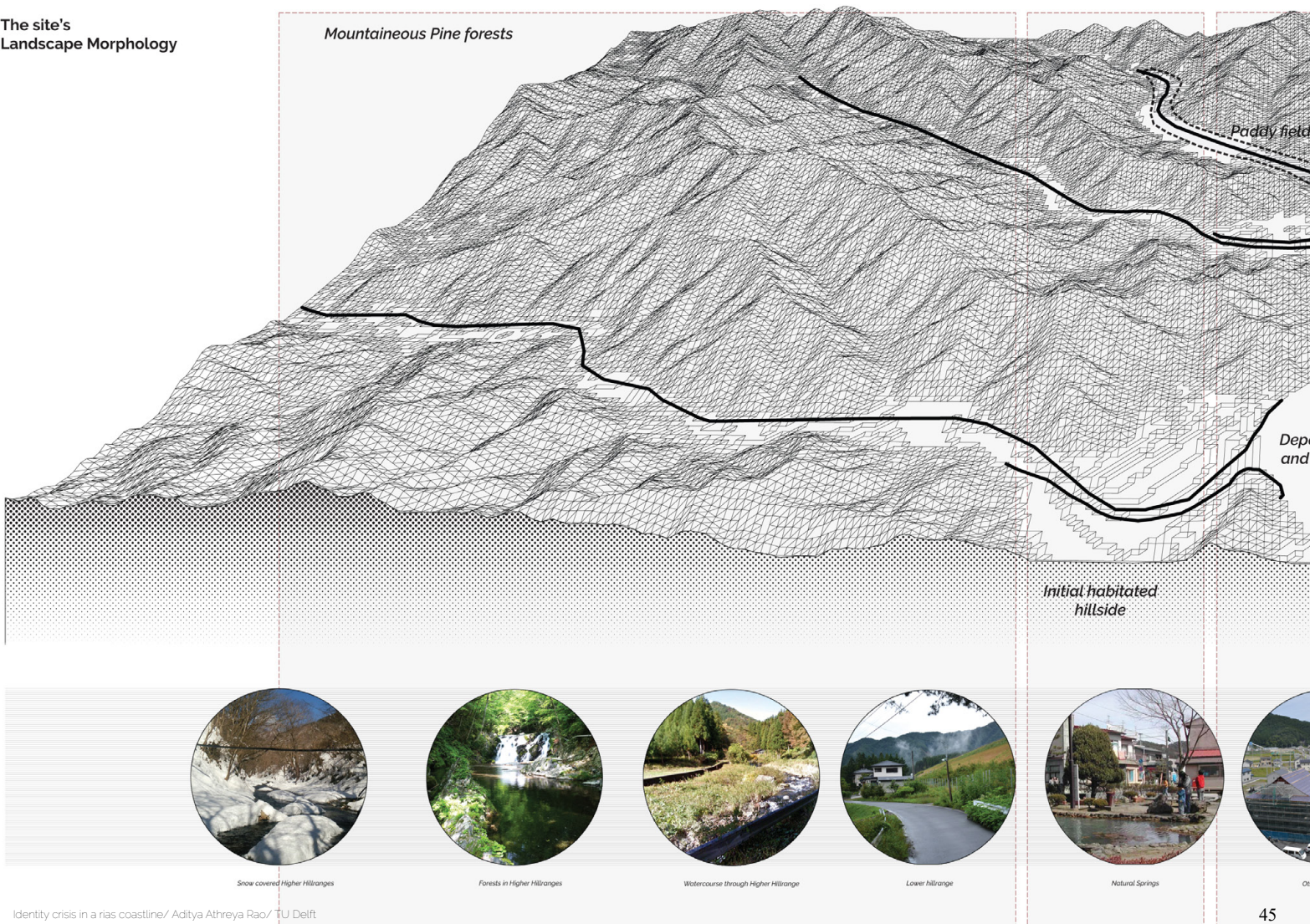
- The region outside the bay mouth.
- Bay mouth
- Rias/ Estuary water
- Alluvial Flatlands and overtopping areas
- Village/town area
- Habituated Hillside
- Mountainous Pine forests

Illustrated in the images below are the flora, fauna of these typologies illustrating how the landscape was linked across to create an ecology of intermixing species.

The strong line-based structures act as a barrier to

Picture No.36 Desk Study Maps - 3D cross section of the district showing typologies of landscape (Author,2018)

#### The site's Landscape Morphology





these rather than an encouragement of this intermixing ecology as it should be

The section of this is linked by the rivers, Otsuchi and Kosuchi river which flow through the mountains and out into the rias where there is a mixing of salt and fresh water which continues to the bay mouth and into the pacific.

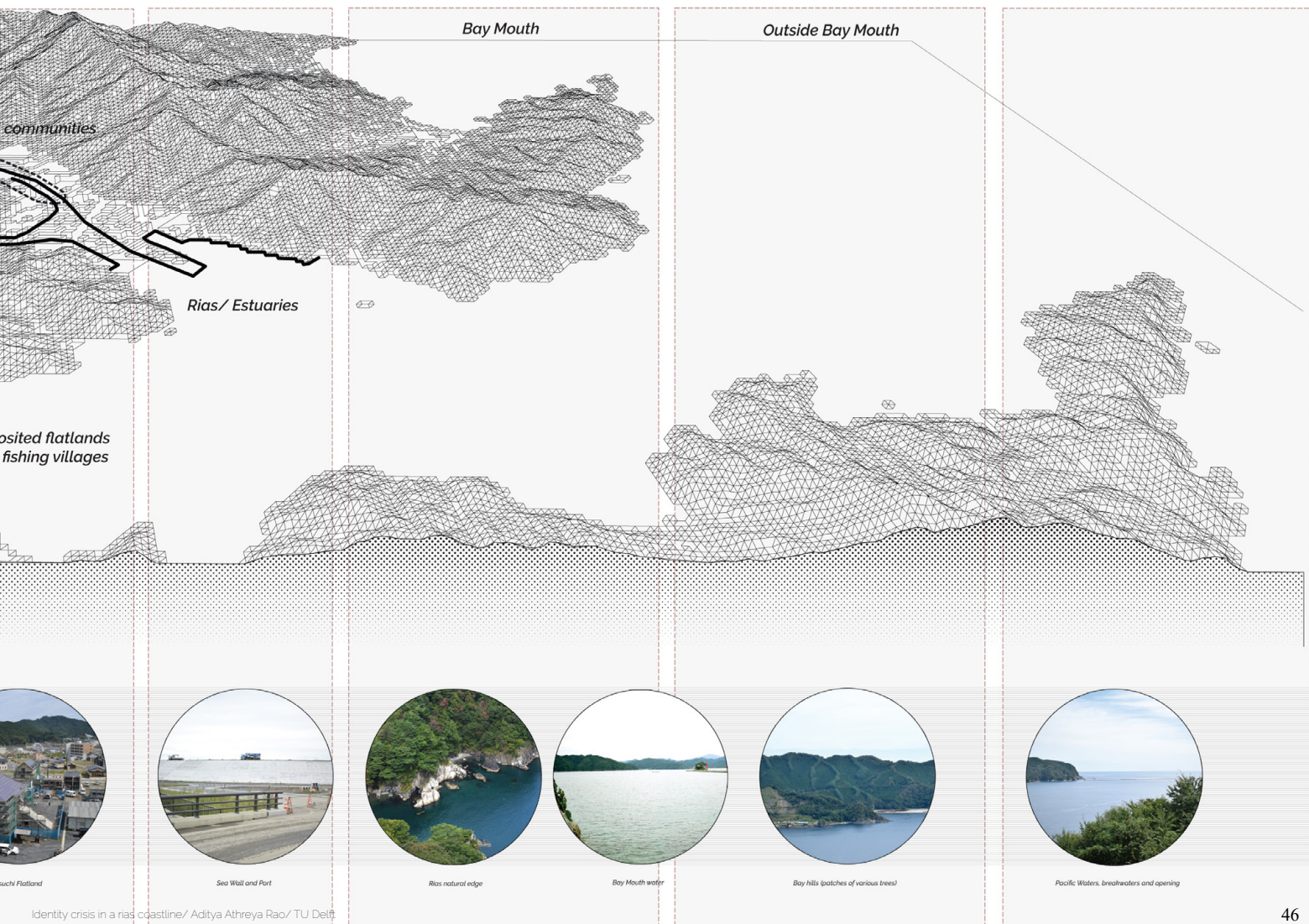
This also happens in the substratum with many spring wells going through the ground and into the aquifer below the Machikata district. Here lie around 200 spring wells originally.

The water ties the landscape together and creates the environment that is "Otsuchi Bay".

Some of the specific findings of this study were flora and fauna that I wished to use in the design as species of local identity, business and economy. They were -

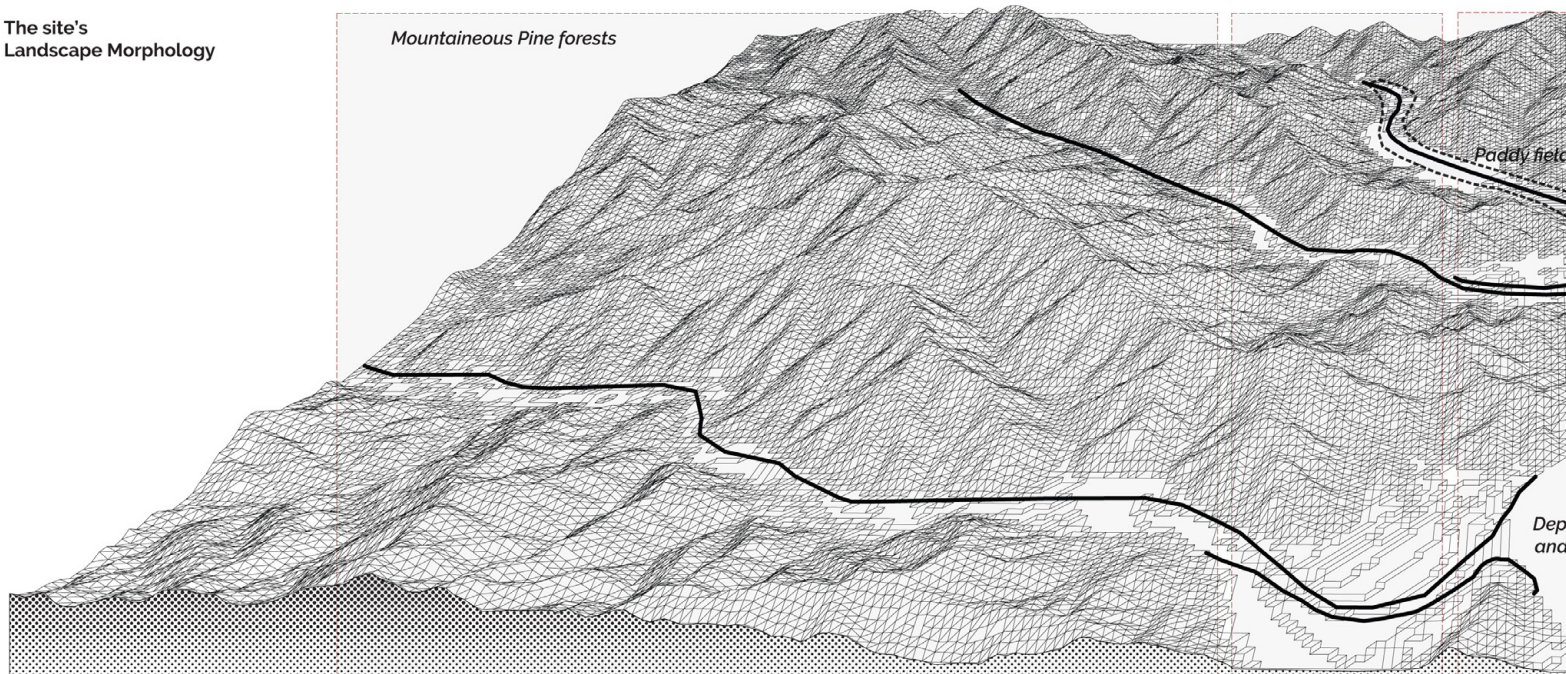
- a. Hijiki Seaweed
- b. Oryza Sativa (rice fields)
- c. Seagrass (*Phyllospadix Iwatensis*)
- d. Hijiki/Kombu Seaweed
- e. *Cryptomeria Japonica*
- f. Three spined stickleback
- g. Sessile species like Japanese scallops
- h. Alabone
- i. Pacific Saury. Salmon
- j. Sea Urchins Etc.

They became important stakeholders, opportunities and environmental thought factors in the design process.





Mountaineous Pine forests



Quercus Serrata communis



Miscanthus Sinensis



Chamaecyparis obtusa



Chamaecyparis thyoides



Pinus densiflora



Miscanthus Sinensis



Oryza sativa Rice and Paddy fields



Quercus Mongolica



Zelkova Serrata



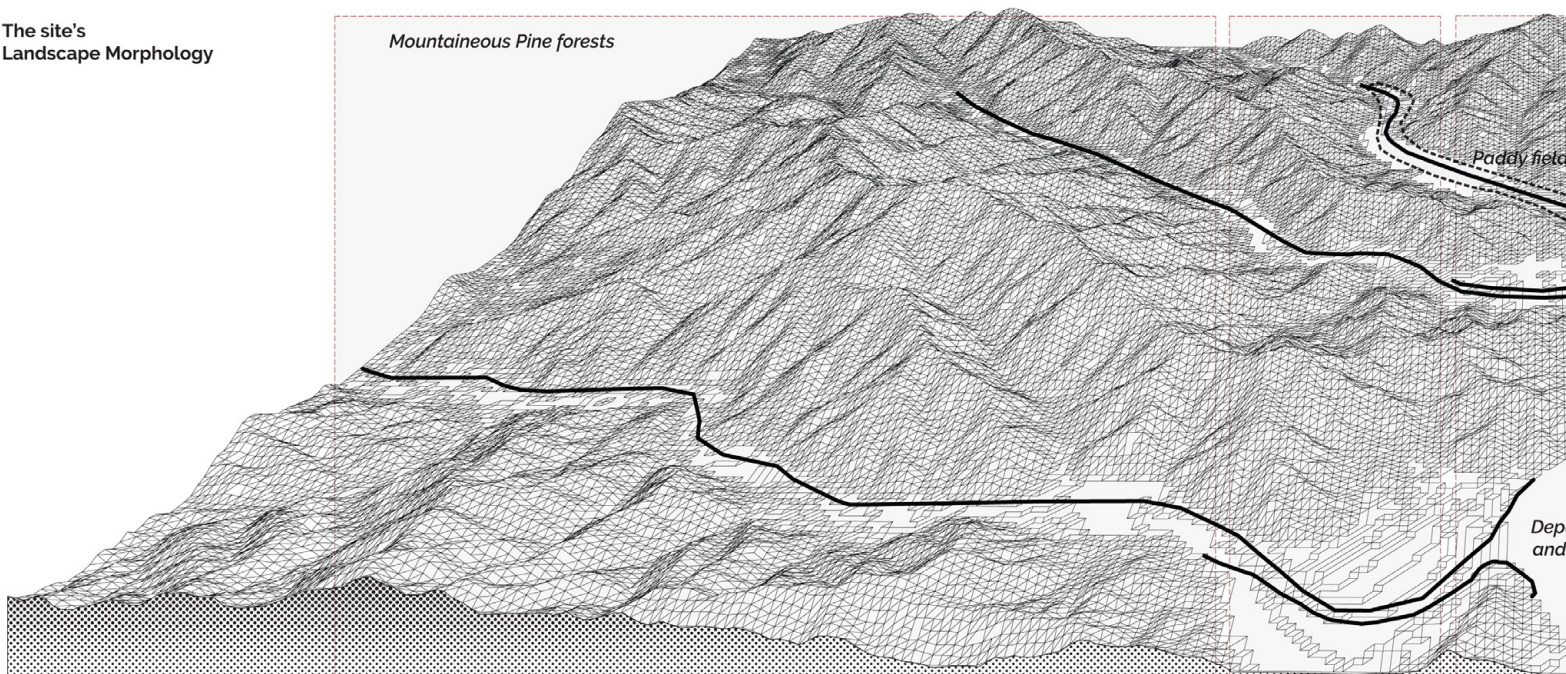
Larix Kobmpferi

Initial inhabited hillside



Morachoria, Koradwai

Mountaineous Pine forests



Mountainous Black Bear



Japanese Red fox



Wild Boars



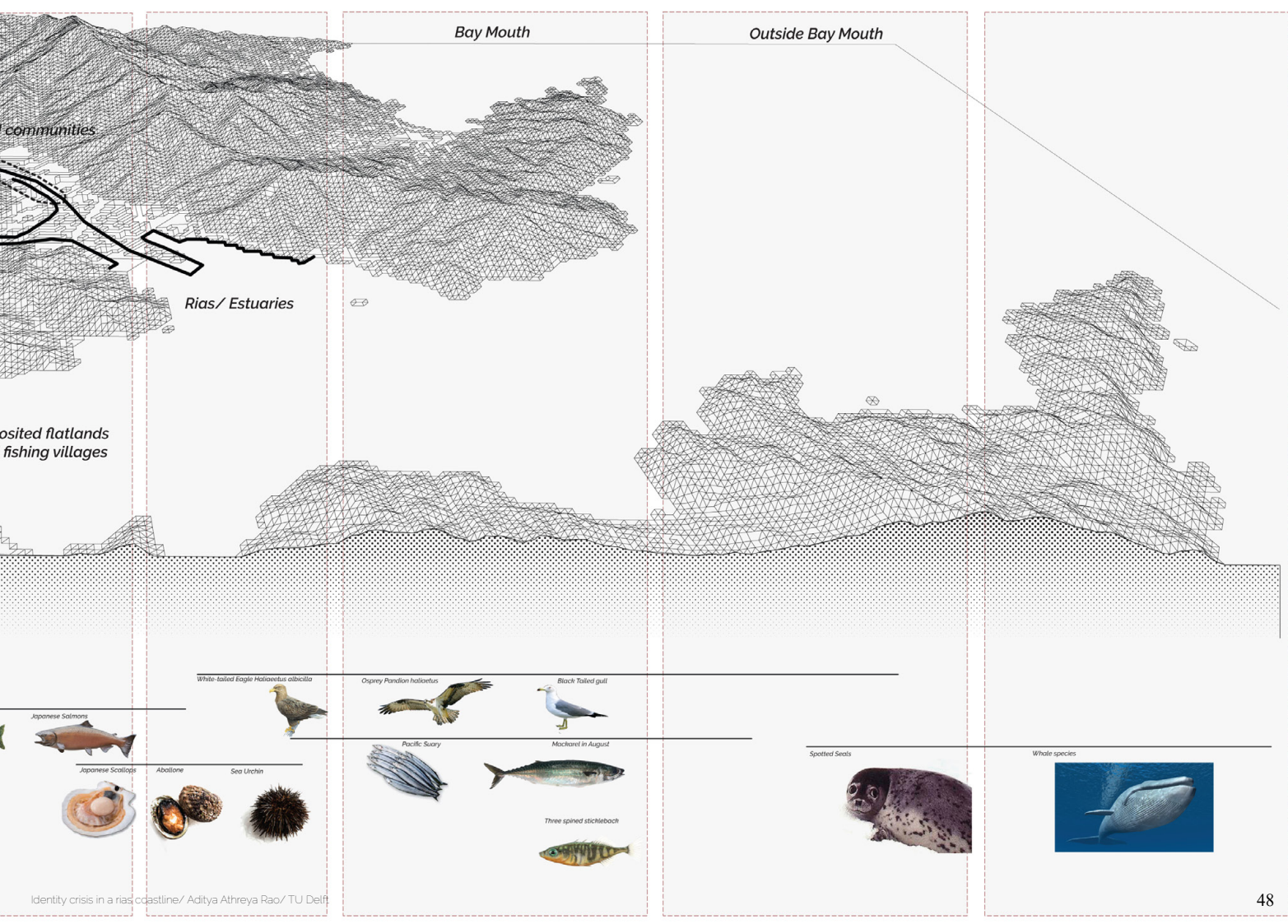
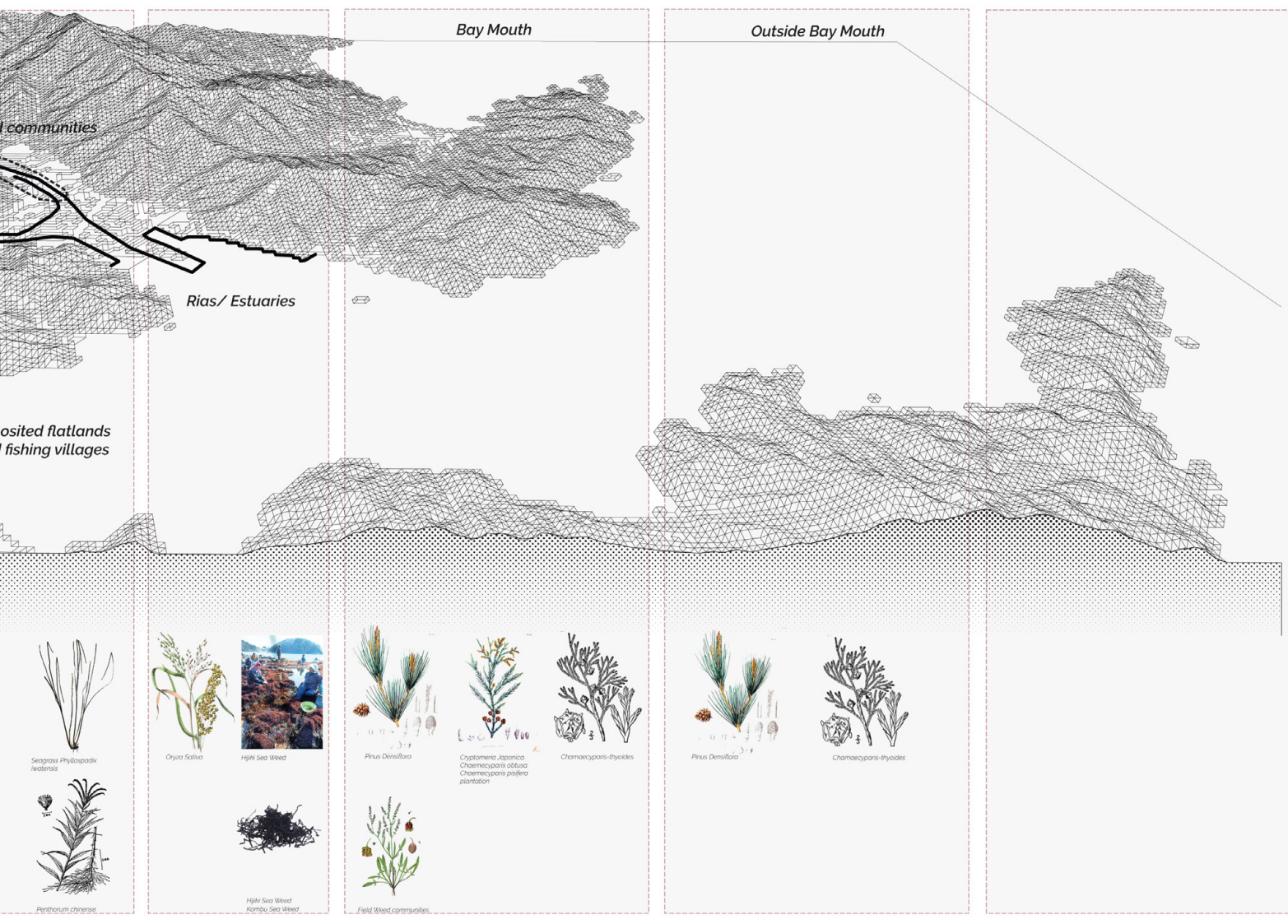
Pacific Salmon



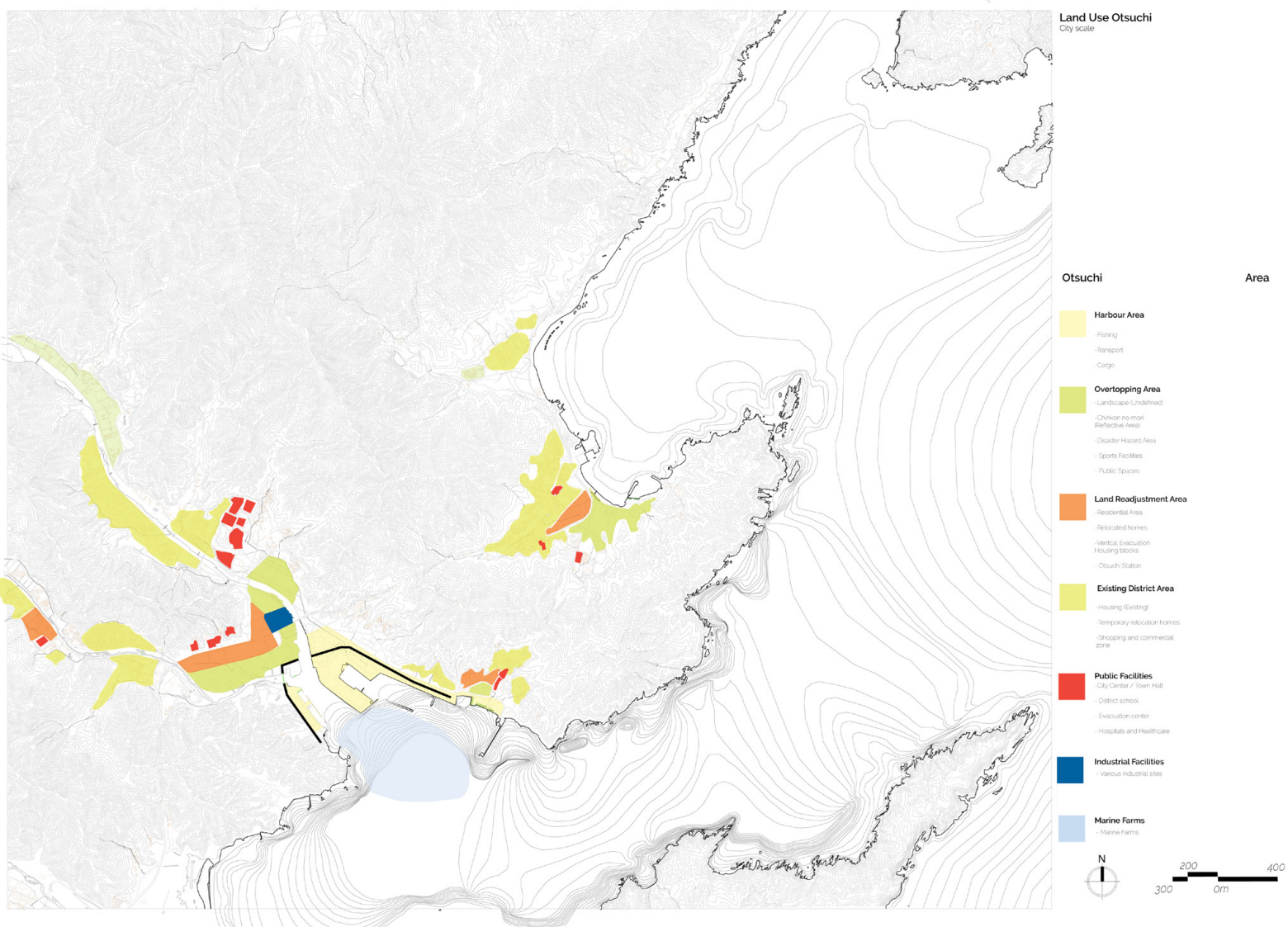
Marine Foris

Picture No.37 Desk Study Maps - 3D cross section of the district showing flora and fauna through the section (Author,2018)

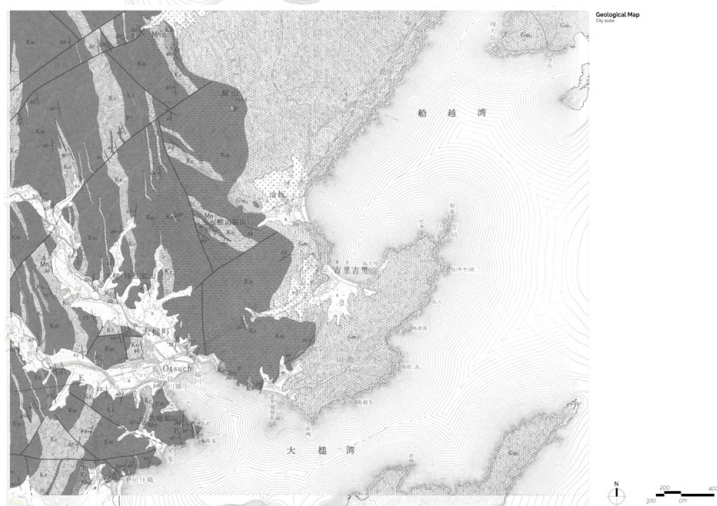
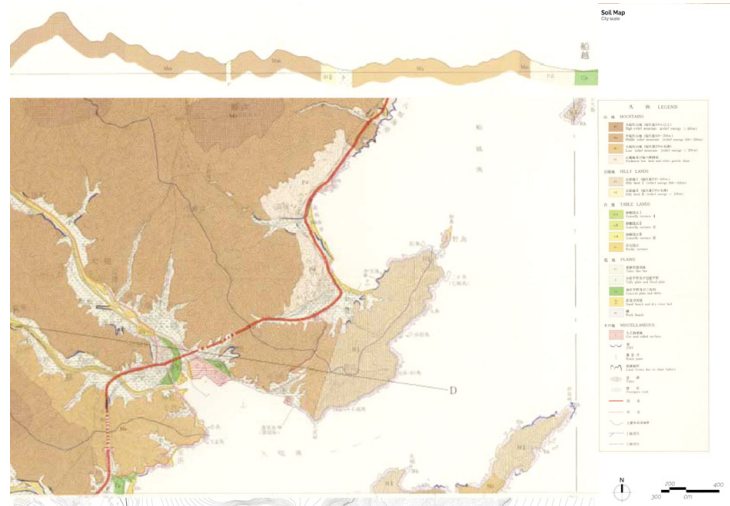
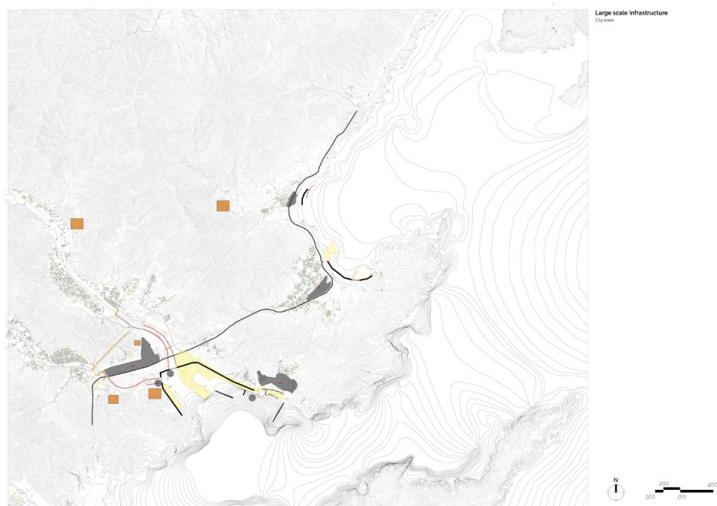








Picture No.38 Desk Study Maps - Land use map (Author,2018)



Picture No.39 Desk Study Maps - Infrastructure map, soil map and geological map (Author,2018)  
Identity crisis in a rias coastline/ Aditya Athreya Rao/ TU Delft

Besides these the land use map makes a clear segregation of various types of functional usage of land in the city. It gives us a segregation that needs to be put together as a more cohesive space.

