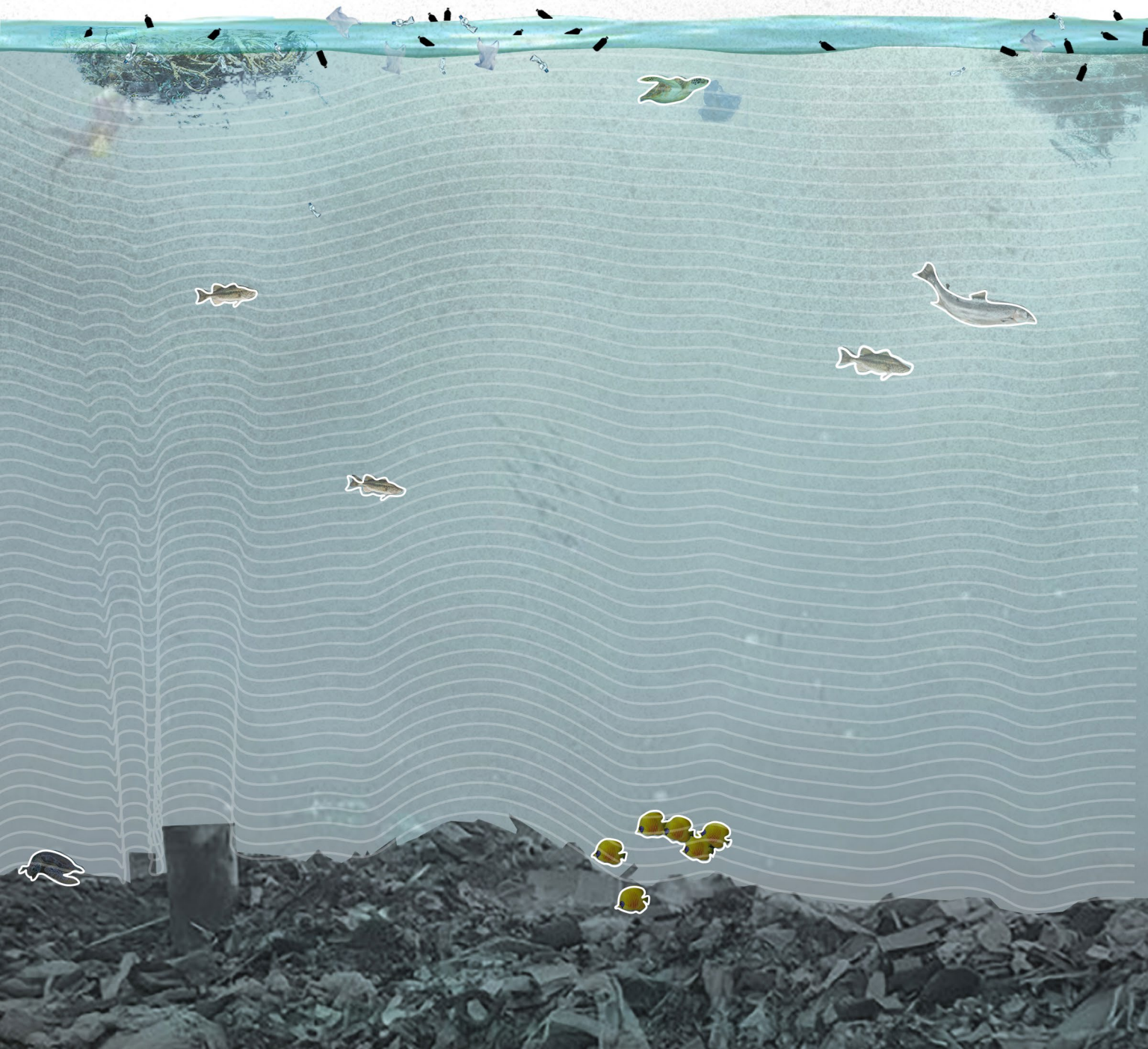


SYNTHETIC UNDULATION



SYNTHETIC UNDULATION

Improving the marine life quality on the
Indonesian island of Selayar

Shreeyaa Shah
MLA Landscape Architecture, RISD

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By Shreeyaa Shah

Date- 05/28/2021

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Abstract

Beginning with a study on the properties and properties of plastic, this thesis examines perspectives and experiences of coastal communities forced to deal with overwhelming quantities of plastic pollution in their waters. With a focus on Indonesia, the second largest plastic polluter in the world, the study examines Selayar island's vernacular ways of being and making as a possible way to understand and deal with the problems affecting their local marine health. Through different research methods, a complex set of factors are identified besides plastic pollution, including the decline in farming and practices that contribute to overfishing.

Through design investigation, three types of aid operating at distinct timescales are proposed in triangulation – immediate, continuous, and long term. These strategies include dealing with plastic, integrating land and water-based practices, and proposing alternative material uses to plastic. The thesis suggests that without access to biodegradable, environmentally friendly products, and a more circular system to deal with plastic utilization and pollution, coastal communities and surrounding marine ecosystems will continue to be inundated in plastic waste.



N.S. Rajappan heads out on his boat every day to keep the waterways clear of plastic debris, and he's been doing it for years. While only making enough to buy a meal with each boatload of trash he collects, he finds satisfaction in helping the planet and keeping wildlife out of harm's way. Photo went viral on social media sites. image is posted by @get.wasted.ed on March 18,2021

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My thanks to Johanna Barthmaier-Payne and faculty to provide us with wonderful opportunity and exposure to various other courses that could shape and prepare us throughout the master's program.

Finally, I extend my deepest thanks to my parents and friends/family for their constant motivation, being source of inspiration, blessing me and emotionally supportive in my journey.

I. Introduction

I believe our future depends on sustainability for the longevity of the world. Post-Machine-age mass-production has become a major force of nature in this new Anthropocene epoch, which advances at an incredibly rapid pace. Specifically, the production of plastic has brought about a lot of social benefits and associated future technological advances. Despite this, plastic plays an alarming role as it is a non-renewable material that contributes to global pollution leading to exacerbating climate change.

The problem of plastic pollution in the ocean is well documented, yet there is little information of the perspectives and experience of the coastal communities facing overwhelming quantities of plastics on the beaches and in their fishing water. After the ban of China importing plastic waste, Indonesia is the second largest plastic polluter country in the world. Indonesia is also the world's largest island country and the largest country by land covered by the ocean around it. Ocean currents pass through the archipelago, from the Pacific Ocean to the Indian Ocean, carrying plastic along with it Indonesia's Coral Triangle, an area.

Rich in marine biodiversity, faces the problem of plastic pollution and the communities that are affected are amongst the poorest of the country. Indonesia acts as an filtration point and Selayar island is a good opportunity to trap plastic, as the ocean currents divert near south Sulawesi archipelago. These coastal communities in Selayar island are facing the problem of plastic pollution through microplastic carried with ocean currents and the macroplastic that leak into the ocean due to the waste mismanagement. These communities depend on the ocean for food and livelihood.

Due to plastic's ubiquitousness and dominance on the planetary systems of water and land and the time it takes to break down, it clearly has deleterious effects on the environment. This thesis explores some of the vernacular Indonesian ways of being and making, to engage coastal communities in dealing with the problem of plastic pollution affecting these rich marine biodiversity areas and the livelihood of these communities to reimagine this archipelago's relationship to plastic.

Due to a lack of available information on the remote

Selayar island, the study included the use the mixed methods of writing, as well the translation of writings and videos to make informed assumptions of traditional ways of being and making through. Through the use of these methods, a complex set of factors that contribute to plastic pollution that affect marine life were identified and studied. Besides plastic pollution two other factors affect marine life along and on the island: the decline in farming and overfishing. Both contribute to a severe imbalance of land and water occupation.

To address the three main problems – plastic pollution, overfishing and decline in farming – three types of aid are proposed: immediate aid, continuous conscious aid, and long term aid by looking at the bigger picture. These three types of aid are then integrated in different formulations that operate in ways related and synchronized to the area's monsoon regimes.

Immediate aid is a first step that can be taken by trapping, collecting, sorting and utilizing the plastic, by capturing it in plastic trapping boxes in the ocean to collect microplastic and providing river

traps for capturing macroplastics.

Looking at the bigger picture, the proposed strategies also include an attempt at balancing the two main occupations – farming and fishing– by interchanging the functions of land and ocean-based practices, Fishing practices are proposed on land (land-based fish farming), while seaweed farming is proposed offshore. Land based fish farming will allow the community to make more use of their limited sea resources and avoid exploiting the marine species and their health, by discontinuing current destructive fishing practices. Seaweed material could be used to replace plastic by providing the raw materials to organizations that produce seaweed based packing/seaweed bioplastics. Standing in between the immediate and the long term aid, continuous aid focuses on trying to improve local lifestyle and attitudes towards the use of plastic, by promoting and encouraging the use of alternative materials or recycling and reuse.

II. NARRATIVE

1. BIG PROBLEM OF PLASTIC

- The invention of Throwaway Living
- Ubiquitousness
- Global Consequences
- Vulnerables



Throwaway living

In August 1955, Life magazine published a large photo of a happy family. Father, mother, and daughter are all standing around a table, smiling with their hands thrown in the air. Around them, as if suspended in anti-gravity, fly dozens of disposables: plates, trays, utensils, and napkins. The headline, printed on the next page in bold font, reads “Throwaway Living.”

The invention of Throwaway Living

I’ve always loved flipping through the pages of old magazines like Life or National Geographic. I would pour over these with a pair of scissors, and the result was a sprawling collage in my childhood bedroom and more than a handful of mixtapes to girlfriends decorated with nostalgic snapshots. And sure, there were beautiful photographs and vintage advertisements, but they were a glimpse of a world that now feels entirely foreign and unreachable.

The message of this piece is clear. By 1955, Americans had entered a new age of technology in product use. In the past, the article explains, these products “would take 40 hours to clean—except no housewife needs bother. They are all meant to be thrown away after use.” Disposable products were the wave of the future. Although this ideology was celebrated in 1955, it had earlier precursors and it continues to be important in American society today, where the average citizen generates seven pounds of waste daily.

Disposable living is deeply ingrained in our culture, and plastic is the material that drives our throwaway lifestyle. Its threads of polymers make up the very fabric of our lives, and the substance comes from a whole host of synthetic or organic compounds you can shape into pretty much anything you want.

All it takes are some petrochemicals to make plastic, and it is pretty cheap to produce.

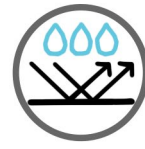
Research writing from Bill McCool “The History of Plastic: The Invention of Throwaway Living” in March 10, 2020.



Durability



light-weight



water-resistant



Non-Conductive



Thermal Insulator



Odour free



low cost



easy to use

Properties of Plastics

Naming all the properties of the plastic which makes the material versatile.

Ubiquitousness

Plastics deliver unparalleled design versatility over a wide range of operating temperatures. They have a high strength-to-weight ratio, stiffness and toughness, ductility, corrosion resistance, bio-inertness, high thermal/electrical insulation, non-toxicity, and outstanding durability at a relatively low lifetime cost compared with competing materials; hence plastics are very resource efficient. Plastic gathers most qualities in itself that are observed and appreciated in a lot of other materials.

Plastics are synthetic chemicals extracted mainly from petroleum and made of hydrocarbons (chains of hydrogen and carbon atoms). Most plastics are polymers, long molecules made up of many repetitions of a basic molecule called a monomer, and this structure makes plastic particularly durable and long lasting. Because of this long chain resulting in stronger bonds, they are hard for almost all bacteria to digest. So, they tend to just stay in the environment.



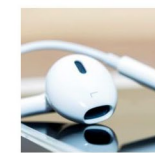
Packaging



construction



mobility & Transport



electronics



agriculture



healthcare



sports & leisure



energy

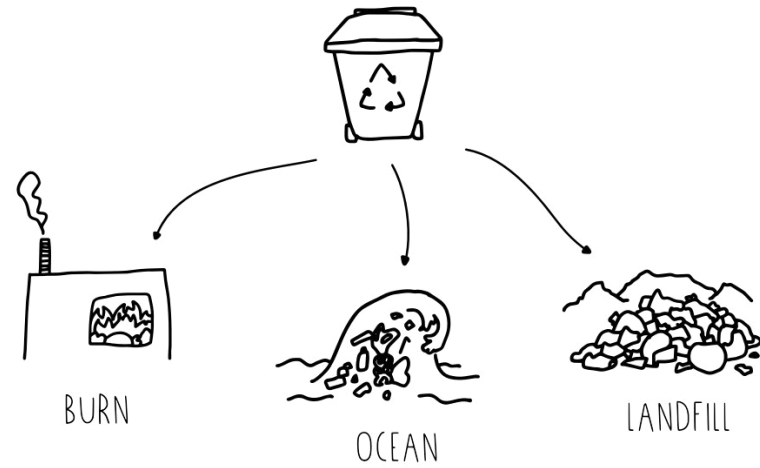
Uses in different field

Versatile Plastic is used for a wide range of applications, both for prototyping and for end products.

The term *plastic* is derived from the Greek word *plastikos*, which means “able to be shaped”. Available in many colors and in transparent form, plastics can be rubbery or rigid. Plastic shapes include sheet, rod, hex, pipe, cubes, balls, and tubes.

Plastics represent the most wide-ranging materials used for food packaging and kitchenware. In many cases they have replaced other traditional materials,

but they have also added a myriad of novel forms and functions. The resilient, supple, light-weight and malleable materials play a key role in our lives and, according to experts, will remain crucial for a long time to come.



Global Outcome

Currently, around nine percent of plastic can be recycled. It needs to go through a very complex, expensive, time-consuming, and energy-intensive process and most countries don't even have the option to do so. The other, more likely scenario is that plastic is either burnt, sent to a landfill, dumped in the ocean, or sent on a cargo ship to Asia or Africa (where they certainly do not have the

infrastructure to deal with it). These solutions cause huge environmental damage and social oppression. Collection systems worldwide are not standardized. Every country and their individual states, counties or municipalities have different regulations often leading to confusion and sense of impotency to deal with the local and global problems caused by plastic.

Easy to recycle	Easy to recycle	Difficult to recycle	Difficult to recycle
PETE	HDPE	V	LDPE
polyethylene terephthalate	high density polyethylene	polyvinyl chloride PVC	low density polyethylene
sort of easy to recycle	Difficult to recycle	Difficult to recycle	
PP	PS	OTHER	
polypropylene	polystyrene	any other plastics	

Subcategories of Plastics

They are categorized by structure and properties, and can be recognized by their name or number that should be usually printed or embossed somewhere on your products.



Typical landfill beside the city where plastic is dumped. Image is posted on Instagram by @get.wasted.ed on March 18, 2021

WASTE
ED



Typical coastal areas where plastic accumulates. Image from: The basics of plastic 2020

Image from This image expresses our disturbance in the life of marine species. As our use of plastic indirectly affects marine species.

Image is posted on instagram by @get.wasted.ed on March 18,2021



Don't bring our world into theirs.



Vulnerabilities.

Plastic accumulating in the oceans and on beaches has become a global crisis and has severely affected marine life, resulting in overwhelming deaths of certain marine species. Studies have suggested that in most cases 90% of plastic waste is found in the bellies of the marine species and the remaining 10% of deaths are caused by suffocation due to entanglement. Plastic can also cause severe blockages and lacerations. Marine researchers have found objects that people use in their day-to-day life like plastic mesh bags, toothbrushes, cutlery, food wraps, sponges, DVD cases, six-pack rings, which are non-degradable plastics.

Plastic research also points out to the fact that plastics eventually break down and turn into microplastics, which are even more harmful. They act like oil and the oily toxins like pesticides stick to microplastics. Microplastic are ingested by zooplankton and eventually contaminate all



Image and research writing from book by Michiel Roscam Abbing "Plastic Soup: An Atlas of Ocean Pollution" April 4, 2019

II. NARRATIVE

2. FOCUSING ATTENTION ON LOCATION

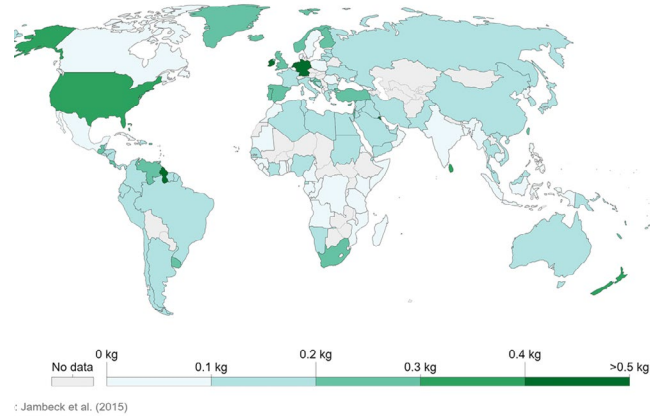
- World Plastic record
- Preconceived notions of Indonesian islands
- Utopia v/s Reality
- Why Indonesia?
- Plastic accumulation on Selayar island
- Circulation of Plastic in Selayar island

World plastic record

Images and research writing taken from "Our world in data- Plastic pollution"
<https://ourworldindata.org/plastic-pollution>

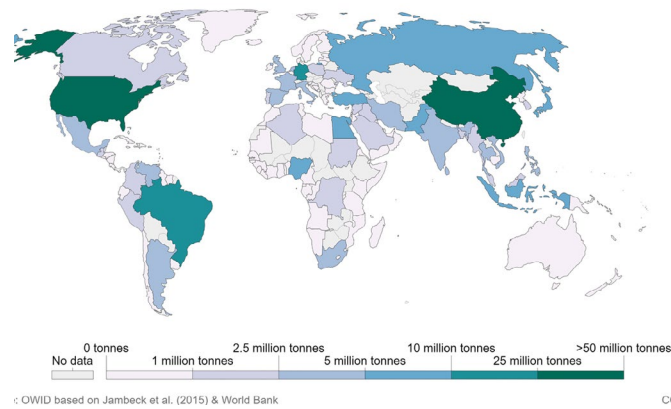
Plastic waste generation per person, 2010

Daily plastic waste generation per person, measured in kilograms per person per day. This measures the overall per capita plastic waste generation rate prior to waste management, recycling or incineration. It does not therefore directly indicate the risk of pollution to waterways or marine environments.



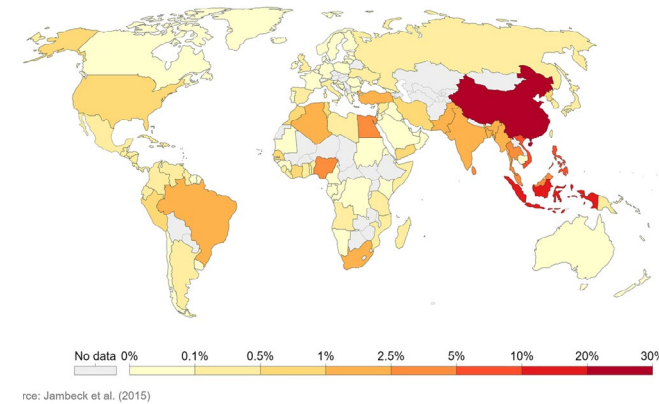
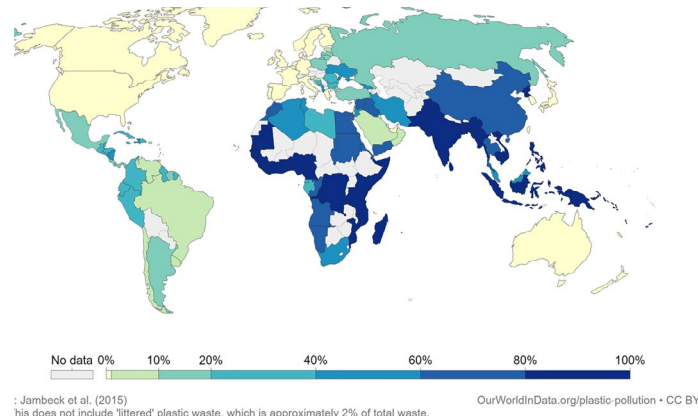
Plastic waste generation, 2010

Total plastic waste generation by country, measured in tonnes per year. This measures total plastic waste generation prior to management and therefore does not represent the quantity of plastic at risk of polluting waterways, rivers and the ocean environment. High-income countries typically have well-managed waste streams and therefore low levels of plastic pollution to external environments.



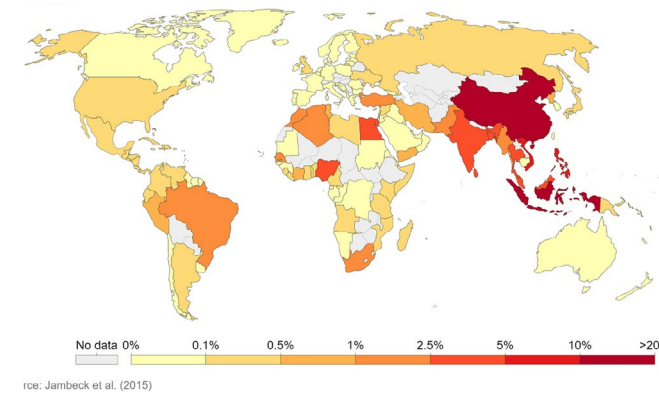
Share of plastic waste that is inadequately managed, 2010

Inadequately disposed waste is not formally managed and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained. Inadequately managed waste has high risk of polluting rivers and oceans.



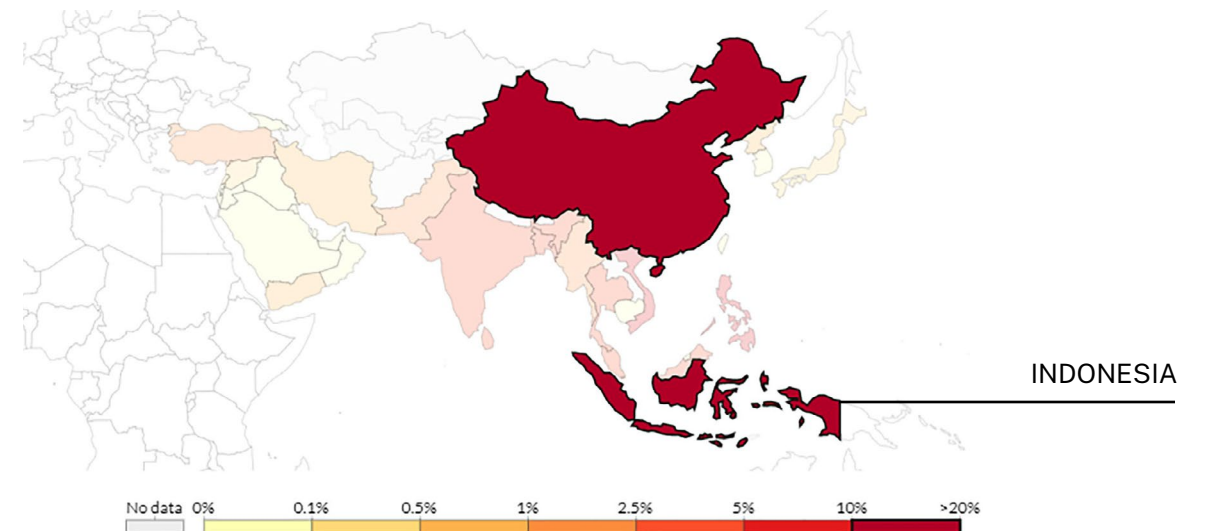
Share of global mismanaged waste, 2010

Global share of mismanaged plastic waste derived from a given country. Mismanaged waste is the sum of littered or inadequately disposed waste. Inadequately disposed waste is not formally managed and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained. Mismanaged waste could eventually enter the ocean via inland waterways, wastewater outflows, and transport by wind or tides.