The most important of these then for me was the large scale infrastructural map, as it defined the problem field for me. They were the issues that we were dealing with besides the way the urban fabric has been put together.

Each of the elements in the infrastructural map then inspired another study into each of them for understanding what it took to make such an element and what is an alternative or a better way to look at this piece of infrastructure.



## 5.3 Palimpsest Analysis/Desk Study

### 5.3.4 City scale

A desk study in the city scale involved a close range of similar factors as that of a prefectural level but at a much closer inspection of the region.

The layers at this scale also involved the evolution of the city, its history, the trajectory of the populations, the social and cultural dynamics of the space, besides the other data.

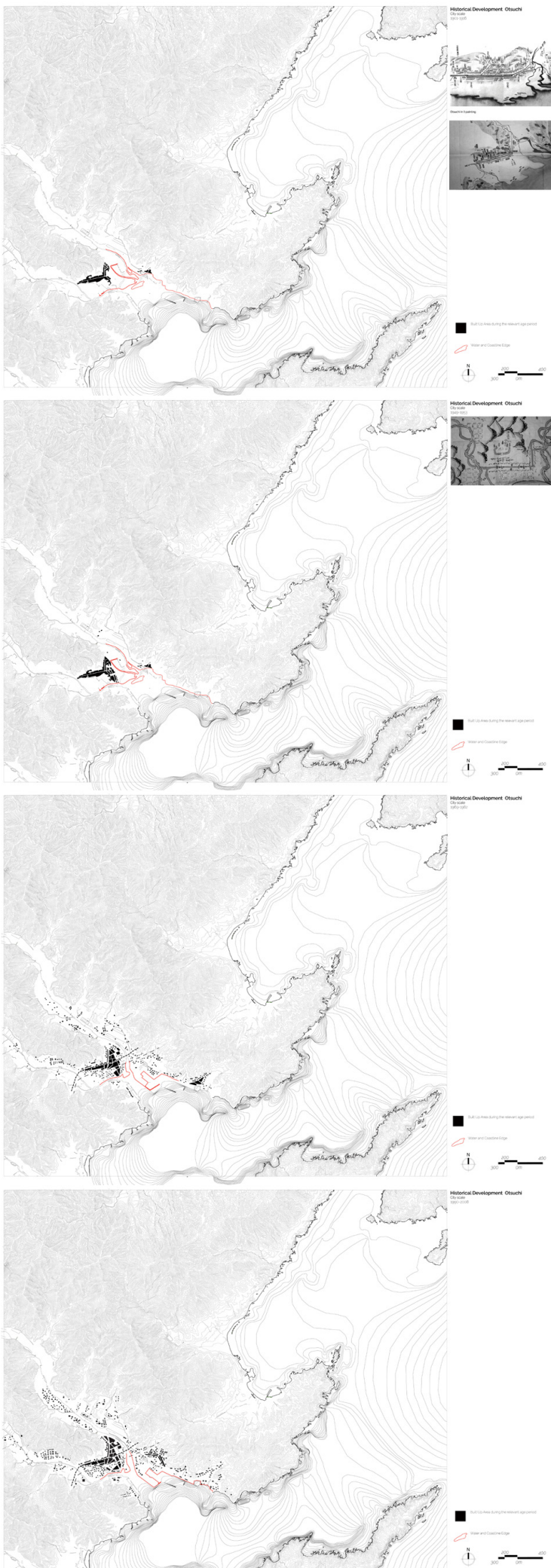
The years that we looked at as a development of the landscape and the city was -

- a. 1901-1916
- b. 1949-1953
- c. 1969-1982
- d. 1990-2008

It showed an overview of how the city grew into the inundation areas of tsunamis and underwent one or two more tsunamis, yet people kept coming back towards the edge of the water.

It also shows how the defined edge of the water (the harbor) was created over time. It shows how it was a sedimented braided river delta with the structure of islets of dropped sediments from the river before the harbor was created.

Besides the history, the soil and geological map made me understand the significance of the space at the seafront. The brackish edge was very fertile with alluvial deposits and was used to grow rice in this area, and along the edge of the river it was the same. These were important elements of importance for Otsuchi that could comprise of creating elements of identity.



Picture No.40 Desk Study Maps - Historical evolution of Otsuchi(Author,2018)

## 5.4 Volume and Tectonic Study

### 5.4.1 Material and Process study of all engineering processes

As the basic reconstruction process mainly looked at infrastructural solutions to solve the disaster crisis with the main tenets being tsunami protection, land utilization and transportation services, a lot of livelihood factors for the villagers were left out of the equation.

At the same time, a lot of money went into the construction of these structures and it is important to not to just understand the return value of these but also to raise awareness of the size and volume of materials and techniques but also see the excess products created by these processes.

The structures analysed in the further pages were as follows -

A. Land consolidation -

5 years

13.1 billion yen

33.2 hectares approximately (divided into three areas)

1.32 million cubic meters of crushed gravel from excavating the mountains of Iwate.

Point to note is the process. Land is added in stages. It needs to settle, and it needs embankment and weight for this. This happens with materials that then get shifted to the next piece of land to embank which then gets wasted. This adds to a list of materials that I wish to think of differently. Each embankment process takes 6 months.

B. Sea Wall -

This looks like something that will take 9 years as it is still halfway under construction,

and approximate 40 billion yen,

9.6 hectares of area

1.52 kilometer long

.75 million cubic meters of crushed gravel.

And a cross section of 14.5m in height by 65.8m in width.

The process involves sand/crushed gravel being levelled in layers initially also requiring condensation. The inner filling of the sea wall is just basic condensation, after which the layers of concrete are added. There is a layer of scree concrete after which a 50 cm layer of concrete is added, and a scouring beam and concrete cover is added.

C. Storm gate barrier-

9 years

3 hectares

1.5 million cubic meters of soil

The storm gate barrier is basically a piece of land that has been made on wet ground in this case the river which is dammed of and made into a piece of land that can be built on.

This exemplifies the process of change of function to create a defense. It also is a construction that requires a removal of a large amount of material from the soil which could be an incentive to use it elsewhere.

D. Fishing Harbor-

28 hectares 5-6/7 height

1.6 million cubic meters of soil

It remains one of the largest interventions done in this city, that was done for an economical purpose purely but also is an act of creating a landscape that impacts the outlook, the spatial character and the functionality of the city.

What is part of the functions is the variety of scale of fishing trawlers that require different kind of volumes of water to go through and this is the machine we design for if fishing is to be an important economy again.

E. Spring wells -

Approximately 24-hectare area is the Otsuchi spring well area. These are the local blessings of Otsuchi.

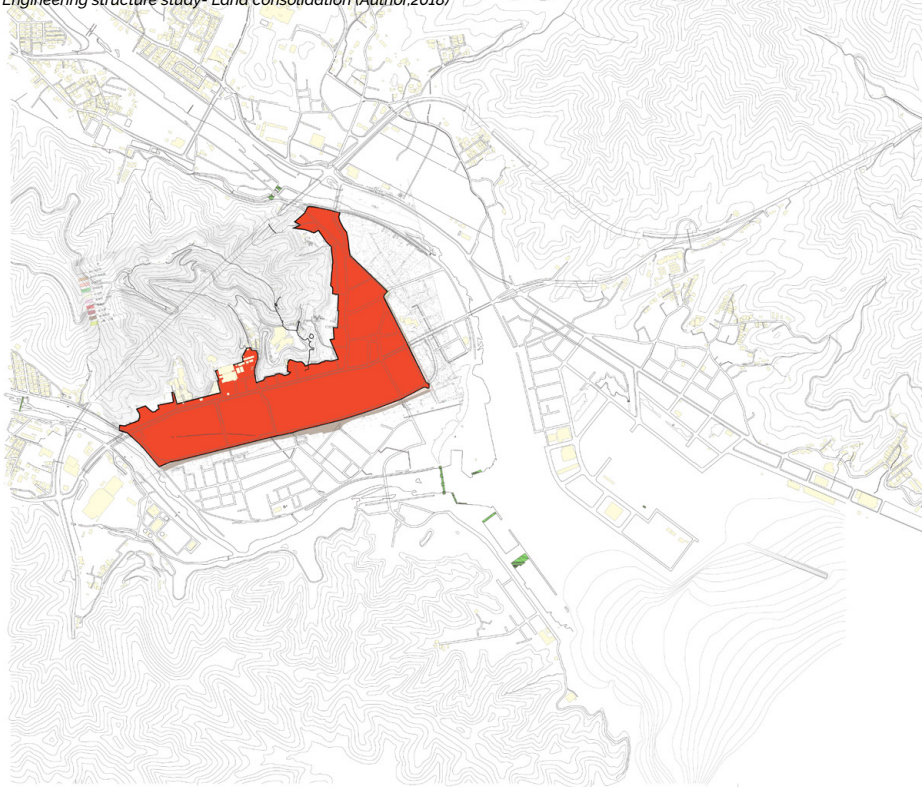
This is a landscape phenomenon that is specific to this site.

The hills around Otsuchi receive rainfall that drains into its marine clay and then into the aquifer that lies below the delta region. This aquifer lying sandwiched between two clay layers are under huge pressure and seek to come out under high pressure.

Specifically, they cater to a lot of issues, people and stakeholders. Many houses pre earthquake used them as a drinking water source, washing goods, and as recreational and spiritual areas.

Many of these are a mixture of saltwater and freshwater, some of them are linked across to the sea and have a few endemic species that lie in these because of these water systems. For example, the three spined stickleback and other fishes. Seaweed of various sort also grow in this water and that is something prime for economic purposes.





- Time for material acquisition and initial layer  
Quarrying and Decomposing granite - 3/4 months  
Material Deposition - 1 month
  - 2nd layer weight deposition and embankment  
Adding more soil - 1 month  
Material Consolidation - minimum 6 months
  - Third layer weight deposition and embankment  
Second layer of 2 m - 1 month  
Embankment - 1 month  
Consolidation time - 6 months
  - Embankment removal  
Embankment Removal - 1 month  
Construction of roads and structures - 3 months  
Liquefaction period -
- 5 years**
- Expense - Approximately **13.1 billion yen**  
Cost as per euro - 302 million Euro
  - Surface Area - **33.2 hectares**  
Divided into 3 parcels of hectares
  - Volume of Crushed Gravel - **1.32 Million m3**  
cubic meters
  - Height of Raised level **4 m**

Land purchase plan area: approximately 8.0 ha

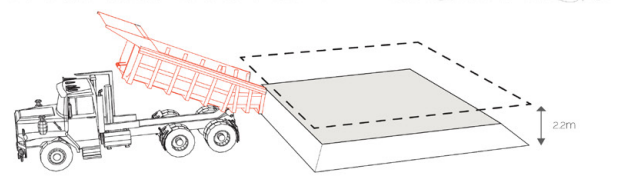
Heisei 24 - Heisei era 34  
2012-2018



Decomposed Granite and Gravel

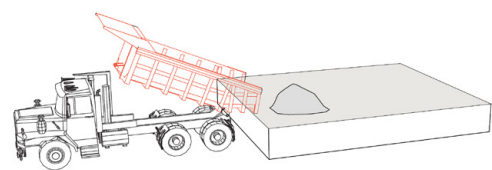


Source and Usage

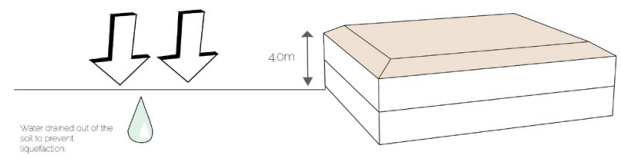


Process of Land consolidation-

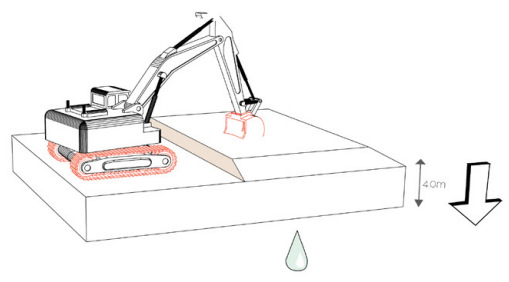
Decomposed Granite and crushed rock with fine sand.  
Location of resource: otsuchi hills?



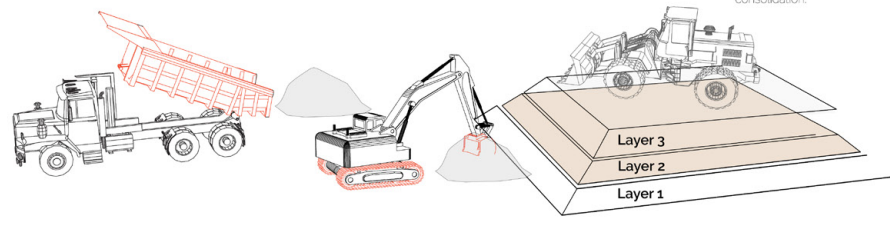
Second layer vacuum deposition  
Weight added to original layer



Sinking to Desired Height and Stability  
According to embankment weight desired for pressure filled settlement for a duration of 6 months

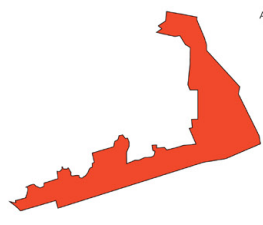


Removal of Embankment for Movement to next area for usage as weight filling embankment.  
Soil has reduced volume to a height of 2m

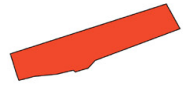


Layer addition for condensation of soil to reach heights higher than 2m.  
Each layer requires the above process and time requirement for land consolidation.

Process of Embankment movement



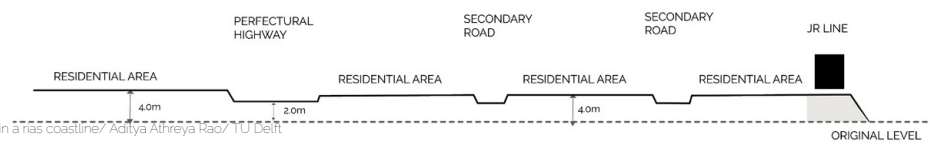
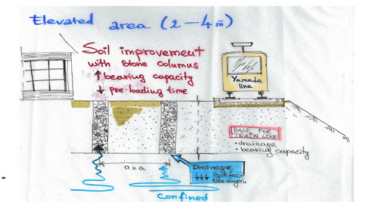
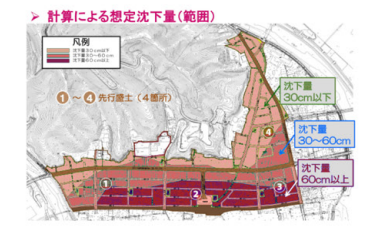
Area of Embankment - 20.6 Hectares



Area of Embankment 8.8 Hectares



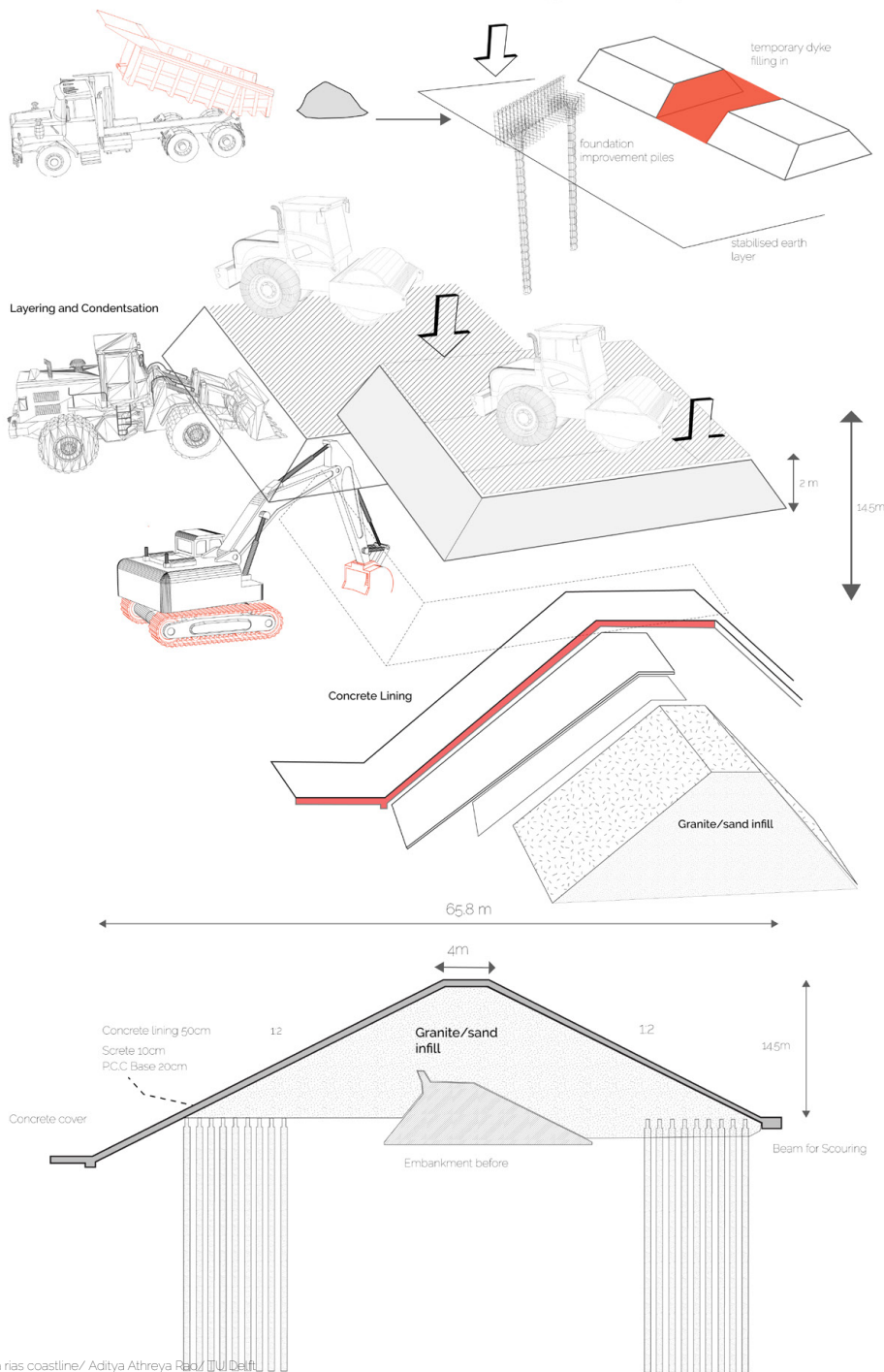
Area of Embankment 3.6 Hectares







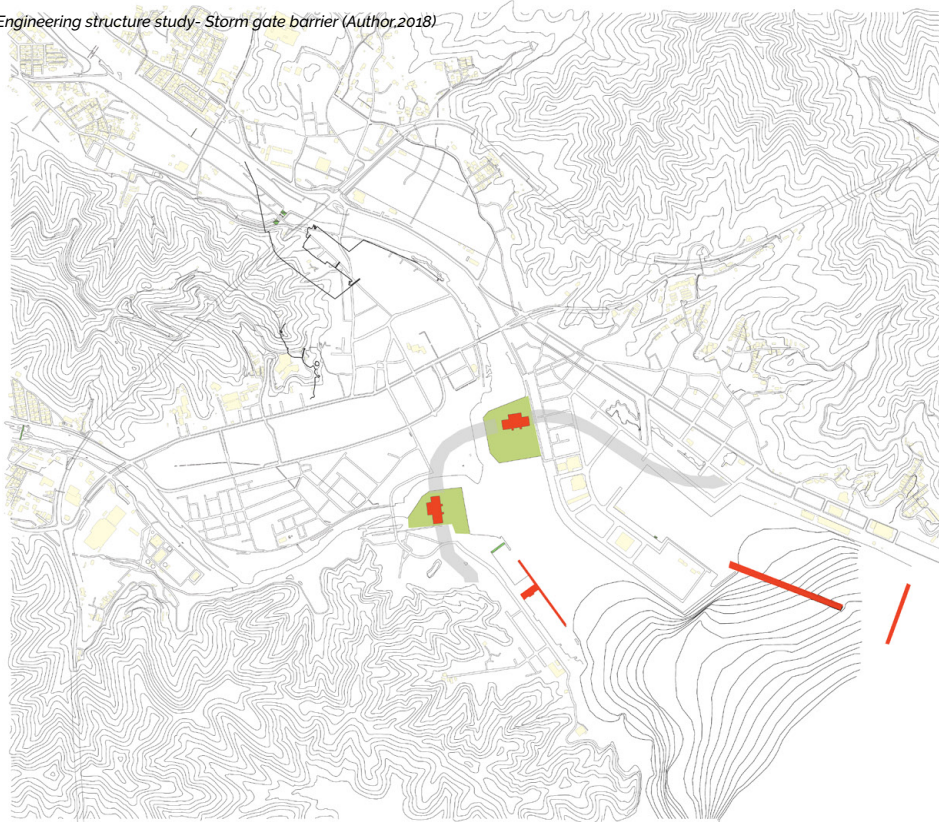
- Repair of temporary systems
- Piles and foundation
- Layers of granite and sand, condensation
- Concrete cover and scouring protection
- Construction period - **9 years +?**
- Expense - Approximately **?? billion yen**  
Cost as per euros - 502 million Euro
- Surface Area - **9.6 hectares**  
Hectares
- Volume of Crushed Gravel - **(a+b)/2\*h\*l**  
cubic meters  
**0.75 million m<sup>3</sup>**
- Height of Raised level **14.5 m**  
**1.52km long**











Construction of Sea Wall - kamishi example



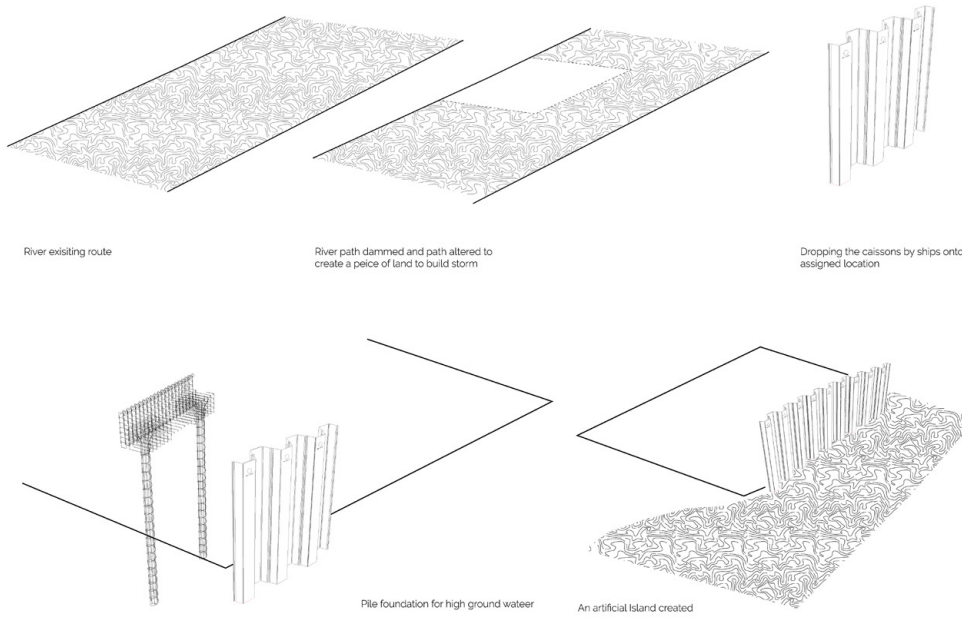




Storm Gate Barrier and Bay mouth breakwaters - ongoing 7years +

-  Repair of temporary systems
-  Piles and foundation
-  Layers of granite and sand, condensation
-  Concrete cover and scouring protection
- Construction period - **9 years +?**
-  Expense - Approximately ?? billion yen  
Cost as per euros - 102 million Euro
-  Surface Area - **3 hectares**  
Hectares
-  Volume of Soil - **1500000 m3**  
cubic meter
-  Height of Raised level **5-6 m**  
meter

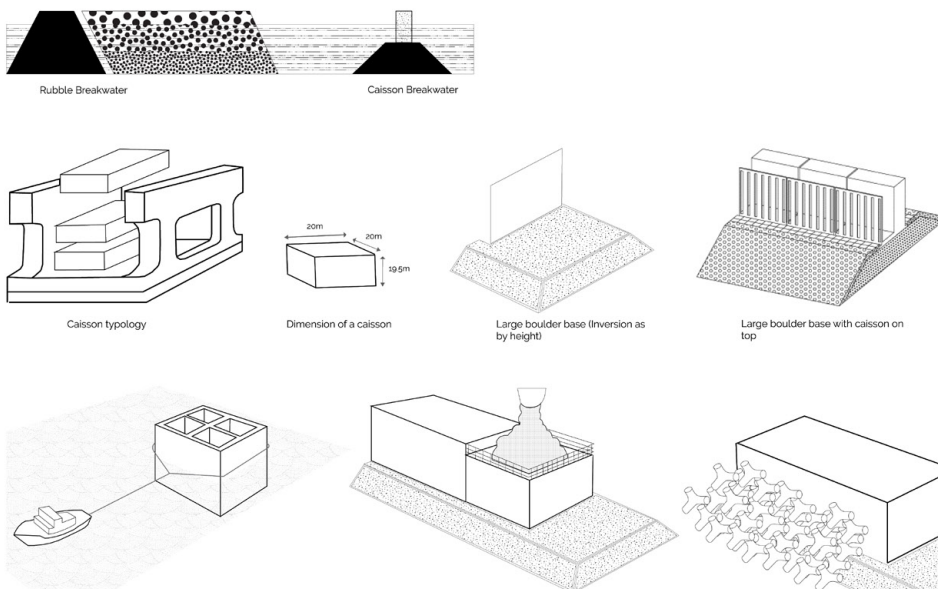
### Construction of stormgate barriers



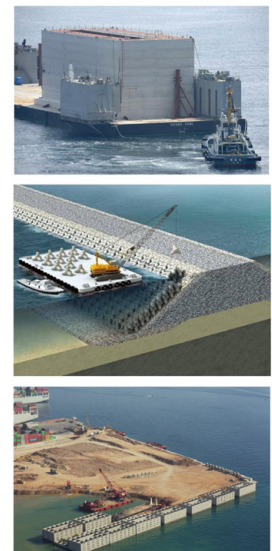
### Construction of stormgate barriers



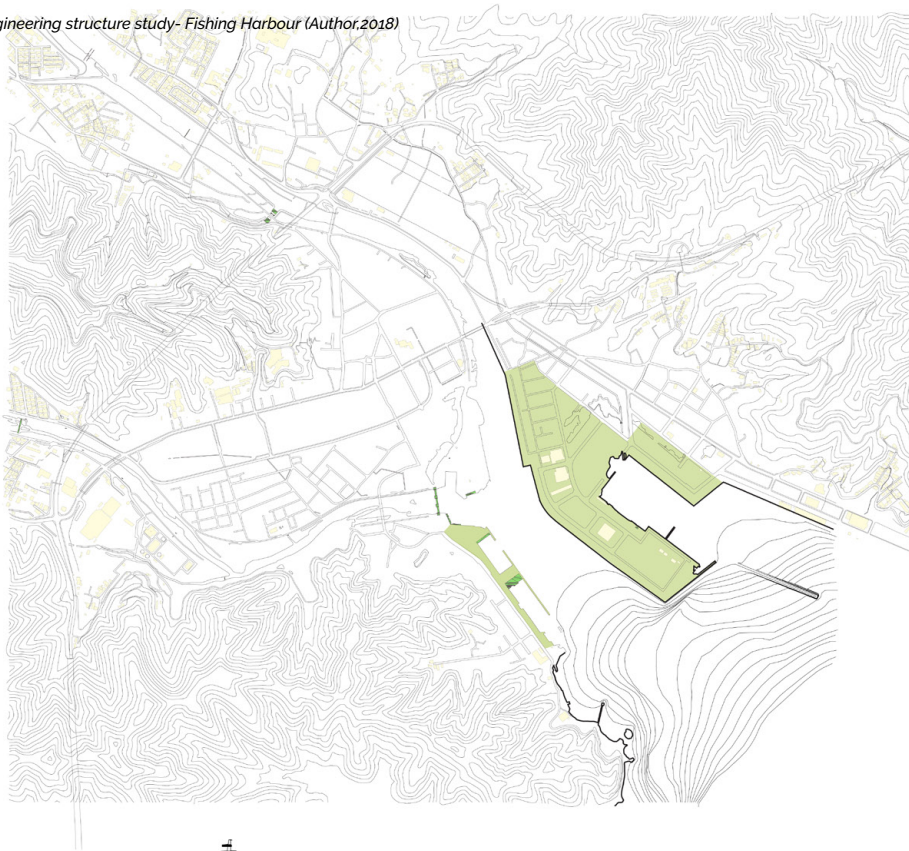
### Construction of caisson and normal breakwater