Projected share of global mismanaged plastic waste in 2025

Projected share of global mismanaged waste produced in 2025. This is measured as the total mismanaged waste by populations within 50km of the coastline, and therefore defined as high risk of entering the oceans. Mismanaged plastic waste is defined as "plastic that is either littered or inadequately disposed."



Preconceived notions of Indonesian islands

Indonesian islands tend to come with some preconceived notions. People around the world have a particular image and mood in mind when they think of islands, usually related to remoteness and utopian idyll. The extensive chain of small islands consists of a string of 110 islands, isles and islets, stretching 45 km north into the Java Sea. 36 islands are used for recreation, but only 13 islands

are fully developed, 11 islands are homes to resorts, and two islands are historic parks, 23 are privately owned and are not open to the public. The rest of the islands are either uninhabited or support a fishing village. And while the atmosphere projected to the world is certainly accurate to some degree, it doesn't sum up the islands perfectly.

Image published in "16,000 Indonesian islands registered at UN" -thejakartapost.com
Click to read: <https://www.thejakartapost.com/news/2017/08/21/16000-indonesian-islands-registered-at-un.html>.
Kepulauan Seribu, Indonesia (The Thousand Islands), aerial view

UTOPIA



Utopia vs Reality

The fetish with islands pictured as a “paradise” or “perfect place” or exotic, as lands of luxury and fulfillment to be in, can be in itself conceived as a Utopia. From around the western world, people mostly come to Indonesia with that disorted and fetishized notion. Are these paradise islands still perfect with the

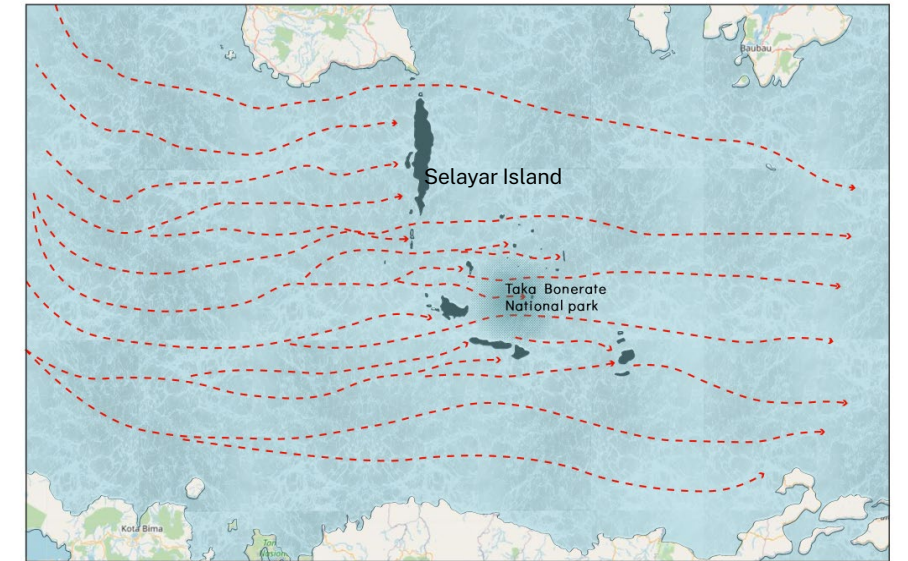
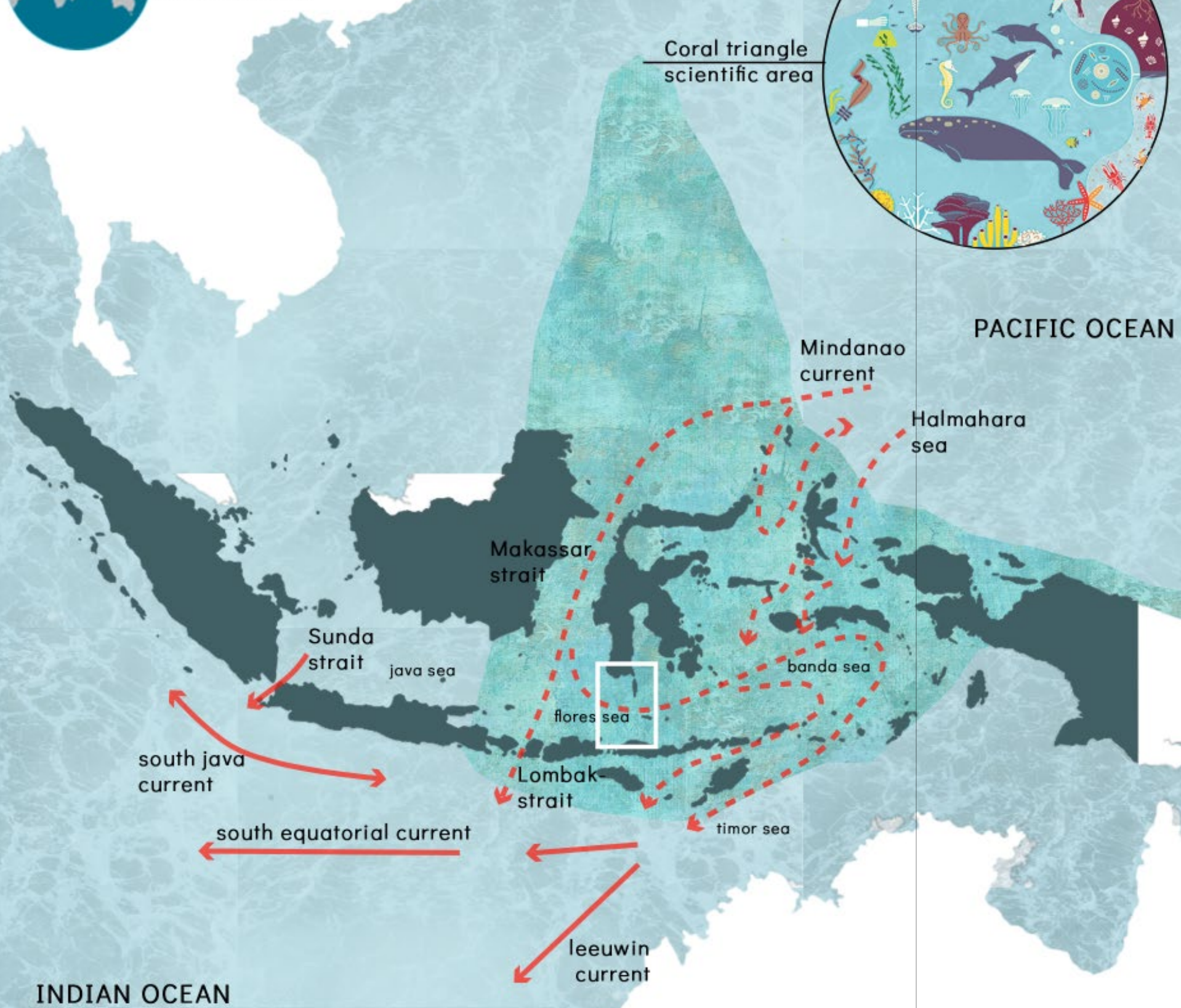
REALITY



increase in mass-production, industrialization and plastic pollution? Instead, they are staged up and presented in a way that we really don't know what's going so that we don't encounter these coastal communities. Communities in remote island are left ignored and affecting their lives.



INDONESIA



Why Indonesia?

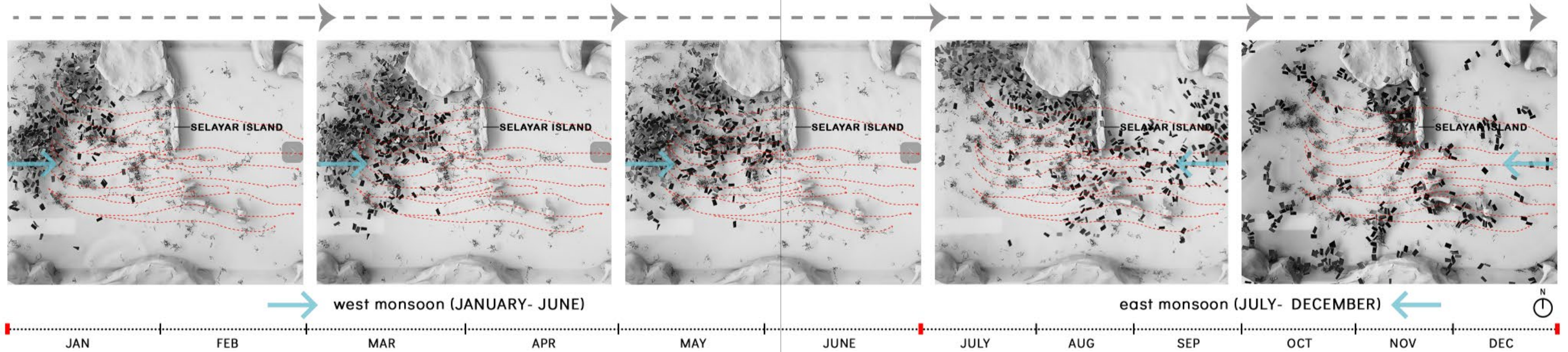
The Coral Triangle is one of the most important reef systems in the world. It covers 132,636 km across six countries; Indonesia, Malaysia, Papua New Guinea, Philippines, Solomon Islands and Timor-Leste. It occupies just 1.5% of the world's total ocean area but represents 30% of the world's coral reefs.

The *Indonesian Throughflow* (ITF) is an ocean current with importance for global climate since it provides a low-latitude pathway for a constant supply of warm water to move from the Pacific to the Indian Ocean. Indonesia acts as a filtration system as the ocean currents are perpendicular passing from Pacific to Indian ocean.

As the ocean currents diverge from Flores sea towards Selayar island, the speed of the ocean currents slows down. Selayar Island becomes a good opportunity to trap plastic as the plastic carried through ocean currents gets accumulated on this island.

Selayar Island is an archipelago of South Sulawesi province, Indonesia. It lies in the Flores Sea, between Sulawesi and Flores. It consists of 130 islands and Taka Bonerate-kepulauan, a biosphere reserve.

PLASTIC ACCUMULATION ON THE SELAYAR ISLAND DUE TO ITS POSITION, SHAPE AND OCEAN CURRENTS CARRYING THE PLASTIC TOWARDS IT.



Experimental model to understand Plastic accumulation on Selayar Island.

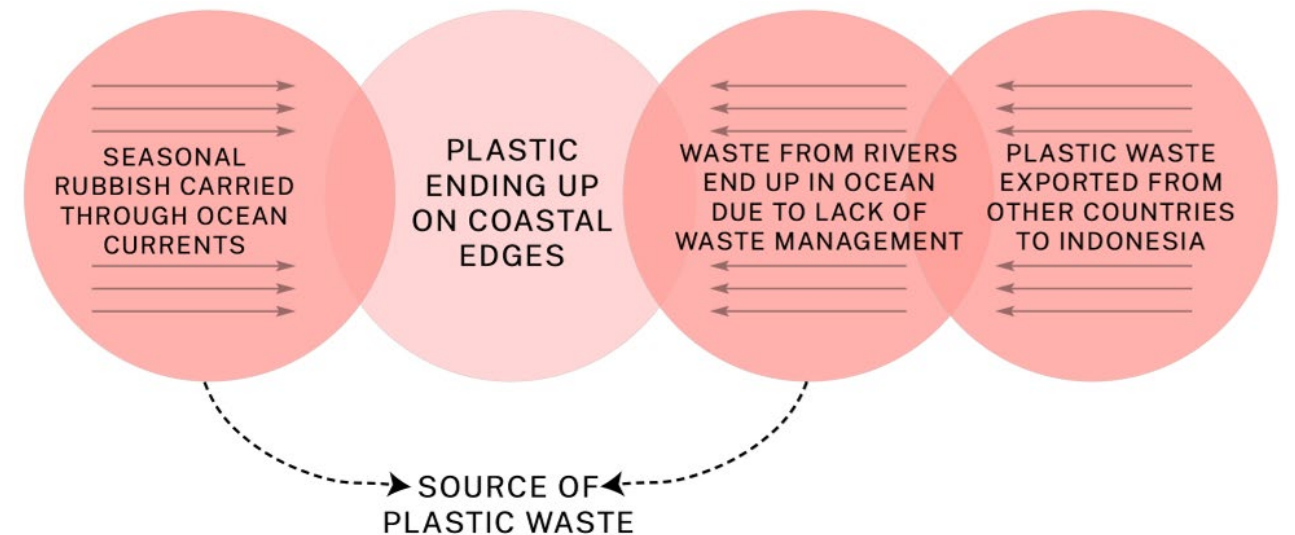
This model is to understand Plastic accumulation due to its position, shape and ocean currents carrying microplastics towards it. West monsoon and east monsoon play an important role to navigate the plastic which accumulates on the coastal edges.

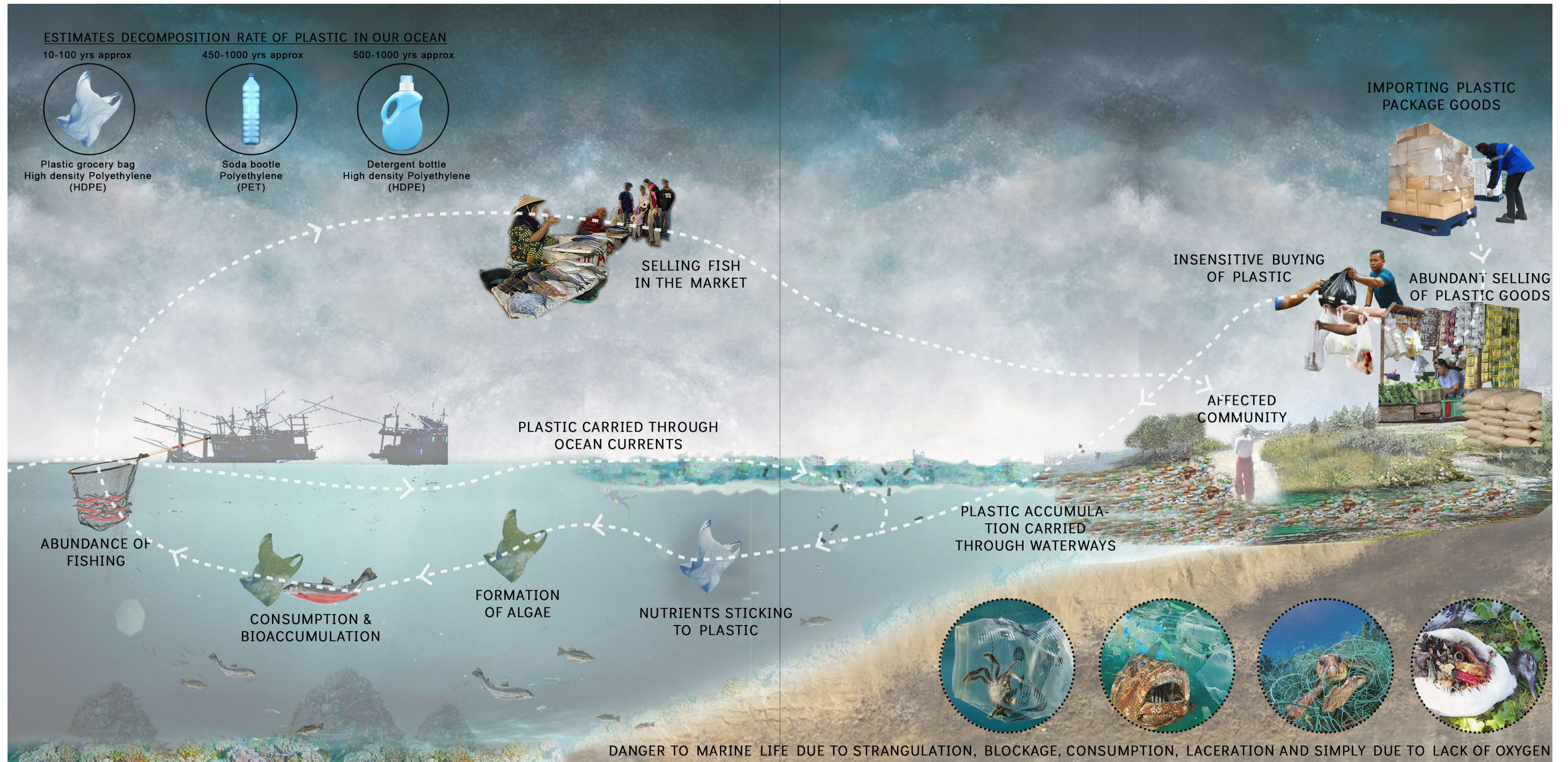


Plastic Accumulation on Selayar Island

After the ban on exporting plastic waste to China, Indonesia soon became the second biggest contributor for plastic pollution. Researchers from Indonesia and Australia found that waste management and infrastructure capacity in coastal communities in Indonesia's South Sulawesi province was ineffective in stopping plastic debris from polluting the marine ecosystem. There are two sources of plastic waste in Selayar

Island: first, the seasonal rubbish carrying microplastics; and second plastic flowing from the rivers of Selayar island. This is the result of plastic waste mismanagement in Indonesian coastal communities including Selayar island, where the use of plastics is outpacing mitigation efforts.





Circulation of Plastic

Research shows that waste in most coastal communities doesn't end up in a landfill or anywhere near a recycling facility. In fact, an average 2,000 kilograms (4,400 pounds) of plastic waste per week might leak into the ocean from just

a single village. Residents burn their waste or dump it, either directly into the sea or in piles that can be washed away in heavy rainfalls. When plastic ends up in the ocean, it encounters other chemicals, as a result of pesticides leaking into the ocean through

agricultural lands and chemicals through industrial waste. This results in the formation of algae blooms, which are often misunderstood by marine animals as food, inevitably developing bioaccumulation up the food chain. Including the

people of coastal communities, who depend on the ocean for food and livelihood.

II. NARRATIVE

3. OTHER PROBLEMS

- Imbalance of Fishing and Framing
- Destructive fishing practices.



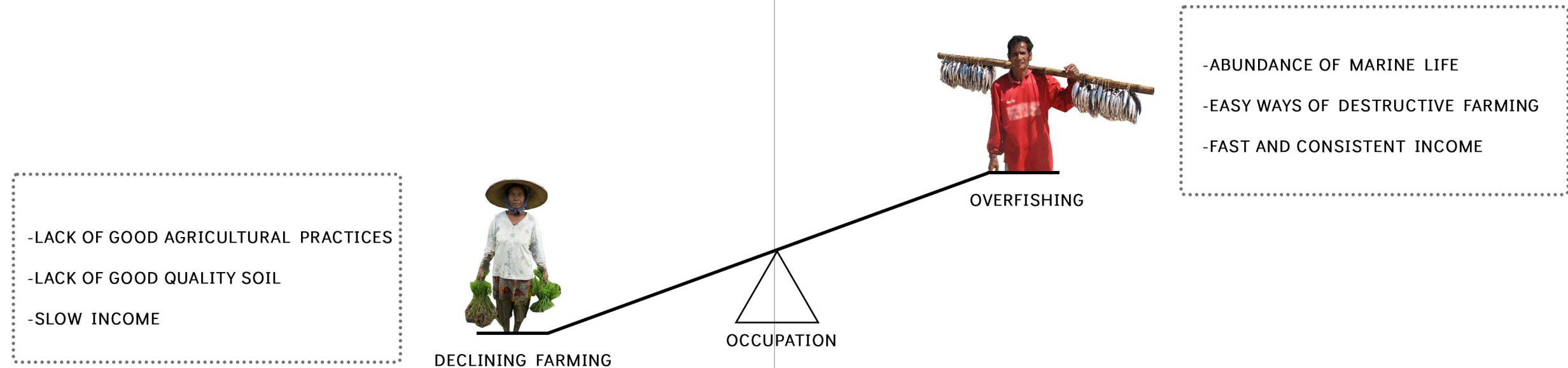
Image from "Population 1: Distribution and Density" -telescola.mt on Jan 5, 2021.



Image from "PT. Comextra Majora" on Feb 19, 2020.



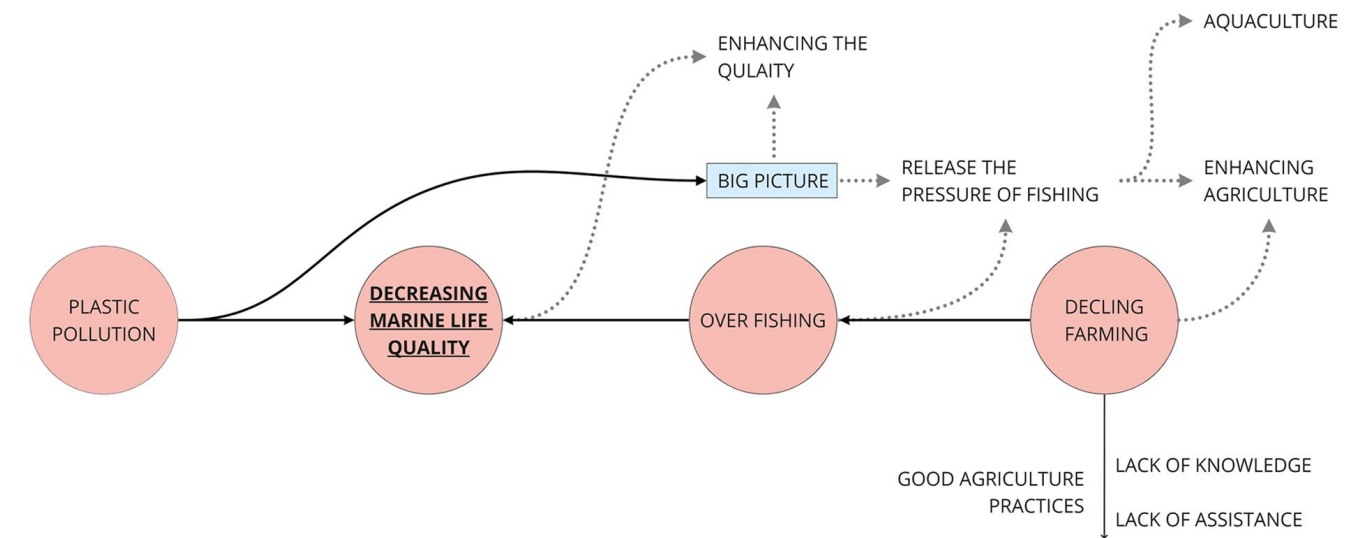
Image from "How to keep slave-caught seafood off your plate" -The conversation on Nov 7, 2018



Imbalance of Fishing and Farming

Farming has been and will continue to be an important factor contributing to the social and economic development of Selayar island. The value of farming lies in the many ways in which it can contribute to improving the quality of life of those who practice it. Reservoir and rice-field aquaculture in Indonesia create employment and increase local food security, while fishing increases the export earnings of the country.

In spite of this, farming in Selayar island is decreasing due to lack of agricultural practice, long supply of chains, lack of good quality soil and slow income. By contrast, fishing has fast and consistent income and the island benefits from an abundance of marine life. This has; resulted in shift in the occupation of people, from farming to fishing. The imbalance of this occupation has caused overfishing, contributing to a decrease in marine life health.





Images source "Coral miners" - WWF Coral triangle blog on Nov 15, 2009.



Images source "Fishing With Bombs and Cyanide Is Taking a Devastating Toll on Coral Reefs" article from Takepart on Dec 3, 2015.

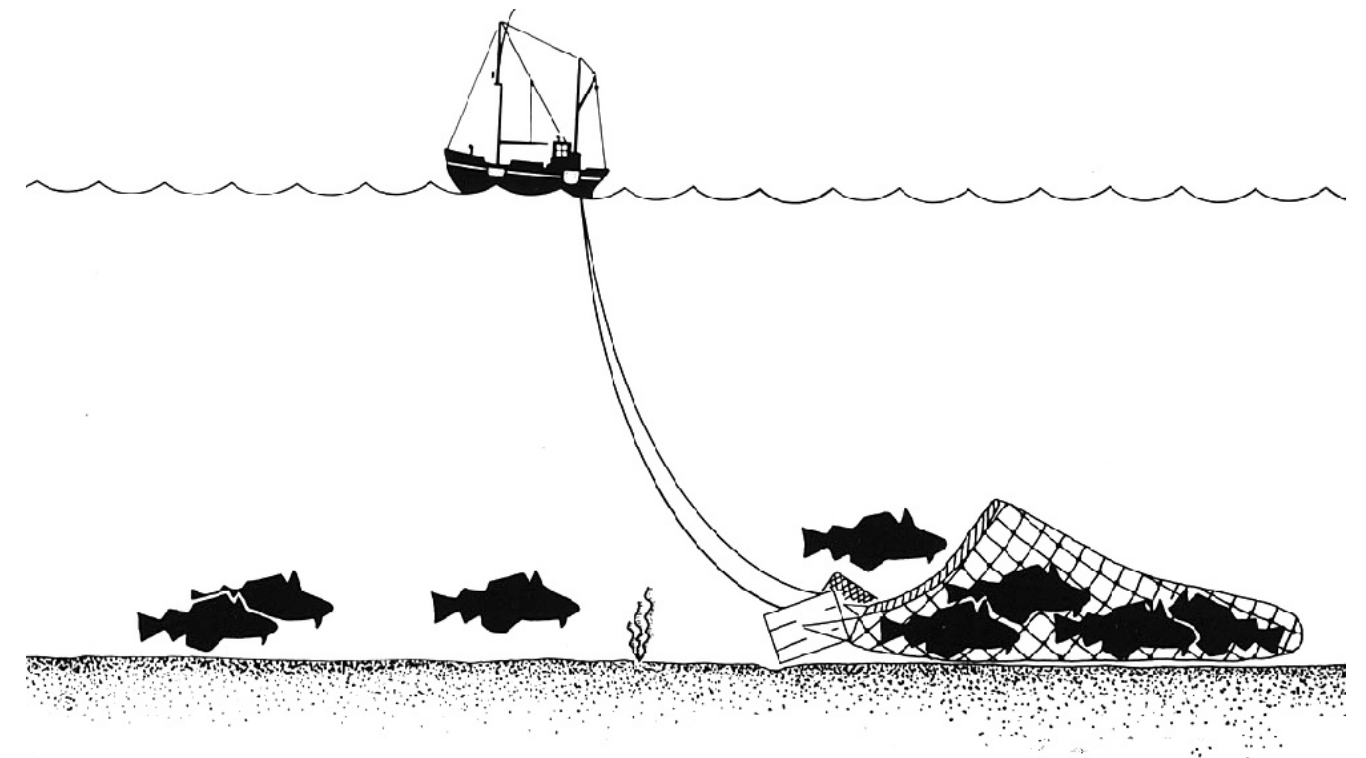
Destructive fishing practices

Every living being, plant, and landscape on our planet contributes to the overall wellness of the Earth. This is why the harmful effects of human waste, production, and consumption can have drastic effects on certain ecologies and biospheres. The coral reef is the most productive marine ecosystem in coastal waters. Coral reefs also provide opportunities for tourism development and other economic and financial returns through fishing that can be used to improve the welfare of coastal communities.

But in this case, the increase of the fishing sector over farming; is affecting the health of marine life. Overfishing simply means catching fish from the sea at rates too high for the fish stocks to be replenished, and the whole ecosystem becomes at risk of irreversible deterioration. Overfishing mostly results from by destructive ways of fishing, in order

to increase the economic welfare in less time. Unfortunately, the island's cost has already suffered from unsustainable human practice, including destructive fishing practices (bombing and cyanide), coral mining, overfishing, settlement pollution and uncontrolled tourism development. These affected the production of those fish stock as an eventual resource in coral reefs. If the destructive uses continue they will result in further deterioration of coral reefs with long-term adverse consequences locally for the welfare of coastal communities, as well as nationally through knock-on effects.

The other collateral damages are :- removal of essential predators, poor coral reef health, growth of algae, unintended catches and threat to local food resources; endangering the marine ecosystem.



“These fisheries are tied to people’s livelihoods and way of life. It’s our responsibility to ensure that this sector is able to sustainably grow and remain viable now and in the future.”

—Jeremy Crawford

International Pole & Line Foundation (IPNLF)

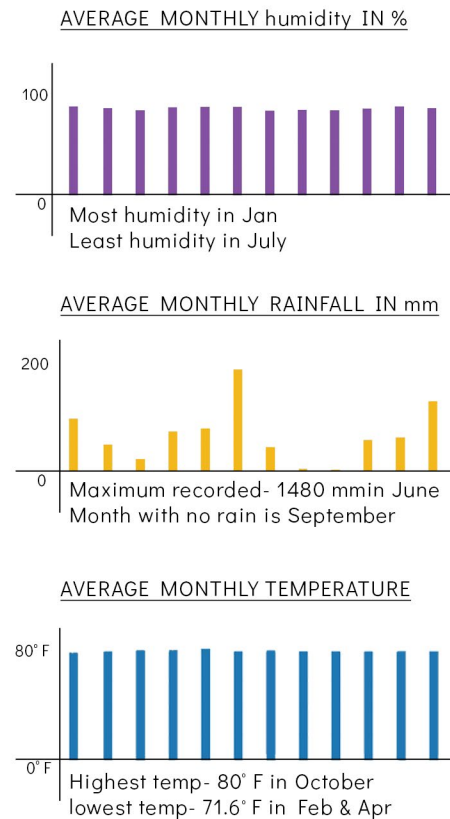
Seaspiracy (Documentary)

The image is taken from Seaspiracy, a 2021 documentary film about the environmental impact of fishing directed by and starring Ali Tabrizi, a British filmmaker. The film examines various human impacts on marine life and advocates for ending fish consumption.





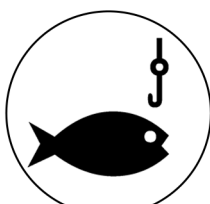





III. LIVING IN SELAYAR ISLAND

- Fast facts and background information of Selayar Island.
- Maritime Traditions
- Maritime Social systems
- Purchase-Disposal-Plastic Literacy



BACKGROUND INFORMATION

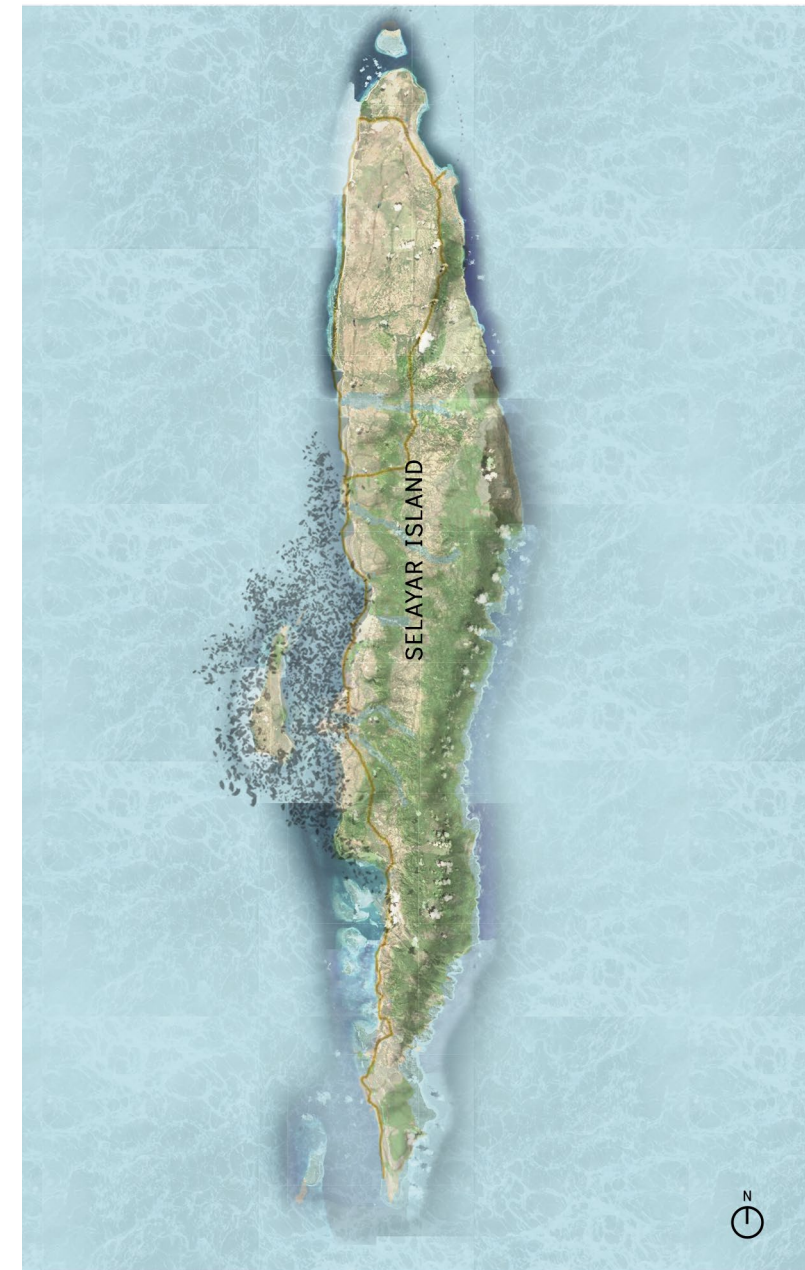
	
selayar island surrounded by 6 islands closely	80% surrounded of total area is marine
	
90,000 aprox. population	foriengn owned tourisms
	
large industries of fisheries	21 coastal villages
	
farmers (coconut, clove, orange, rice, nutmeg)	taka bonerate national marine park located near by

Facts and background information from CCRES-Site report on Selayar, Indonesia, july 2018

Fast facts and background information of Selayar Island.

Selayar, an archipelago of 130 islands (26 of which are inhabited) in South Sulawesi. Selayar has 60 village-level marine protected areas, covering 52 coastal villages, a national marine park, Takabonerate, 11 sub-districts, 57 coastal Villages and 74 non-coastal villages. Covering a total area of 10,503.69 km2, including

9,146.66 km2 of sea and 1,357.03 km2 of land, Selayar encompasses a wide expanse of coral, including the third-largest coral atoll in the world. The waters of Selayar are a meeting place for currents from the Indian and Pacific oceans and border deep ocean waters. This geography gives rise to rich and fertile pelagic fishery resources

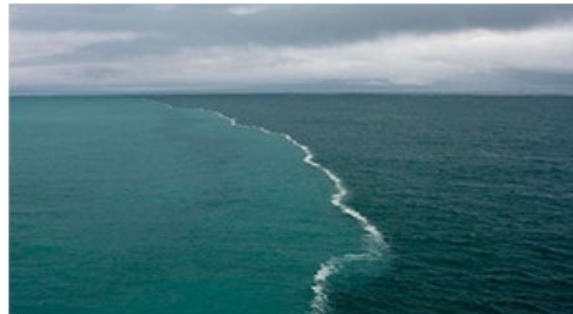


with high economic value, such as tuna and skipjack, and fish exports to Bali and Hong Kong. As well as the potential of its fisheries, Selayar's coastlines have potential for development of marine tourism, supported by the white sand, and the many coral reefs and turtle nesting sites. Selayar faces obstacles and challenges because of

the over-exploitation of reef fish using destructive methods and extensive coral mining. In addition, marine fisheries infrastructure is still relatively minimal.

Maritime traditions

Research writing taken from Ahmadi's "Maritime Traditions And Local Community Knowledge Systems on the Island of Selayar", 2017.



BELIEFS

Families or ancestors who live in water (Bija to ri Je'ne')

The local people in Selayar island still believe that their ancestors have twins with crocodiles. From various folklore it is known that the communication relationship between family on land and in water (river and sea) should not be cut off. At least certain families who have twin ancestors with crocodiles, should always remember and recognize the existence of the crocodile.

Whirlpool (Kala-kala or Simbula')

People on Selayar Island believe that the whirlpool in the ocean is not just a natural phenomenon. But it is controlled by a magical power. Thus, such circumstances can be addressed through local knowledge or expertise.

Meeting of fresh water and salt water (Pa'rappaang Je'ne)

The meeting point between the river water and the alut at the estuary, the local community is believed to be a sacred place.

His eyes water (Matanna Je'ne or Mattana Bombang)

According to local people's belief, in Selayar it is strictly forbidden for someone to step on je'ne's eyes or eye bombing, because it can cause the guards or watchmen sungat or sea angry. Eyes je'ne is the tip of the water or the boundary between water and land on the edge of the river or the sea. People are forbidden to step on this edge when it is down to the river. The trick is to walk through this water and land boundary.

ANALYZATION OF THEIR KNOWLEDGE

Realization of coexistence and relationship with land and water.

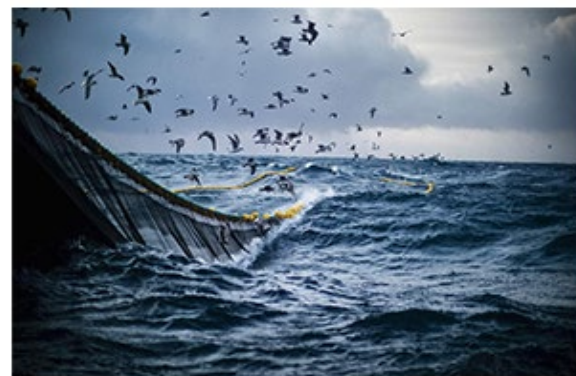
Missinterpreted.

Nature is valued and respected.

Responsible towards nature.

Maritime social systems

Research writing taken from Ahmadin's "Maritime Traditions And Local Community Knowledge Systems on the Island of Selayar", 2017.



BELIEVES

ANALYZATION OF THEIR KNOWLEDGE

Ritual of offering

In the local language this tradition is called *attoana*, which is a package of offerings (*songkolo'*, eggs, *cucuru'*, betel leaves, and other ritual favors) on the edge of the river or washed away on water or sea using a particular container. This is the form of interaction between humans and nature full of

Study and function the mantra (*syara'*) in the move. Some local people on Selayar island believe that every activity at sea must do certain things as part of the way to adjust. A recommendation is to hold the hair before going down to the sea, to avoid the disturbance of marine animals. Another suggestion is to fold both thumb hands, also believed to be a way to free themselves from the gangs of sea animals. The philosophy is that the thumb is the symbol of a conquered animal's head.

Avoid actions or deeds that are considered taboo

The local people avoid ordering fish from a person (buyer), and instead catching it directly from the sea. The reason for accepting orders means that we are arrogant and predate the will of God. This is because accepting the same order means it has ensured that we will get the fish, whereas uncertain sea conditions can change the situation even the fisherman's plan in fishing.

Release the power or powers of a science

Someone who wants to be free from the influence of black magic, which is controlled because of parental inheritances is recommended to perform a ritual at the mouth of the river or sea.

Considers ocean water as holistic.

Sensitive towards other living beings.

Understands uncertainty of the nature.

Praying to their whole and sole.



This image shows global attitude of companies towards plastic wastage. Image from @get.waste.ed

Purchase and disposal

I. VENDORS

- 1) NO REFRIGERATOR to sell.
- 2) LESSER QUALITY FISH for their own and sell GOOD QUALITY FISH.
- 3) Very LESS VEGETABLES are grown on islands die to poor quality of soil.
- 4) Vegetables are IMPORTED AND SOLD.

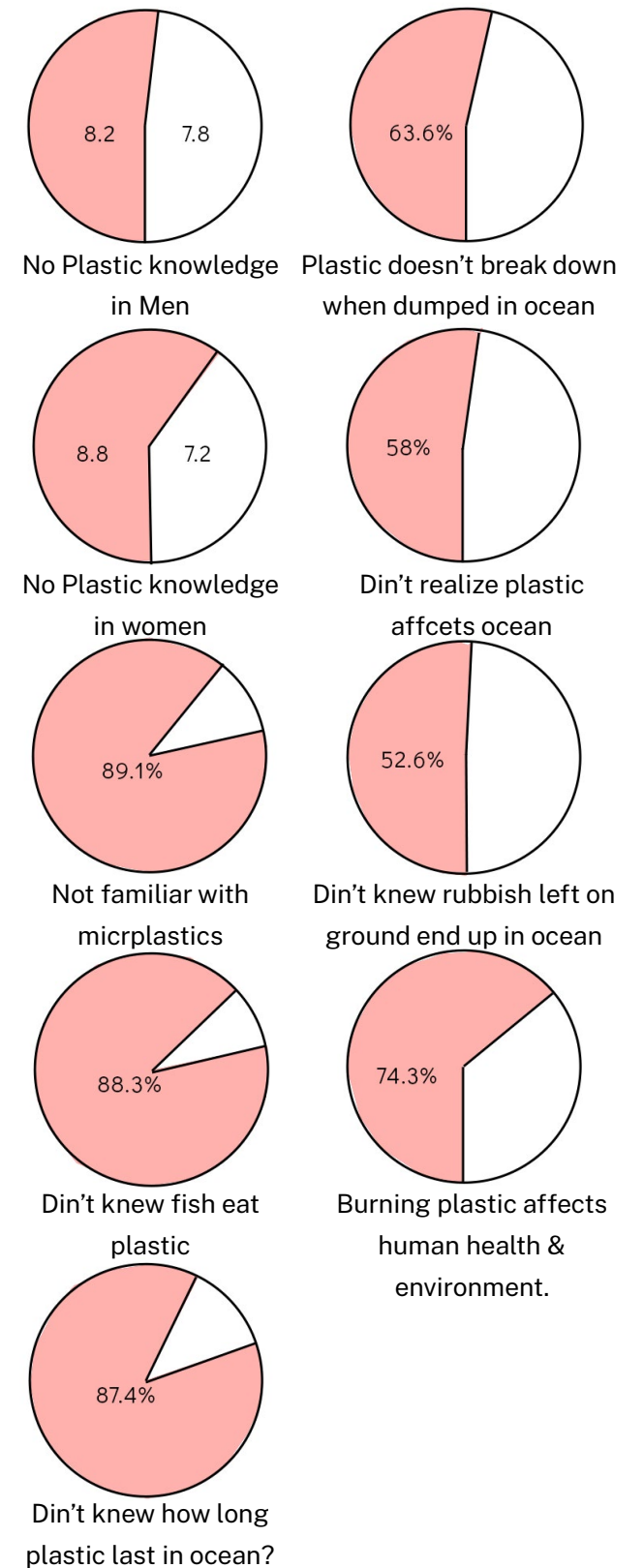
II. BUYERS

- 1) Processed PACKAGED FOOD from stores are cheaper and more convenient than fresh.
- 2) Processed PACKAGED SNACKS food from stores are cheaper.
- 3) DAILY local shopping is preferred.

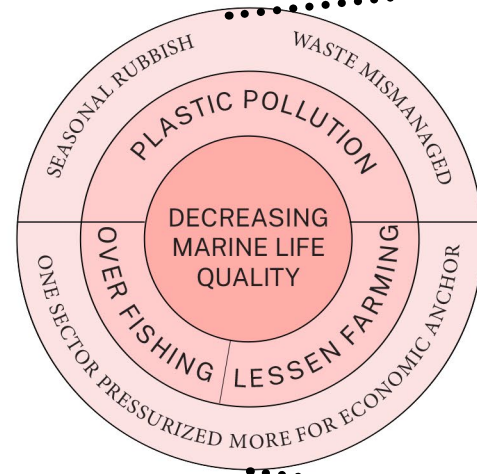
III. DISPOSAL

- 1) CHICKENS AND GOATS are used to dispose of kitchen waste.
- 2) 2KG-14KG FROM AVERAGE DAILY HOUSEHOLD WASTE from kitchen waste, garden leaf, cardboard package, plastic bottles, & packaging, cigarette packing, glass bottles, paper and miscellaneous.
- 3) 0.25KG PER FROM PERSON RECREATIONAL & GATHERING SPACE from plastic bottle and plastic packaging.
- 4) 48% BURNT.
- 5) 25% IN OCEAN.
- 6) NO WASTE COLLECTION SERVICES OR GARBAGE BANKS.
- 7) MANGROVES AREAS USED AS DUMP SITES FOR PLASTIC.
- 8) 92% OF PEOPLE are prepared to walk a very short distance from their house to dispose of rubbish.