### Construction of caisson breakwaters





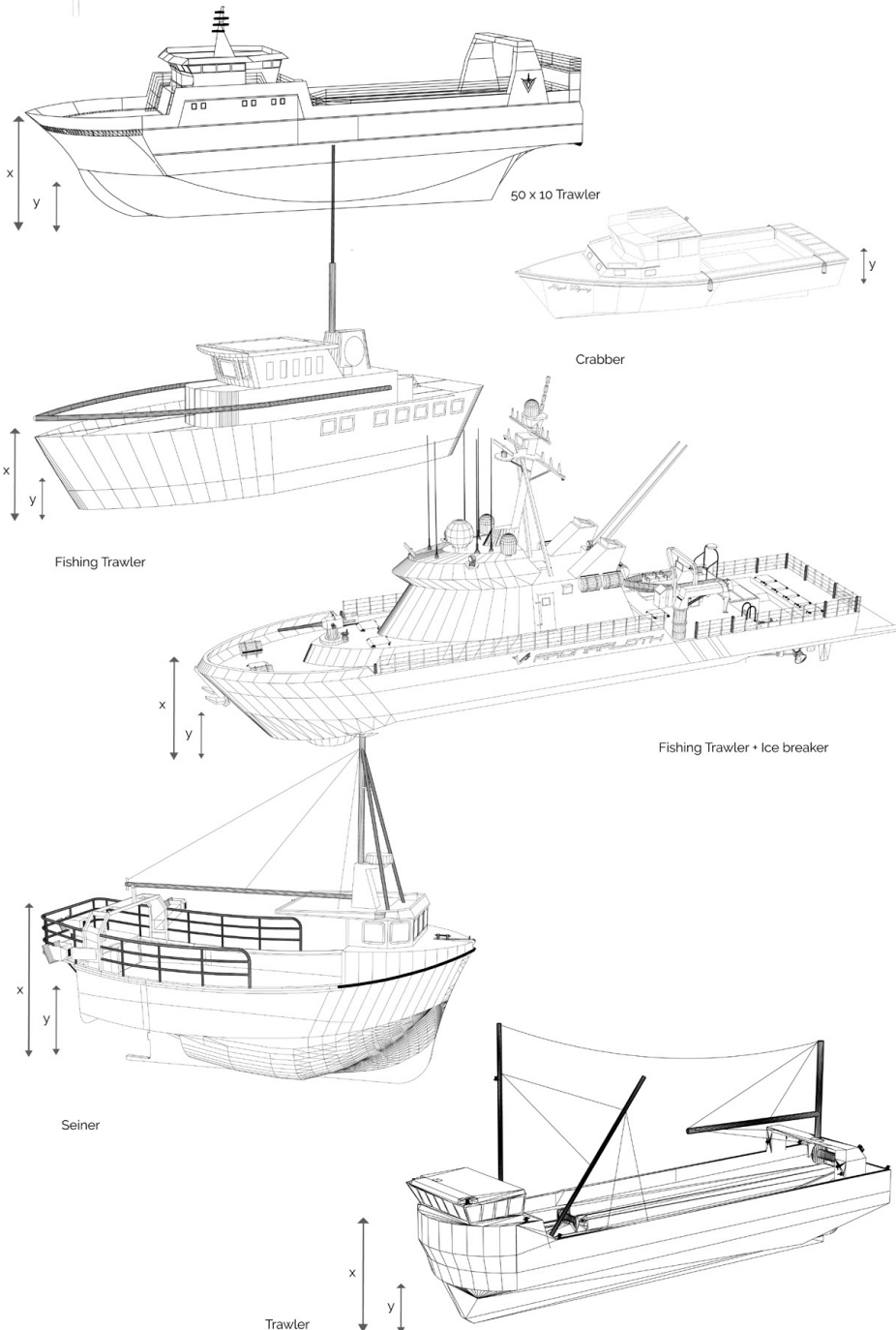


-  Demarcating and draining marked area
-  Piles and foundation
-  Layers of granite and sand, condensation
-  Construction period - **? years +?**
-  Expense - Approximately **?? billion yen**  
Cost as per units - 10.2 million Euro
-  Surface Area - **28 hectares**  
Hectares
-  Volume of Soil - **1680000 m3**  
cubic meter
-  Height of Raised level **5-6 m**  
meter

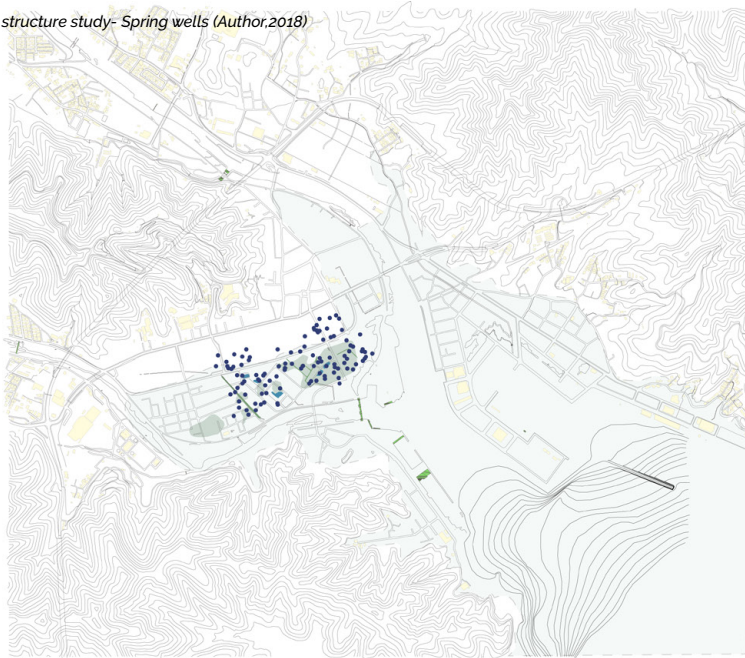


Harbour before complete construction

Revival of the fishing industry







Spring Water wells and Aquifers: Otsuchi's local blessings

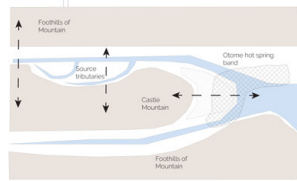
- Before the disaster, Otsuchi Town had many wells and springs. The water temperature was stable at 10-13 degrees Celsius, and the water was highly valued because of its good quality.
- After many houses were washed away by the tsunami and a huge amount of debris was removed, many ponds were formed, as spring water spouted up from the earth in various places. The presence of approximately 200 artesian wells have been confirmed.
- Loss of ecological life in the spring wells
- Layers of granite and sand, condensation in the raised area
- Loss of spring wells in area condensed by land, new wells being monitored - no effort in conserving them with a landscape element.

Expense - Approximately 300 million Yen **no money spent**

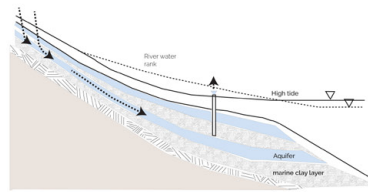
Surface area of springs- **approx 24 hectares**



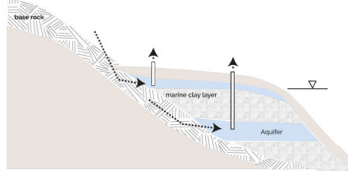
Osachi spring water (Restored and made into a public park)



Outline of ground plan and water movement



Longitudinal section of the river



Ground water flow near machikata district and aquifers

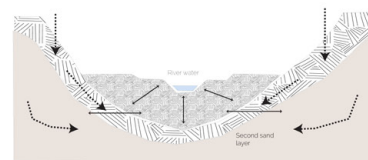


Image of water flow in upper river valley transverse section



Spring well in overflow area



Spring well in overflow area



Three spined stickleback



Sea weed in mixed water/tray/brick areas



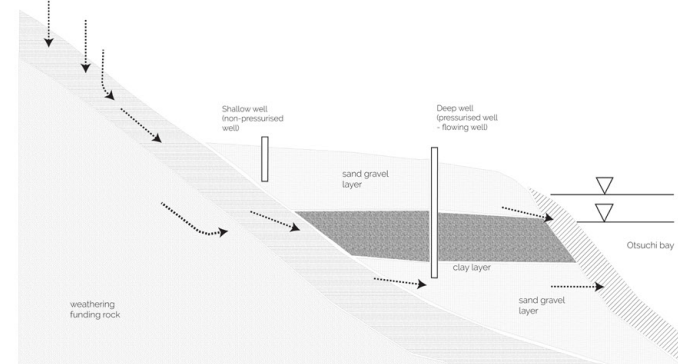
Cluster of three spined stickleback



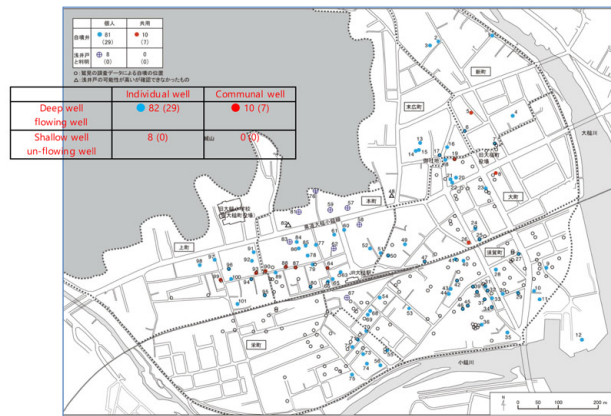
Otsuchi-Dopunungi



図-3 大粒自噴帯付近の主要地点のボーリング柱状図 (参考文献2)



Detailed section through machikata district



## 5.4 Volume and Tectonic Study

### 5.4.2 Rethinking Materials

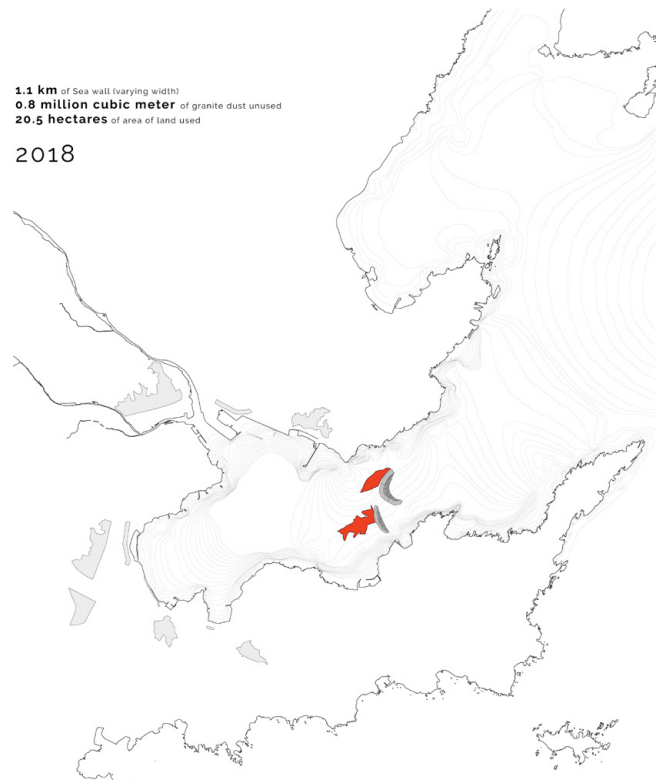
Considering that a total of 2.5km of sea wall was built, 7.6 million cubic meters of crushed granite and 137 hectares of area used for land consolidation, we have a lot of material to work with as a resultant of this.

The ideal situation of this would be, when as an idea it would be proposed to have the structure at the bay mouth alternatively to the idea of building large constructions at the foot of each town blocking them from the bay.

The material for a protection structure still needs to be sourced and acquired, but the usage of it could be better.



Picture No.46 Material and volume study as in year 2018 (Author,2018)



The visuals here represent how these materials (granite crushed for land consolidation) in red and (Concrete and crushed granite + coarse rock) in grey look, if moved to the bay mouth at the sea edge. These were analysed, to show what it would look like in volume and size.

The area and volume were in fact quite large and considering the bathymetry being shallow at the edges of the bay mouth which in turn provides a strong concept based on good backing for using it in a way that plays much more to the larger scheme of the bay and its ecology and economy.



2.5km of Sea wall (65m width)  
 7.6 million cubic meter of crushed granite  
 137 hectares of area used for land consolidation

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8



Picture No.47 Material and volume study as in year 2011 (Author,2018)

2.5km of Sea wall (65m width)  
 7.6 million cubic meter of crushed granite  
 137 hectares of area used for land consolidation

2.6 km of Sea wall (65m width)  
 3.0 million cubic meter for ridge areas  
 20 hectares of area used for land consolidation



Picture No.48 Material and volume study as in year 2011 (Author,2018)

## 5.5 Research by Design

### 5.5.1 Design at Prefectural level to set precedent for ideas

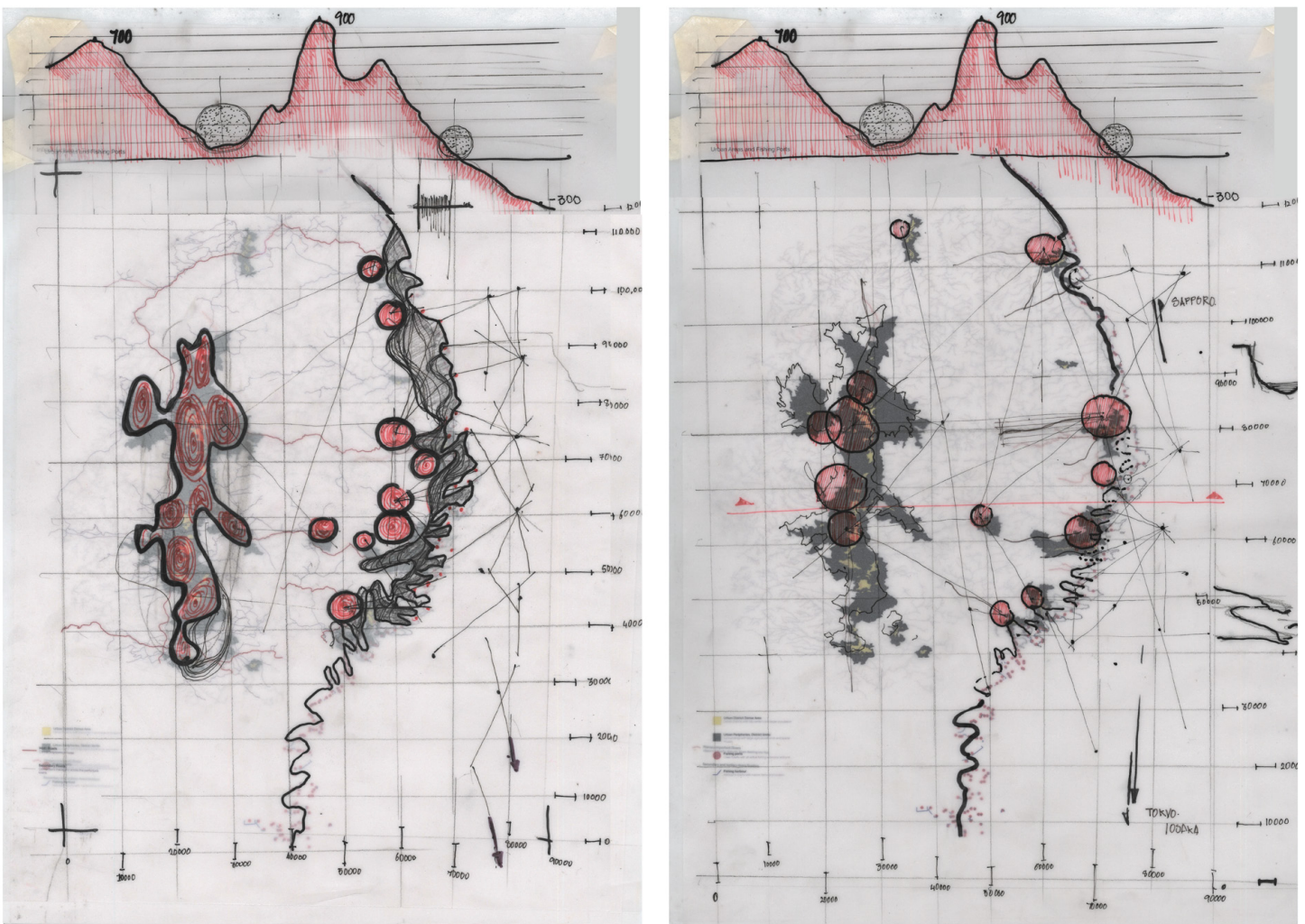
The concept of rethinking material did not come from just calculating the areas and knowing that this could fit as a solution.

It was an exploration or research in design through ideation at the level of the prefecture initially to look at a set of solutions that could look at the future of the coastline of San Riku and see what can happen. Space is not really a large option if we were to consider the issue of alternatives to an urban fabric depending on a line of protection and one must look at large alternatives.

The recession of Iwate is more than just a concept of economical proportions, it can reflect in the abandonment of the coastline for residential purposes and become an ecological /economical identity for the coastline. This was a prefectural scale solution seen below in picture .

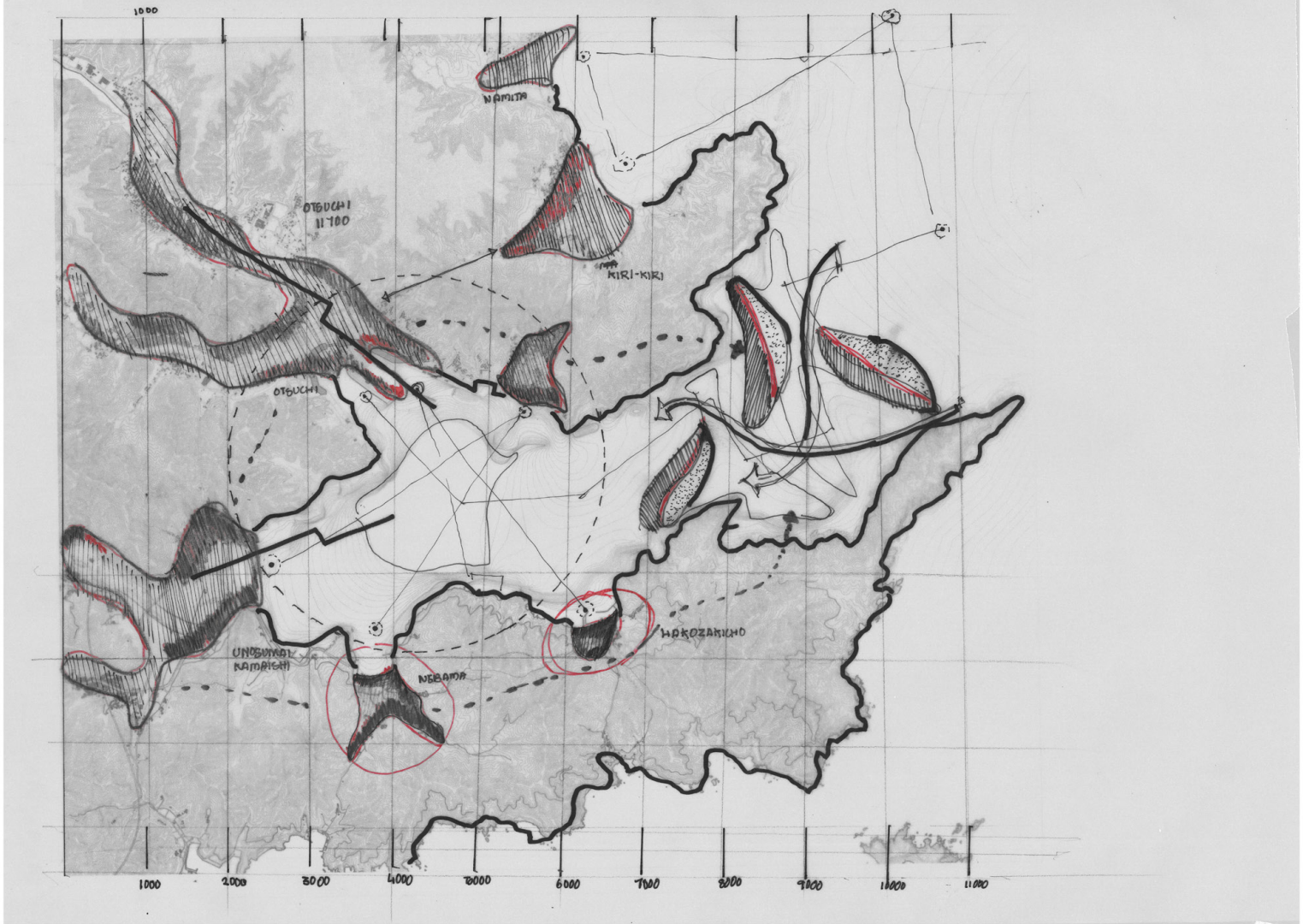
Understanding that larger picture could be then reflected on how the abandonment of the coastline can be reflected as a theology in the smaller scale. It reflected how the bay was important to the economy and how the edges of the villages to the sea were to move backwards.

Do the villages recede and let environment take the first hand? or does civilization control this process? How does one design such a situation. This was essentially the progress through the design sketches.



Picture No.49 Conceptual planning ideas at a prefectural level (Author,2018)





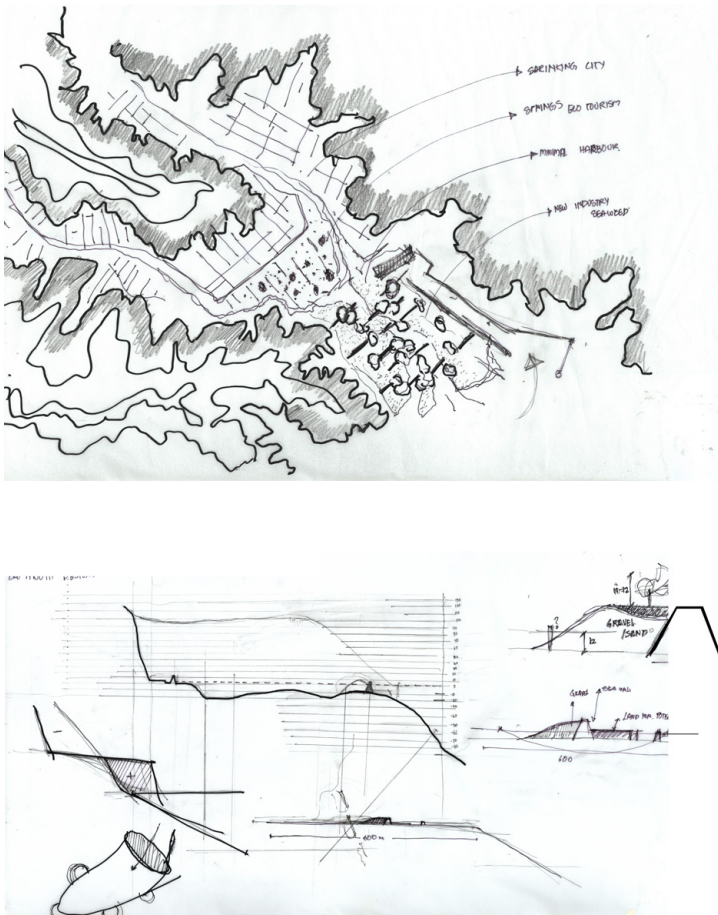
Picture No. 50 Conceptual planning ideas - district level - villages in the vicinity (Author,2018)

### 5.5.2 Design at District level

Here the bathymetry influenced the design of the new village environment quite a bit. Finding out that there are certain shallow areas in the bay that are ripe to receive the materials that have been used in the city as sea wall, land consolidation helped the design. It set out to create an environment with this material.

It was necessary to see what sections would be sufficient to create some impact strength wise but also aesthetically to create the structures. They would no longer be mono functional but act as an element that would join the bay provide an alternative space for reflection and open the towns and villages in the bay to trade and commerce.

Seen in the picture above and on the left-hand side are scaled versions of sizes areas, heights and sections to see what this space would look like and where and how would it be placed to create the best impact for the immediate environment.



Picture No. 51 Conceptual planning ideas at a District level (Author,2018)

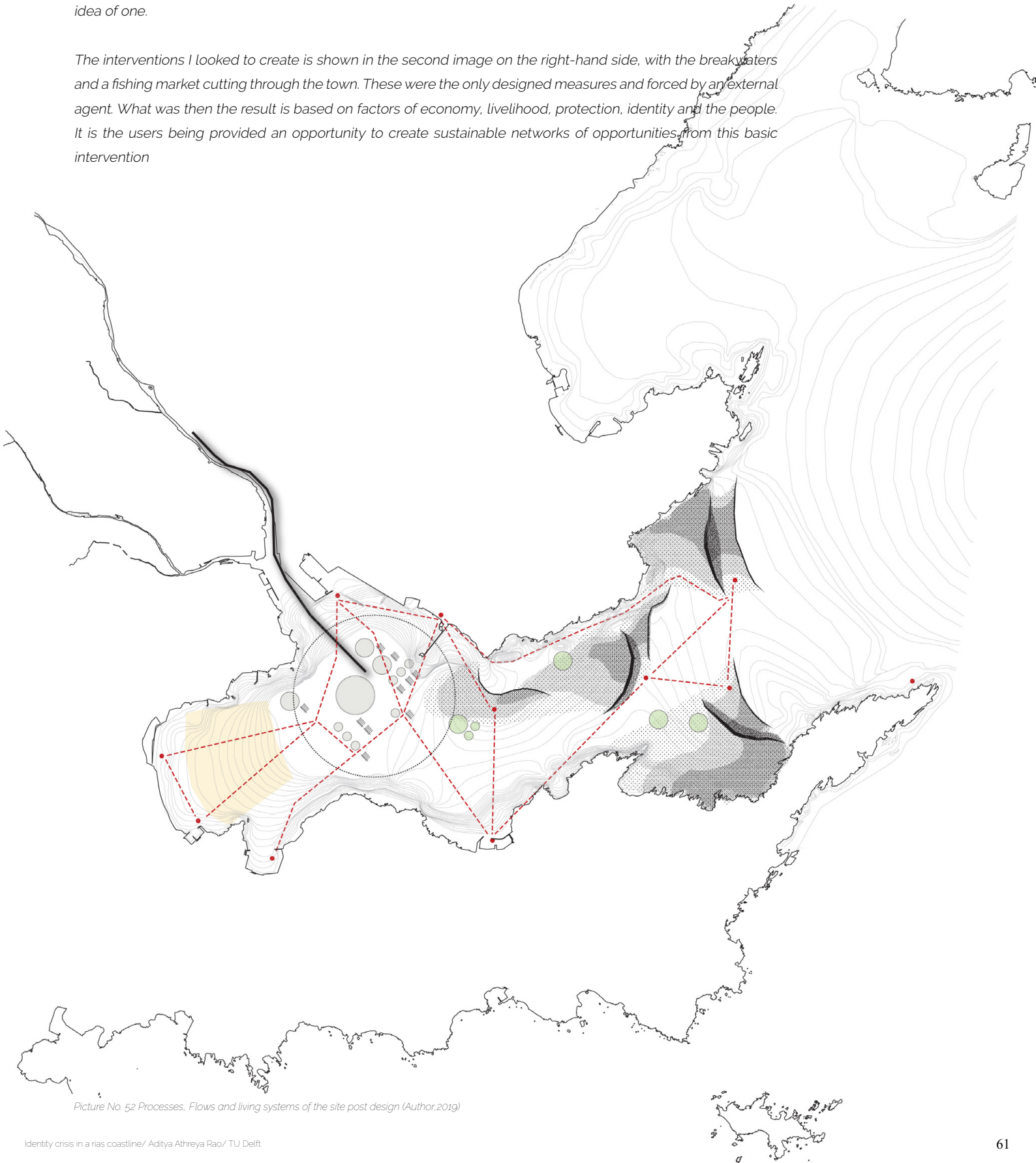
### 5.5.3 Processes and Flows

*A design that happens at one instant is likely not to be landscape architecture related. The field revolves around a science that is created by living systems. Entities that change over time to create a continuous revolution of built spatial changes.*

*Unlike Architecture, where an object designed by the designer only has few characteristic changes mainly dealing with the user and external wearing, landscape is not a field where a master plan is an image of an ideal setting of a finished design. In fact, there can be no one clear cut timepiece where you could click the picture and say this is the design, since living systems change.*

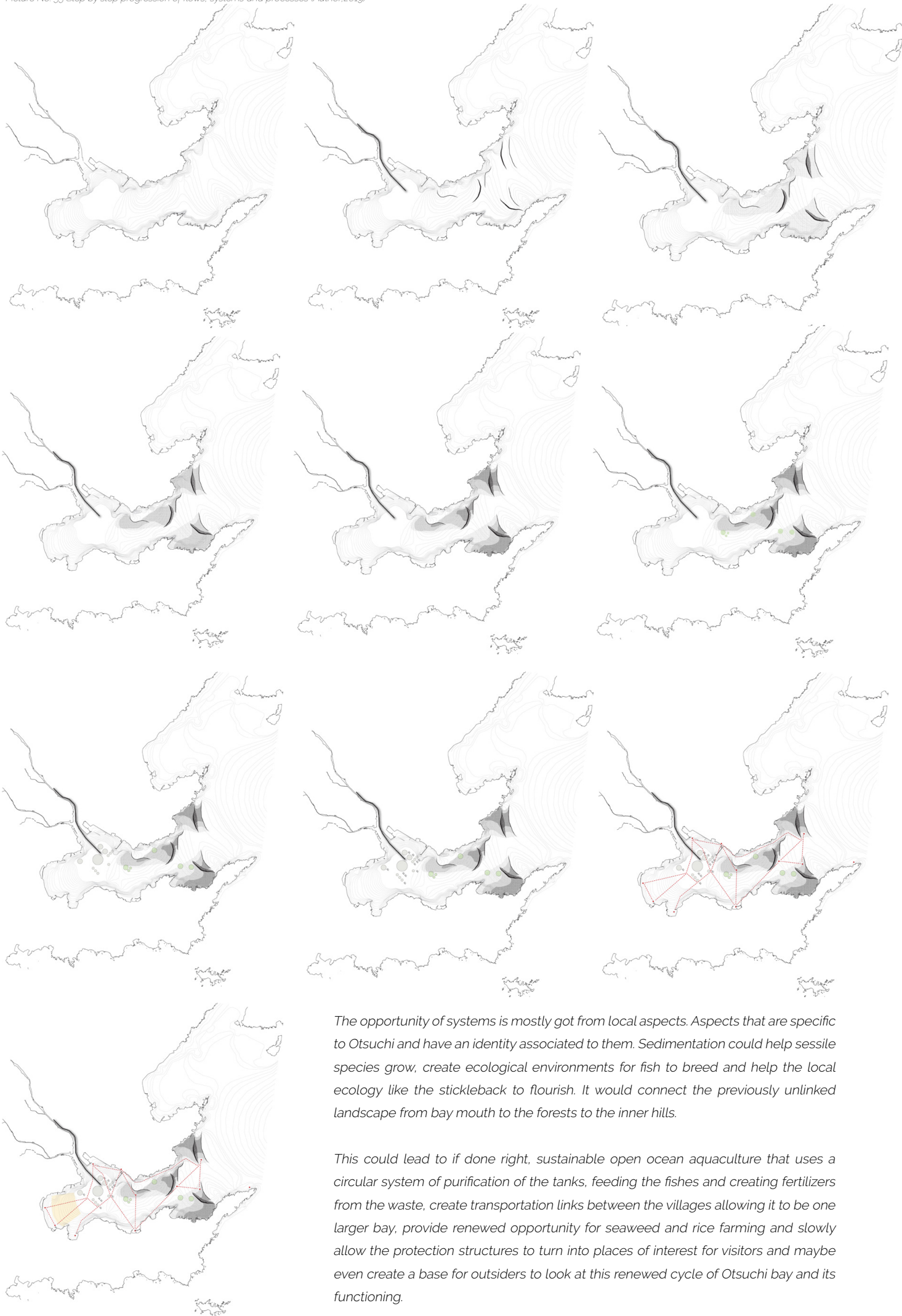
*In the study shown here I tried to give an estimation of how time would help create the design through minimal interventions showing some of the steps. It does not ideally show a finished state, or a start point but gives an idea of one.*

*The interventions I looked to create is shown in the second image on the right-hand side, with the breakwaters and a fishing market cutting through the town. These were the only designed measures and forced by an external agent. What was then the result is based on factors of economy, livelihood, protection, identity and the people. It is the users being provided an opportunity to create sustainable networks of opportunities from this basic intervention*



Picture No. 52 Processes, Flows and living systems of the site post design (Author,2019)





The opportunity of systems is mostly got from local aspects. Aspects that are specific to Otsuchi and have an identity associated to them. Sedimentation could help sessile species grow, create ecological environments for fish to breed and help the local ecology like the stickleback to flourish. It would connect the previously unlinked landscape from bay mouth to the forests to the inner hills.