Plastic literacy rate

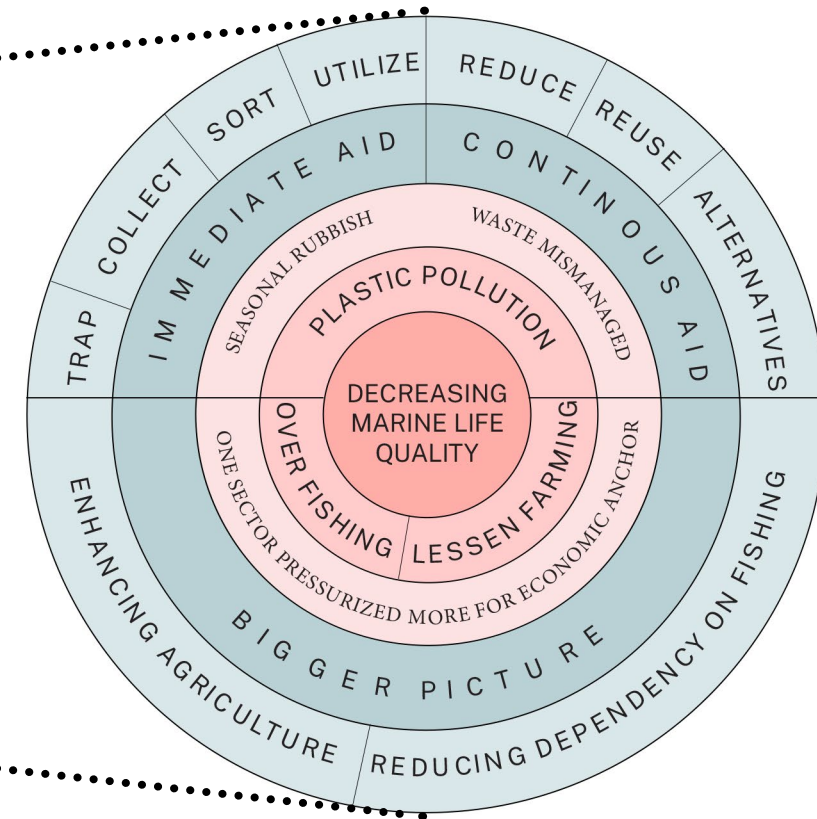


IV. APPROACH



A Triangulation between three local Conditions

The thesis revolves around a complex triangulation between- plastic pollution, overfishing, and decline in farming. Plastic pollution is caused due to seasonal rubbish from the ocean to coastal edges and waste mismanagement systems. Overfishing and decline in farming promote an unbalanced situation, which ultimately also affects the marine ecosystem.

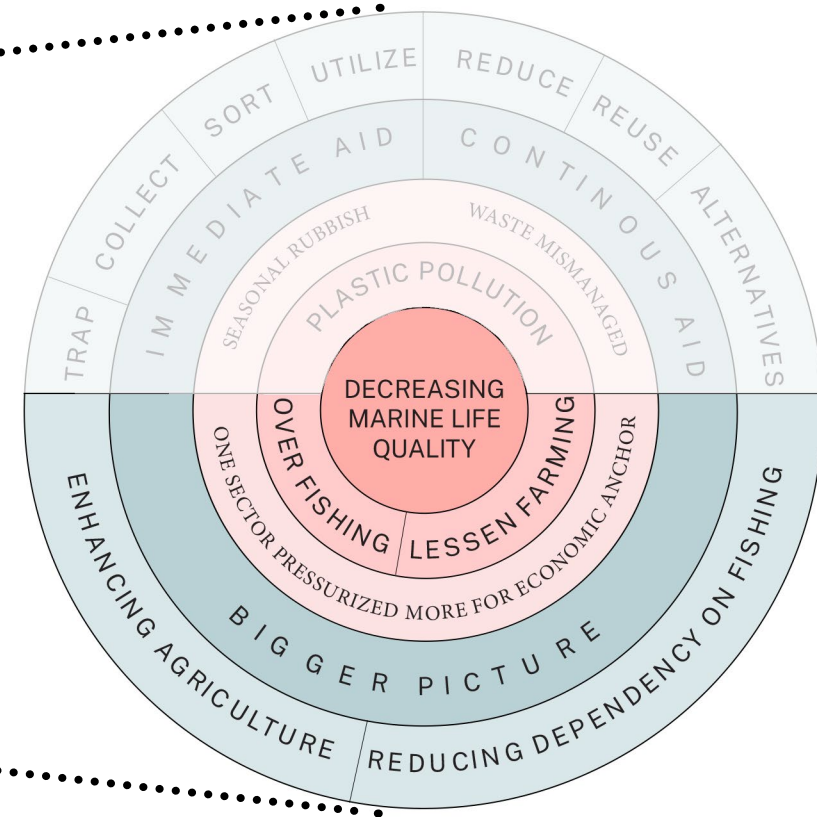
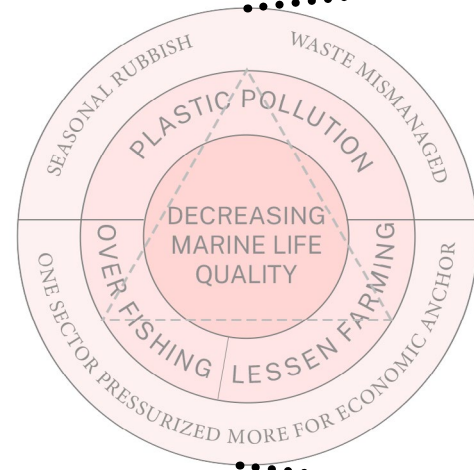


Different types of aid

The triangulation encouraged a design strategy of interrelated practice, organized into three types of aid: immediate aid, continuous conscious aid, and long term aid by looking at the bigger picture.

V. UNFOLDING DIFFERENT TYPES OF AID

- Bigger picture
- Continous aid
- Immediate aid
- Activated water clock

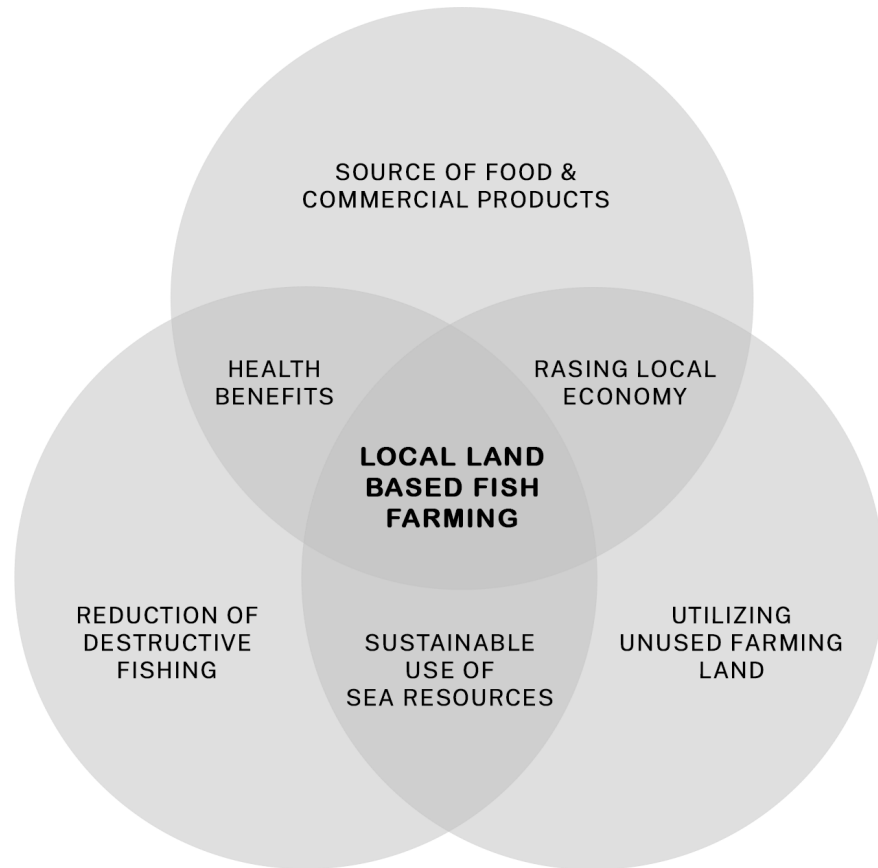


Bigger picture

The main goal of looking at the picture is to eventually balance the two main occupations - farming and fishing - in sustainable ways.

III. BIG PICTURE

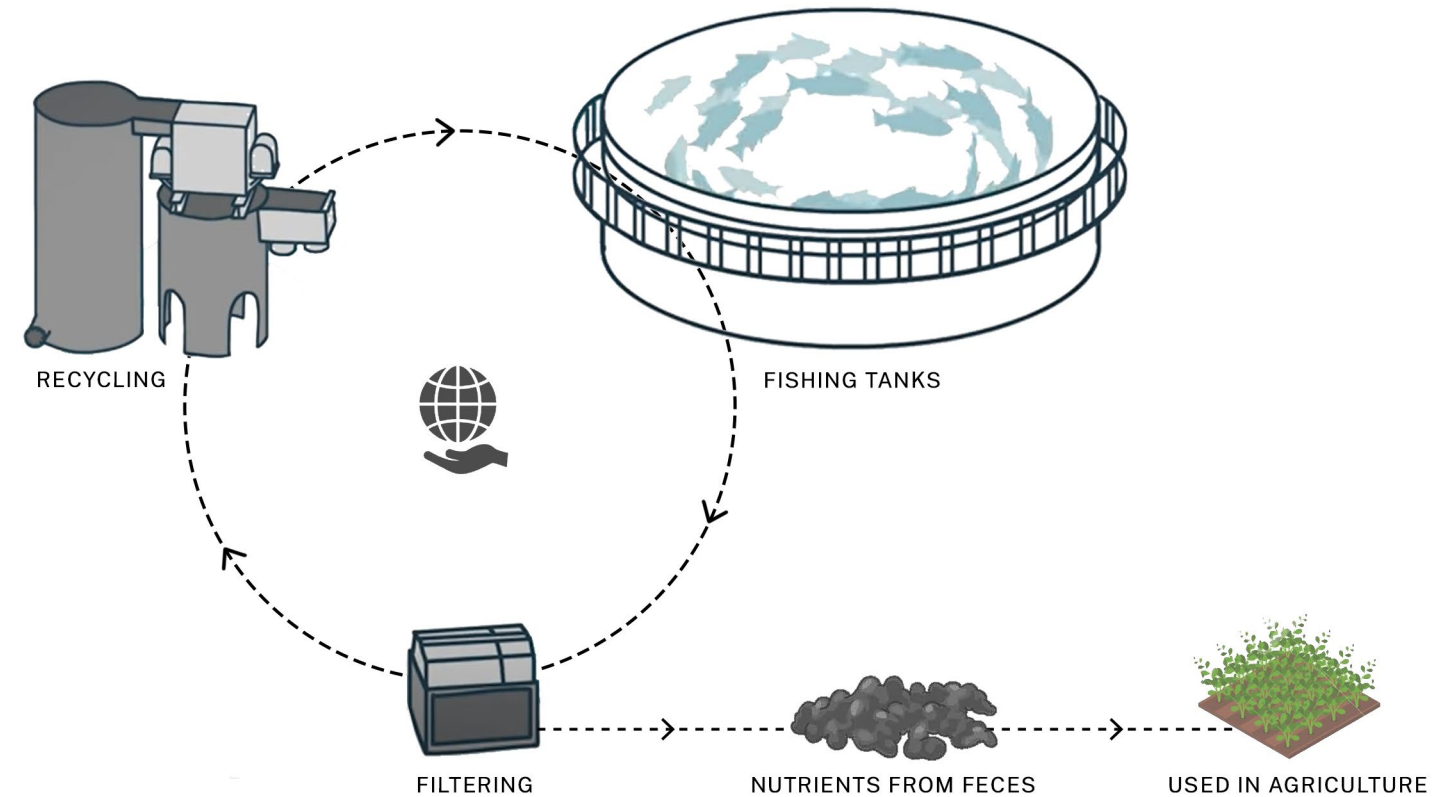
LAND BASED FISH FARMING



Land based fish farming stands for Recirculating Aquaculture System. This involves cultivating freshwater and saltwater populations under controlled conditions, and can be contrasted with commercial fishing, which is the harvesting of wild fish. Land-based fish farms ensure marine species to grow in the ideal habitat by using natural resources responsibly.

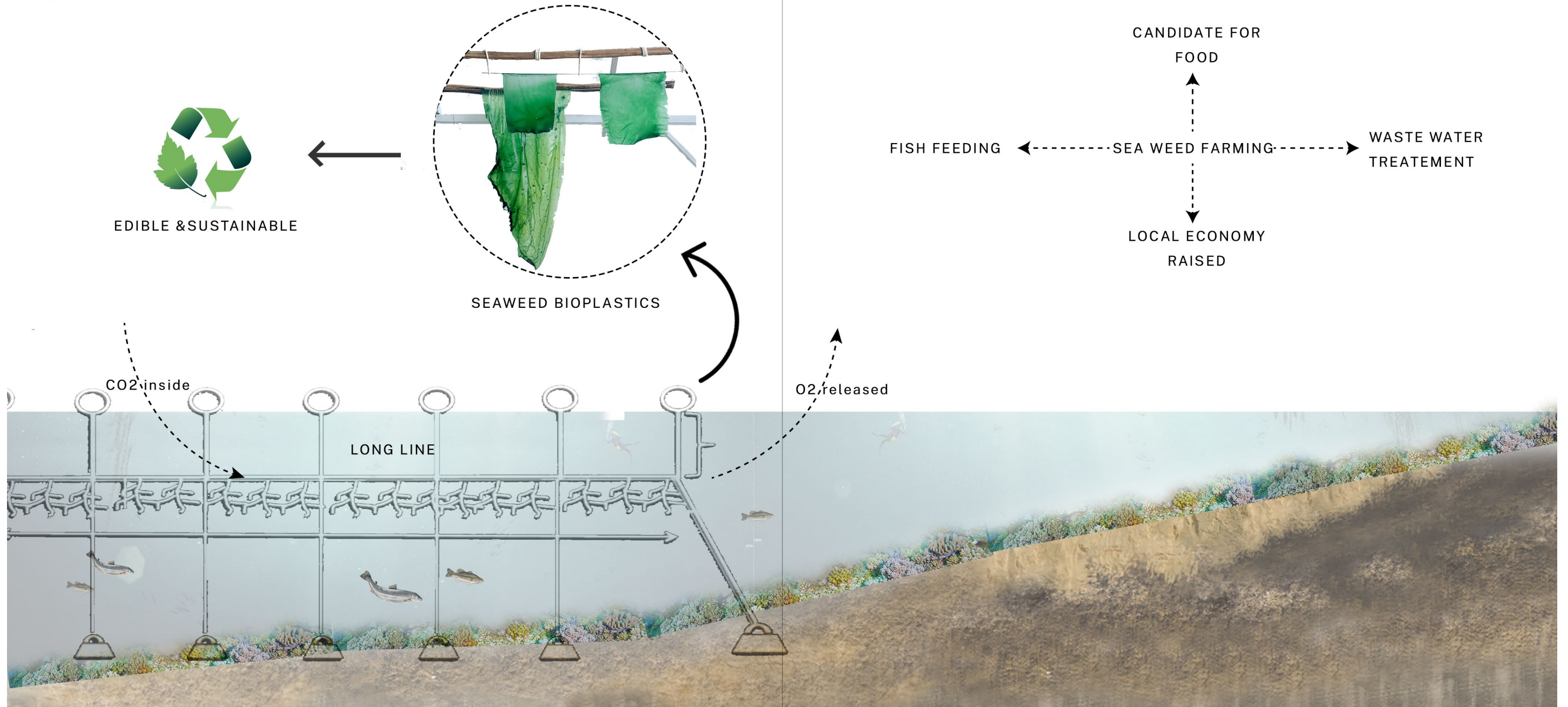
It provides source of food and commercial products but also reduces overfishing and destructive farming practices exploiting the marine life health and becomes a sustainable use of sea resources. It helps to raise the local economy of the people in Selayar island.

RECIRCULATING FARMING SYSTEMS



Recirculation of farming systems helps to filter and recycle the water, and the water is not stagnant in the tanks which spreads diseases to the fish skin, due to excretion of their own. The waste released from these species can then be filtered, segregated, and used as fertilizers for agriculture.

SEA WEED FARMING



Seaweed farming is considered poor economy in Indonesia. But it has several benefits to people and environment. Seaweed ocean farms require no addition of feed, freshwater or fertilizer and there is no waste from marine plants, making it the most sustainable form of agriculture on the planet. Seaweeds are incredibly efficient at sucking up

carbon dioxide and using it to grow. Eelgrass, mangroves, and salt marshes are already known for their ability to store carbon. But seaweeds pull more of the greenhouse gas from the water than all three combined based on biomass. That means seaweed farms can help to combat local impacts of ocean acidification.

Along, with being candidate of food it has high fiber, vitamins, and minerals. But due to long marketing chain the income is slow and not a lot of seaweed is absorbed and goes to waste. Seaweed is the material used to manufacture edible bioplastic which can be used as food-based packaging. This edible bioplastic uses natural materials and lasts

for 2 years with preserving it. It is biodegradable and can be used as fertilizer for plants. It is the best replacement for plastic. It has the same qualities of plastic like printable, heat sealable, customized color and branding and can give additional customized taste to edible food-based packaging systems.

Research writing and image from Charles ARTHUR's "The tide is coming in for Indonesia's seaweed" Aug 24, 2018.



In 2014, the United Nations Industrial Development Organization (UNIDO) launched a programme to strengthen the three main value chains in Indonesia's fisheries sector: seaweed, tuna and pangasius. As part of this programme, UNIDO has been teaching farmer groups and cooperatives in coastal regions of Sulawesi how to grow seaweed in accordance with global standards. Some 550 farmers in South Sulawesi have received training on more effective cropping practices.



Indonesian eco-social startup uses edible seaweeds to replace plastic packaging

Everyone knows plastic waste is a global issue and our ocean is under severe threat as 90% of plastic waste goes into the ocean every year. According to the United Nations, 70% of that waste comes from food and beverage packaging and by 2050, there will be more plastic than fish in the sea.

According to Nature Research, four of Indonesia's rivers rank among the 20 most polluted in the world in terms of mismanaged plastic waste. This makes Indonesia the 2nd largest contributor to marine plastic pollution after China. In 2017, Indonesia Environment and Forestry Minister Siti Nurbaya Bakar has set a target to reduce plastic waste by 70 percent to preserve the environment. According to DotAsia's Youth Mobility Index (YMI.Asia), though Indonesia ranks in the middle among 20 localities, it has achieved a good ranking in Start-up capital

Research writing and image taken from DotAsia- Indonesian eco-social startup uses edible seaweeds to replace plastic packaging

availability and education workforce, showing that the government has achieved results in inspiring young people to start to change the world. Originated from Jakarta, Indonesia, Evoware is a socially responsible enterprise which provides an eco-solution for plastic waste problems. The co-founder and designer of Evoware, David Christian, believes the production chain of Evoware can bring mutual benefits to both environmental safety and livelihood of seaweed farmers in Indonesia.

First of all, this seaweed-based packaging's patent has been granted and received a halal and safety guarantee certificate. It is 100% biodegradable and served as a natural fertilizer for plants. Seaweed-based packaging is extremely good for small-format food sachets and wraps, e.g. instant noodle



seasoning, tea or coffee powder and the complements and burger wrap etc. It's good to replace conventional packaging in a convenient and healthy way. It can also be used to package the non-food based contents such as toothpicks, soap bars and sanitary pads. If this innovative method is adopted widely in FMCG products in Asia, it would be a good news for our planet.

Secondly, a large volume of seaweed production is oversupply in Indonesia. "Indonesia produces 10 million tonnes of seaweed per year and targets 19 million tonnes by 2020", said Christian. And there are 5 of the 6 poorest provinces in Indonesia that are actually producing seaweed. Most seaweed farmers are poor due to a long marketing chain and loan sharks. While using seaweed as the main raw material of the packaging material, the success of

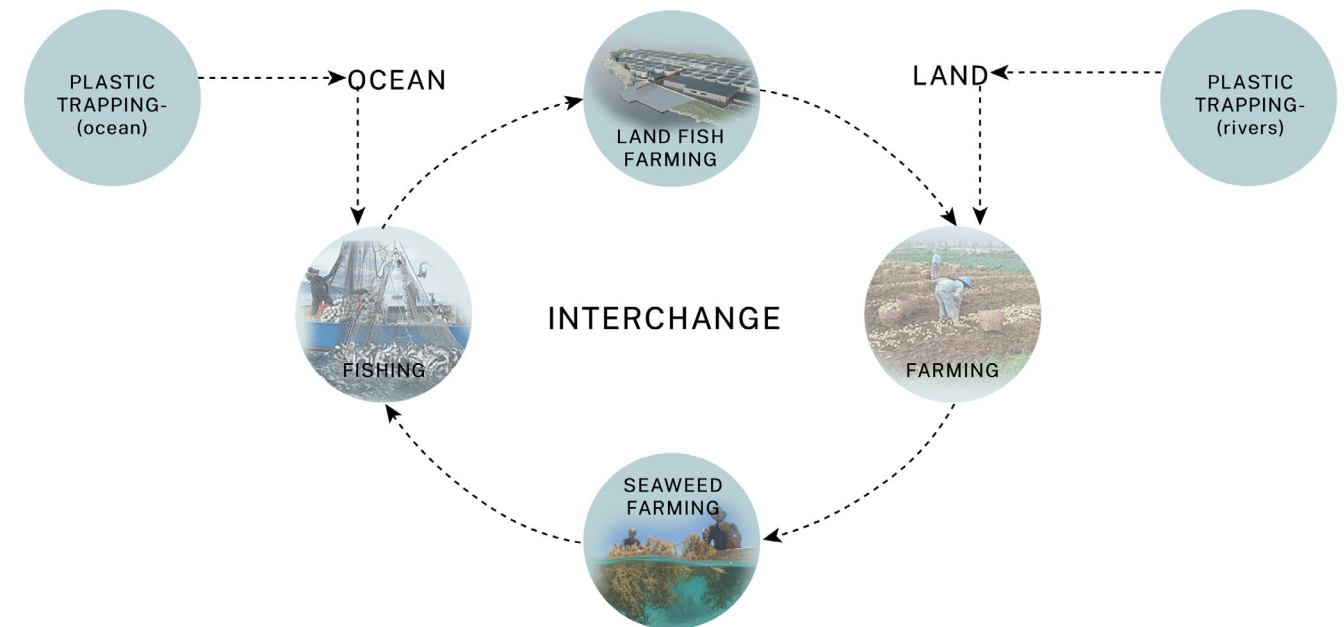
innovative packaging can add value to seaweed production so as to help improve the livelihood of local seaweed farmers.

Through using Evoware's products, people evolve to be closer to nature and live a more responsible and sustainable life. Christian hopes to educate people to replace plastic with its biodegradable seaweed packaging that can be eaten along with the food inside. 'We want to create a cleaner world by stopping plastic waste from the root,' he said.

Interchange

This interchange of land is shifting the fishing on land and farming in ocean. Basically it is interchange of function of water and land, to provide sustainable ways of practicing these two occupations which helps to remove the burden of fishing and enhances the agricultural practices on

Selayar island. Along with that plastic trapping is to be designed in ocean for capturing microplastics and river traps to be designed on land for capturing macro plastics leaking into the ocean through rivers and waterways.