This could lead to if done right, sustainable open ocean aquaculture that uses a circular system of purification of the tanks, feeding the fishes and creating fertilizers from the waste, create transportation links between the villages allowing it to be one larger bay, provide renewed opportunity for seaweed and rice farming and slowly allow the protection structures to turn into places of interest for visitors and maybe even create a base for outsiders to look at this renewed cycle of Otsuchi bay and its functioning.

# 6.0 Conceptual Design

## 6.1 Concept

Creating Identity through a unified bay.

*"Unity, Design and Identity lay in the landscape structure of the location "*

*Looking at the various research studies, maps and analysis of this site, I was searching for something that could create the specificity for Otsuchi. While I investigated its culture, history and social aspects of the citizens of Otsuchi and Japan, the idea of a concept came from the most prominent landscape structure in the site. The bay, its bathymetry and its specific shape.*

*The bay was earlier fragmented in the design solution provided at the prefectural level. It was more looked at as individual little towns bordering the water in the bay. I saw it as one large entity that could grow off each other. It didn't help that the district line was divided in between the bay rather than have a bay as a district.*

*What this does is that it provides an opportunity to look at the protection structures differently. Instead of blocking out each village and town by individual sea walls, what is there was one protection structure at the bay mouth that fit in with the landscape better and had a multifunctional usage? Could it be a reflection space? Could it be an economical area? Could it be a harbor?*

*The options were available and the bathymetry study and the area study showed the possibility of creating these structures with the material that was used for the structures currently designed by the government mainly including the sea walls and the land consolidation measures.*

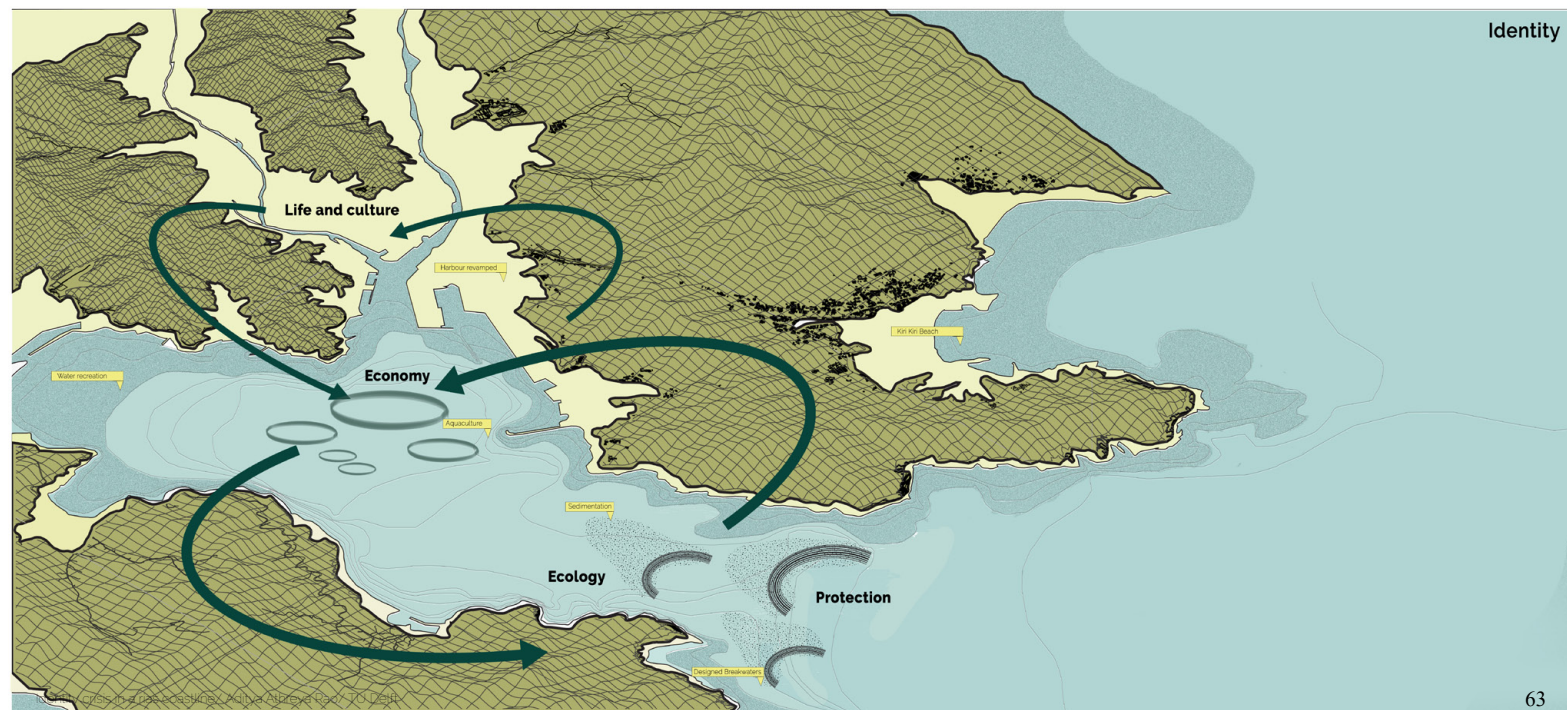
*The other study into processes and flows showed me the economical and lifeline opportunity of making these interventions in the bay mouth. They were not just multifunctional protection structures, rather they were the elements that create a lifestyle, an opportunity of an economy based on their identity, their profession and what happens locally in Otsuchi.*

*All these factors were very local and the sectional drawing on the right hand side shows how the current structures have a limited flowing opportunity and life, whereas the next drawing shows how it would connect that landscape, make it something unique to Otsuchi while providing the impetus for growth, economy and specificity for Otsuchi.*

*For me the concept was best personified in the drawing below.*

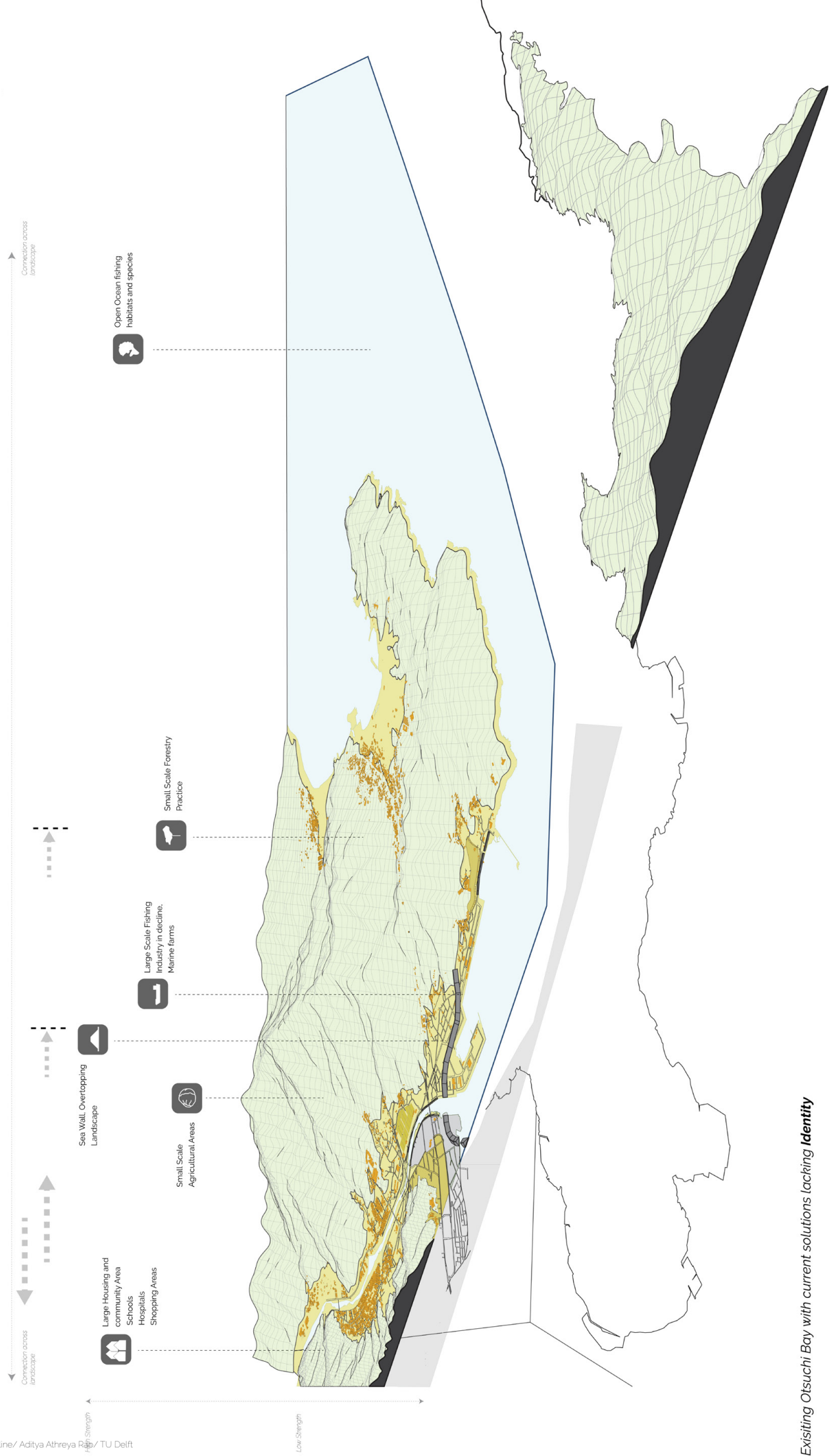
*"A protection structure that helped create ecology which in turn created the economy, which then in turn helped fuel the life and culture of Otsuchi and its surroundings while uniting the bay."*

Picture No. 54 Concept Diagram - Uniting the bay (Author,2019)



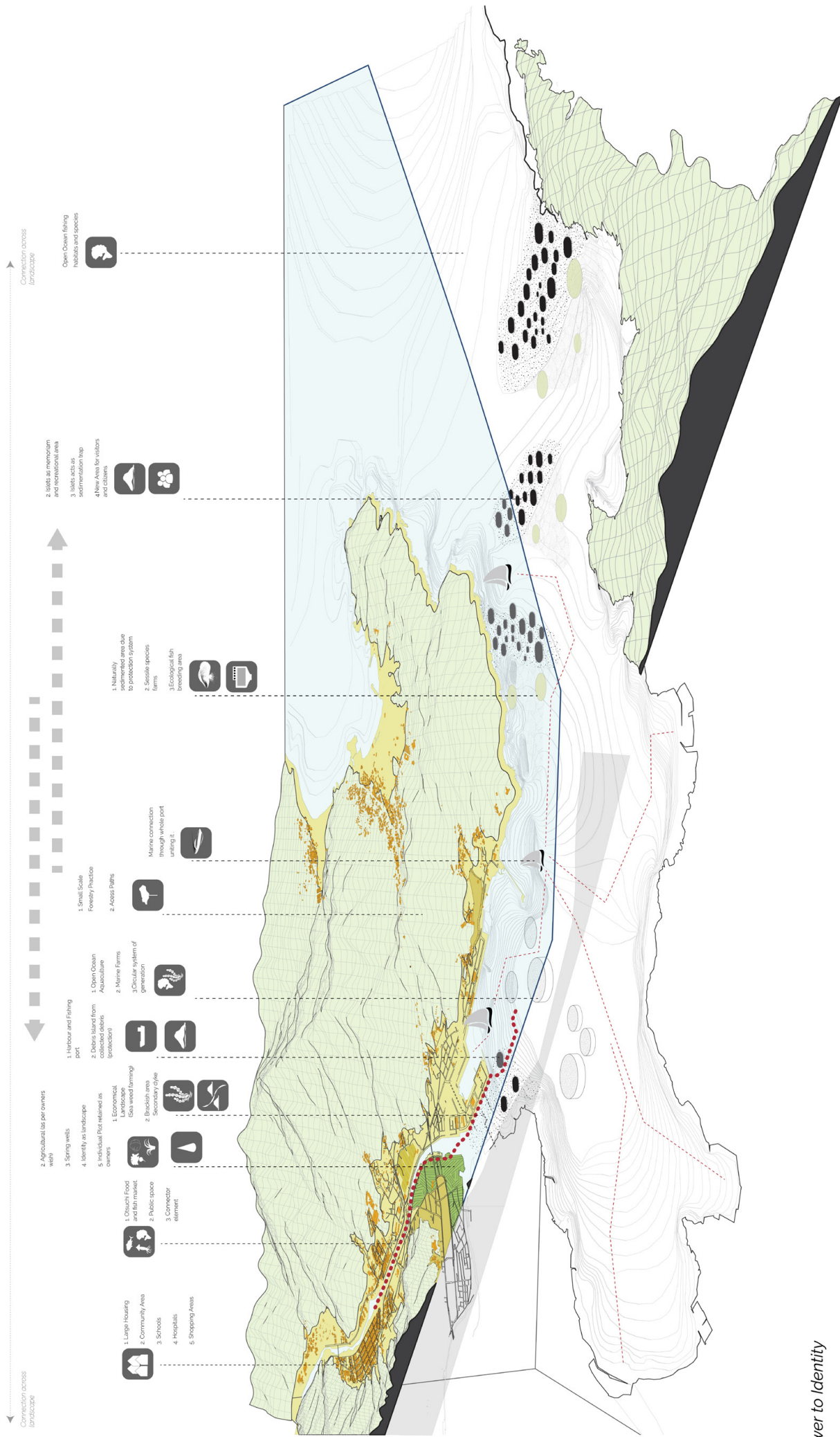


Picture No. 55 Concept Diagram - The functional aspects of the current solution (Author, 2019)



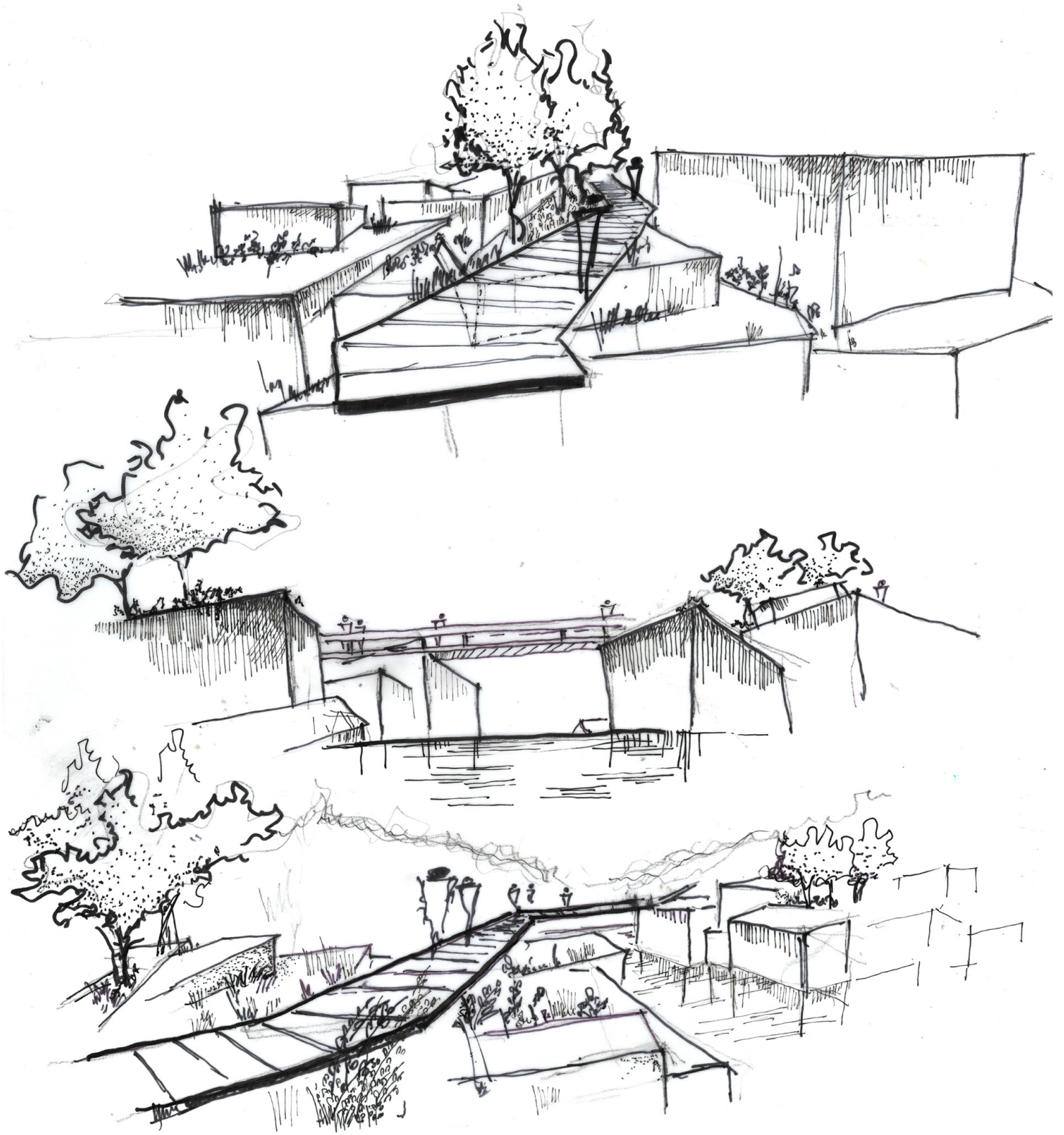
Existing Olusichi Bay with current solutions lacking **Identity**

Picture No. 56 Concept Diagram - The functional vibrancy of the alternative proposed solution (Author, 2019)



The Answer to Identity





Picture No. 57 Visualizing the Islets in the bay mouth (Author, 2019)

Seen in the left is an image of the concept as when developed to unite the bay.

The feature I wished to highlight is the idea of creating opportunities through this design and it is best seen above the drawing, showing how and what all is happening functionally to create the space and its uniqueness.

The image above shows the eye level views of what one notices while passing these islets. We look further in the report to understand why these structures are in such a spatial manner and quality.



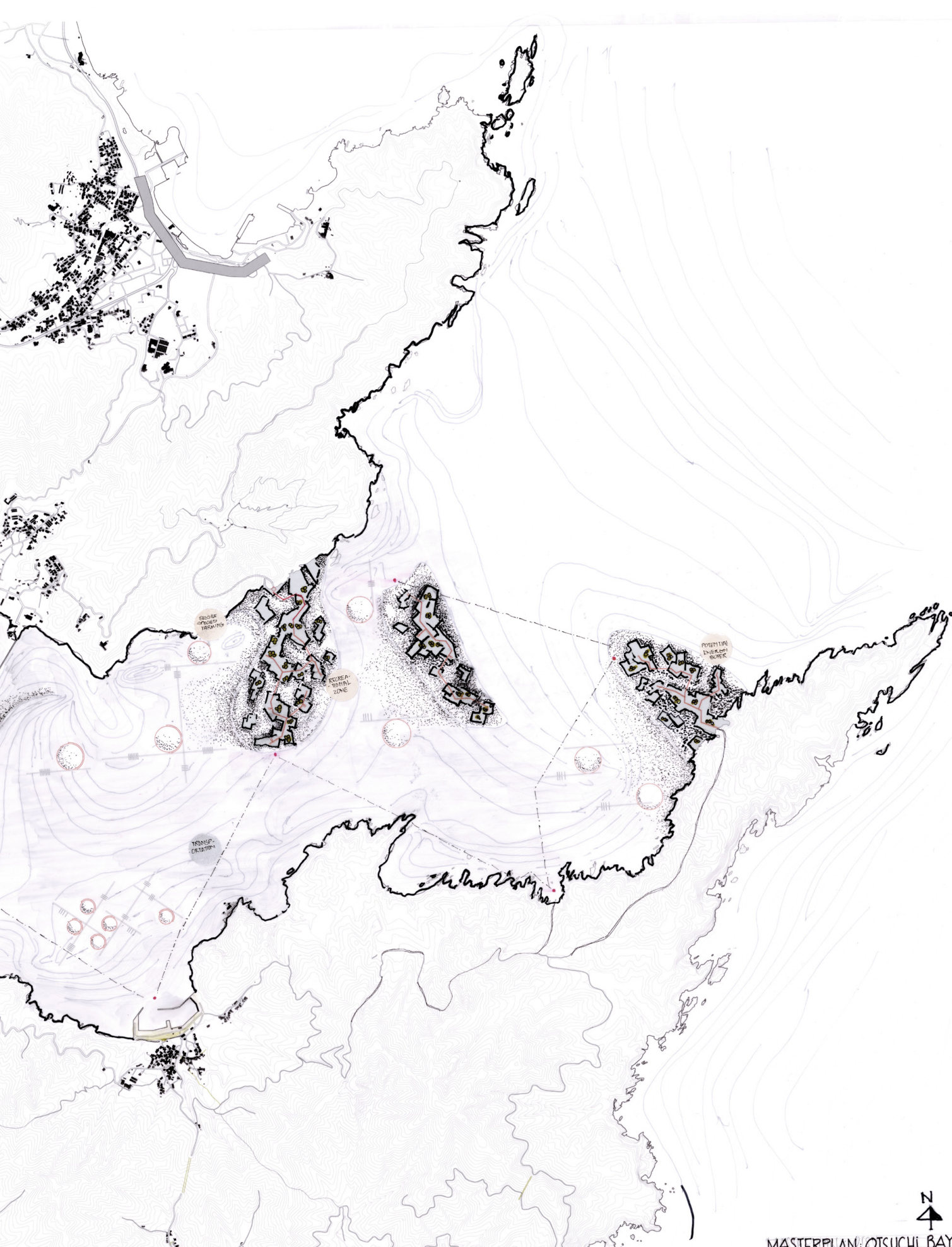
## 6.2 Masterplan

Imagining the design solution



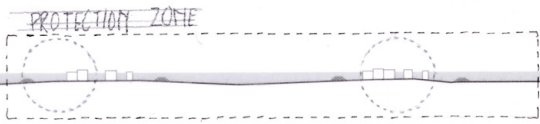
Picture No. 58 Masterplan(Author,2019)





MASTERPLAN: OTSUCHI BAY  
 ADITYA ATHREYA & RAO

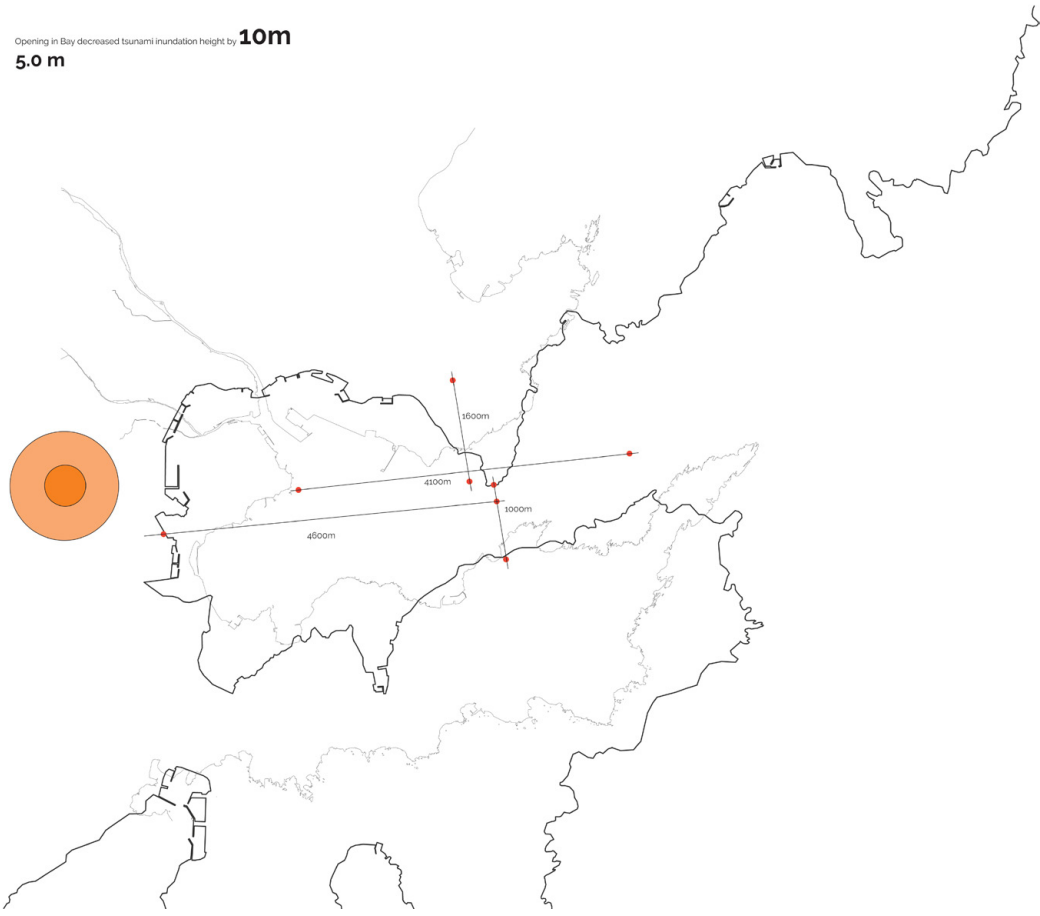
SCALE 1 : 10000



### 6.3 Protection Structures and their design

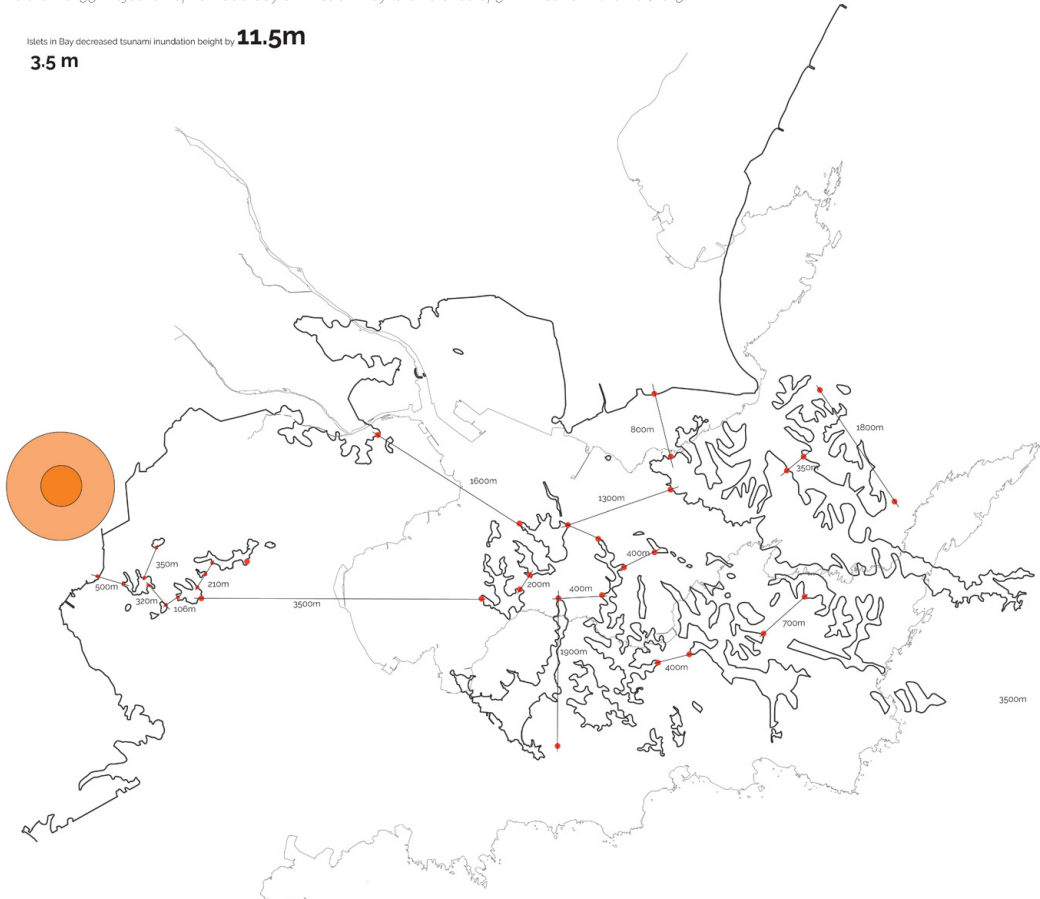
The logic behind the islets.

Opening in Bay decreased tsunami inundation height by **10m**  
**5.0 m**



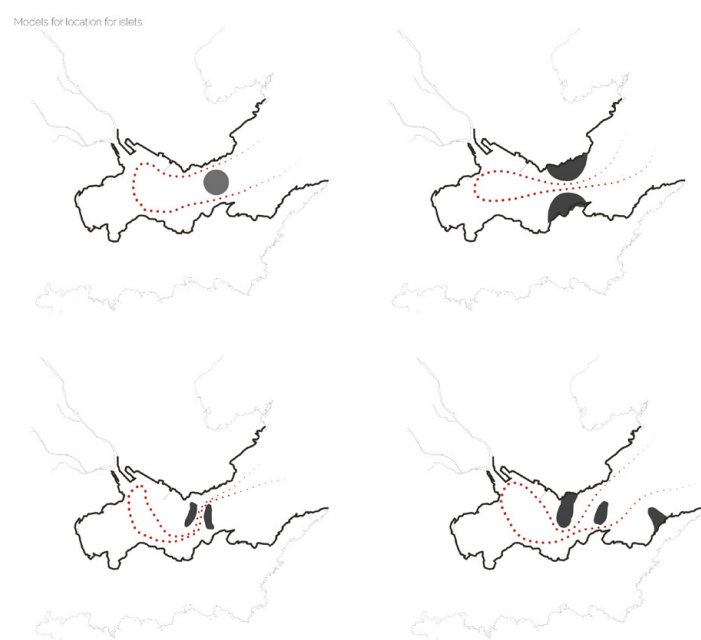
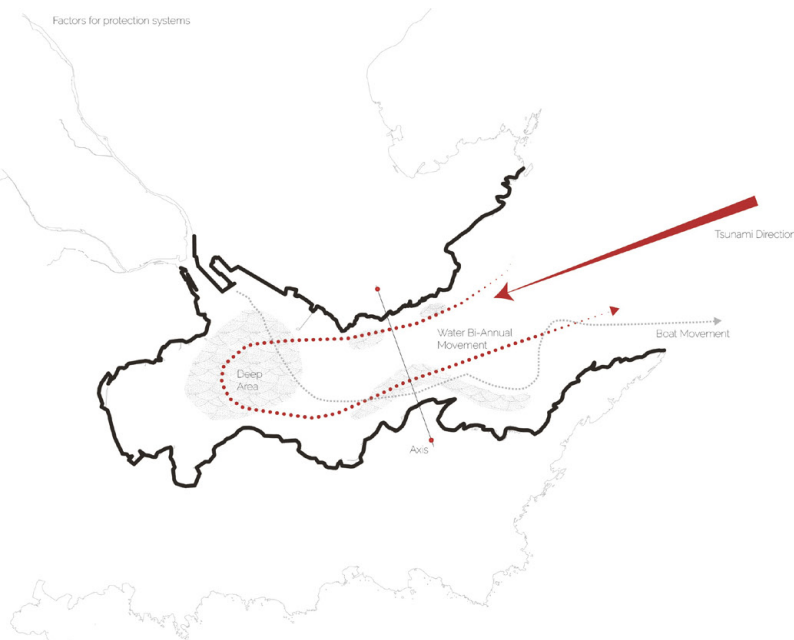
Picture No. 59 Projection of Yamada bay on Otsuchi Bay (a difference of 5m in Tsunami (Author,2019)

Islets in Bay decreased tsunami inundation height by **11.5m**  
**3.5 m**



Picture No. 60 Projection of Matsushima bay on Otsuchi Bay (a difference of 7m in Tsunami (Author,2019)





Picture No. 61 Reason for placement and location of Islets (Author,2019)

The protection structures had to have a basis for its design. It was not an arbitrary aesthetical location or structure. It was not intended to be "just a recreational structure".

That was the added benefit. The first important aspect was the bathymetry. It had to be at the shallowest possible place in the bay. According to the bathymetry maps the lowest area is 12m below the sea level but that is at its widest. So, I choose something that was 15 m below the sea level. The other aspect was the narrowness of the bay or in the diagrams the axis.

The water movement and ship movement had to be taken care of. During research I also found examples of two bays whose shape really influenced the movement and size of water overrunning into the city. Yamada bay which has a very similar size to Otsuchi bay

had a much lower impact by the tsunami even though it was only 50 km north of Otsuchi and was very close to the epicenter. It was because of the narrowness of the bay at a certain distance from the city.

The other example was Matsushima bay where a large bunch of islets reduced the height of run up of water by 7m causing only the first floor to get impacted by the tsunami. A lot of people were able to flee to higher levels of their house to escape the effect of the water.

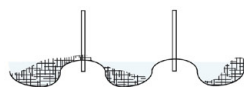
Another thing noticed was how these islets help in creating sedimentation. With a large number of irregularities in the surface it traps more sediments, somewhat similar to the idea of the wooden traps in the Wadden sea in the north of Netherlands but at a much larger scale here.

I was also inspired by the shape and scale of the islets and in picture no.60 I was trying to see how they can influence the islets in Otsuchi Bay. The sediments will go on to play a role in the larger concept to help in creating some of the other spaces in other parts of the bay.

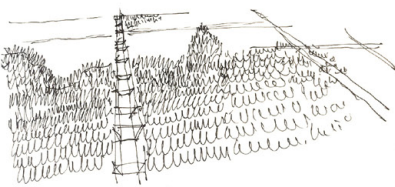
The material composition was to be made from the material that went into the land consolidation and the sea wall - granite. But instead of crushing it we could use the quarry size stones for making the islets.



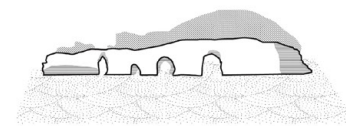
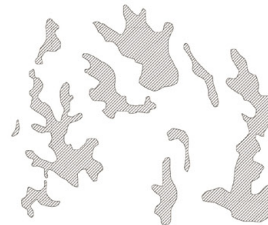
Wadden Sea Sedimentation techniques



Sedimentation in Uneven Islands



View of Wadden Sea sedimentation



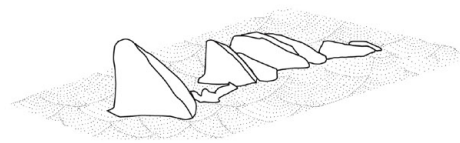
Matsushima Bay Islet characteristics



Islets creating sedimentation



Islets Location by considering factors



Group of Islets typical of Japanese Tohoku coastline

Picture No. 62 Reason for shape and design of islets and the process of sedimentation (Author,2019)



**Experience :**

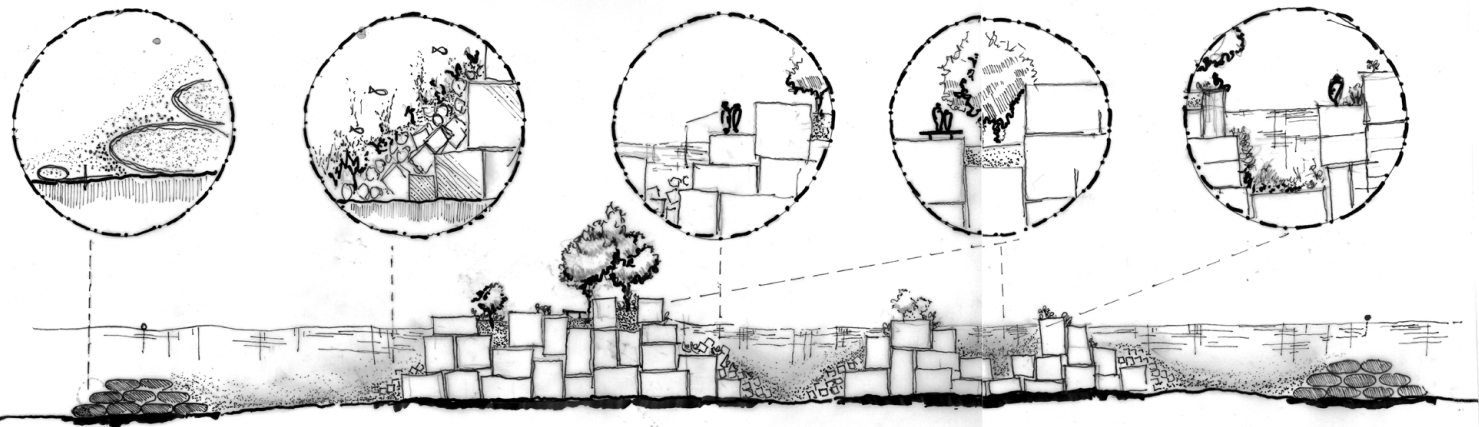
As a person walks on this forest of granite stones all at different levels, he sees small plants growing between the crevices of the rock cracks and sees the resistance of how these plants survive on any piece of surface. There are a few black pine trees growing in the corner of the eye. These black pines have survived on ocean islets like these for centuries and are reminiscent of the islets in Matsushima and other such characteristic landscapes of the Iwate prefecture.

Walking on the deck above these stone structures usually one is surrounded by large granite quarried stone, but there are many openings where one can see the beautiful horizon the blue pacific sea when the sun is setting and on the other side the light falls on the rice fields at the edge of Otsuchi which is lined by cherry trees at the distance, and the mix of the golden light reflecting off the water in the rice fields and the pink of the cherry blossom invite the eye into the interior of Otsuchi lined by some beautiful typologies of Japanese home that reminisces of the past.

These islets are places people come to remember their family that now lie on other side of the horizon, somewhere that no boat or plane can reach. They can reflect in silence as the bird calls of the gulls go through the air.

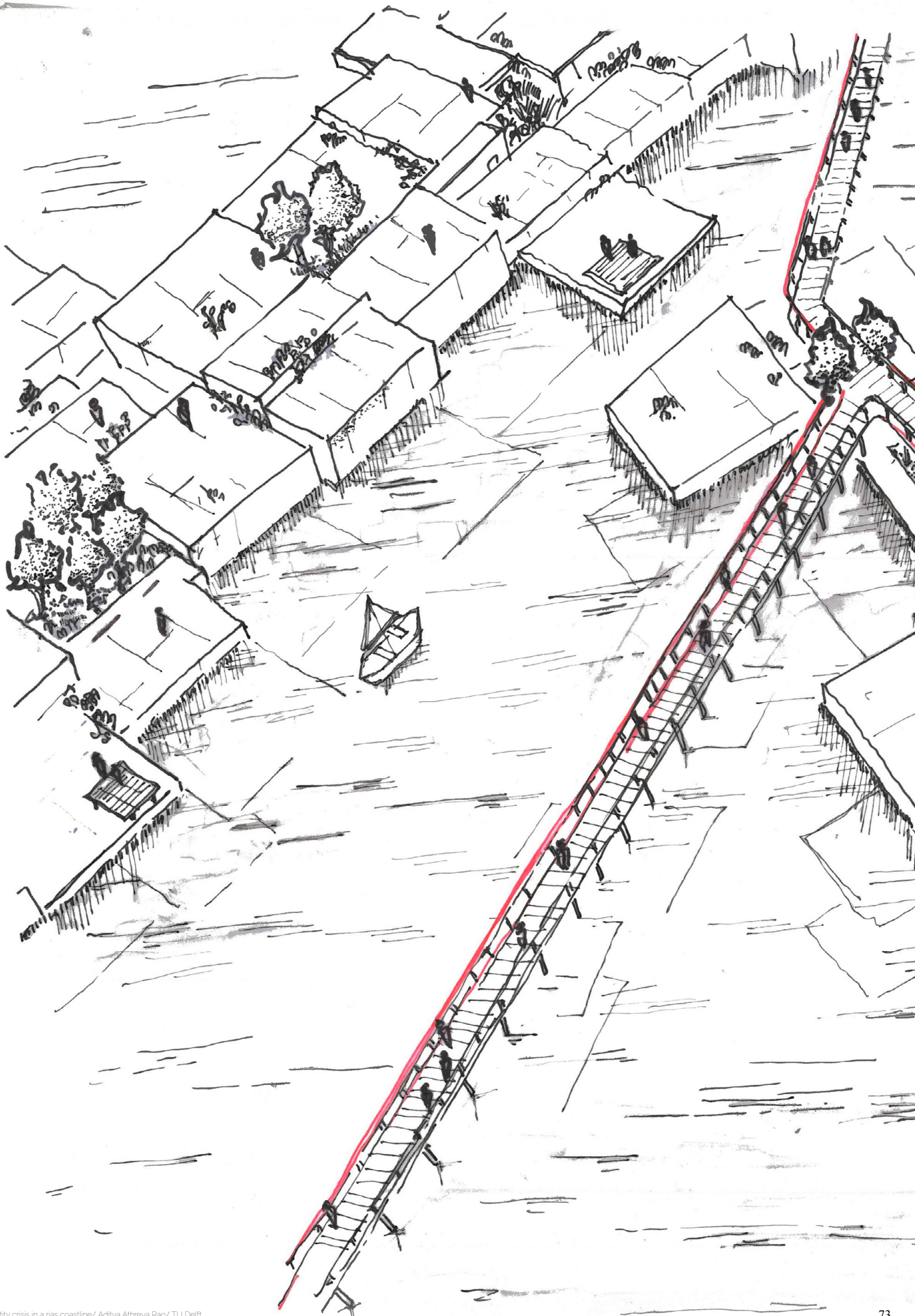
Picture No. 63 Cross section of the islets and view in between the granite rocks. (Author,2019)



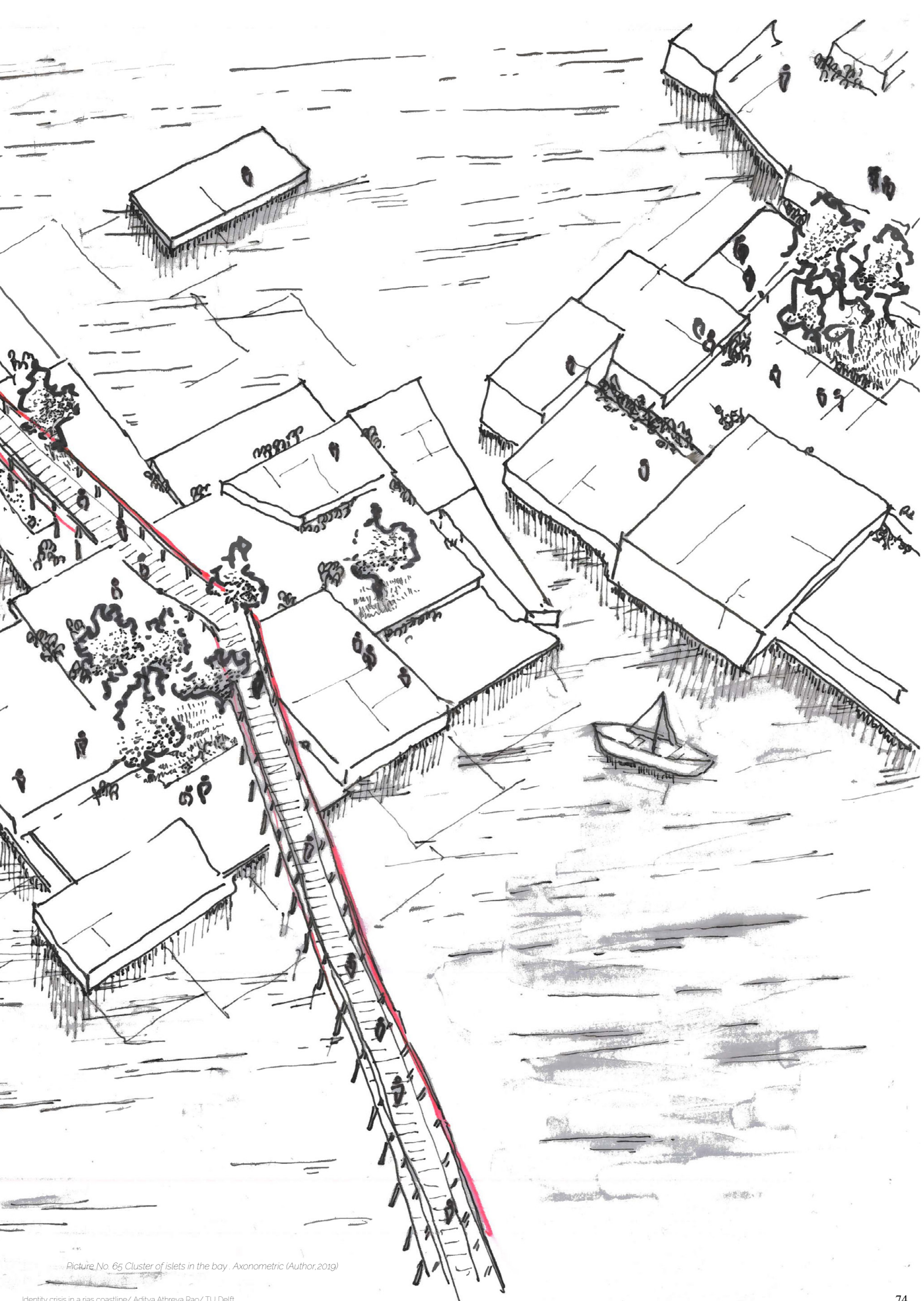


Picture No. 64 Cluster of islets in the bay - Plan and sections (Author, 2019)





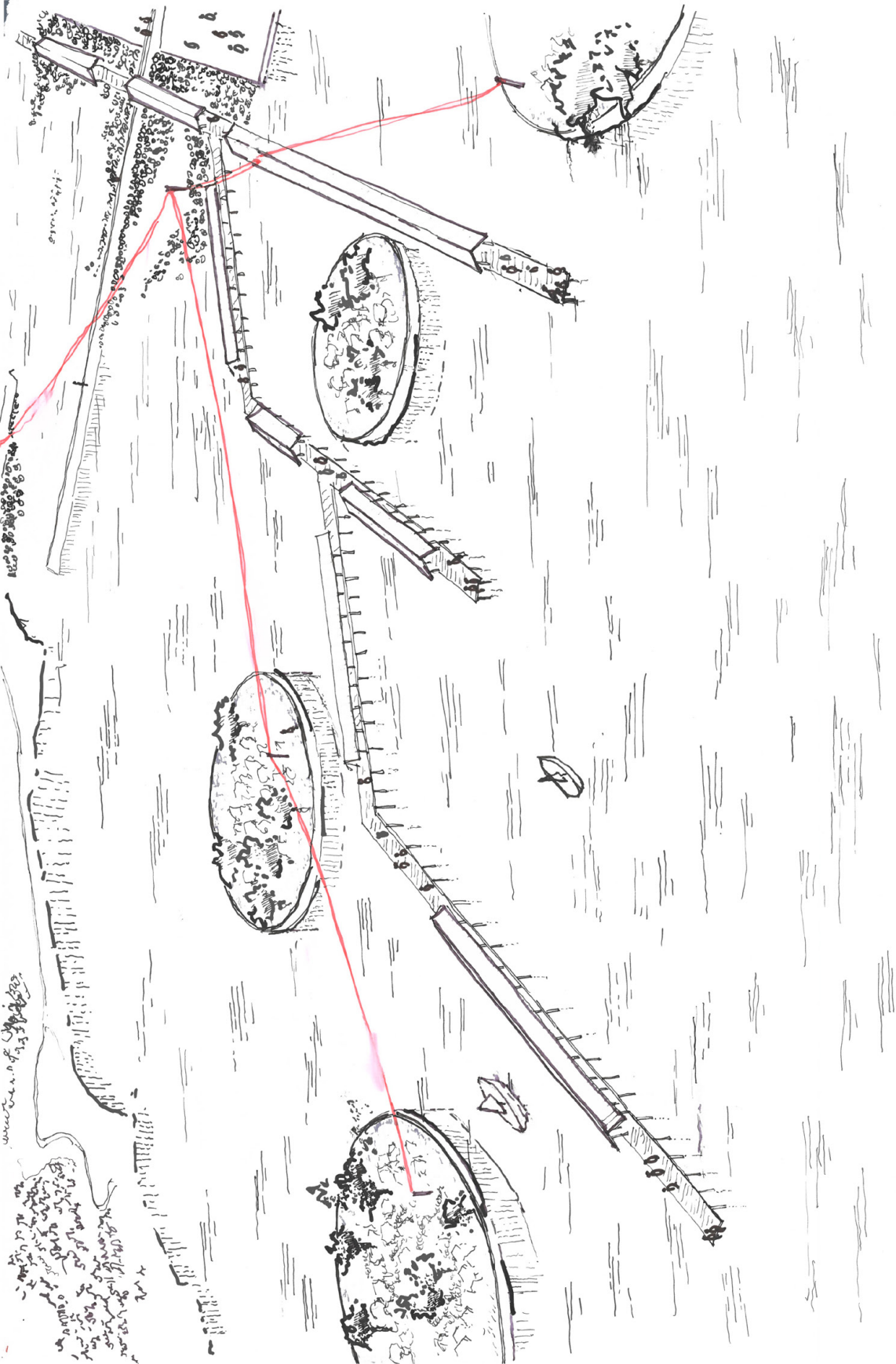




Picture No. 65 Cluster of islets in the bay . Axonometric (Author,2019)

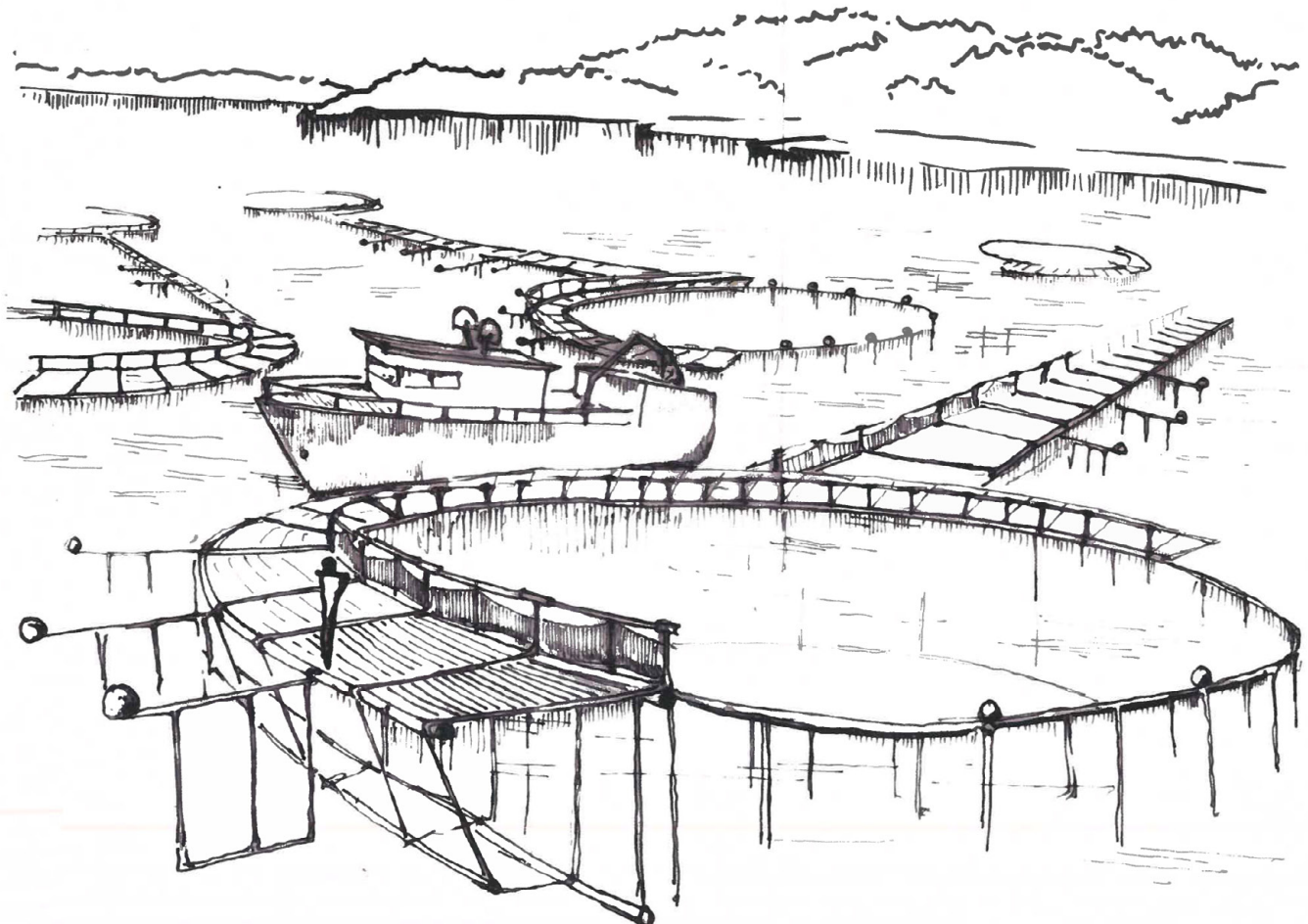
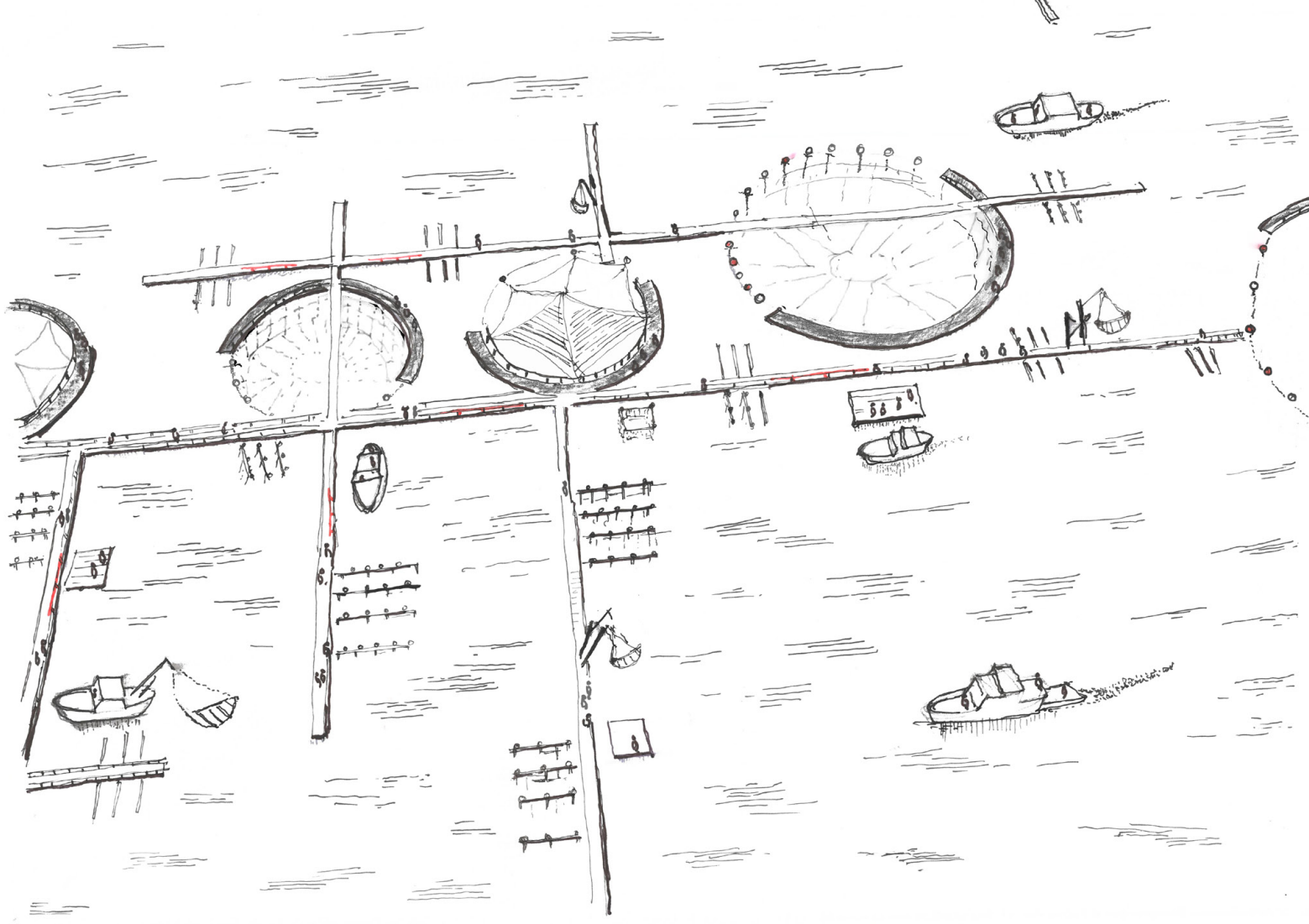
# 6.4 Economical Structures and their design

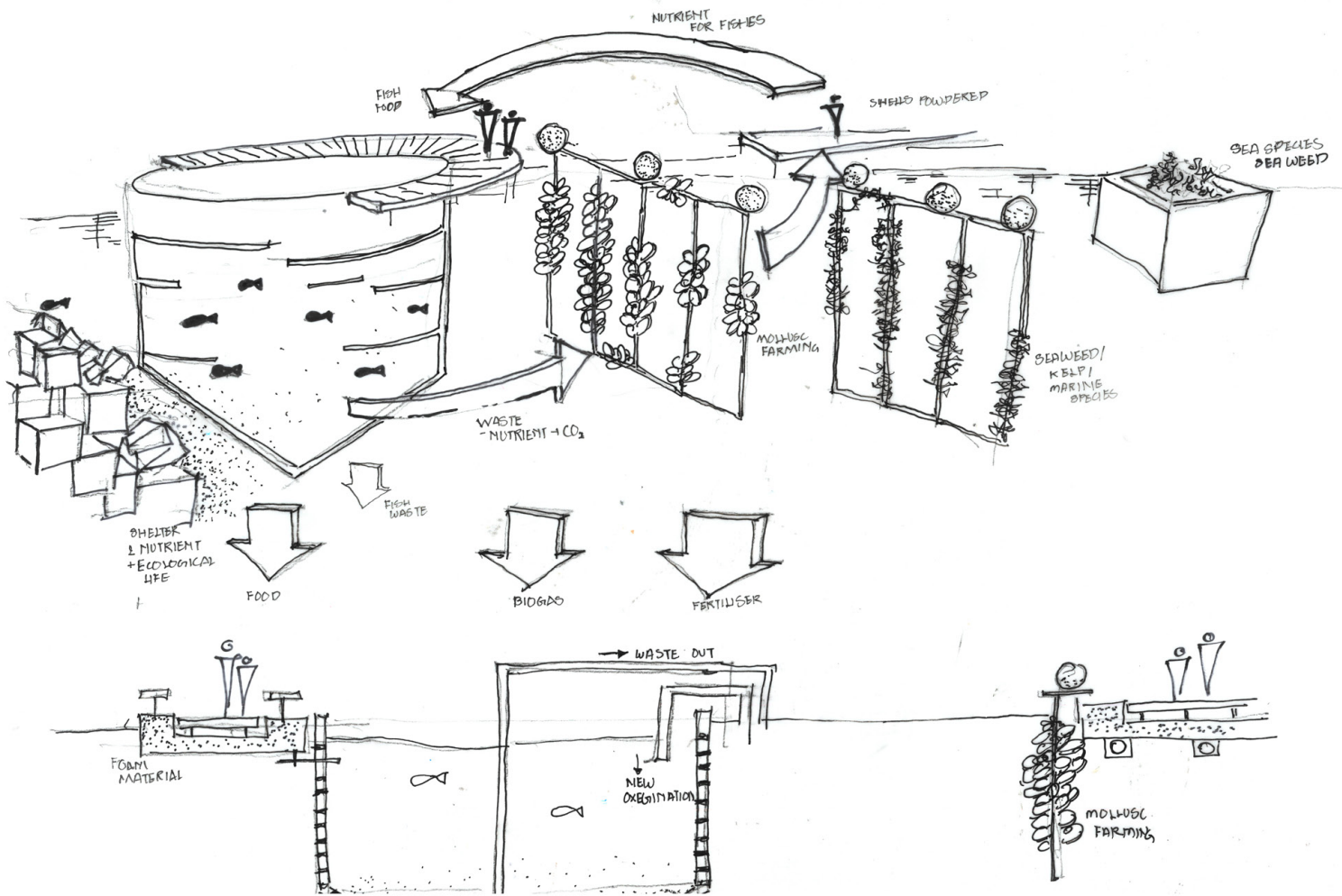
The logic behind the economic zone as a resultant of the protection zone



Picture No. 66 Economical Zone Plan. (Author, 2019)







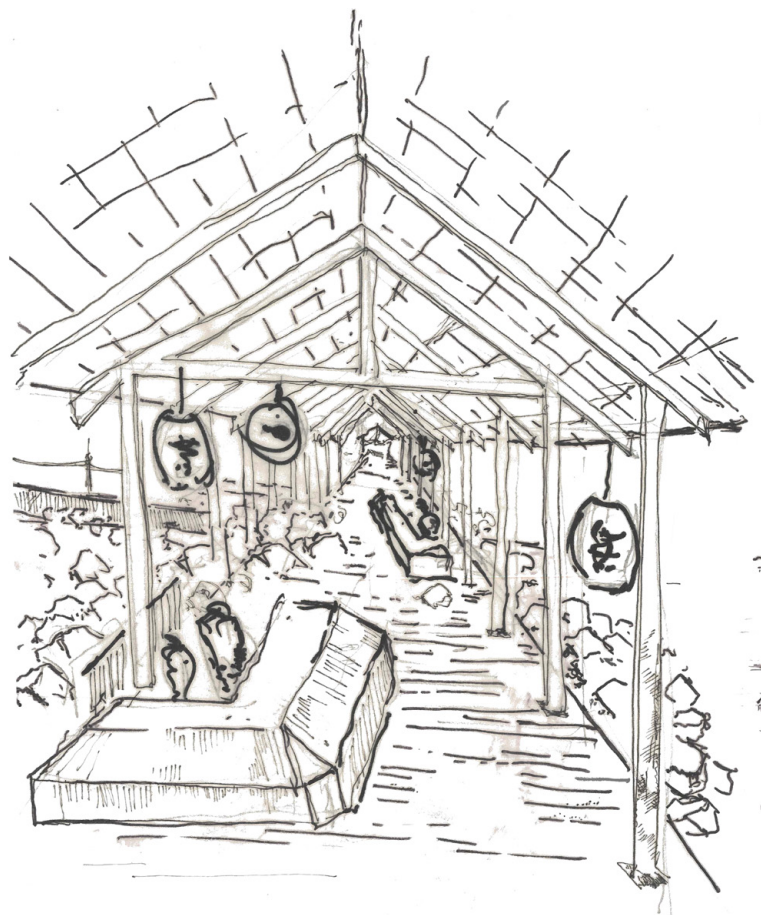
Picture No. 67 The system in the economical zone. (Author,2019)

As a resultant of the islets in the bay mouth a lot of changes start appearing in the interior of the bay. This is best personified by the economic zone which is a resultant of this. The idea is that commerce in the bay is not a new thing with marine farms existing already in the current solution, but they are isolated in its systems.