EXISTING



DRY SEASON

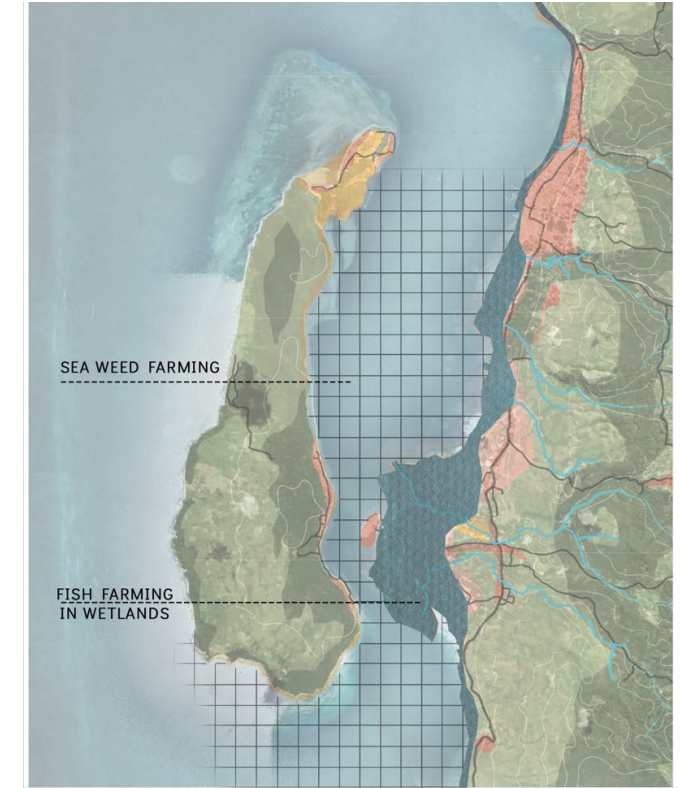


WET SEASON

PROPOSED



DRY SEASON



WET SEASON

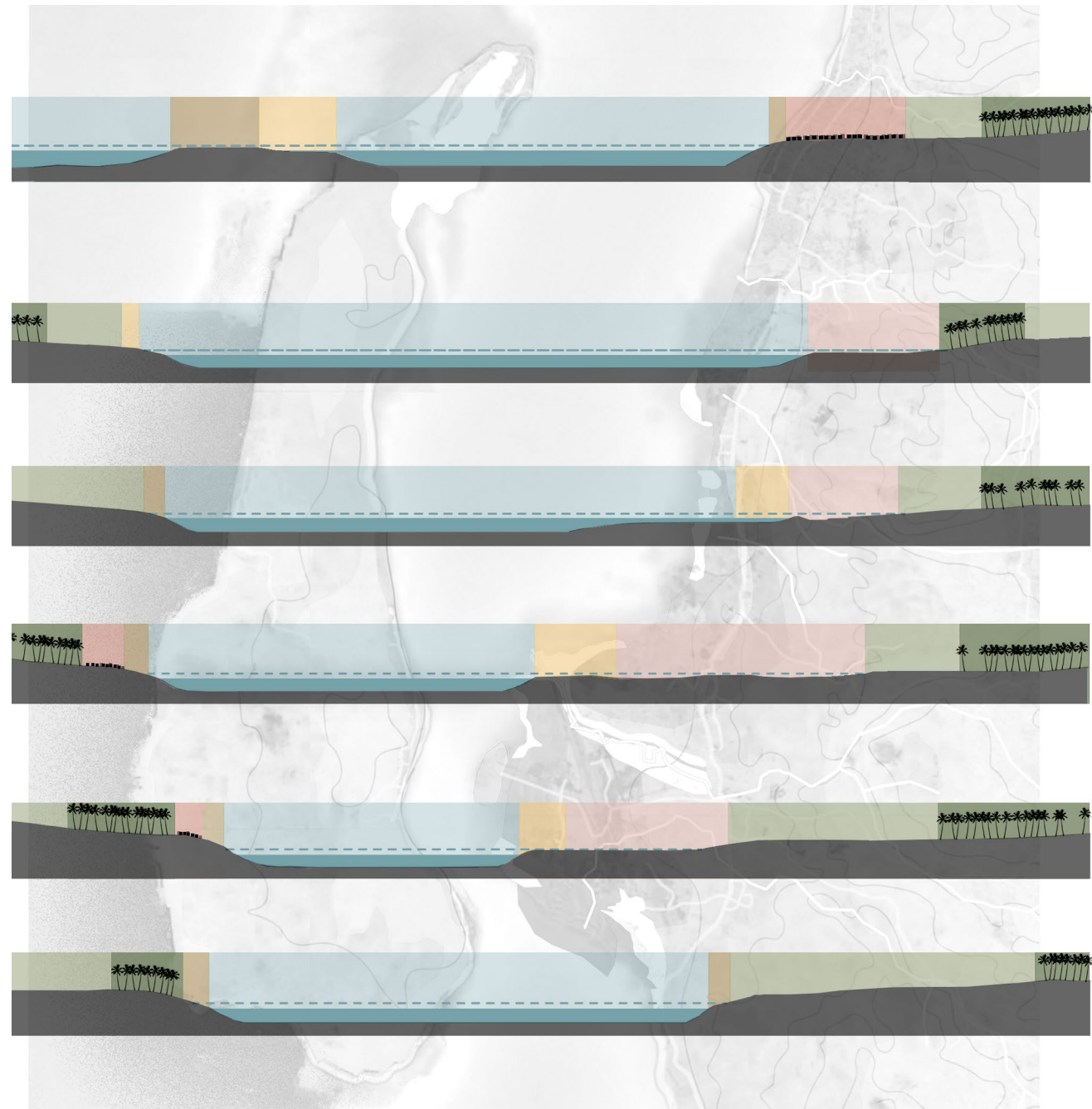
Proposing Seaweed and land-based fish farming

Selayar island has tropical climate and has wet and dry season. As you can see in the existing wet season, animal farming area is under water and the land is not in use. This is a good opportunity for proposing land-based fishing in wet season the animal farming area by providing depressions to allow the water to flood in from ocean and let the fresh water coming from land mix into the

depressions making it brackish water. This becomes ideal habitat for species to grow in, that are found in this area. Water between two islands can be converted into seaweed farming as most of the communities on this island lives on the coastal edge facing the area between two islands, which helps them to access seaweed farming area..

- FOREST
- AGRICULTURAL LAND
- MANGROVES
- ANIMAL FARM
- RESIDENTIAL AREA
- BEACH
- ROAD
- WATERWAYS





- FOREST
- AGRICULTURAL LAND
- MANGROVES
- ANIMAL FARM
- RESIDENTIAL AREA
- BEACH

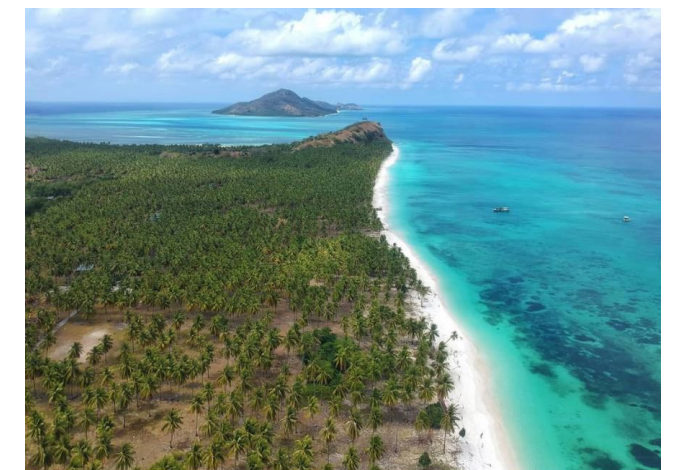


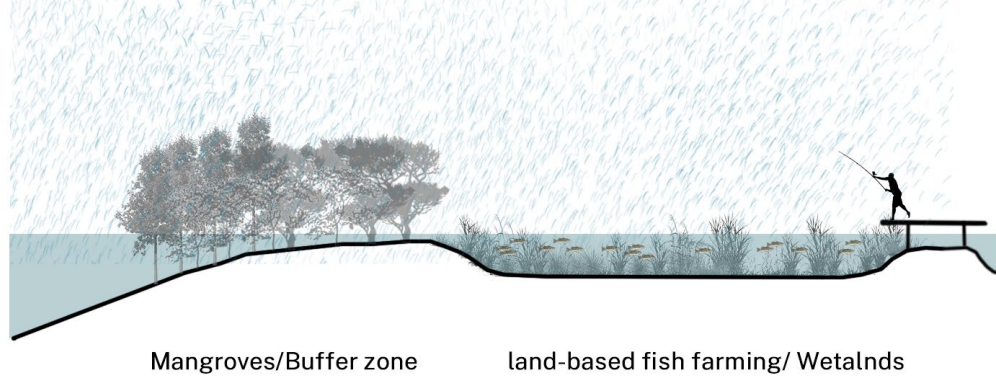
Image are taken from @alif_fajrin_selayar instagram profile

Transects

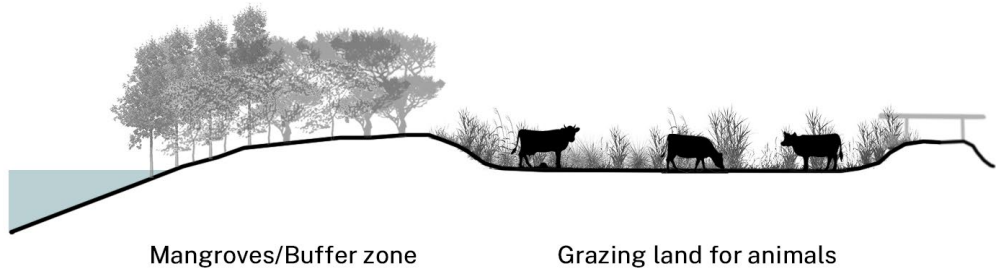
There are various edge conditions between two islands seaweed farming and land-based fish farming proposed. These transects helps to understand the system and relationship between spaces. Most of the edges have beach, mangroves,

animal farming or agricultural land. As the animal farming land will be used for land based fish farming, edge condition needs to be well treated.

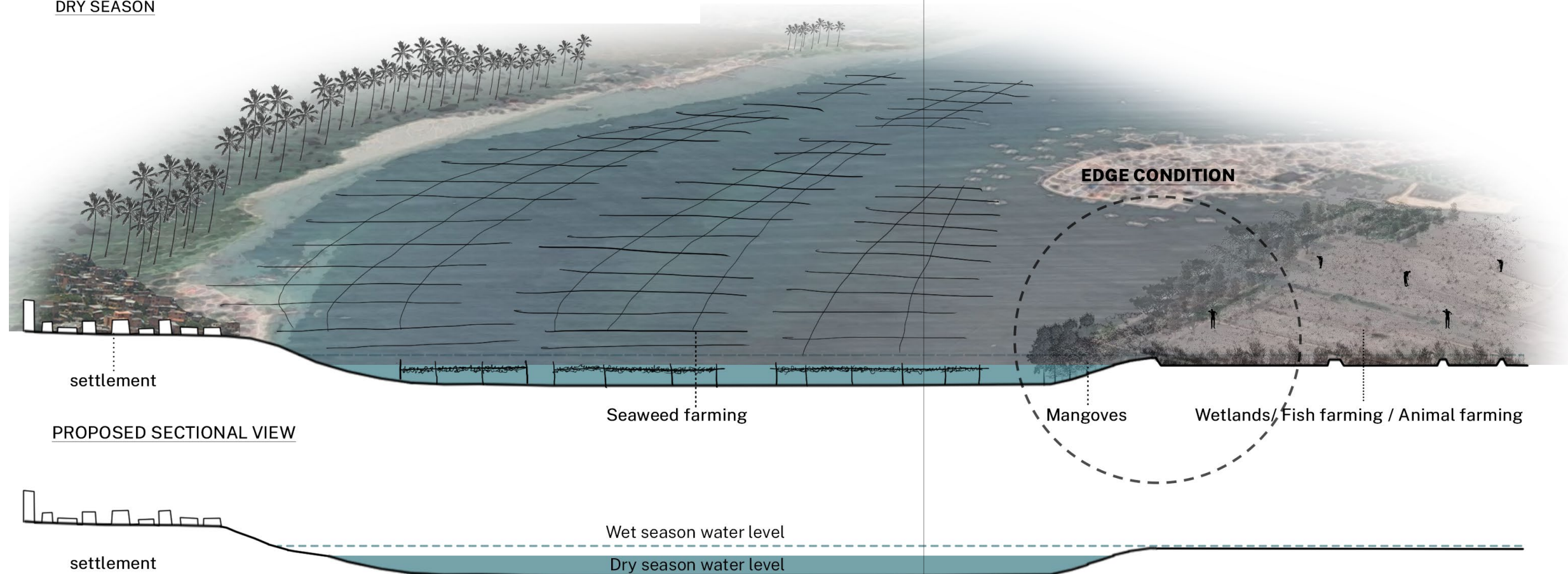
EDGE CONDITION



WET SEASON



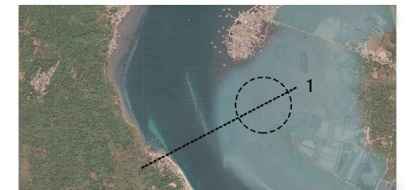
DRY SEASON



Typical edge condition

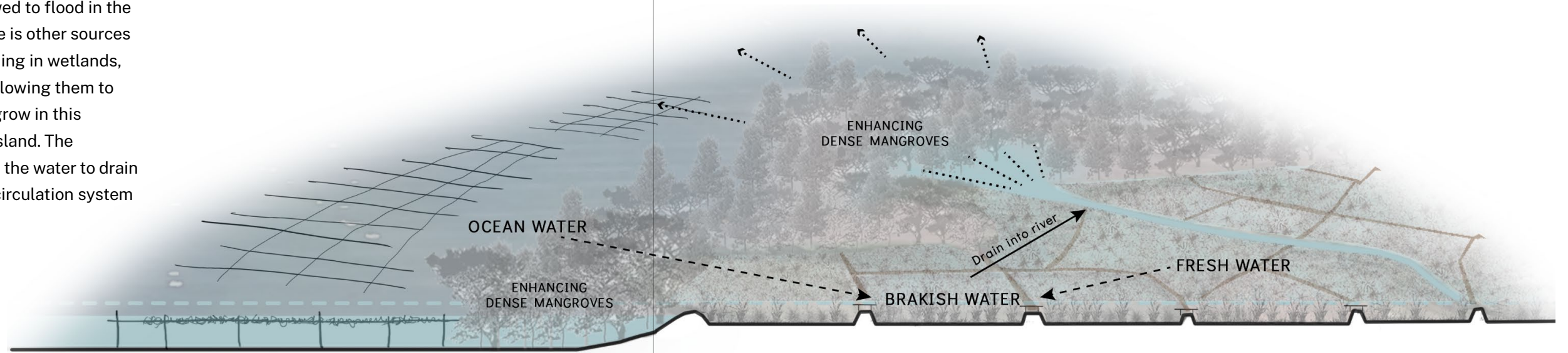
So, this is the typical edge condition of it. Where land is manipulated, and the depressions create wetlands which could then be used for land-based fish farming in wet season and could then be turned into grazing land for animals in dry season. Mangroves acts as the buffer zone and filtration system to avoid entering the excess of nutrients released from the waste of the fish to get into the ocean. Wetlands become healthy habitat for fish to live in and avoids getting the nasty diseases that

they usually get in tanks of aquaculture; not only that but these wetlands helps to address the limit between land and water by blurring the lines.



Recirculation of water

This is another typical section which cuts through the animal farming or wetlands and river. In this you can see that ocean water is allowed to flood in the wetlands in wet season and there is other sources of fresh water from the land coming in wetlands, which makes it brackish water allowing them to produce species that typically grow in this condition found here in selayar island. The manipulation of land then allows the water to drain into rivers which completes the circulation system of water.



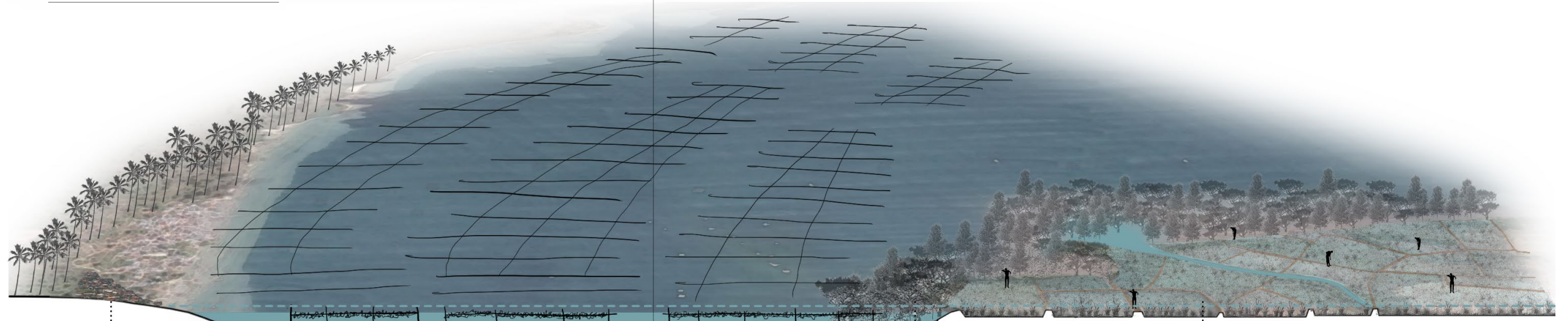
RECIRCULATION OF WATER



WET SEASON



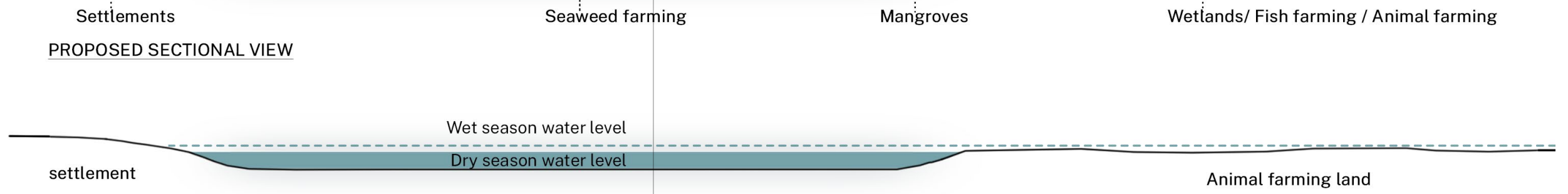
DRY SEASON



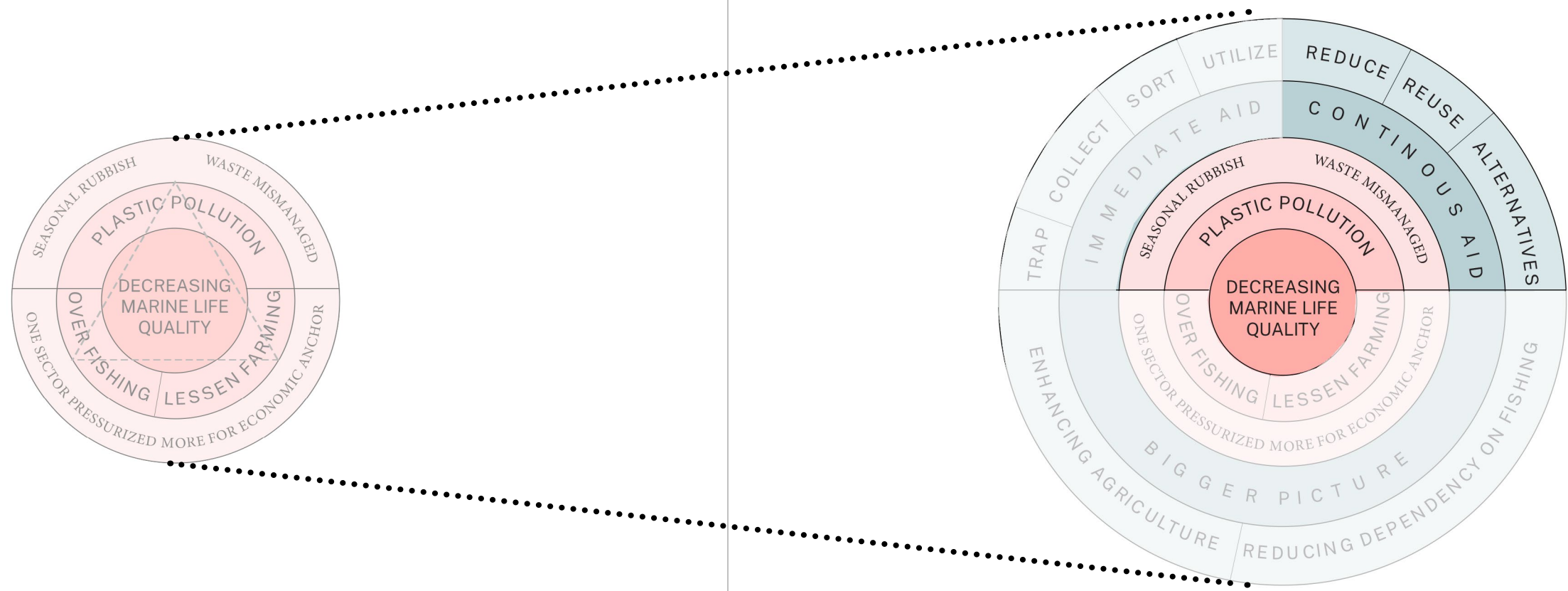
PROPOSED SECTIONAL VIEW



KEY MAP



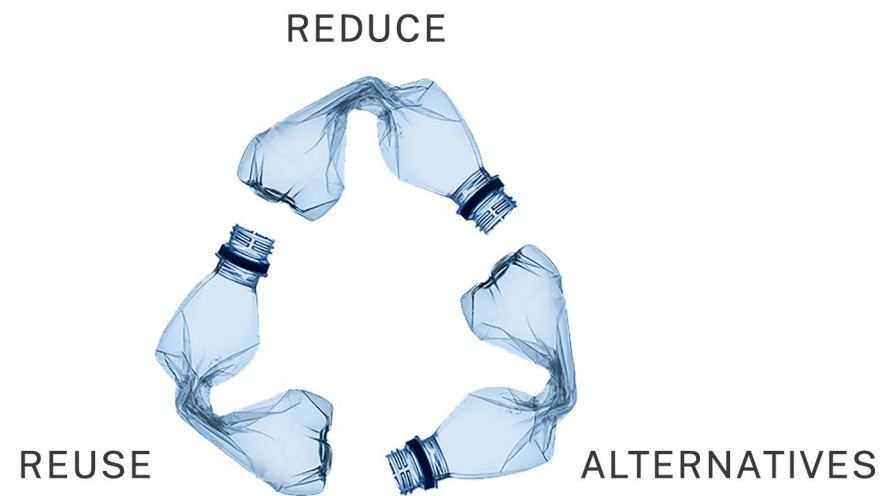
EXISTING SECTION 2



Continous aid

Continous conscious aid addresses more about changes in the lifestyle and attitudes towards living sustainably by reducing, reusing and enhancing the use of alternative sustainable local materials.