Here, the idea was that the marine farms which would now be open ocean aquaculture would be a part of the larger system. They would feed off the system and into it.

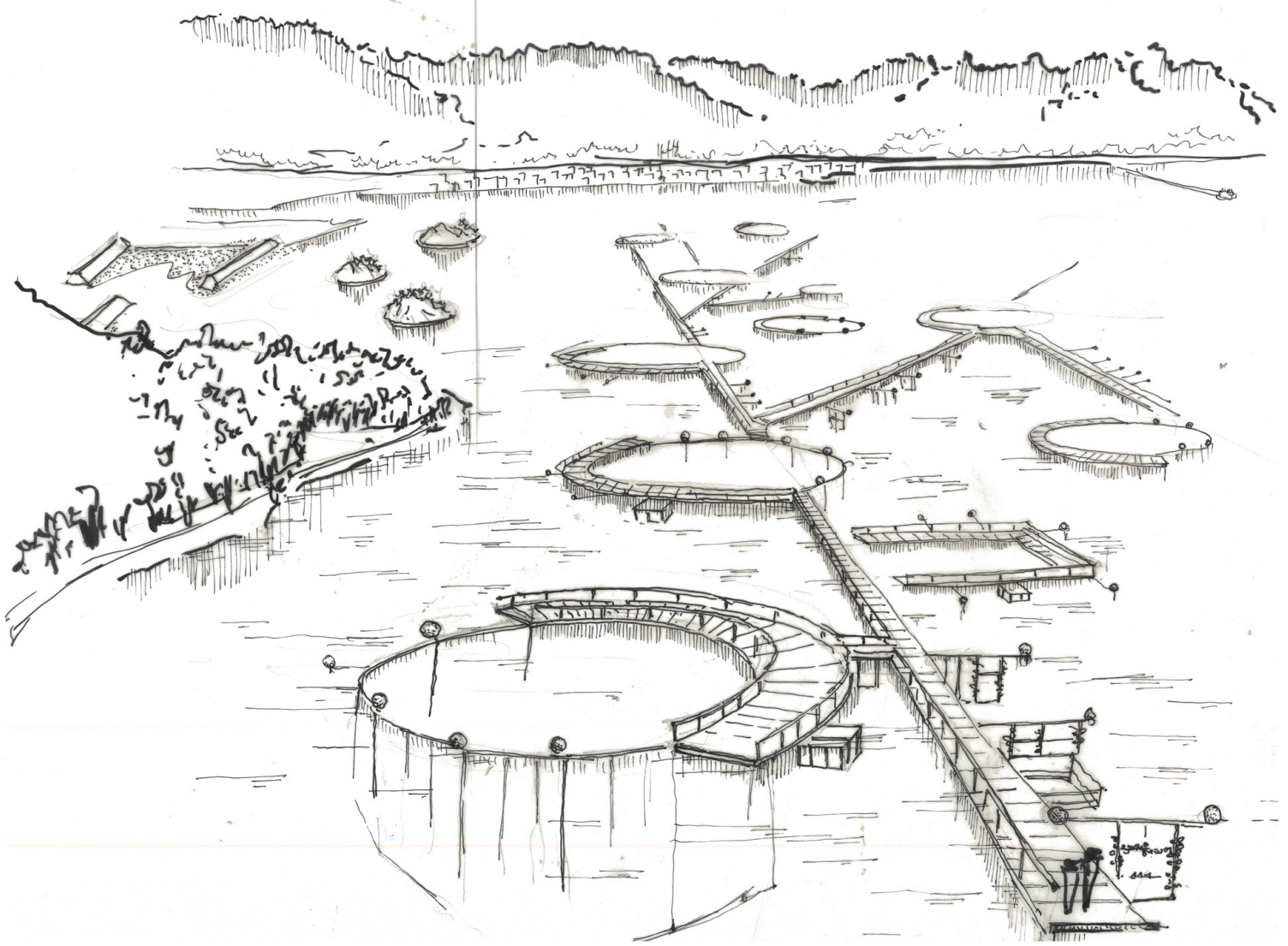
Firstly, it was imagined that the sedimentation caused by the islets would be a place where the fish could breed, a rich ecology of other sessile and benthic species form and where many other species would go annually. At the same time, they would be caught annually inside open ocean tanks where they were part of a larger circular system displayed in the picture no.66 above.

The fish waste could be used as a byproduct in fertilizer biogas and as manure in the rice fields. The waste that also filters through acts as food for the sessile species like abalone, sea urchin and oysters, when the shells of these are crushed act as food for the fish. The seaweed in the system acts as a purifier for the whole system.



Picture No. 68 The fish and food market selling the product (Author,2019)





Picture No. 6g Aerial view of the economic zone (Author, 2019)

After all these the fish and the sessile species act as an important food source of course. It would also help to grow marine forests in the shallower areas as another source of economy.

Besides being a circular system at this level at the larger scale the migration of fish upstream and the downstream movement to the sea front islets for breeding is encouraged.

And also, the species that lie at the edge of land and water now have larger places to reside such as in the nooks and corners of the islands. It could provide incentives for many businesses besides helping the new local market to revive in food industry, besides the fishing industry of course.

Then these spaces were made spatial by thinking how people can walk through such an economical landscape while learning about fish, the species and a sustainable way of conserving them and at the same time farming them.

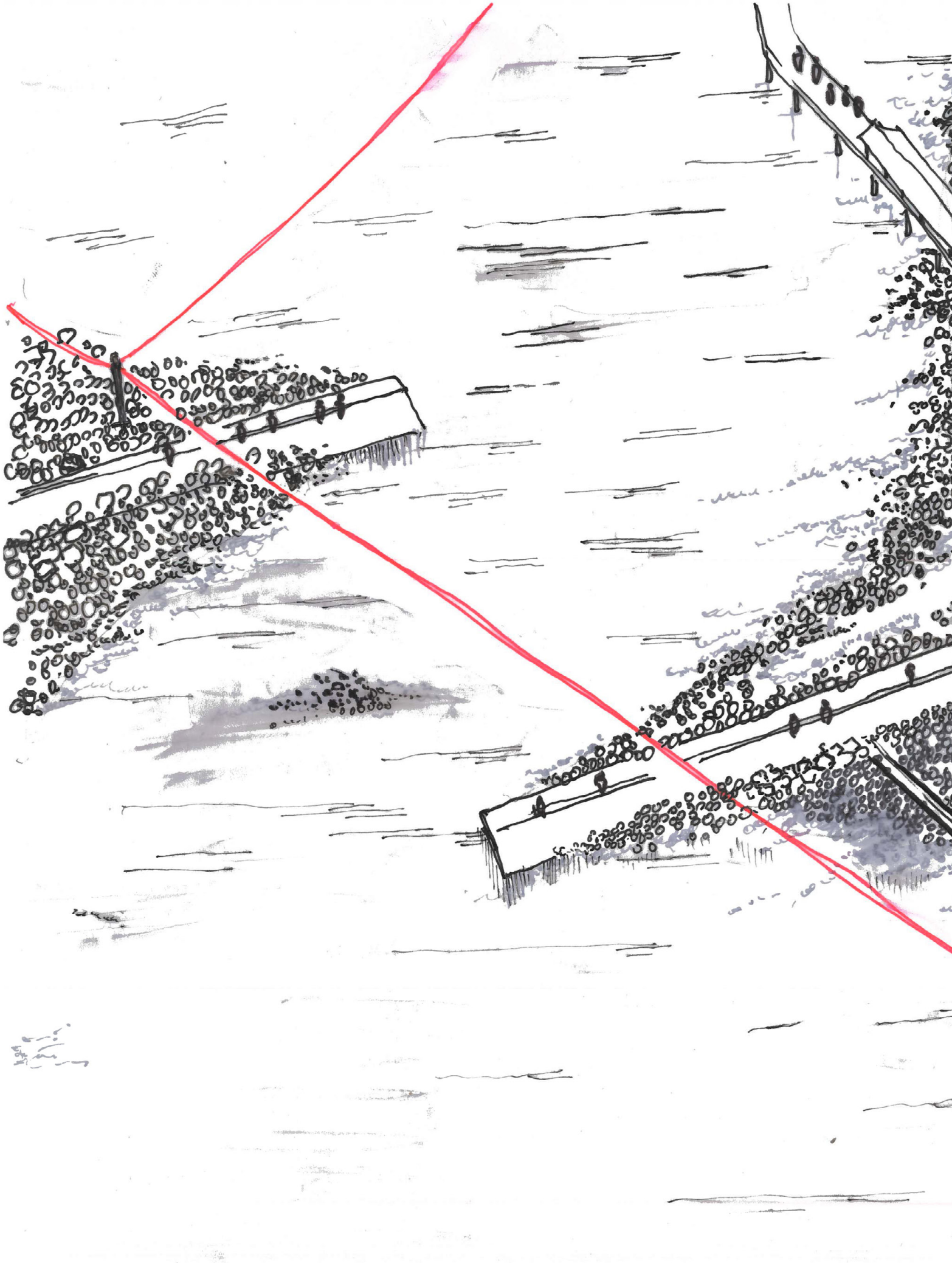
It is an approach of aquaculture where supervision is necessary fishing trawlers, equipment, and movement of goods would be a part of the design language. This creates a machine landscape in this area that would invite the curious and the eager.

As we get closer to the coast, I wished to think of a way of reusing the debris to create smaller islets held in a certain way that continues to act as a potential energy buffer for the forefront of the village. The existing harbor would have to be possibly re looked to create a larger capacity for a larger number and variety of fishing trawlers.

Also a few commercial transportation barges would go through these areas connecting each village. This meant that in essentiality someone from Otsuchi could be working in Ando or the village across the bay and in the economic area without having to go through a lot of hills and tunnels to reach their workplace, or their home.

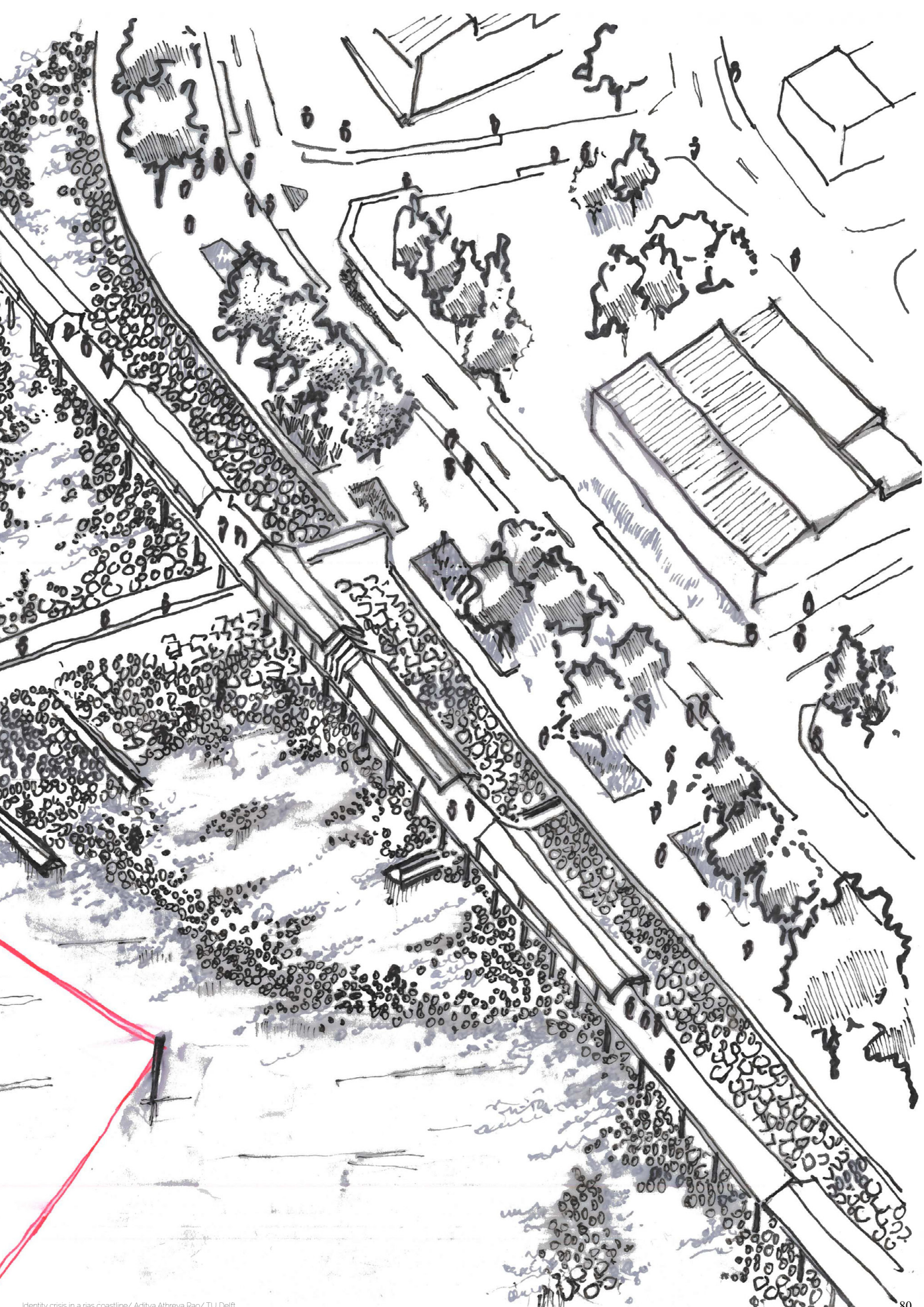
As like most of the solutions here this acts as an enhancer to opportunity for the actors.

The people would now be a joint Bay of Otsuchi citizen.



Picture No. 70. Seaweed landscape and fish market. Axonometric (Author, 2019)







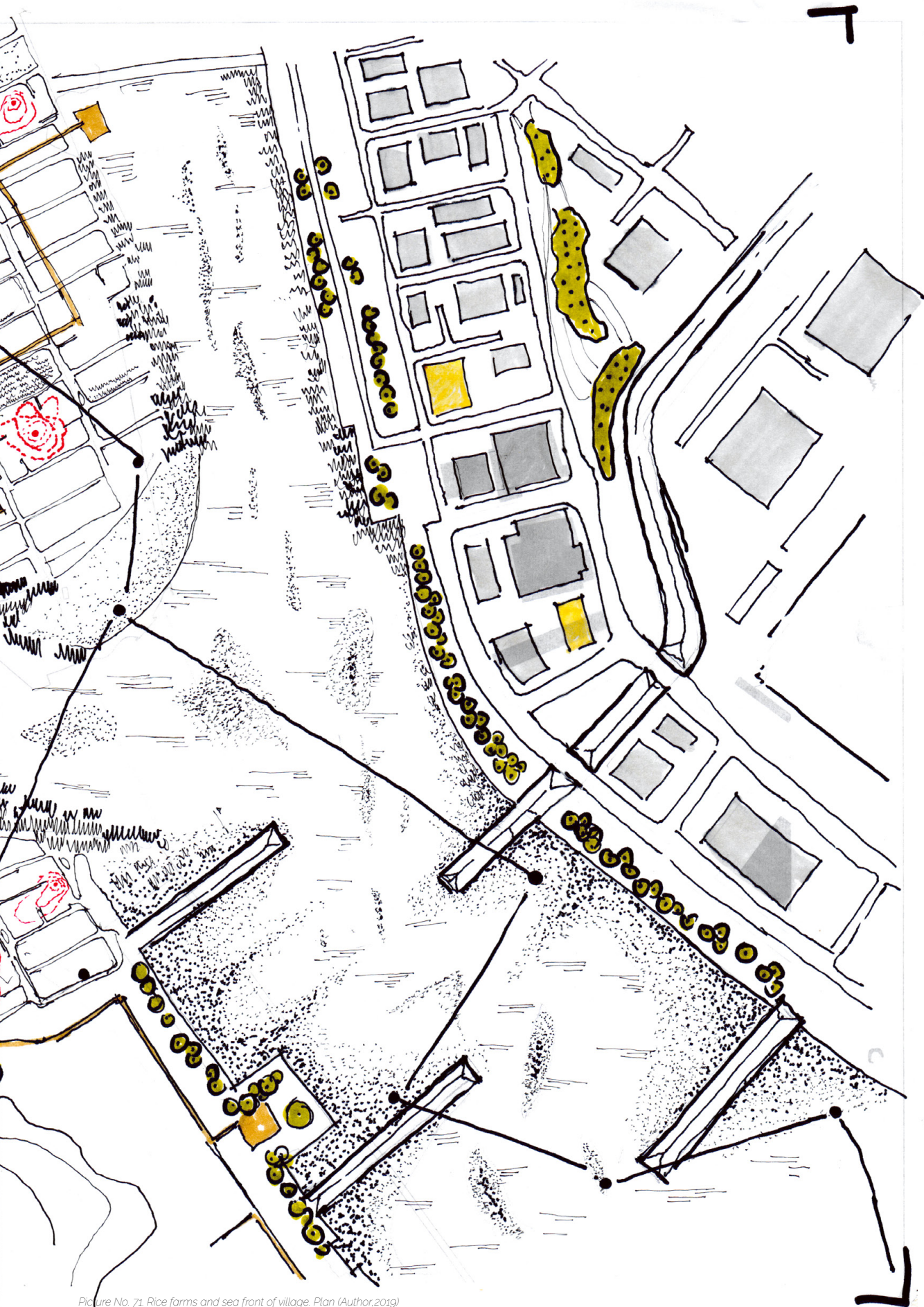
## 6.5 Town landscape and the design

The resultant of a new unified landscape for the town of Otsuchi

Picture No. 69 Otsuchi Village forefront landscape. (Author, 2019)

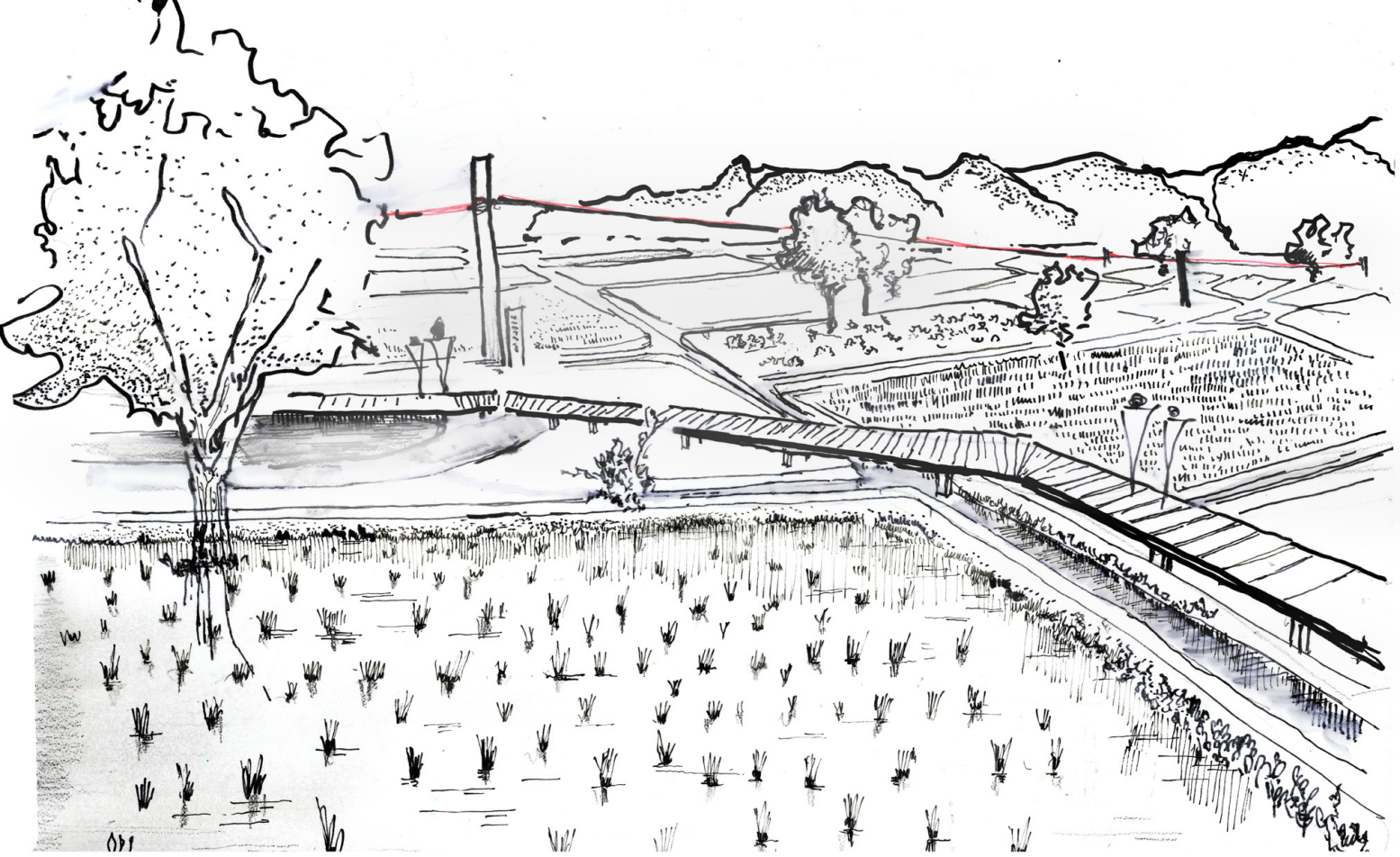






Picture No. 71 Rice farms and sea front of village. Plan (Author,2019)





Picture No. 72 Otsuchi Village rice fields. View (Author,2019)

The village opens out to the bay in this area and I re imagined it with rice fields. Why? Due to the historical relevance of this piece of land.

At the edge of land in Otsuchi once not so long back was rice fields facing the sea. Imagining the sunset over water filled rice fields while the sea stretches out after it in the horizon is an image that fills the mind. Why is this piece of land not built upon? It acts as an overtopping area in case of the tsunami.

After the potential energy buffer from the 3 set of islets and then the debris filled islets there would be smaller soil dykes in the opening between the harbour and the hill.

In case the water still comes in this acts as a flood space that collects some of the water before it impacts the houses that lie beyond this space, as in the current governmental strategy.

Currently this area is a region of active spring wells and water basins. It is also a brackish landscape since the water from the sea flows in through small channels, in here.

It is also an area that these spring wells form small ponds where species unique to Otsuchi thrive, the "three spined stick-leback" Sea grass that is unique to the estuaries and Rias of Iwate grows here.

The design is based on many such identities. Rice fields were proportioned according to a scaled version of the ken system which is historically how the fields were divided in Japan. 1 ken was 1818 sq.m which was basically in form of a square of 1 cho which was 109m\*109m. This was then proportioned into 1 tan which was 18 \* 54.8m. Taking this as 20\*60m rectangles and then forming a square of 60\*60 this land was divided to create

a pattern that had a historical, traditional, cultural but also an aesthetic significance. The patterns were divided by small streams that source the mountain water down to the bay. The overflowing spring water goes into these streams also. In between this landscape of rice fields was scattered the many springs that exist over here.

They were given significance by the help of Shimanawa ropes that connect across the landscape and go out to the sea. Each point of marriage of the Shimanawa rope with the soil was marked with the names of people who died there in that plot of land.

This connected the land to their owners. It also allowed the owners to be responsible still for their plot of land. They could farm in that piece of ken if they choose to do so, and slowly this landscape would evolve into something more personal. It would give this city an identity beyond just a re-built city.

There are many other elements that would go into this space to make it personal to this city that I do not go into here -

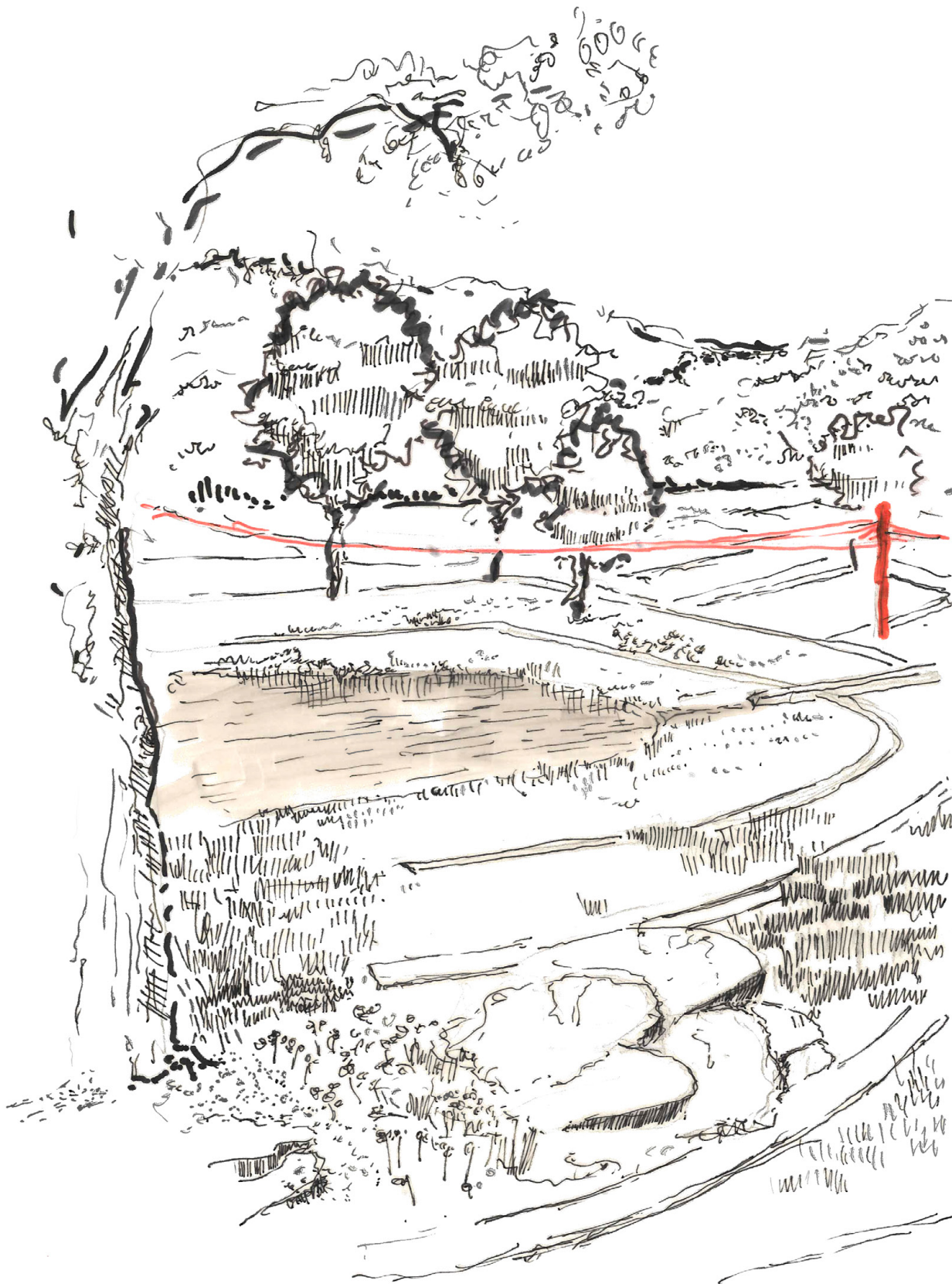
A. The market going through the city would connect land and sea and act as a stitch in the landscape

B. The smaller dykes in this harbor would help grow the seaweed through an active mixing of salt and fresh water and act as a small-scale industry for Otsuchi.