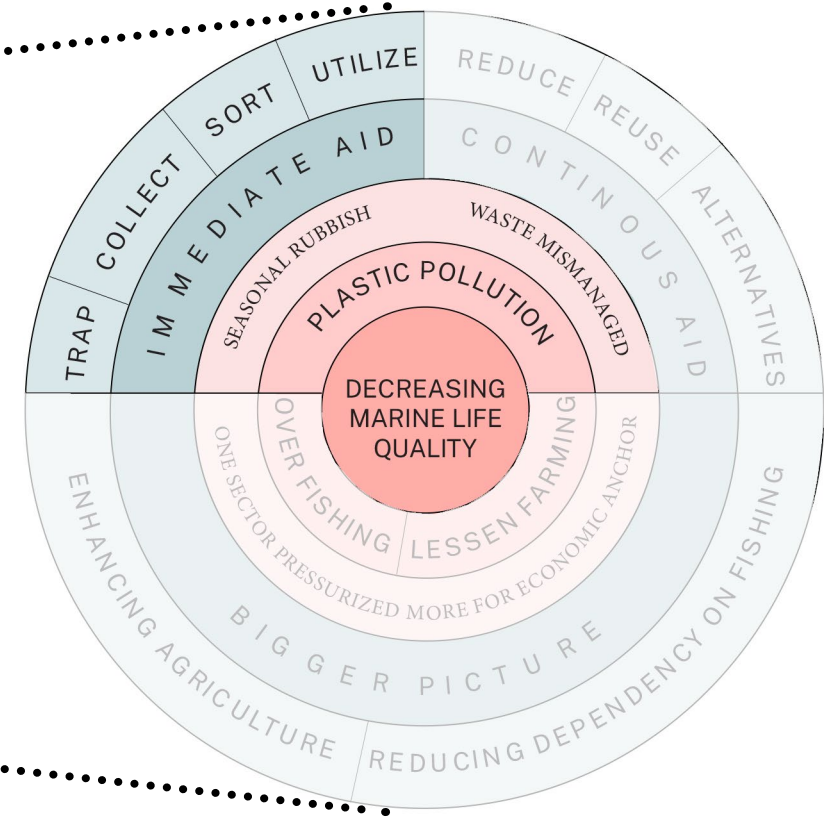
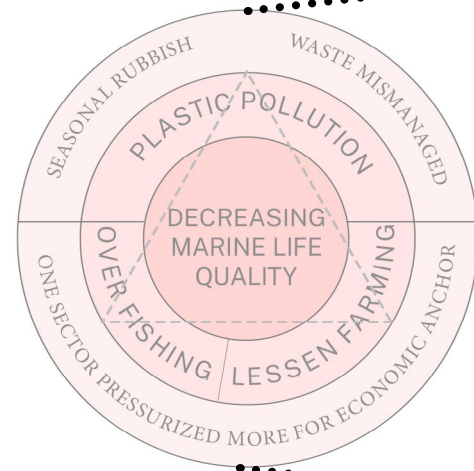
II. CONTINUOUS AID
 REDUCE, REUSE, ALTERNATIVES



Specifically, the production of plastic has brought about a lot of social benefits and associated future technological advances. Despite of this, plastic plays an alarming role as it is non-renewable material contributes to the global pollution leading to exacerbating climate change. We need to stop the production and urge the manufacturing

industries to find alternatives to plastic. It is hard to believe in the reduction of plastic, but it is certainly possible to switch to degradable materials. Hence by Reducing, Recycling, and Reutilizing plastic should be practiced. Continuous aid is more about changing the lifestyle and attitude towards use of plastic.





Immediate aid

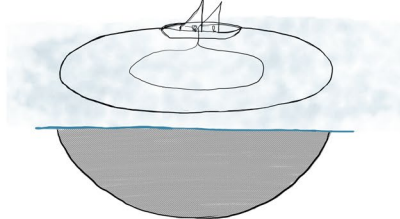
Immediate aid includes trapping, collecting, sorting and utilizing plastic. This is the first step that can be taken to address the problem of plastic pollution.

Various types of fishing practices (1st horizontal row of diagrams)

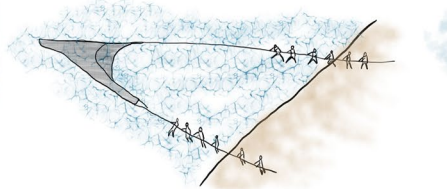
Understanding the following list of local/traditional ways of fishing carried on Selayar island



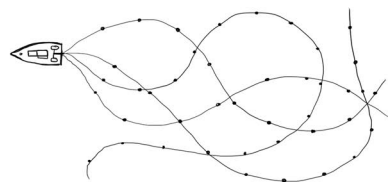
LONG LINE FISHING



PURSE SEINE



BEACH SEINE



FLOATING



HAULING

Strategies for various types of fishing practices (2nd horizontal row of diagrams)

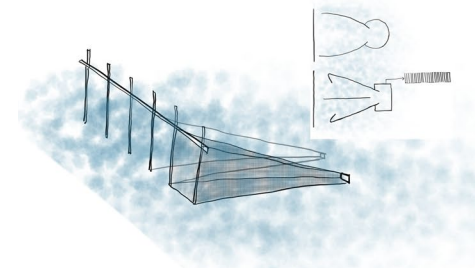
Vocabulary extracted from various fishing practices used as strategies for further development for plastic traps.

Various fishing practices

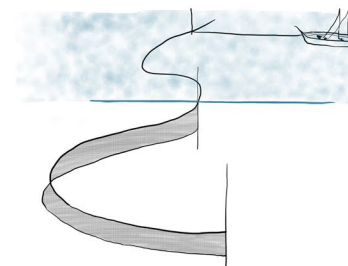
Drifting pelagic longline is used worldwide to catch widely distributed pelagic and semi-pelagic fish. This gear is very effective in catching tuna, billfish and sharks. It consists of a main line or “mother” line, suspended in the water by secondary lines called float lines, which carry the floats. The branch lines hang from the main line and carry hooks on the ends. The characteristics of the materials, dimensions, types of floats and hooks, as well as the configuration of the lines are quite variable, depending mainly on the origin of the fleets, the fishermen and the target species.

Purse seines are commonly used all around Indonesia to catch small tunas as well as small pelagic fish, but they are particularly developed in West Indonesia. Excluding the big purse-seiners operating from Biak in the Indonesian Pacific rim, most of the Indonesian purse seiners are multipurpose boats.

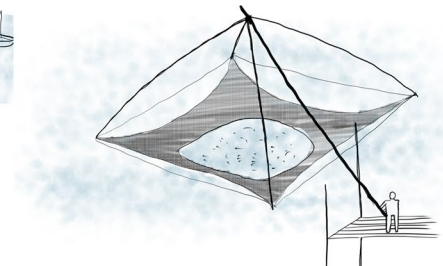
Beach seines are widely distributed throughout Indonesia with the Malacca Straits and Northern Sulawesi as a major concentration of this gear. All beach seines have the same basic design, i.e. with



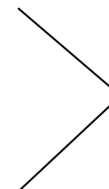
STAKE TRAPS



GILL NET



LIFT NET



FUNNELING AND STRAINING



BARRICADING



SCOUPIG

Gill nets are single-walled nets found in various mesh sizes. Fish of different body sizes get gilled or tangled into the netting when they try to pass through it. Trammel nets are included in this group. These are passive gears, but fish can also be driven into gill nets. The most numerous of the drifting gill net use of which is widespread throughout Indonesia. The netting material is monofilament for small scale gill nets, and multifilament for large scale gill nets. Drifting gill nets hang on floats just below the surface and are used to capture various pelagic species.

The most important type of lift net found in Indonesia is a stationary platform built on pilings in shallow water and used at night to capture anchovies or other small schooling pelagic fish which are attracted over the net with light from powerful kerosene pressure lamps. Though lift nets, when not equipped with other fishing devices are regarded as passive and inefficient gear.

Observation



Wood and bamboo

This is an interpretation made by observing various videos and images of Selayar island. Looking at the settlements, materials used for housing or any structure in Selayar island is bamboo and wood. Along with houses, even the decks or near the port area, structures are made of bamboo and wood. Looking at it, assumption is made that there is plenty vegetation in forest and bamboo trees. This abundance of material can be used for design further.

Image taken from @ alif_fajrin_selayar instagram profile



Coconut trees

The coconut palm tree (*Cocos nucifera*) is native to tropical islands in the western Pacific Ocean. These are found in abundance on this island. Coco coir comes from the fibrous coconut husks inside of coconut shells. This strong and useful by-product is sourced for the production of a number of different products. Coco coir is an extremely durable, rot resistant, fibrous material making for an excellent material to use in producing products with plenty of exposure to water and/or used outdoors.

MATERIALS



FILTERING



STRUCTURE

-

TYING & WEAVING



FLOAT

-

NUTRIENTS



-



-



-



-



-



-

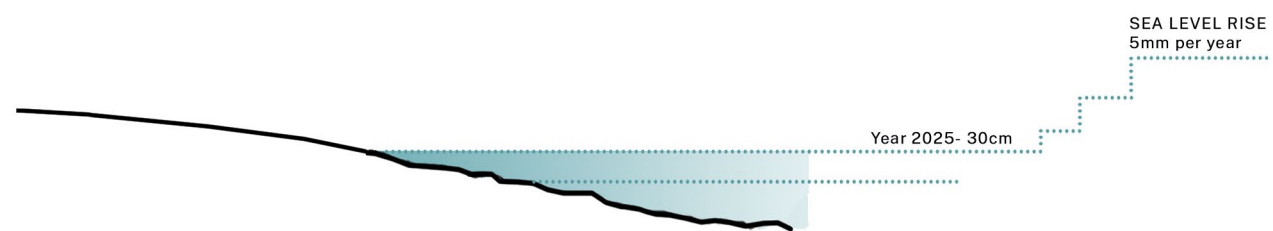


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Sea level rise (SLR)

Risk related to SLR (including erosion, flooding and salinisation) is expected to significantly increase by the end of this century along all low-lying coasts in the absence of major additional adaptation efforts.

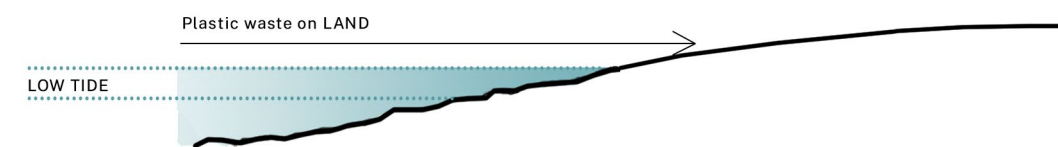


Coastal ecosystems are already impacted by the combination of SLR, other climate-related ocean changes, and adverse effects from human activities on ocean and land (high confidence). Attributing such impacts to SLR, however, remains challenging due to the influence of other climate-related and non-climatic drivers such as infrastructure development and human-induced habitat degradation (high confidence). Coastal ecosystems, including saltmarshes, mangroves, vegetated dunes

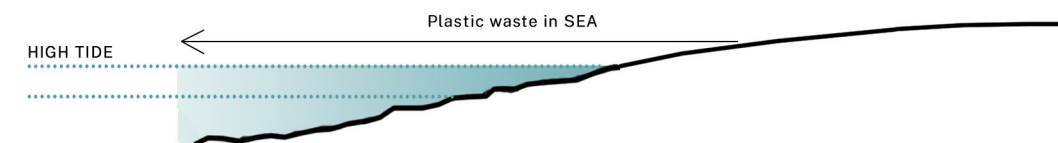
and sandy beaches, can build vertically and expand laterally in response to SLR, though this capacity varies across sites (high confidence). These ecosystems provide important services that include coastal protection and habitat for diverse biota. However, as a consequence of human actions that fragment wetland habitats and restrict landward migration, coastal ecosystems progressively lose their ability to adapt to climate-induced changes and provide ecosystem services, including acting as protective barriers.

Plastic undulation

Higher quantity of increased weight of plastic materials was collected during low tide conditions.



Only a fraction of plastic returns to land during high tide as compared to quantum that goes into the ocean. High tide flooding worsens the condition of the ocean, as it carries all the pollutants inside.



Fishing timings

Temperature: colder - unfavourable.

Warmer - favourable

Sunlight: low light- favourable

harsh sunlight- unfavourable.

Tides: low tide - stagnant water - lack of fish movement - no need to for food.

high tide- “

BEST TIME flooding tide - more movement of water- fish want to eat again as water moves.

falling tide - as water retreats back down - water sucks insects and plant fragments- food for

fish- best time

for fishing- bait and anchor will be carried down deep & get closer to fish.

Rains: rains are favourable as there is alot of movement and on the surface of water, so fish assumes and are mistaken that food is constantly supplied and so fish rises up for food.

What is a “Water Clock”?

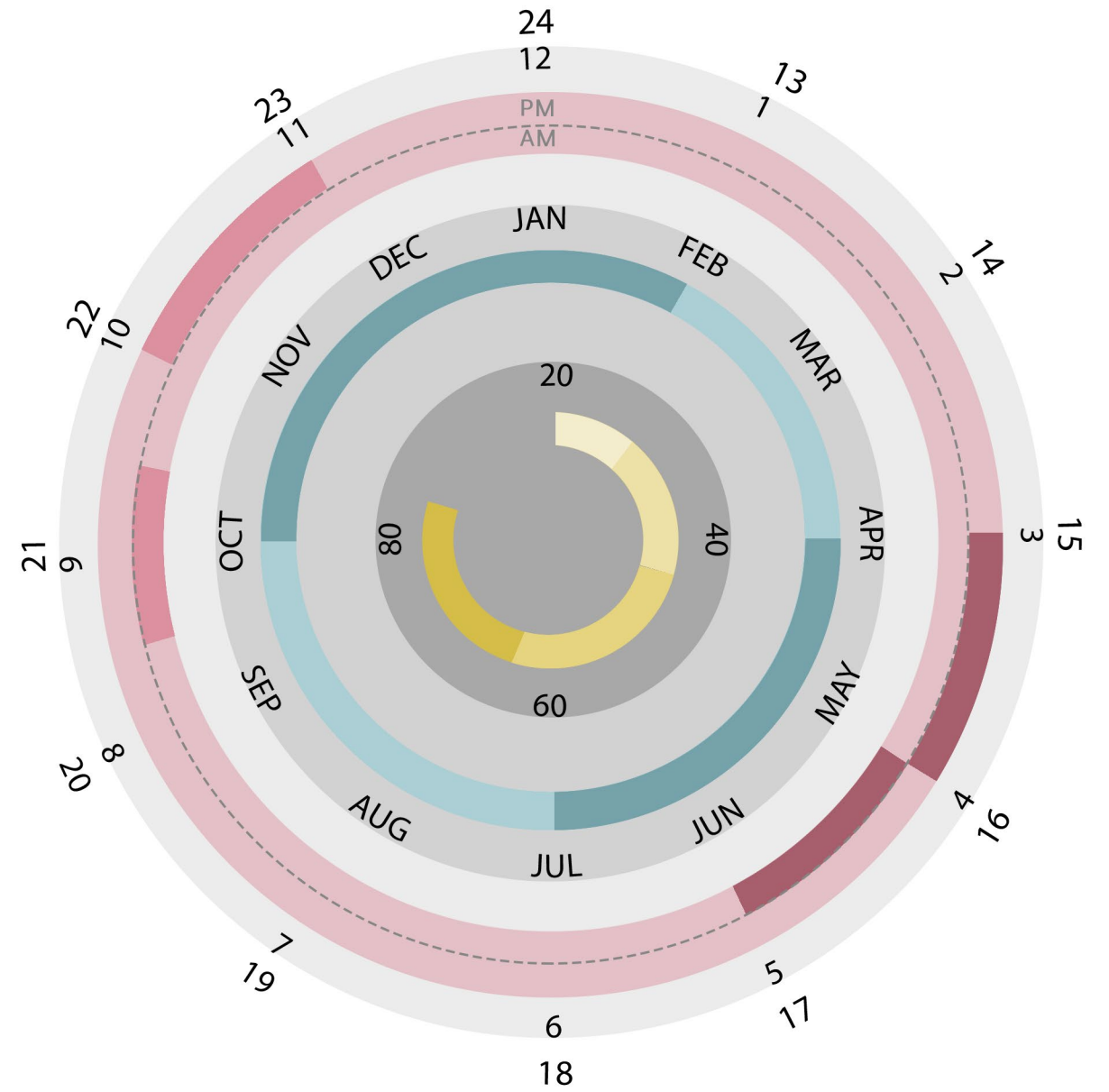
Water has played an important role for this region where activities, traditions, social systems and occupation are shaped accordingly.

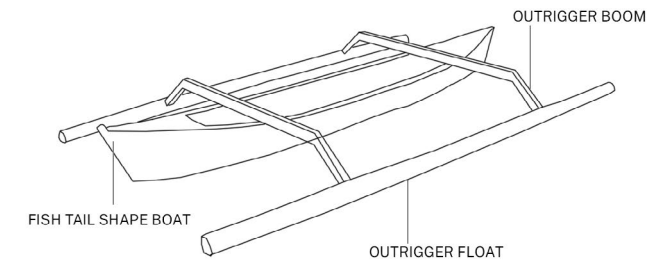
This water clock shows the pattern of how water behaves in a pattern daily, year and predictions of

water behaviour eventually throughout decades. Tides play an important role in Plastic undulation and fishing activity.

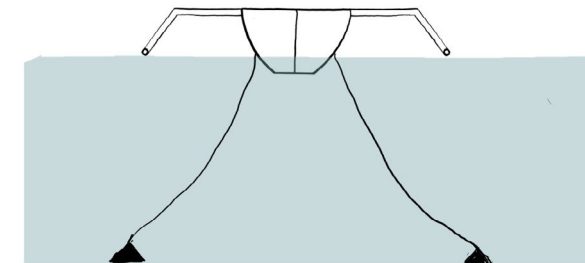
Selayar island has a tropical climate, with dry season and wet season.

- SLR water clock (in cm)
- Year 2025
- Year 2050
- Year 2075
- Year 2100
- Yearly water clock
- Dry season- Plastic waste on coastal edges
- Wet season- plastic in ocean & fishing season
- Daily water clock
- Falling and rising tide
- Low tide
- High tide





TRADITIONAL SELAYAR ISLAND'S BOAT FOR FISHING



MOORING OF THE BOAT

Traditional boat “jukung”

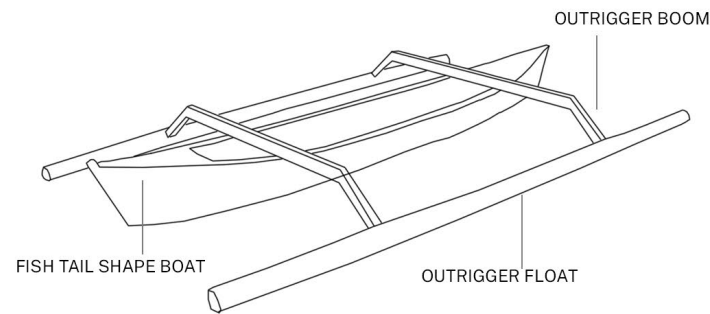
A jukung or kano, also known as cadik is a small wooden Indonesian outrigger canoe. It is a traditionally fishing boat, but newer uses include “Jukung Dives”, using the boat as a vehicle for small groups of SCUBA divers.

The double outrigger jukung is but one of many types of Austronesian outrigger canoes that use the crab claw sail traditional throughout Polynesia.

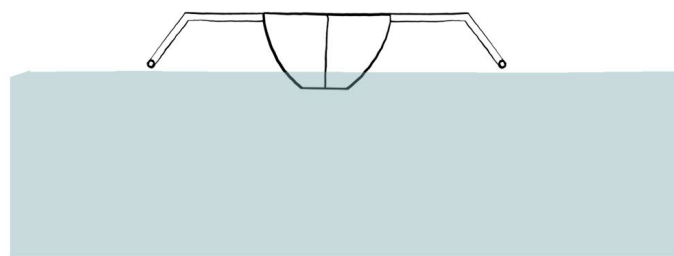
Whilst this sail presents some difficulties in tacking into the wind, actually requiring to jibe around, a jukung is superb in its reaching ability and jibe-safe running. They are usually highly decorated and bear a marlin-like prow.

This is the traditional boat of the selayar island which is in fish tail shape and has overhangs to help it balance the undulation of water in the ocean.