C. The springs themselves are a strong design element I don't go into here.

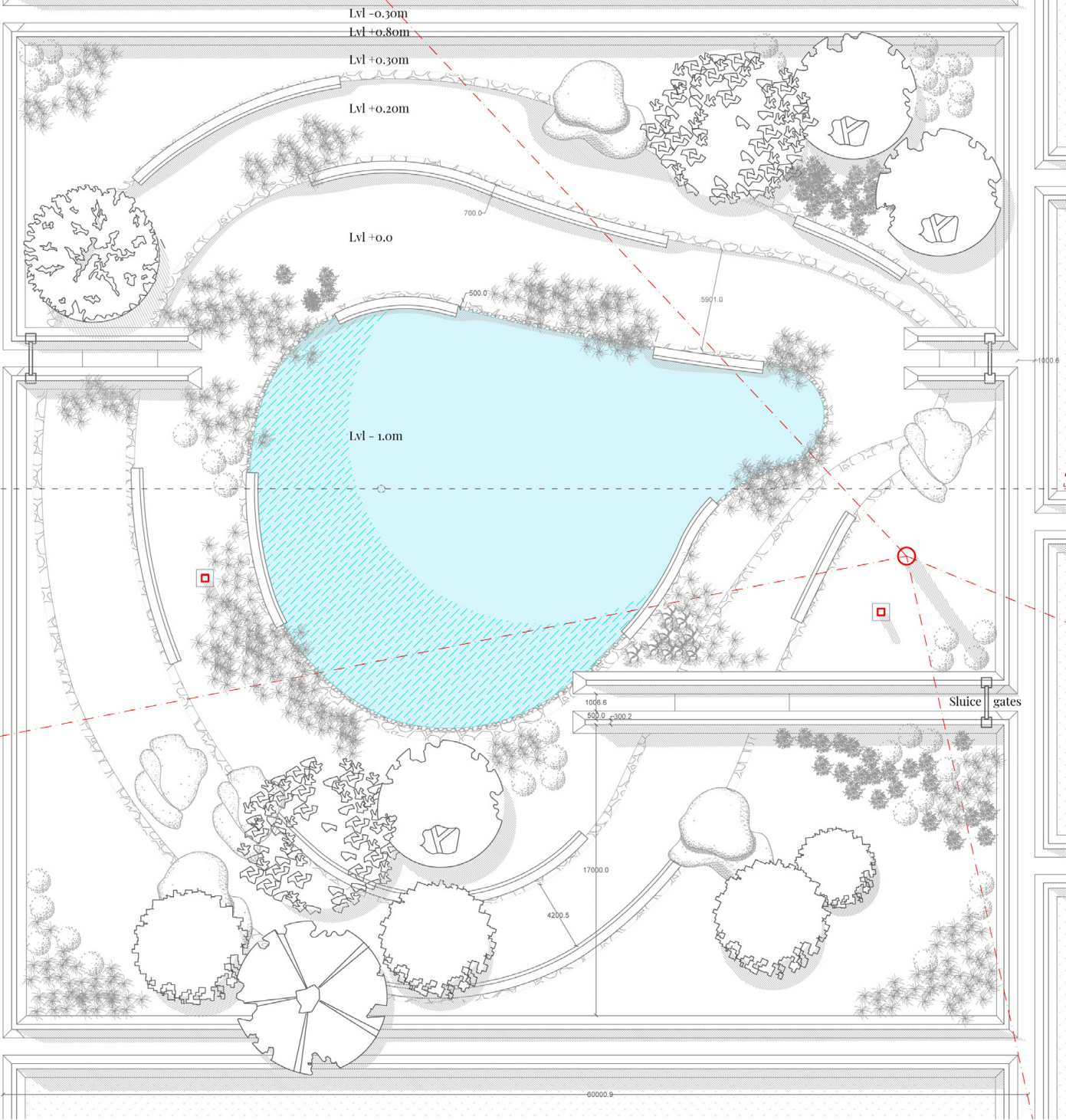
D. The border between river, land and city would be more blurred and not be an absolute border as it is currently.



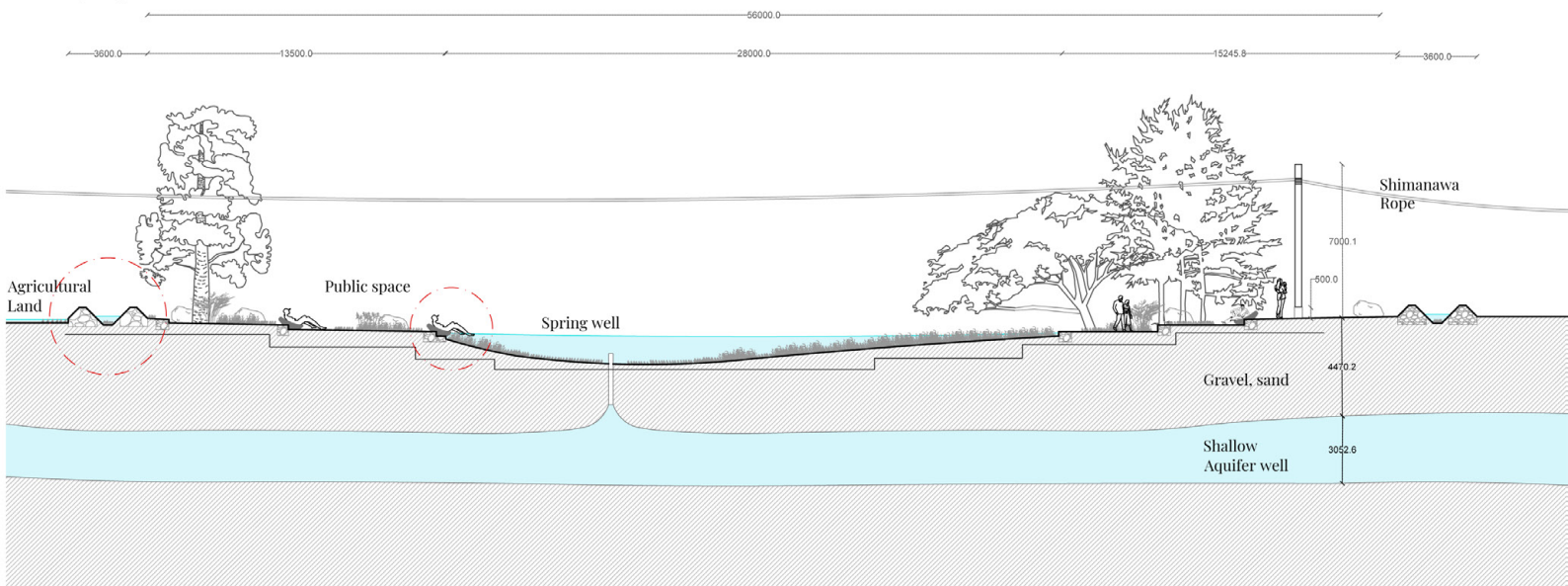


Picture No. 73 Otsuchi Village spring water points.(Author.2019)

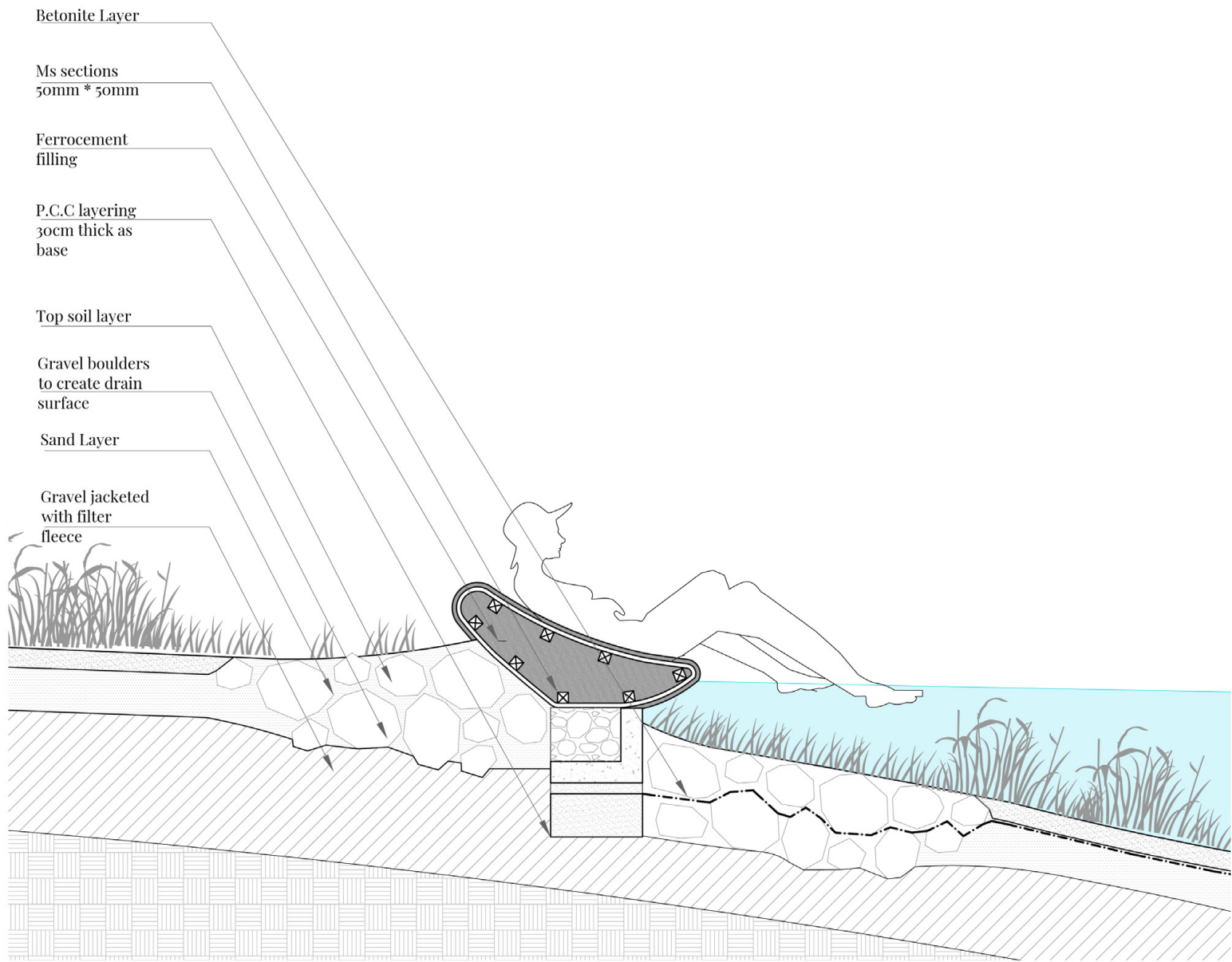




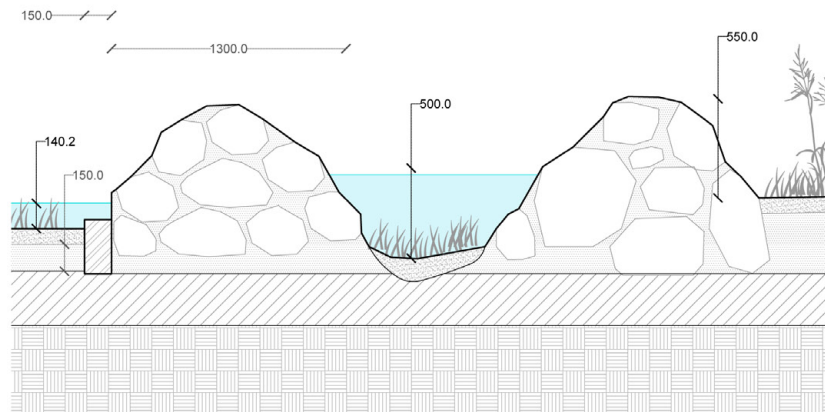
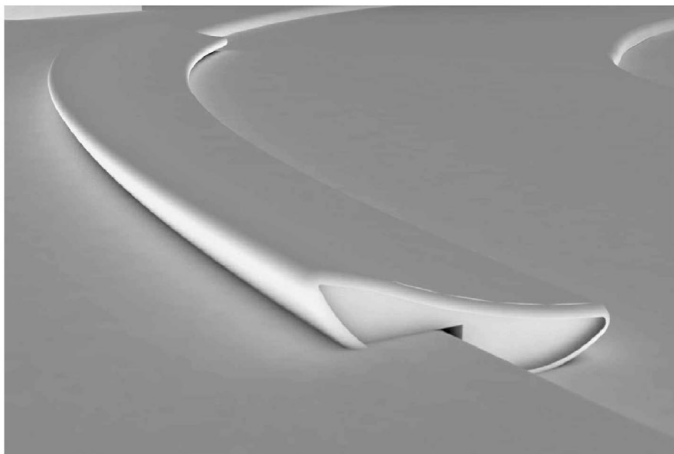
Plan - Spring well Area



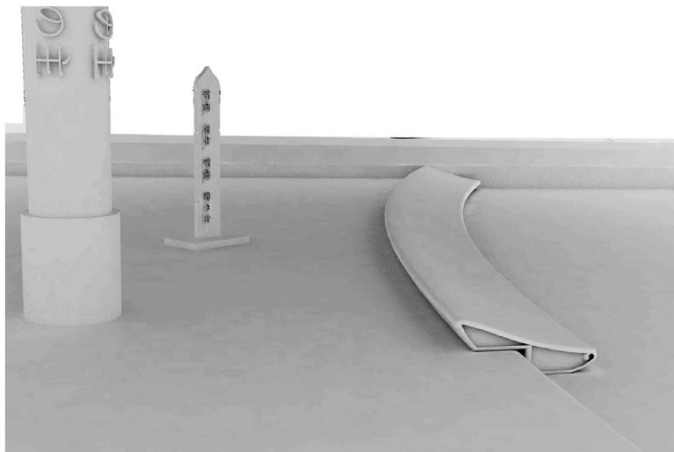




Detail A - Seating design and spring well edge



Detail B - Trenches and water gullies



Monochoria korsakowii



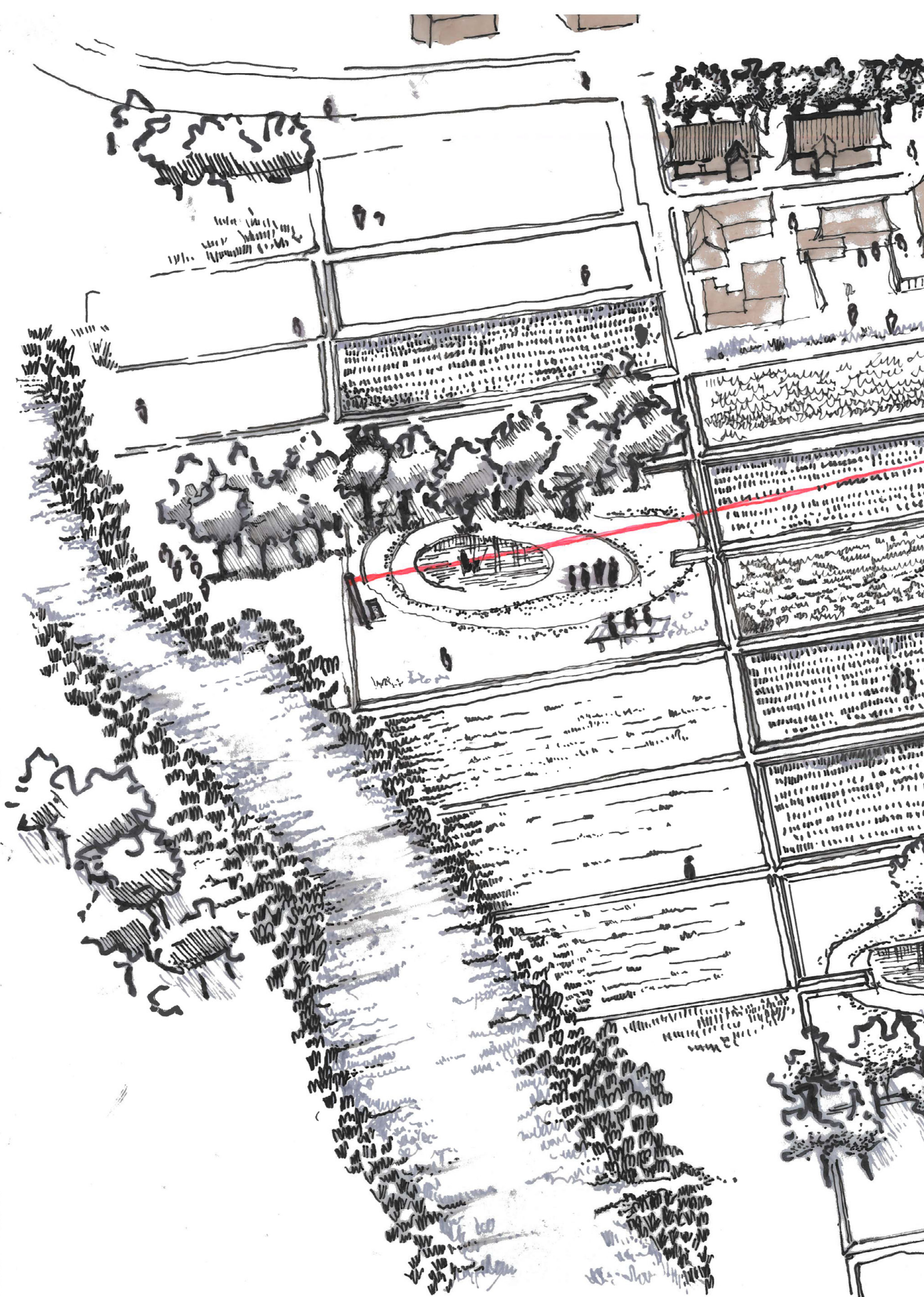
Penthorum chinense



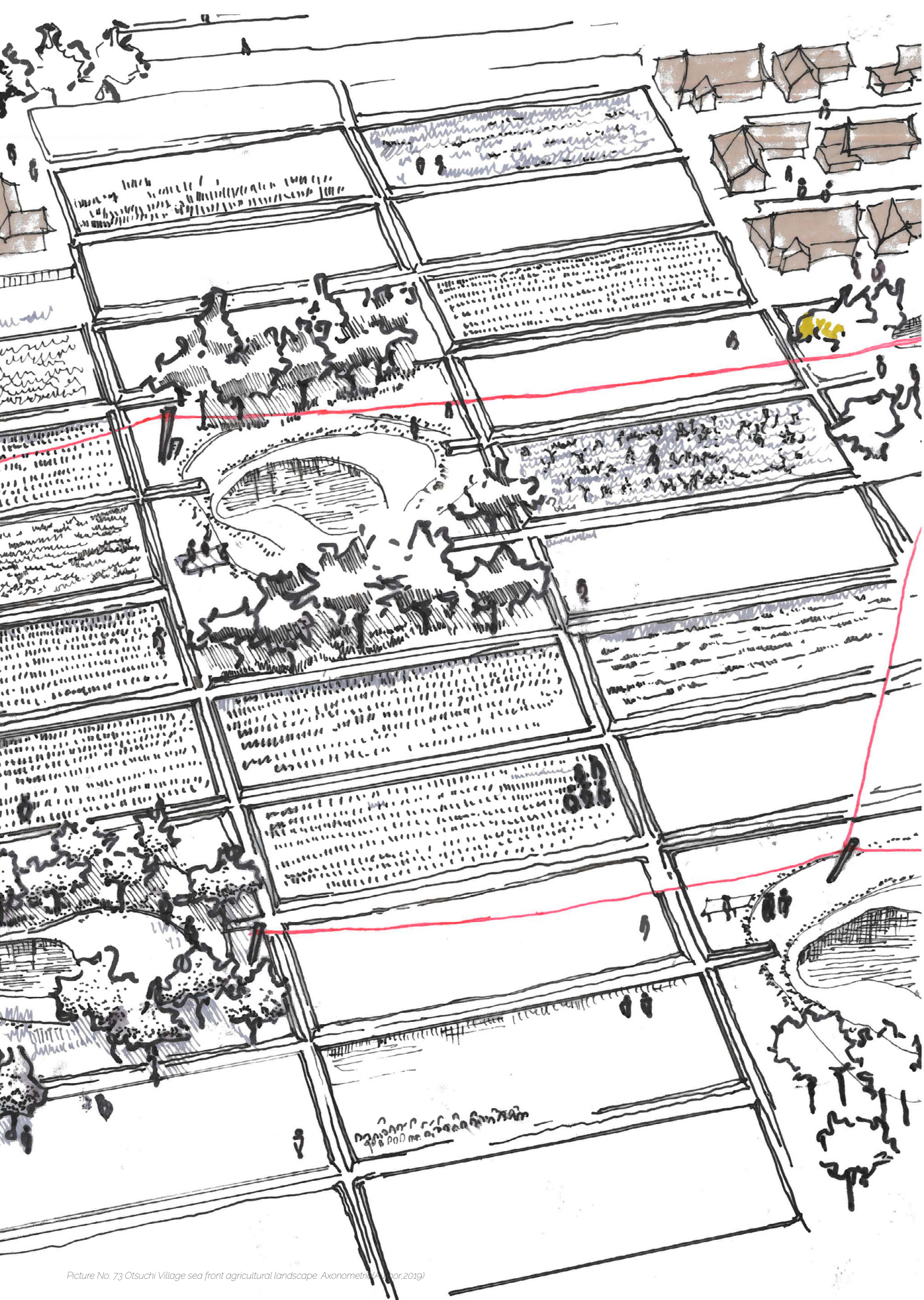
Japanese Brackish water seaweeds

Plant species in spring well and brackish region









Picture No. 73 Otsuchi Village sea front agricultural landscape. Axonometric (2019)



## 7.0 Virtual reality as a design tool



Picture No. 74 User experience by mentors. (J. Deuskar, 2019)

*Design after spatial and programmatic planning involves seeing what the user sees on site. Many a times this is a step that cannot be accommodated into design as we previously had a limitation in knowing what the sense is a person feels like while walking through the design. We make smaller scale 3d models, collages and 3d views to compensate description on how we feel in the space, but it does not give a total and complete idea of what this is like in reality.*

*With virtual reality I wished to understand what the design would act, to a user. It would no longer be a static model one would see after putting a plan into the third dimension.*

*As a tool currently 3d renders/collages are seen more as an output tool and VR stands out against that by allowing the designer to change shapes and sizes of the spaces constantly and see the virtual reality effect of this space constantly. Doing this makes the designer go back once the result is not satisfactory to create something in the second dimension again and then back to reality.*

*This is a repeated iteration that requires the designer to evaluate materials, techniques, scales and proportions besides the sense of space as one walks through his/her design.*

*Virtual reality also allows interpretation of various users, not just the designer. Further on if this research were to be taken to the next level. It would be highly useful to test the reaction of various actors in this space in virtual reality and see what they sense about the space. It is a very participatory process but one in which the various users can experience firsthand the resultant of the designer's idea.*

*I used this tool to visualize the islets and agricultural area in the design to give a sense of quality of what one gets for piling large granite stones and creating patterned rice fields with spring wells. The visualizations helped me realise how one could adapt this space to work it better and improve the user experience.*





Picture No. 75 Sneak peek into the virtual reality world in a 360 globe view. (Author, 2019)

# 8.0 Conclusion

## 8.1 Conclusion

Summary of the design story for Msc Landscape Architecture graduation thesis

*A year in research of the town of Otsuchi in Japan.*

***How could a Landscape Architecture approach towards design have created a tsunami protection that respects the genius loci of the different places?***

*As a landscape architect the reason I took up this project was the multidisciplinary aspect of it, yet out of it rose more the idea of an strength of landscape architecture as a profession individually while also working with this team of engineers.*

*Japan has a strong history of disasters; it deals with these like the Netherlands deal with its floods and being above the sea level - with constant resilience. The rather larger impending danger is that of an aging population, deserting places like Tohoku where there is not much of an economy left. Japan needs to work on keeping its local regions alive and develop to regain its potential that was once present through the country.*

*The prefectural top down solutions proved to be a limitation in creating solutions that are based on the local aspects of a place. Space making is something that requires help from the top down and in a certain sense direction, but it requires local ingenuity and a keen eye to details in its strategies aimed at reconstruction of the local community.*

*While protection took centre stage a lot of aspects of the city were forgotten and could die down in memory if not for the people who keep its culture alive. Aspects that really matter to the people are in the traditions, livelihood, economies, culture, food and spirit. The sea wall/land consolidation or the idea of zoning various solutions do not bring to the table how it will create a lifeline for the citizens. This, besides the fear causes many people to turn their back on such cities and move to other larger cities and here it is important to get new innovative ideas to surprise them with the opportunity to stay back with a livelihood that flourishes.*

*As a landscape architect I think this whole link was missing in the current reconstruction work with no presence of a landscape architectonic designer and the lack of an element that went beyond planning and zoning to mark out what in fact made each of these bays different or special from each other. In fact, there was no planning document that showed in detail how these bays had societal variation and the opportunities available. Without these it is impossible to create a "place that people identify with" from a location.*

*On a larger scale the idea of resilience through design stood out and creating a zone-based protection over a line based protection was one strong inference from the study. The other was structures becoming adaptive organisms compared to hard backbones was very important. This is something that could be taken as a concept in an exemplary project for any disaster struck area. Adaptive pattern planning based on local gems of identity (may it be food, economy, culture helps the local reconstruction progress much faster than creating a structure and letting people do their own job of growing a village out of it.*

*Besides this a multidisciplinary approach in a hard-right state thought of mind with the involvement of designers, planners, historians, artists, entrepreneurs could play even a larger role in such a case.*

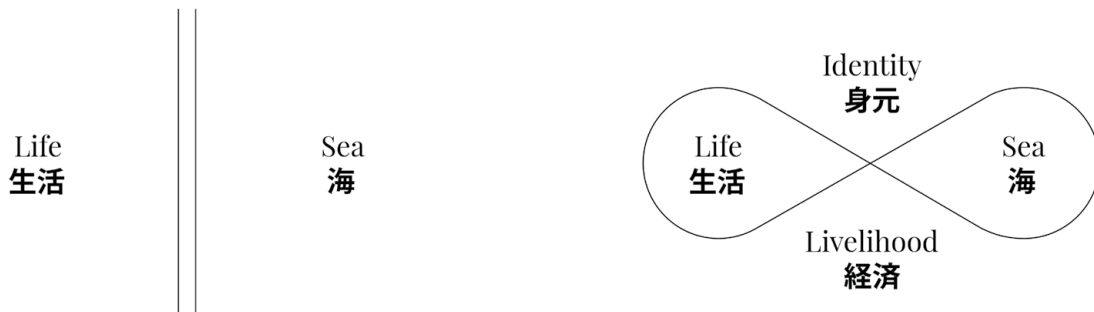
***Picture no 76 illustrates the conclusion in a simple theoretical model of two situations. The current situation shows how life and sea have been separated as a model and the other theoretical model shows loops of systems to be formed between the sea and land while working with the identity and livelihood of its citizens.***

*The involvement of a new design process creates opportunities and as a reconstruction process it was very vital to create systems that develop from the actor's point of view. The current built design is a static concept , it is not a reconstruction scheme that tends to change with time or mold to the users need. Creating that space for opportunities is something that needs to be used in the newer model as illustrated in the picture on the right. The city and the people need to identify and build themselves around something. They cling on to the hope of a new city and with that comes opportunities.*

*This is an research into design thinking that supports a participatory process that involves various actors - humans and other fauna which participate in the natural system creating a link that stitches the landscape.*

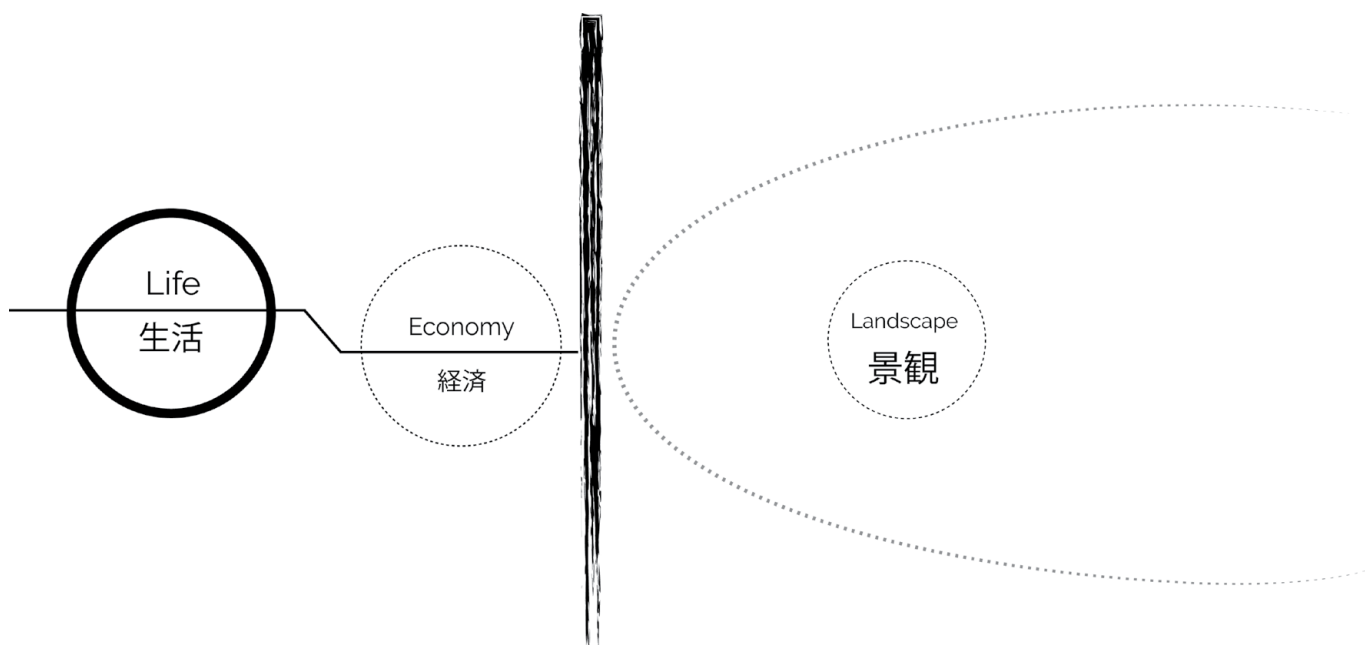
*It also builds on the body of knowledge on designing with genius loci and creates an example for identity-based reconstruction in post tsunami conditions.*



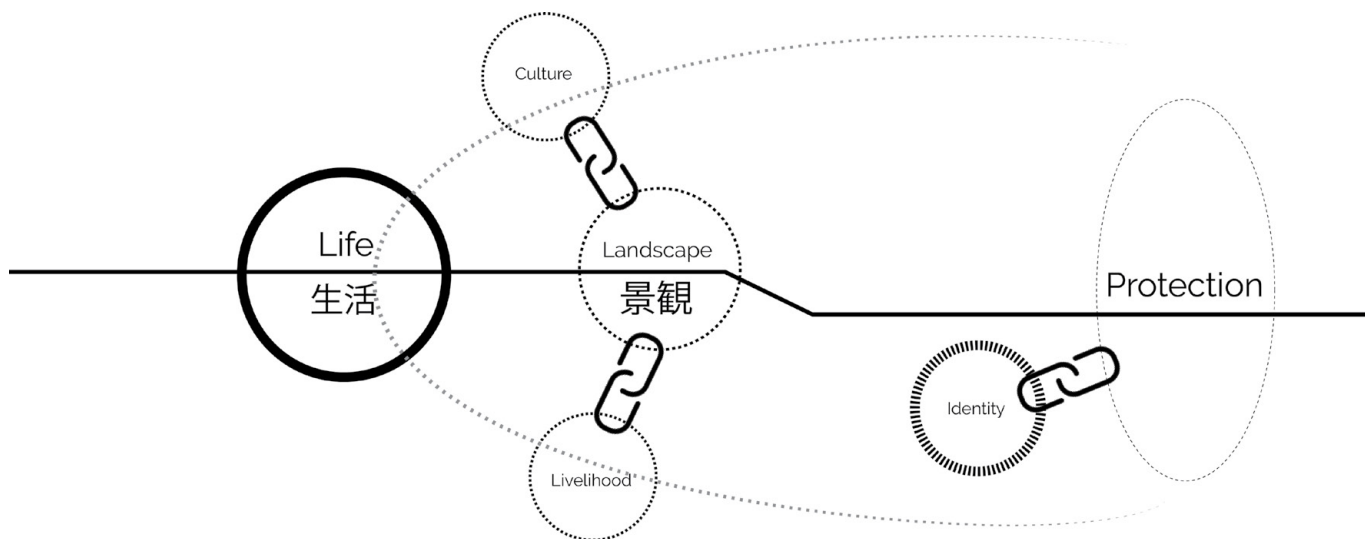


Existing

Proposed



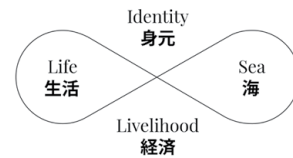
Existing



Proposed

Picture No. 76 Conclusion models - theoretical models replicable in other sites (Author, 2019)

## 8.2 Reflection



### **Relation between solution and the societal impact-**

The Tohoku region has numerous bays like Otsuchi and the central government has implemented an identical set of solutions irrespective of the thing that separates each of these bays, namely of which is the people, their lives and economy and the landscape of the bay.

When they were not considered, the value of identity was lost. All these towns were considered as identical places and the defence the same. There was no thought into economy besides the functional placement of it.

The other major problem these areas face is an issue of shrinkage. Most of the youngsters from these town think of moving out and going to cities like Tokyo and Sendai where there is more work and life. This had led to cities like Otsuchi having an average population of around 60.

It is only design that investigates this while creating protection that can solve these issues.

Instead of having individual defence structures for each town which blocks them from each other, there was a solution seen in this project that holds a theoretical model which bases itself on the citizen of the towns. Local reconstruction meant designing for the opportunities that citizens could have. As a way of integrating the sea with the town, this model as a structure for disaster struck society, could be an option of working methods in which this theoretical framework could be tested and is thus a direct impact on such a society facing similar issues.

Also, the design must look into how processes can create economies and the local landscape has a way of nurturing that. This is a method for making society understand how good design can not only protect their lives but also generate a livelihood for them if done well. As a catalyst, landscape architectonic design can be the means to generate processes that deal with sustainable usage of land and water to create lifestyles.

So as an exemplary project in terms of design scales and the theory that can be used, the project acts as a way to show disaster struck design planning on a theory of zonal protection compared to linear based protection. It sets a societal academic example of what such a planning alternative could be like spatially.

### **Relation between graduation project topic, the studio topic, master track and master programme -**

This is of a twofold importance.

Firstly, it has to deal with landscape architecture working with a variety of multidisciplinary fields.

It creates a value field for landscape architecture in a co-working method with other engineering fields like hydraulic eng., water management, geotechnical and transport planning. Such projects on field would be managed only by the collaboration between these fields and they act as a method for the various other disciplines to understand the role of design in such cities and sites.

Landscape architecture has slowly started to define its role in such trans-disciplinary projects through projects such as Afsluitdijk landscape edges, Room for the river projects and more. With more such room coming in for landscape infrastructure projects this academic work acts as a continuation of enforcement of an understanding of the role of landscape architecture in the multidisciplinary field.

I believe that the future of landscape lies in these collaborations with more such projects having to deal with such sustainability issues for the planet.

The other is for setting it apart from the engineering fields by showing how space is about more than strict values and numbers but about the lives of people, about their values, their interests and creating value through space.

The city is a place that has dealt with huge disaster and loss. A designer can not only provide protection through hard space but also create an atmosphere of memory and reflection, of dealing with loss and creating a peacefulness of mind for the future generation. A lot of this can be found in open space and being part of nature and landscape has to deal with both of these to create value for the citizens.



## **Relation between research and personal design process -**

*As a master's thesis in Landscape Architecture it was important for me to embrace an interest in a multidisciplinary field of working. I believe that the profession works hand in hand with a lot of different specifics to come up with hard spatial solutions for a landscape. A landscape can have many issues - a degrading ecology, water shortage, lack of public space or may deal with yearly impactful disasters and in this the designer can only seek to make not only the users but also the various professions involved in making the place better, understand the scope of the field.*

*We are now dealing with complex climatological and morphological issues that requires a large set of eyes to analyse and create solutions in the hope of the betterment of the place and in general the planet and working in a multidisciplinary network plays a huge role in this future.*

*Having to do the same here for the thesis lets me pursue this idea wholeheartedly and try to see where it lands me a helping hand to continue this idea in the future somewhere.*

*It also helps me understand a new culture, new ideas and a site with vast opportunities but at the same time it comes with the same number of challenges.*

*This shaped my process of work and the way I took this design question forward.*

*The role of research in design was shaped through going through various scales, various modes of study and various tools, plus, the lenses of various fields.*

*By going back and forth between ideas and details back to ideas as a designer it made me understand not only the larger urban issues from a prefectural level to what materials can be used at what parts of the bay and at what slope various kind of plants work at the coastline.*

*I learned how to be flexible and work between ideas and hints of various things the site can offer, to go between various layers and understand user requirement at different aspects. For me design and spatial implication played the biggest role as a landscape architect finally and let me pursue how space can affect people in a landscape.*

*It also showed me new tools for working with virtual reality which played a big role in the design process and being able to experience the design at 11 while designing. It shows the future of the process of design where space is experienced while designing.*

*As a process still in work it gives me the opportunity to yet experience each of these separate layers of design put into one usable landscape. This brings about the complexity in design process.*

## **Relation between research and technology for design-**

*The design process and research for me in this educational experience had a very new facet that I have embraced as a very positive tool for design. Virtual reality as a design tool was something I observed and implemented to realise a new method of research in design. The design becomes more than an optional reality, it envelopes a 3 dimensional reality that helps the designer place himself on a point in his design and realise the advantages and disadvantages of a particular space with respect to proportions, space, materiality and size.*

*It takes the next step from 3d models and visualizations to give an understanding of how a particular piece of material is positioned on ground, what are the faults and problems of doing this in a certain way and how it could be made better.*

*The software and technology I used allowed me to go back and forth between plans, 3d to virtual reality allowing me to create multiple options of design and analyse the problems in size and proportion (spatial aspects of the design)*

*I found it to be an invaluable and a very fun tool in creating spaces.*

*I could see this becoming an opportunity for not only landscape architects, designers and multidisciplinary teams but also the stakeholders in the design process. Individuals involved in the decision making and the citizens could be given an opportunity to see what an alternative option would look and feel like in reality compared to the sea wall that was currently built. To visualize is to empower the citizens to see the truth and the alternatives. The next step is making it into a reality.*

## 9.0 Reference List

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## 10.0 Appendix

### 10.1 Otsuchi in Images

#### Representing the current situation

*Otsuchi is best represented visually through images that showcase the beauty and the missing identity of this town. Here are some representative images of what is happening in these towns affected by the tsunami and how they look now -*



Picture no 77. View from Namita village out to the sea (Author 2018)



Picture no 78. One of the last spring wells in the land consolidated area - Osachi spring well (Author, 2018)



Picture No.79 What remains of the town hall post-tsunami (Author 2018)





Picture No.80 The storm gate barrier under construction as of 2018 , 7 years after the tsunami. (Author, 2018)



Picture No.80A. Generic street in Otsuchi (Author, 2018)



Picture No.81 Sea wall seen from inside the village. The pacific lies outside this wall (Author, 2018).



Picture No.81A. Otsuchi downtown pre-tsunami (Mr Ken presentation, study material, 2018).



Picture No.82 Horajima Island outside otsuchi at the middle of the bay, which cant be seen from the village (Author, 2018)

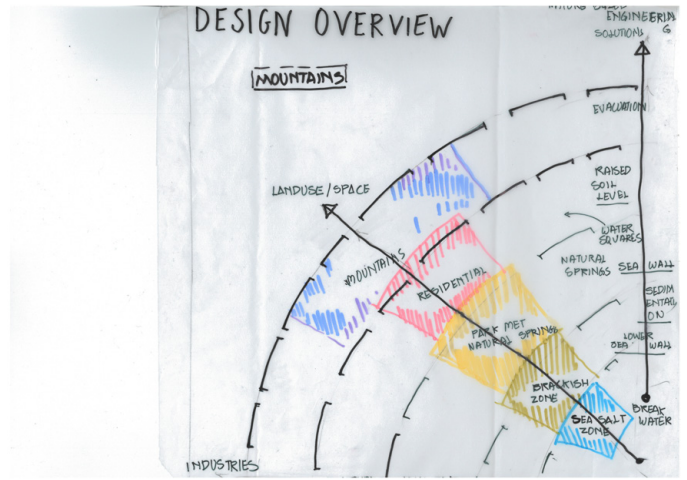


Picture No.82A. One of the multitude of spring wells in the no build zone of Otsuchi ( Mr Ken presentation, study material, 2018).

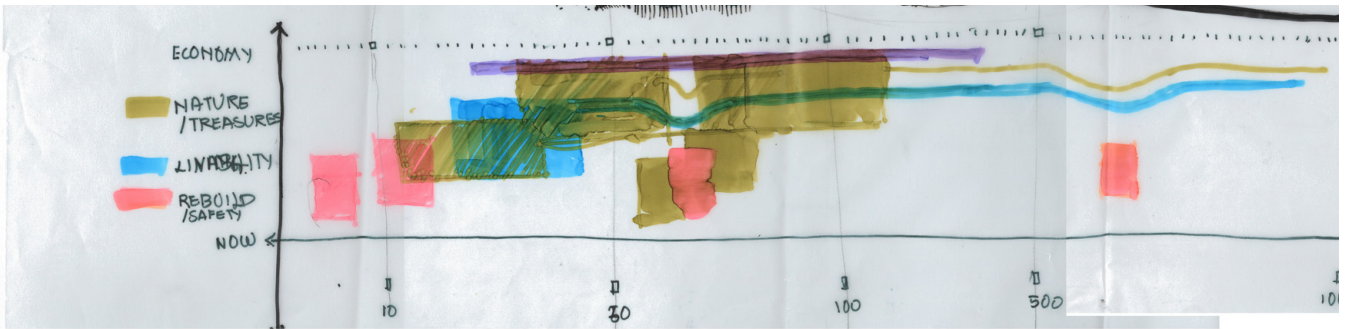


### 9.3 Multidisciplinary workshop in Otsuchi

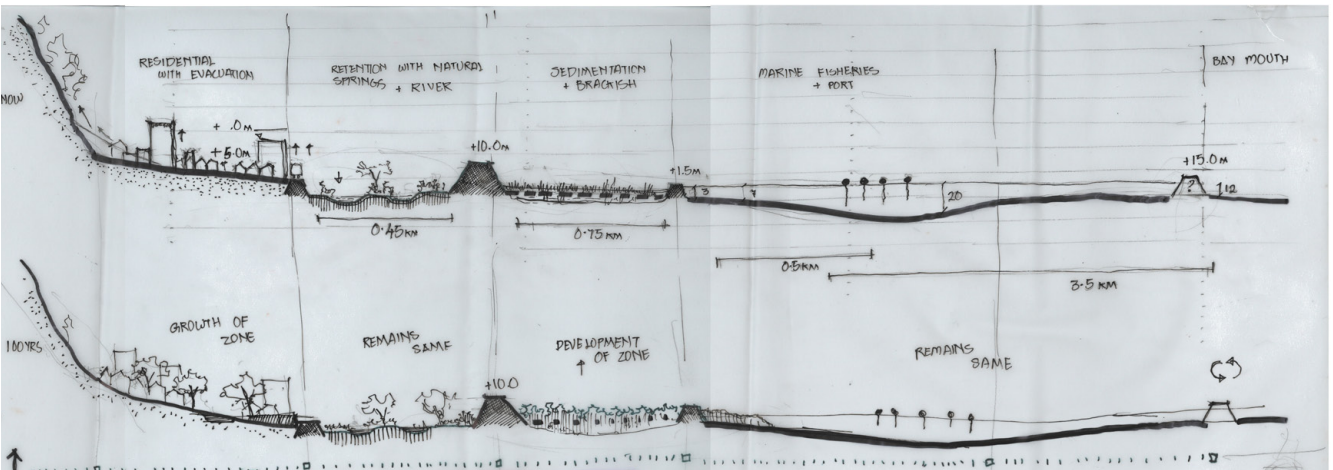
Representing the combination of a multidisciplinary group work on site.



Picture No.85 Photos from workshop at Otsuchi with the multidisciplinary group (Research group, 2018)

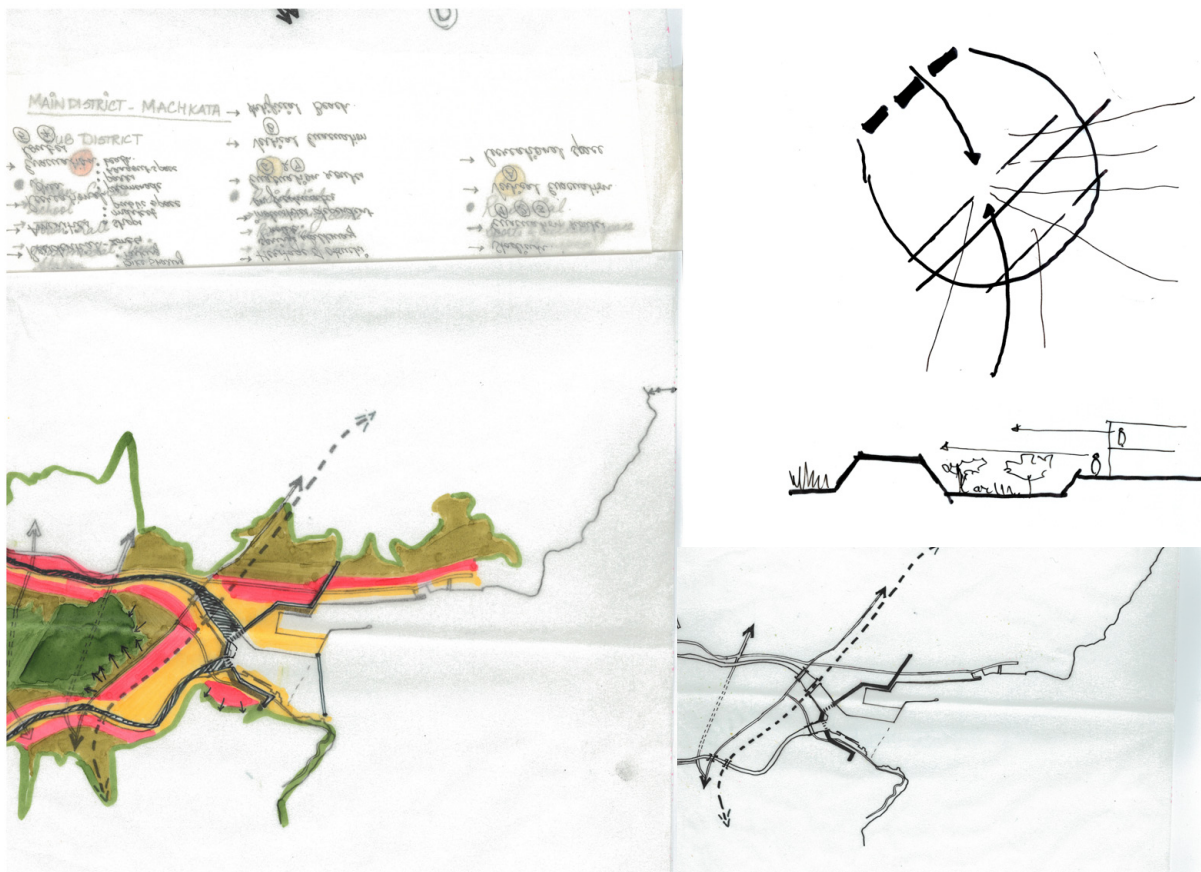


Picture No.86 Time scaled nature based growth vs hard physical solutions. (Research group, 2018)



Picture No.87 Section of growth of zonal protection (Research group, 2018)





Picture No.88 Zoning for proposed design (left), Concept drawing (right top), Main infrastructural lines as stitches(right bottom) (Research group, 2018)

#### **The workshop -**

The field of Architecture, Urbanism, Building Technology, Hydraulic Engineering, Management, Structural Engineering, Water Management, Geo technical and Transport and Planning studied solutions for Otsuchi post tsunami and the current situation of the infrastructural work

#### **Our theory -**

It was widely agreed among the thesis group which had most of the above fields that it is highly necessary for physical engineering solutions at the immediate post tsunami period for protection, but if we were to look at a longer period of time and a more sustainable nature based solution then it would be ideal to allow of design that had two facets.

Seen in picture 86 is this idea represented on a basis of time vs solution section. Initially a temporary dismantlable hard physical solution is installed that then allows for a slow takeover by nature based solutions that allow a time growth to create a barrier. Meanwhile these nature based solutions provide access to economy, profits and livelihood for the recovering citizens. What is also noticed in the section is that when this incident of a disaster happens, the rebuilding period is much shorter as seen in the pink part and it will decrease over the years on further such disaster.

In this way time is seen as a method of protection against these disasters.

#### **The solution -**

Creating a double dyke both at a lower height with an opening in both of them would allow for intermixing of water and create a brackish zone that would help in growing seaweed and other such economical species for the citizens. Also was incorporated the idea of a breakwater at the bay mouth as the lower height was already noticed. It would also by lowering the sea wall height to 8m connect the city to its surroundings more than the current solution

#### **Inference for the individual project -**

The time based solution with sedimentation was a huge inference besides the bathymetry providing the opportunity for creating breakwaters.

- Jochem Roubos's study of the bay and the bay mouths shape influenced the creation of the islets.

- Isle Nederlof's studies on the spring wells influenced the study of location and societal design usage of them.

Besides this the constant back and forth with geotechnical engineers helped me come up with the materials for these structures.



### 9.3 Multidisciplinary workshop in Otsuchi

#### Historical Imagery



Picture No.8g Historical Map of Otsuchi showing braided river edge (Mr.Ken presentation, study material, 2018).



Picture No.90 Historical Map of Otsuchi showing rice fields (Mr.Ken presentation, study material, 2018).



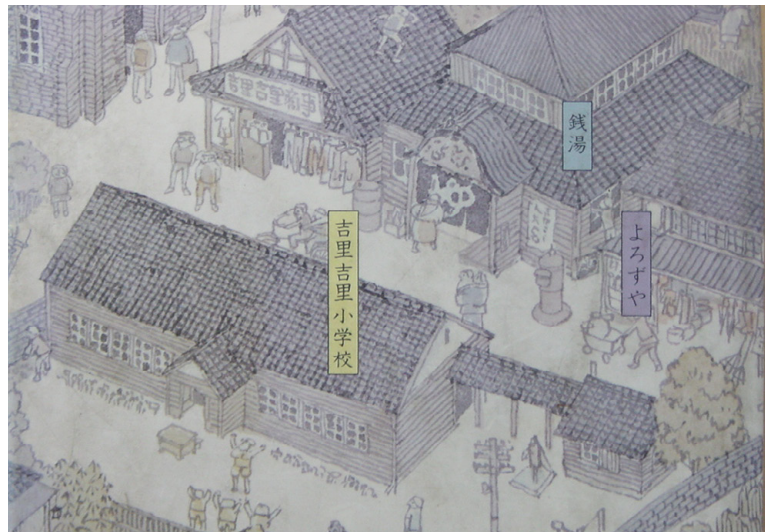
Picture No.g1 Osachi spring well unknown date (Mr.Ken presentation, study material)



Picture No.g2 Osachi spring well unknown date (Mr.Ken presentation, study material)



Picture No.93 Osachi spring well unknown date (Mr.Ken presentation, study material)



Picture No.94 Otsuchi streets and life activity on a book cover (Mr.Ken presentation, study material)



## Interviews and discussions

**Shinya, Amu and Nene** (*remembering the incident from a kids perspective*) (September 2018)

### **Points of observation -**

Shinya, Amu and Nene were 16 year old when we interviewed them. They were 9 when they ran up the hill from the tsunami. The teachers who were with Amu and Nene asked them not to look back while running up. Shinya happened to look back during this incident.

What struck me was that when asked what they thought of the sea wall, the two kids who never looked back were very scared of the sea and found security in the sea wall.

Shinya said that no sea wall would help and there should be none. It stood out that the fear of the something unknown would cause something like this.

**Masahiko Haga - Director of Kiri Kiri NGO** (*remembering the incident and the steps taken after*) (September 2018)

### **Points of observation -**

The forester here inspired me the most when he talked about how the landscape is connected along all the scales. He told us about how he tended to the forest and from ages together otsuchi has functioned because of the connection of the land to sea.

Of how the materials from the forest go into making the boat that then go into the sea and collect the fish that feed the citizens on the land.

It left a lasting impact of a connected landscape that Otsuchi once was. It was very heart moving when he recounted the story of searching for survivors the day after the incident in the wreckage and making the tough choice of staying back in the village after seeing what he saw.

**Mio Kamitani - Otsuchi disaster recovery office** (*Town hall memories*) (September 2018)

### **Points of observation -**

What stood from Mio's talks with us was the story of how on a Monday afternoon when most of the family is not home, an alarm for the Tsunami rings. The only people at home were the grandparents. She tried to let us imagine the situation of how an old grand mum with knees paining from arthritis would have to run up the hill. And neither the parents or the children would have any contact at that period of time.

The shock of the incident, the trauma from no communication and the feeling of being lost all didn't help the situation and putting ourselves momentarily in those shoes was traumatizing to think what happened during this disaster.

**Mr. Yutaka Ikarigawa - Former Mayor** (*On what went right and what was not good enough*) (September 2018)

### **Points of observation -**

As the person at the forefront person involved in reconstruction in Otsuchi it was remarkable to see the effort and dedication from his side despite various difficulties he and his team faced through the task. His dedication made us realise the difficulties a mayor of a town like this would face when there are no officials around and situations are dire.

The remarkable observations that struck in my mind through his interview was how he showed some images of a landscape he wished in Otsuchi that was filled with tulips. While I did not agree on this direct import of an image I noticed that he strived during the process to make the reconstruction process very "Landscape Architectonic and green" but it failed in happening as he visioned.

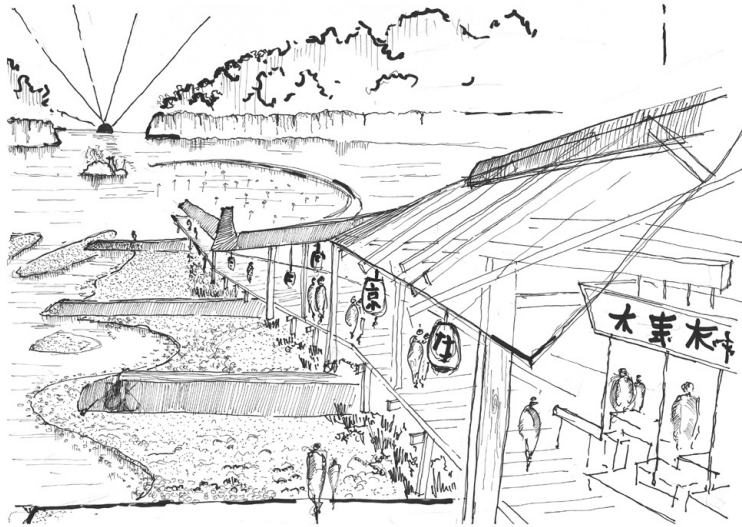
Due to budget and issues with structural and technical requirements these ideas especially like that of the "chinkon no mori" which are currently in the reconstruction drawings, failed to go through and all that remained were the sea wall and the land consolidation.

I felt it was natural for a human being to go back to nature but not having the flexibility to allocate budgets for the community because of certain design restrictions was already noticed during the workshop here.

## 10.2 Visual Ideas on spatial quality

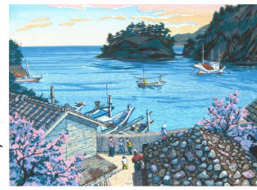
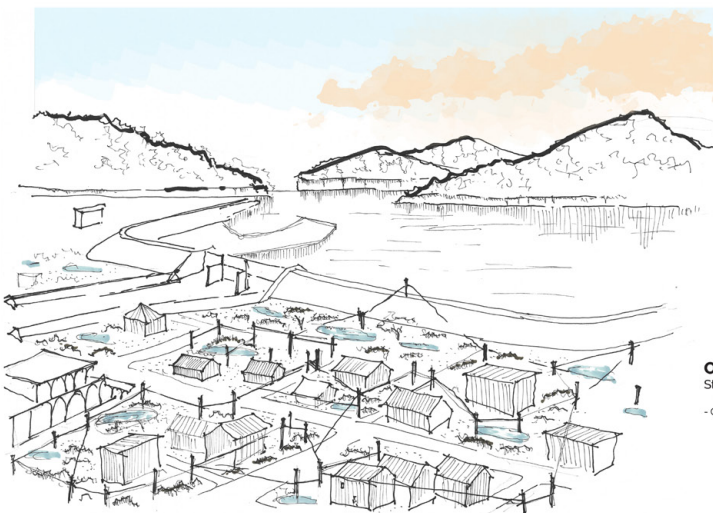
### Representing the broad spectrum of Ideas

The research in design process was one where there was a broad spectrum of ideas approached from the joint study at site to the visualising various utopian ideas for the town of otsuchi. Here are some of the representative images of the same that were part of this broad research -



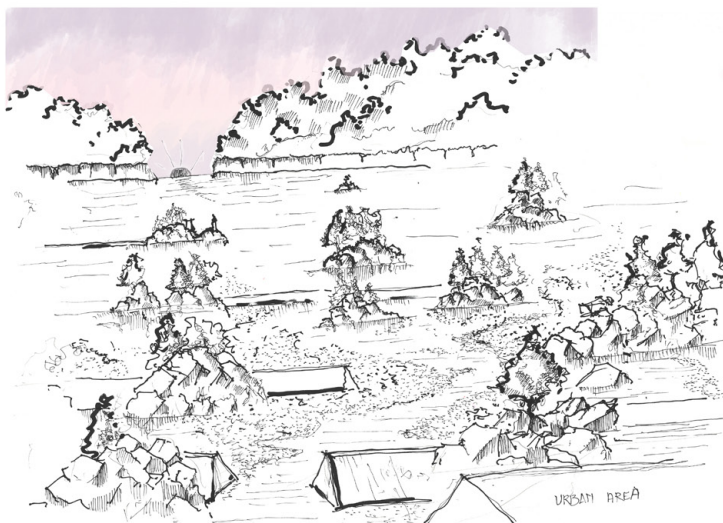
**Option a : A fish market makes itself with the city**  
The life of a fishing town put into good use of creating a landscape

- Can work with existing scenario



**Option b : Local blessings and their ecology**  
Studying , preserving and enhancing the springs of otsuchi

- Can work from existing , but would prefer a new one .

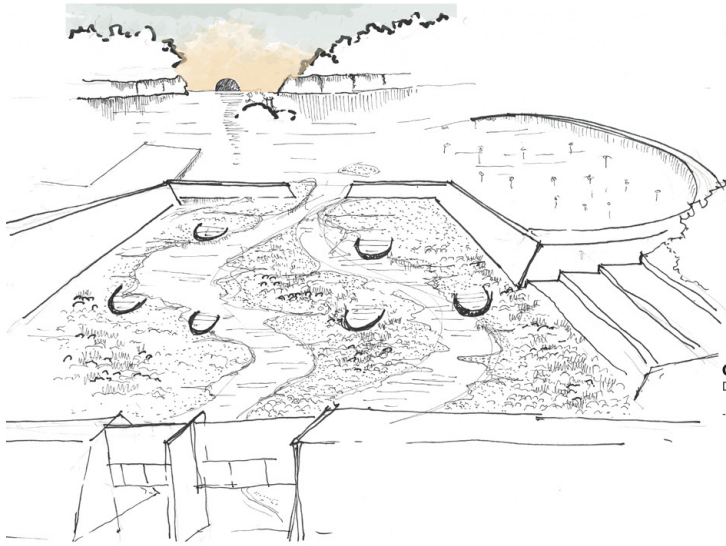


**Option c : Debris and Rock island's sedimentation**  
Creating a slow process of protection and sedimentation through debris as rock islands

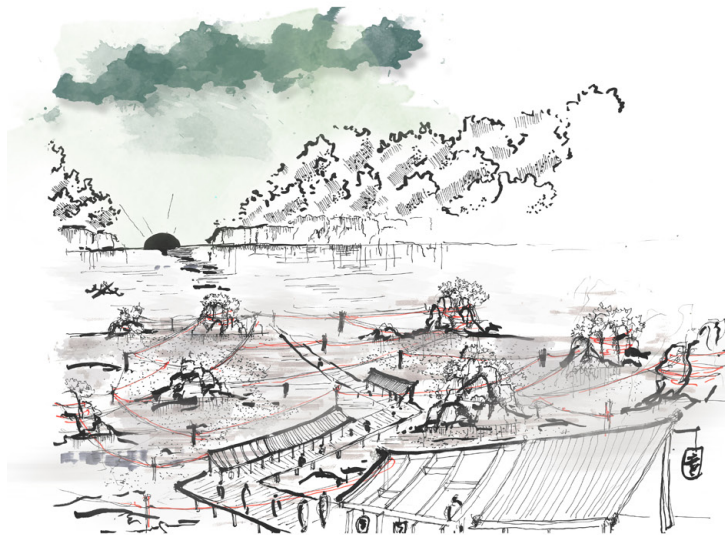
- can work individually like matsushima bay

Picture No.83 Set of Utopian sketches. (Author. 2018)

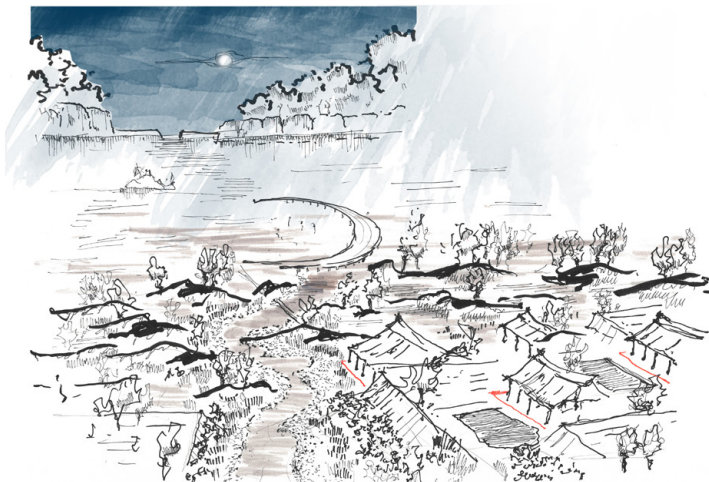




**Option d : The buffer zen garden**  
 Double dykes and the in-between of the aquifer zone.  
 - Imagines a scenario which is new but can work with the old.



**Option e : Married Debris and a new coast.**  
 Married by an economic meaning of fishing and other local stores.  
 - Start from a new scenario



**Option f : Levels and working with waste**  
 Married by an economic meaning of fishing and other local stores.  
 - Start from a new scenario

Picture No.84 Set of Utopian sketches. (Author, 2018)

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Landscape Architecture