IMMEDIATE AID
TRAPPING



TRADITIONAL SELAYAR ISLAND'S BOAT FOR FISHING

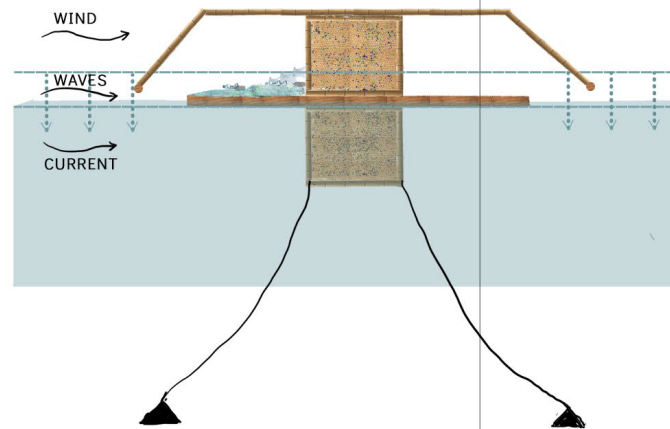
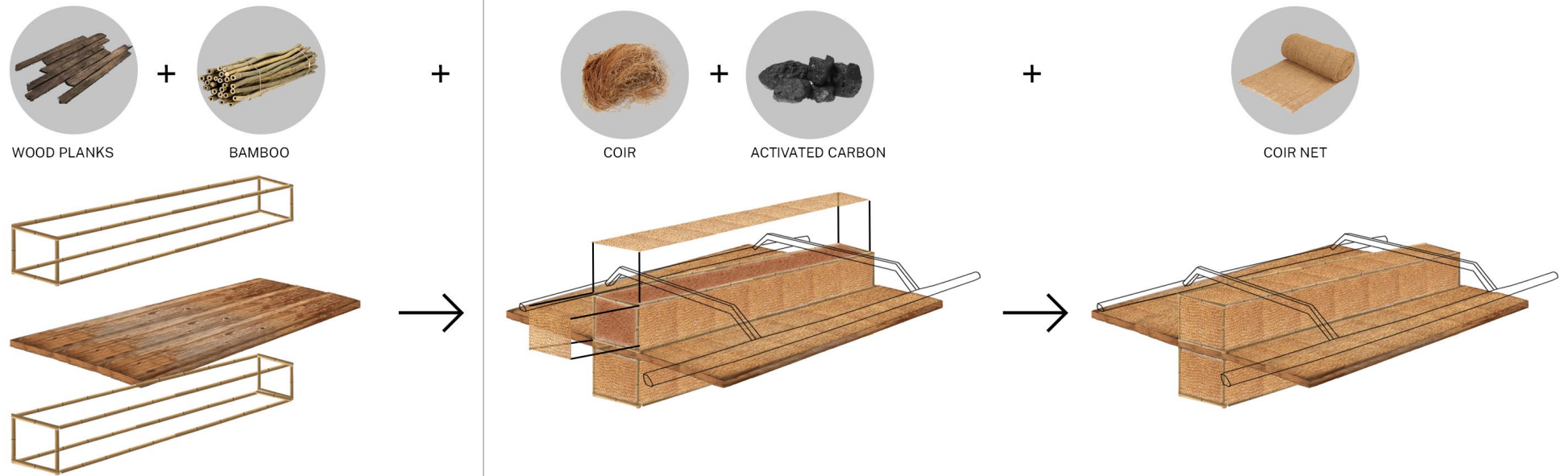


MOORING OF BOATS

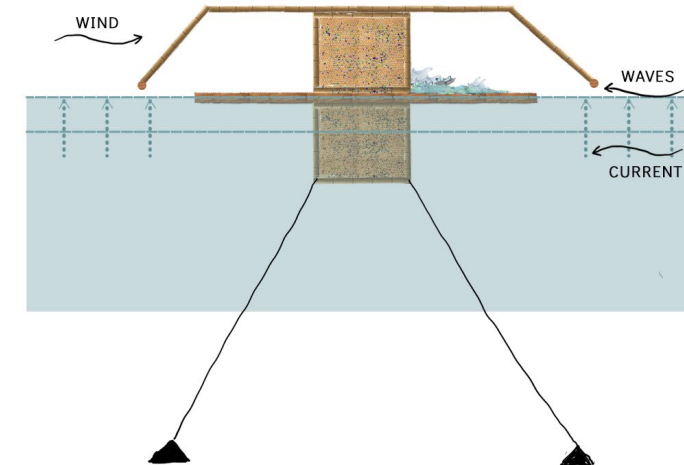
Plastic trapping box

Inspired by the traditional Indonesian boat, a plastic trapping box is proposed by using wood and bamboo as structural and floating materials. Overhang on both the sides helps to balance the boat from undulating ocean currents and tackle

with wind, currents and waves. As most of the plastic coming in the ocean exists in the form of microplastics, coir and activated carbon are used to fill up the boxes for trapping the microplastics. Coir as a material has the same



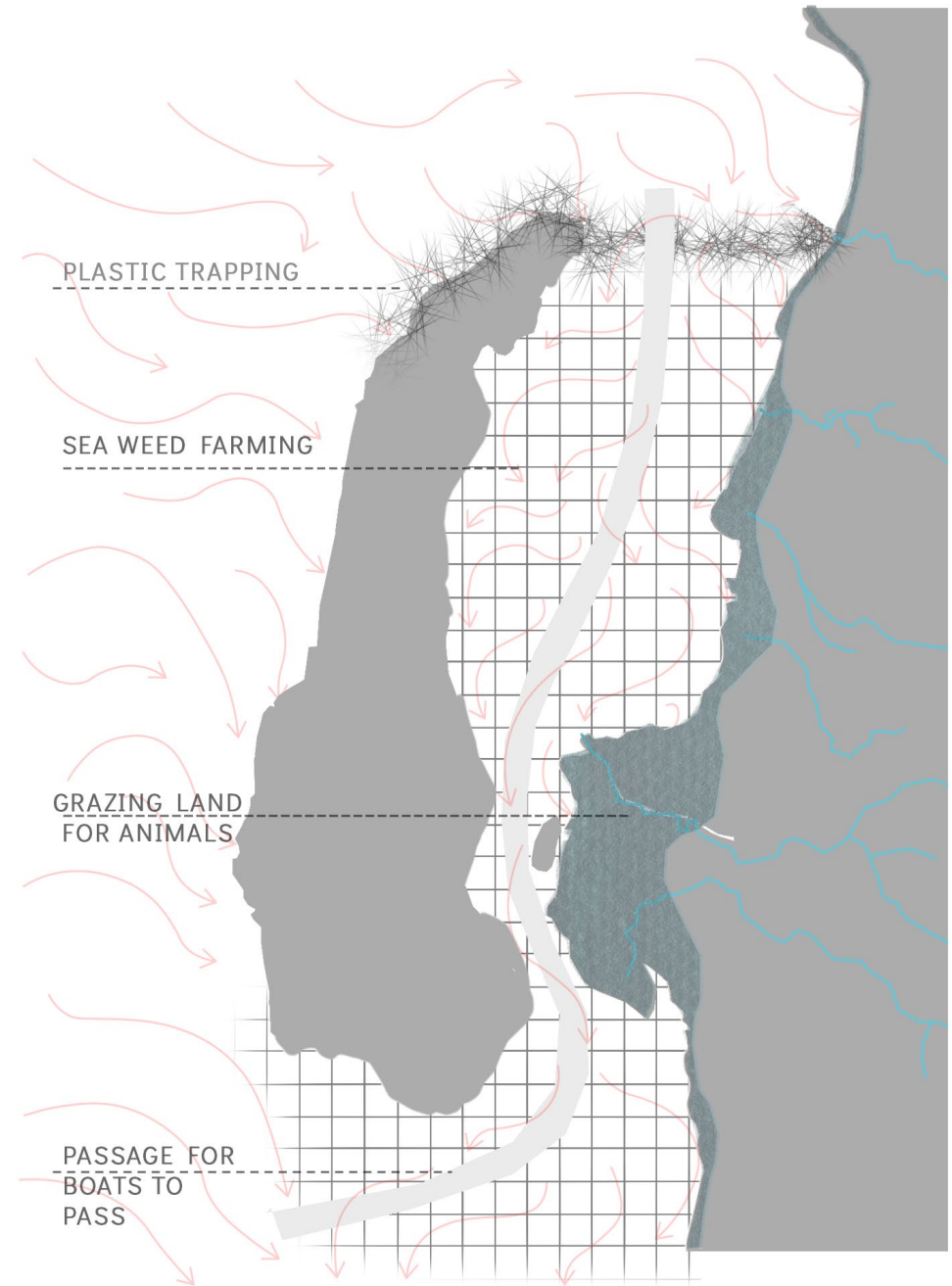
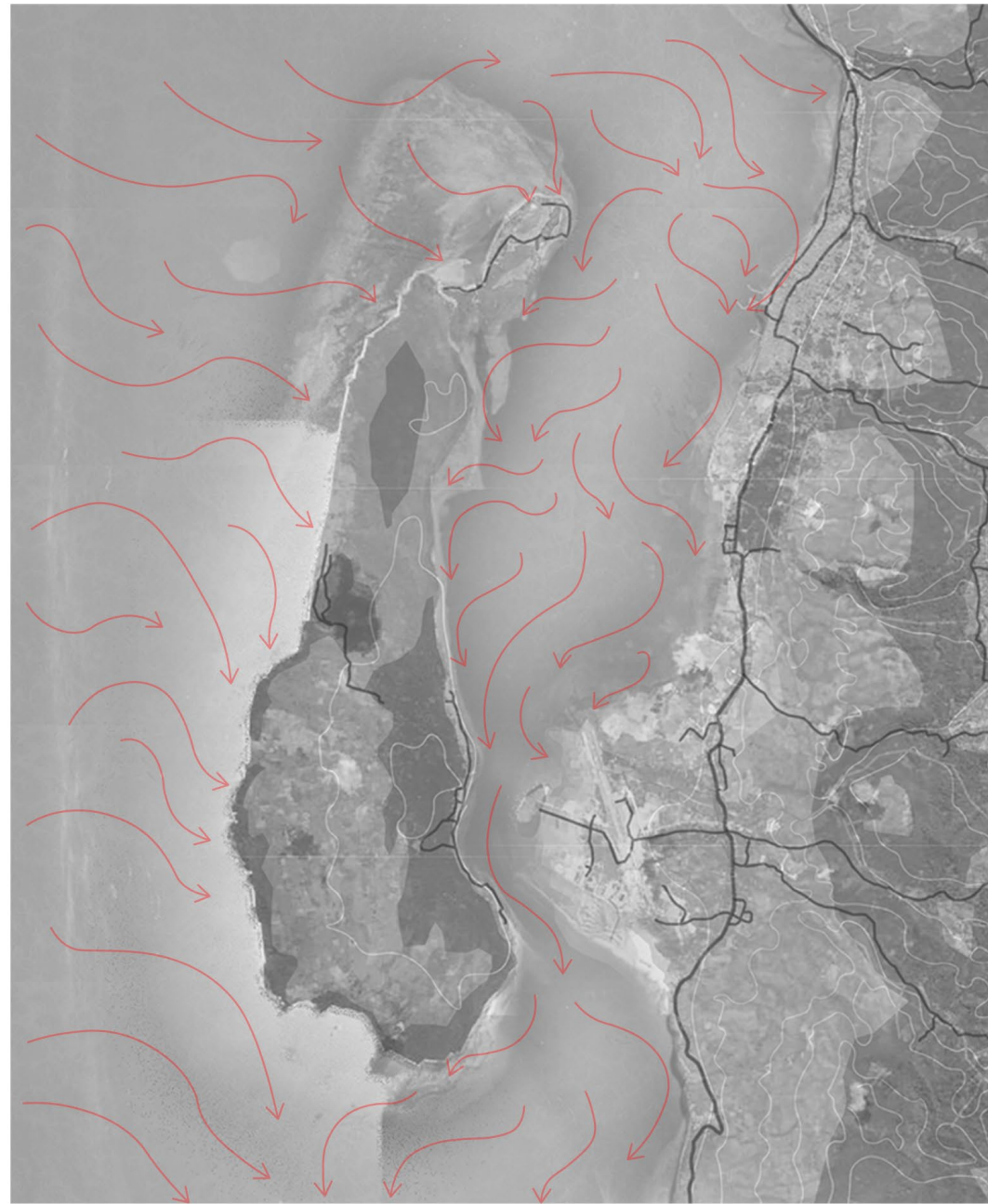
HIGH TIDE TO LOW TIDE

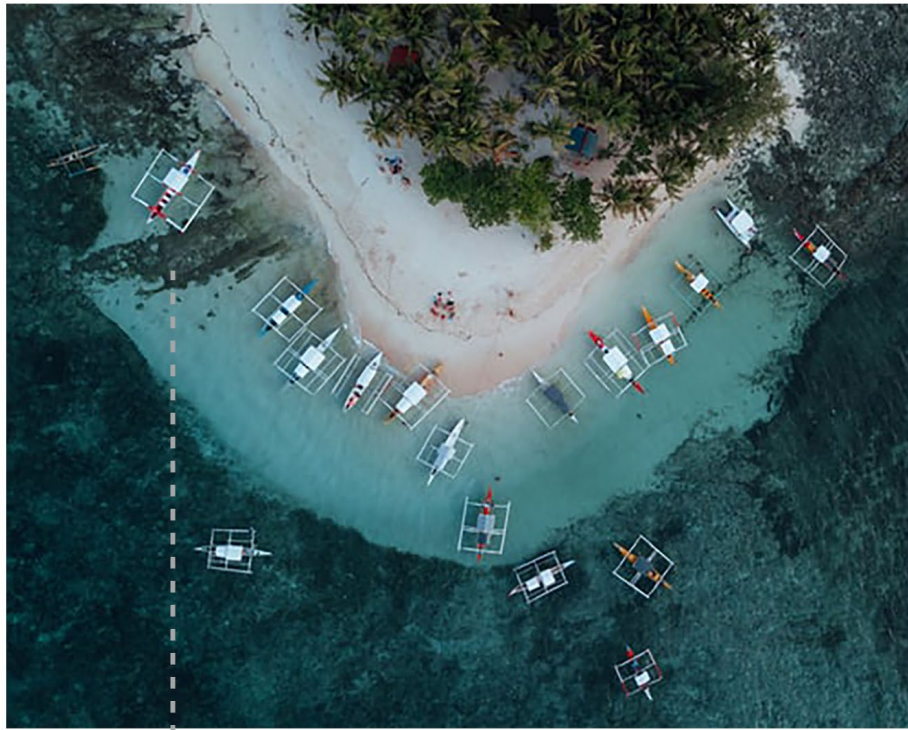


LOW TIDE TO HIGH TIDE

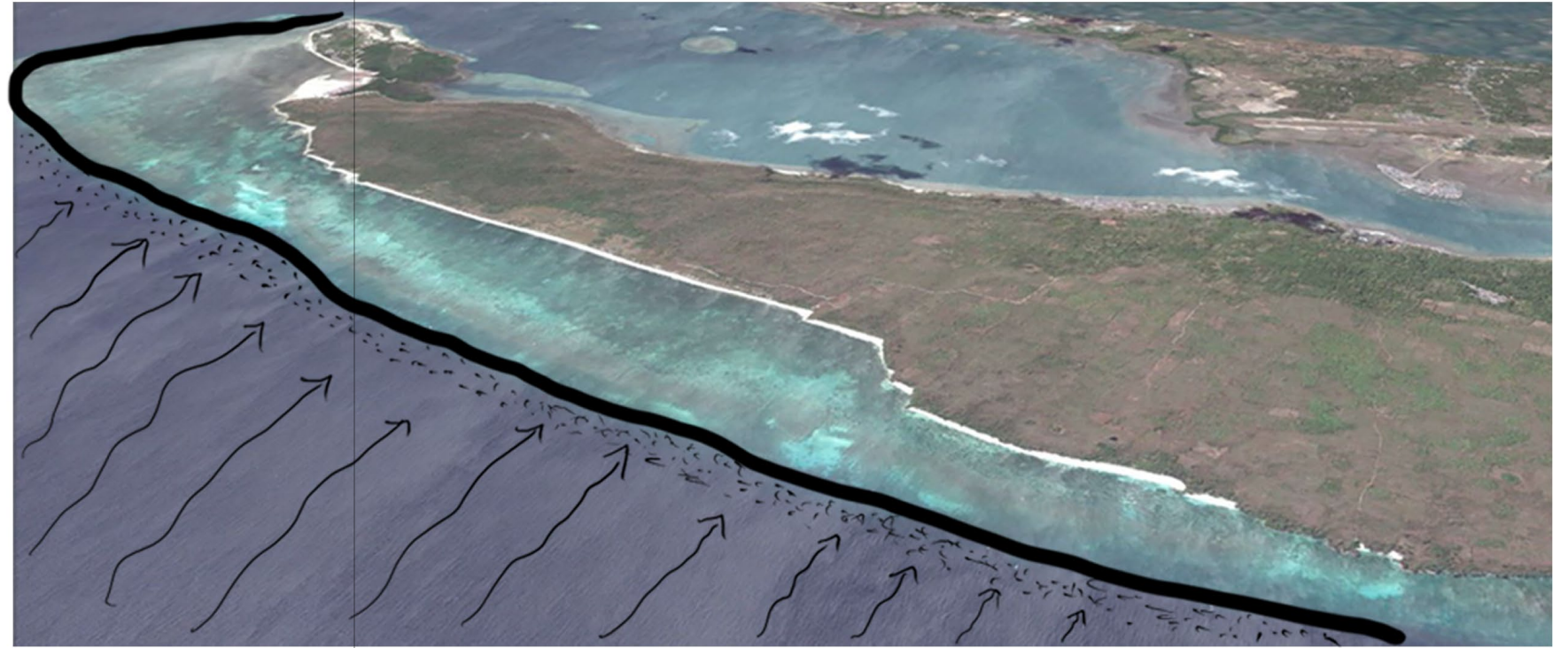
quality as Neptune balls, which are found in mediterranean sea where seagrass is grown and have been discovered to trap microplastic in them. Activated carbon is used in chemical filtration systems which can also trap plastics and both

materials are made out of coconut which are found in abundance on this island.

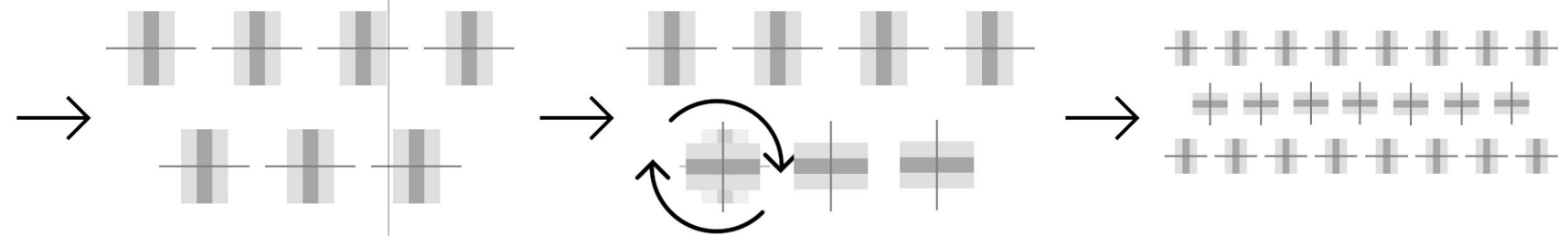
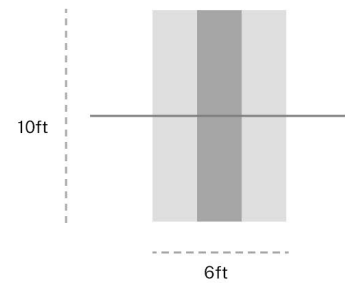
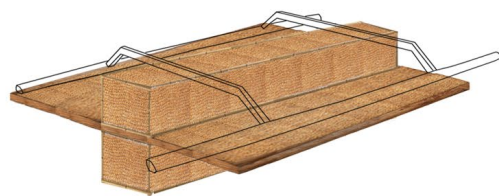




Coral reef Attenuates the undulation



ITERATION



Mooring of boats

A mooring is any permanent structure to which a vessel may be secured. Examples include quays, wharfs, jetties, piers, anchor buoys, and mooring buoys. A ship is secured to a mooring to forestall free movement of the ship on the water. An anchor mooring fixes a vessel's position relative to a point

on the bottom of a waterway without connecting the vessel to shore. As a verb, mooring refers to the act of attaching a vessel to a mooring.

A swing mooring consists of a single anchor at the bottom of a waterway with a rode (a rope, cable, or chain) running to a float on the surface. The float

allows a vessel to find the rode and connect to the anchor. These anchors are known as swing moorings because a vessel attached to this kind of mooring swings in a circle when the direction of wind or tide changes.

Mooring of boats is usually after the place where

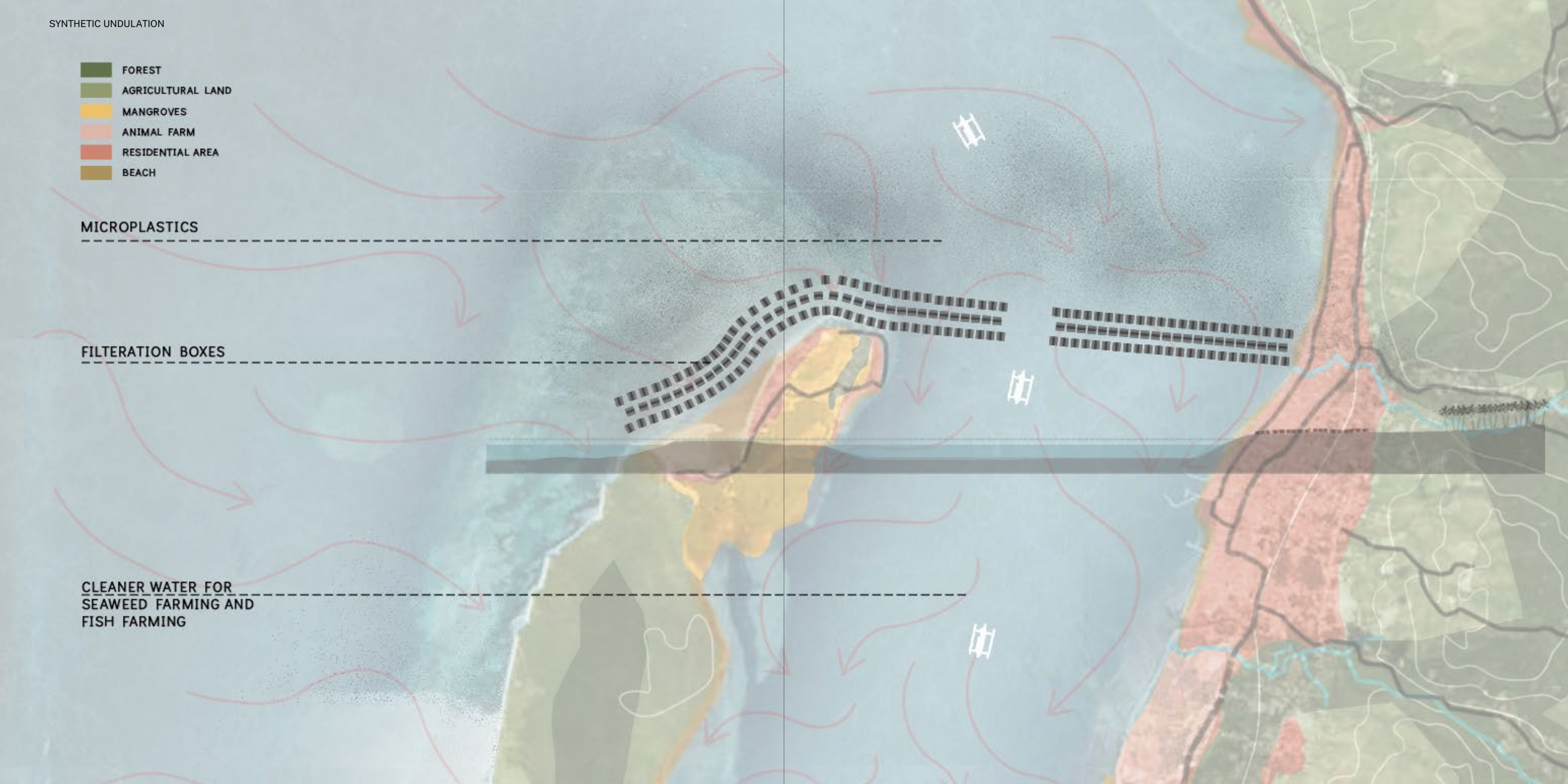
waves crush, so in this case coral reefs attenuates the currents and is the best place to install the box module in an alternative manner vertically and horizontally to the shore similar to how the boats are moored and behave to currents.

- FOREST
- AGRICULTURAL LAND
- MANGROVES
- ANIMAL FARM
- RESIDENTIAL AREA
- BEACH

MICROPLASTICS

FILTRATION BOXES

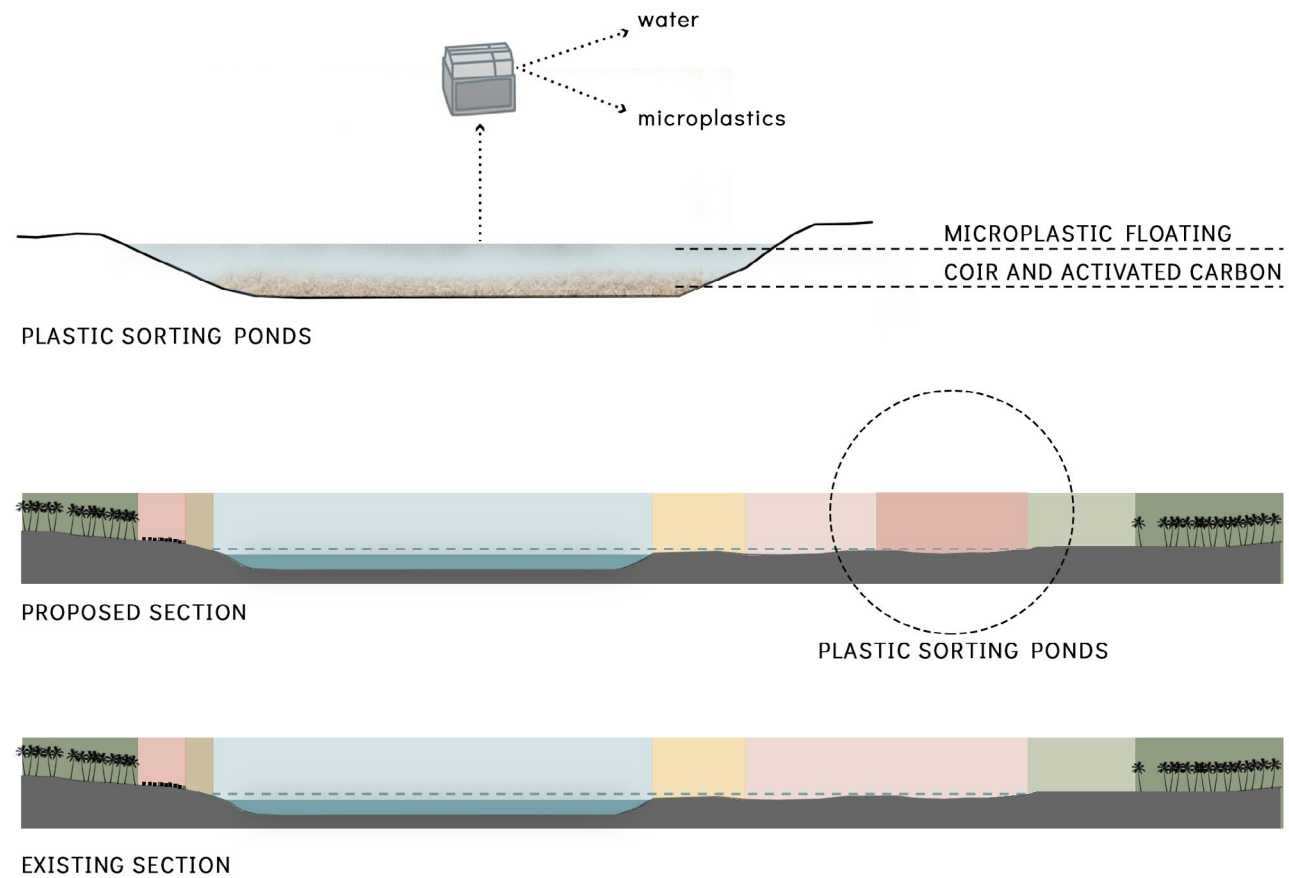
CLEANER WATER FOR
SEAWEED FARMING AND
FISH FARMING



Plastic trapping boxes can be installed at the top from where the water carried by ocean currents enter between the two islands. In this way it reduces the content of microplastic entering the area of seaweed and fish farming and is much cleaner than

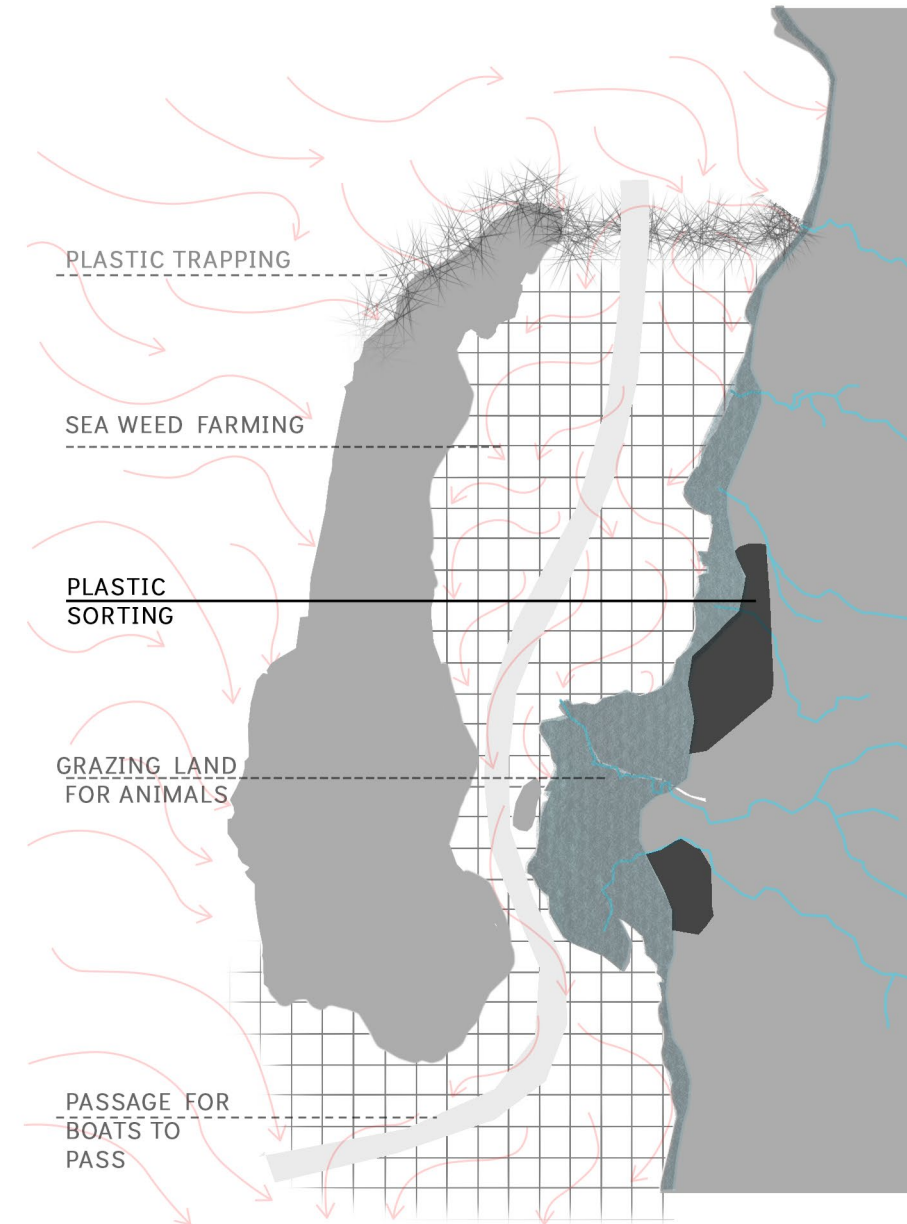
surrounding water. The filtration boxes extend towards west the side, as most of the area here is mangroves and beach and is under water in wet season.

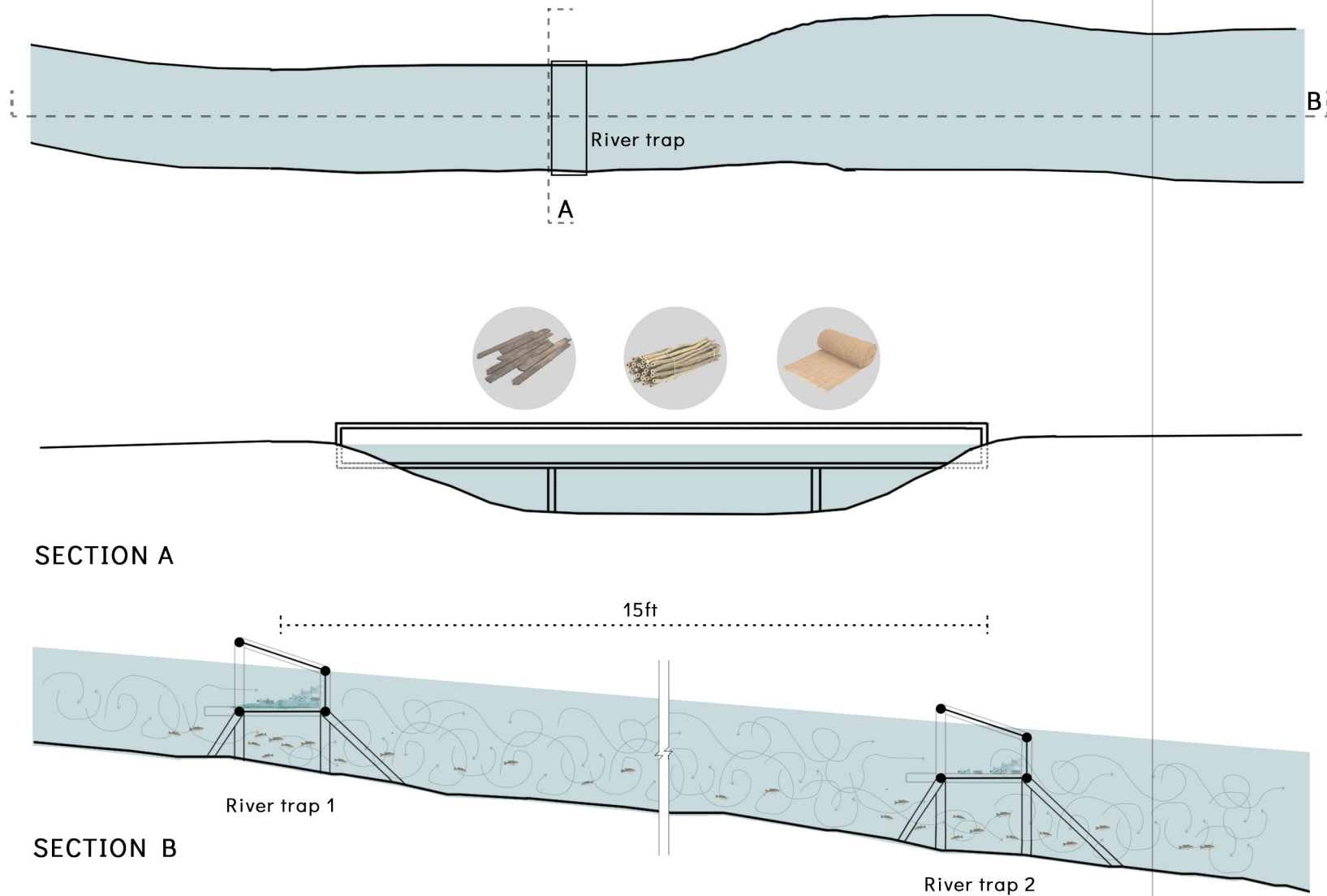
IMMEDIATE AID



The coir trapping the microplastics in the boxes can then be put into the wetlands at the other edge towards the land in between the transition from wet season to dry season where the water is accumulated in the depressions due to flooding. By doing this the coir and activated carbon will settle

down in the water and the plastic will float on the top layers. The water from these ponds could then be extracted and put into the actual chemical filtration systems to separate microplastics from water.



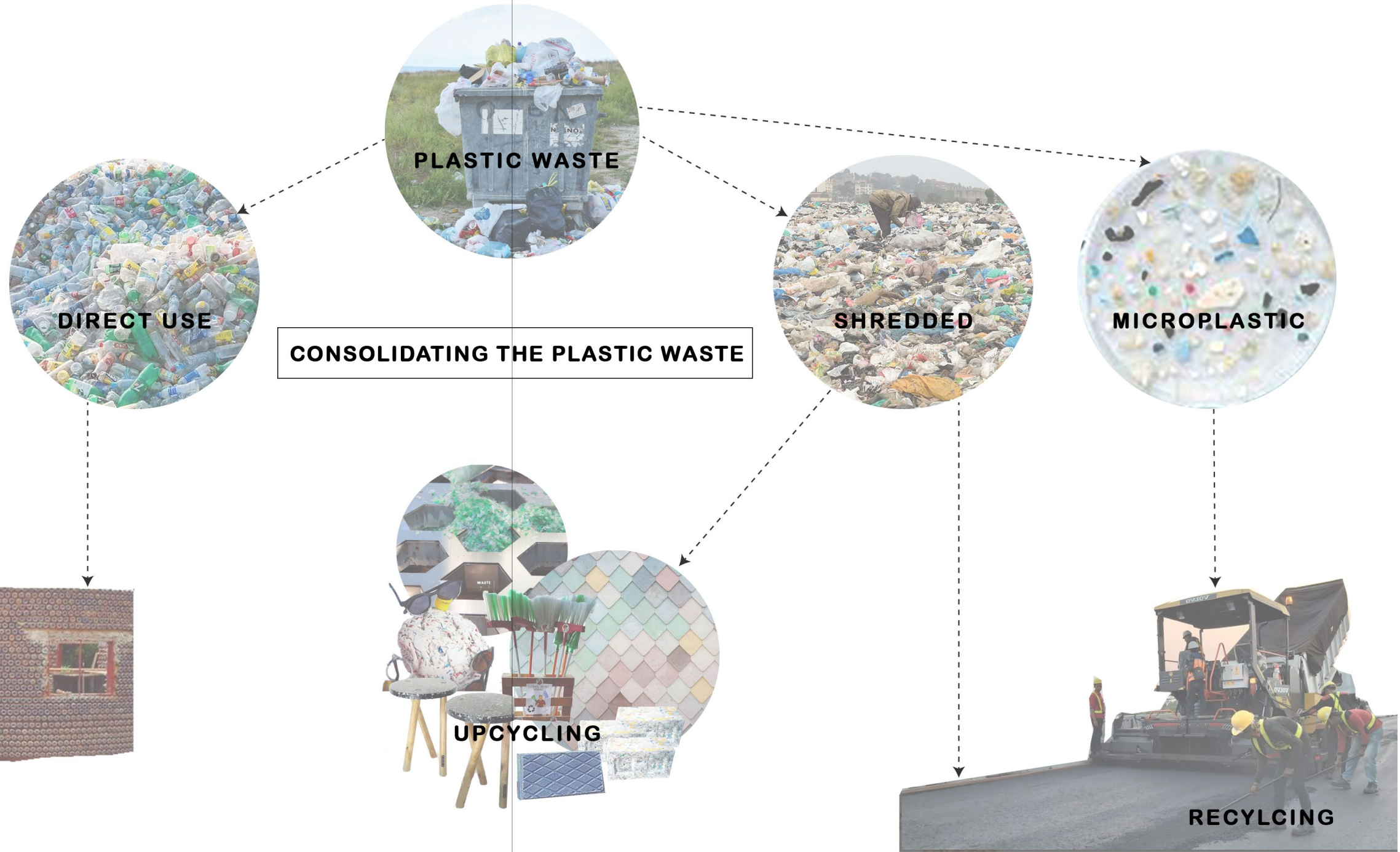


River traps

Not to forget the macroplastic that is carried by the rivers into the ocean can be blocked by river traps installed before the mouth of the river. The number of traps can really depend on the urban occupancy near that river. Also if there is a possibility of plastic escaping from one trap, it can eventually be trapped

in the following trapping point. This may happen because river waters, unlike the undulation of ocean water, tumbles down the slope and flows in irregular ways. The traps are raised from the bottom allowing the fish and other species to pass through in the river.

I. IMMEDIATE AID
UTILIZING



The micro and macro plastic collected in plastic trapping boxes and river traps could then be used by the Selayar communities. Plastic could be looked at from a new perspective by considering it as an

asset. It can be a new locally available material if put into the right use. It can be reutilized by direct use of plastic such as the plastic bottles which can be used in construction of walls, foundations or as a

thermal material between walls. Other plastic waste could be shredded and used in construction of roads which increases the durability or used for upcycling of furniture or other products used in

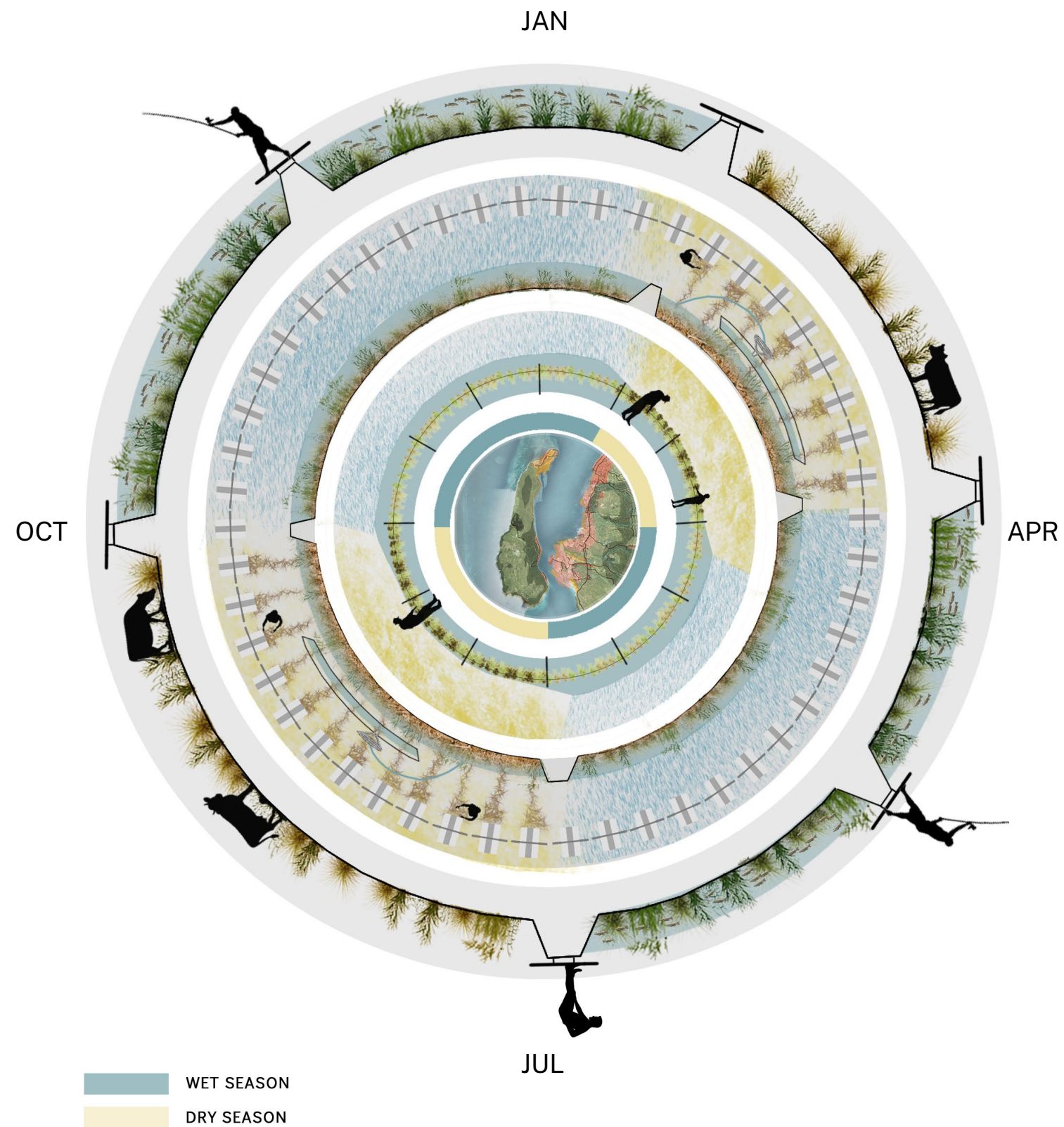
daily life. The ultimate goal is to consolidate the plastic at one place. By engaging it in a long term use, rather than short term use, which plastic is usually known for.

VI. ACTIVATED WATER CLOCK

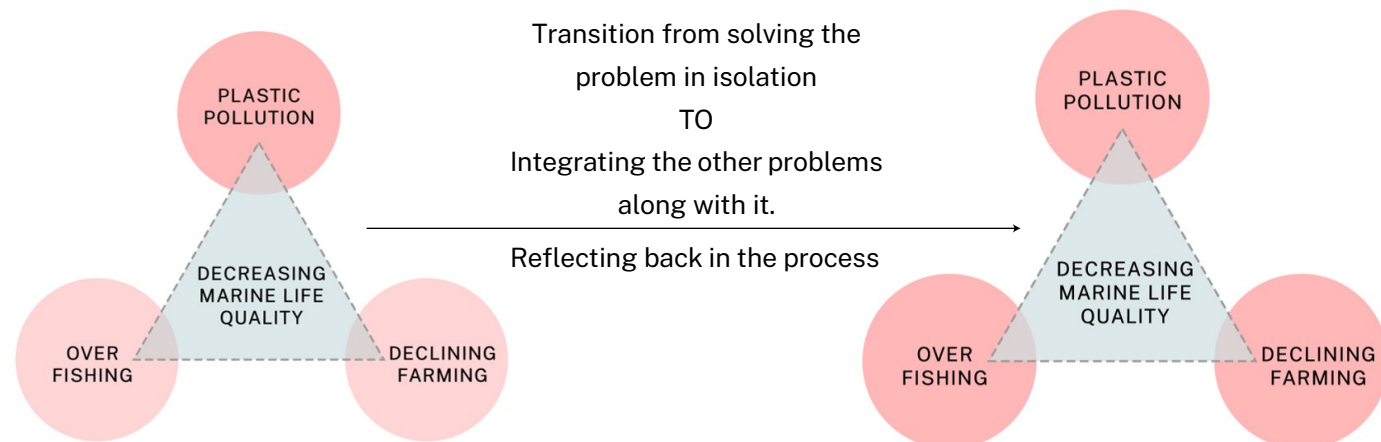
Activated water clock

This water clock shows the water movement around the year in Selayar island. Activities in landscape needs to adapt the wet and dry season and function accordingly. All the above different types of aid run according to the water clock in yearly pattern, by embracing and responding the climate, geography,

culture and social systems altogether seen in one picture- by trapping, collecting, sorting the plastics and balancing the farming and fishing sectors. This an integration of plastic trapping and sorting systems along with seaweed farming and land-based fish farming.



VII. CONCLUSION



Conclusion

This project helps to realize and break the UTOPIA of preconceived notion of imagining the island, by facing the reality and the problems that these remote coastal communities face. And this is a start an attempt to reimagine these islands by adapting their ways of being and making, for resilient future and provoke other Indonesian islands and around the world to do so.

When I reflect and see that even though my initial concern was plastic, there was this pivotal moment when I realized that it's impossible to isolate the issue of plastic and deal with it in isolation. It always must respond to the context that is geography, social, cultural systems that are attached to it. There is influence and collateral damages to a lot more than just it. And that's when the attention shifts from one problem to other related problems which then directs to sort out the priorities, integrate and synthesis new addition to systems that tries to solve the problems while coping with others.

There were some parts that was not completely addressed that was about what happens to the plastics after they are trapped. I have expressed few suggestions of how they could do it, but there are limitations to it as it very much depends on the awareness and educating the people of Selayar island. But, in all I think, it is a starting point to reimagine Selayar's relationship to integrate all the systems together responding to their ways of being and making to engage them to deal with the problem.

Further steps in the process

- 1) Testing and experimenting the module of plastic trapping box.
- 2) How can I engage with communities to help spread awareness of plastics? Which leads me to the question of how I can carry the process and ideas to consolidate the plastic by engaging the communities?
- 3) Being a remote island and lack of access to accurate date of geology, topography and oceanography; and by having this access to date How can this idea be provoked and carried further?

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