

# ***Taking Back Control***

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Nafeesa Hamza



*“The people sensed that Grand Central Station, like a giant machine, was steering and classifying them: some to the luxurious platform of the Boston Express, others to the overcrowded suburban trains and the rest to the dark depths of the metropolis... acquiring a velocity that is proportional to the affection that the society outside professes to have for them”*

*RECYCLING MADRID, Eduardo Arroyo*

***Taking Back Control***

*Master Thesis*

*Delta Interventions Graduation Studio*

*MSc Architecture, Urbanism and Building Sciences*

*TU Delft*

*Author:*

*Nafeesa Hamza*

*4617142*

*Mentors:*

*Hamed Khosravi*

*Sjap Holst*

*Stefano Milani*

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### **THE ISLAND IN THE NORTH SEA**

The sea as a territory remains the last frontier for humanity, with much of it still unmapped and unoccupied. Our efforts to conquer it are largely thwarted by its impermanence and constant movement. Just a few hundred years ago, however, it would have been easier to travel to Bergen by boat from the east coast of England than to use land routes to travel within the island. Roads and robbers presented worse dangers than pirates and the wind, which gave rise to the popularity of the ship as a means of access. Since the Industrial Revolution, however, there has been a paradigm shift - the role of the sea has changed from being something which facilitated transport to a space to be used and exploited.

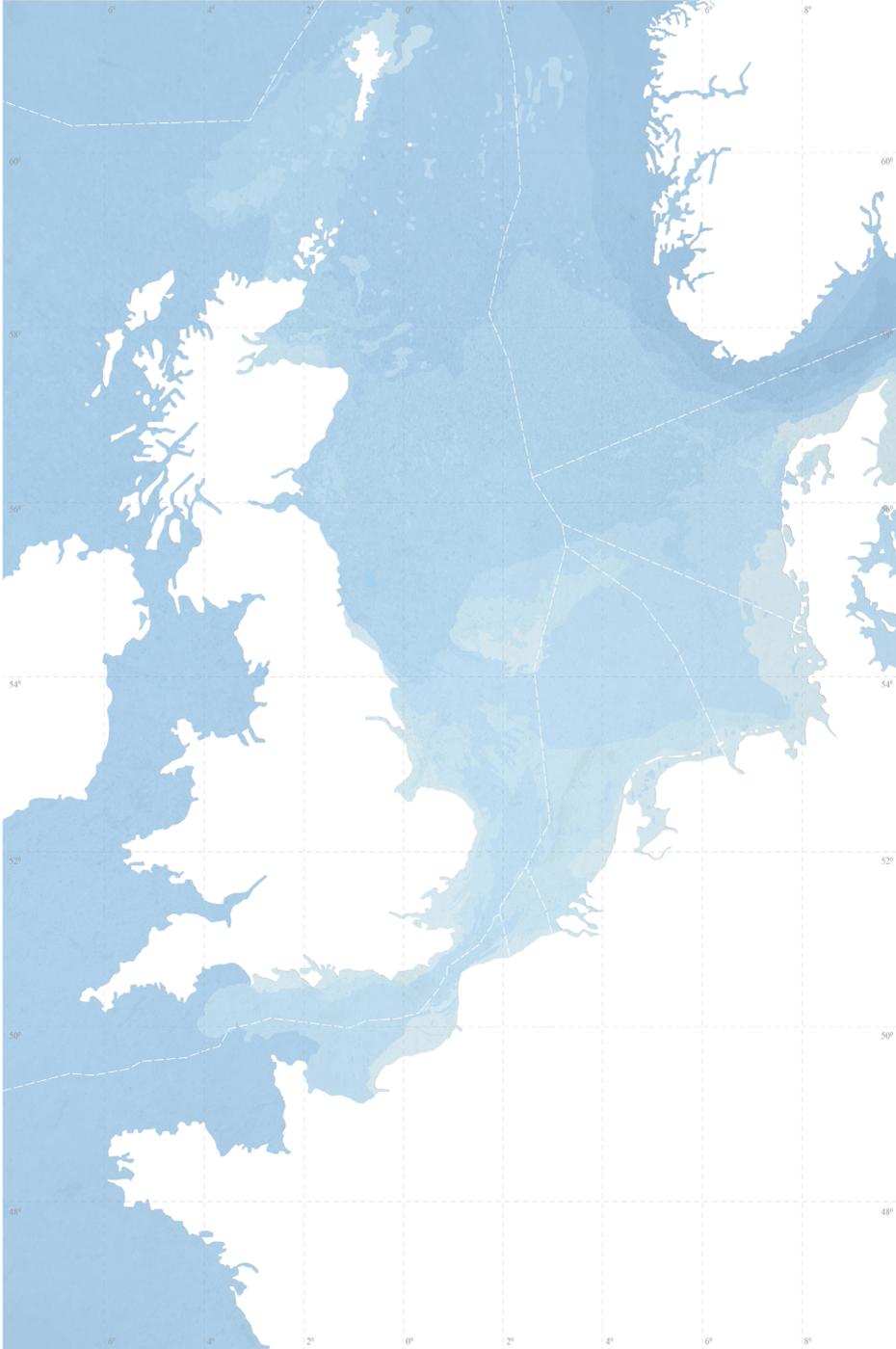
Given its nature as an island, the United Kingdom occupies a special position within the context of the North Sea. Based on the viewer's perception, the churning water alternately severs or

connects the country with Europe, acting as both bridge and barrier. Over the last four hundred years the extents of what is referred to as Great Britain has changed dramatically, and contentiously so. Its territorial expansion through colonization staged from the North Sea led to a vast empire which served to benefit only its original form. As the UK's role on the world stage has shrunk, however, concern has shifted from its activities abroad to the influx of the world into it.

The interface between sea and land forms a belt which is the most densely populated and economically vital area of the island, which is hardly a coincidence. The close link between the urban development of the UK and proximity to water indicates what a crucial role the sea has played in its history.

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*Opposite: The North Sea Appropriated*

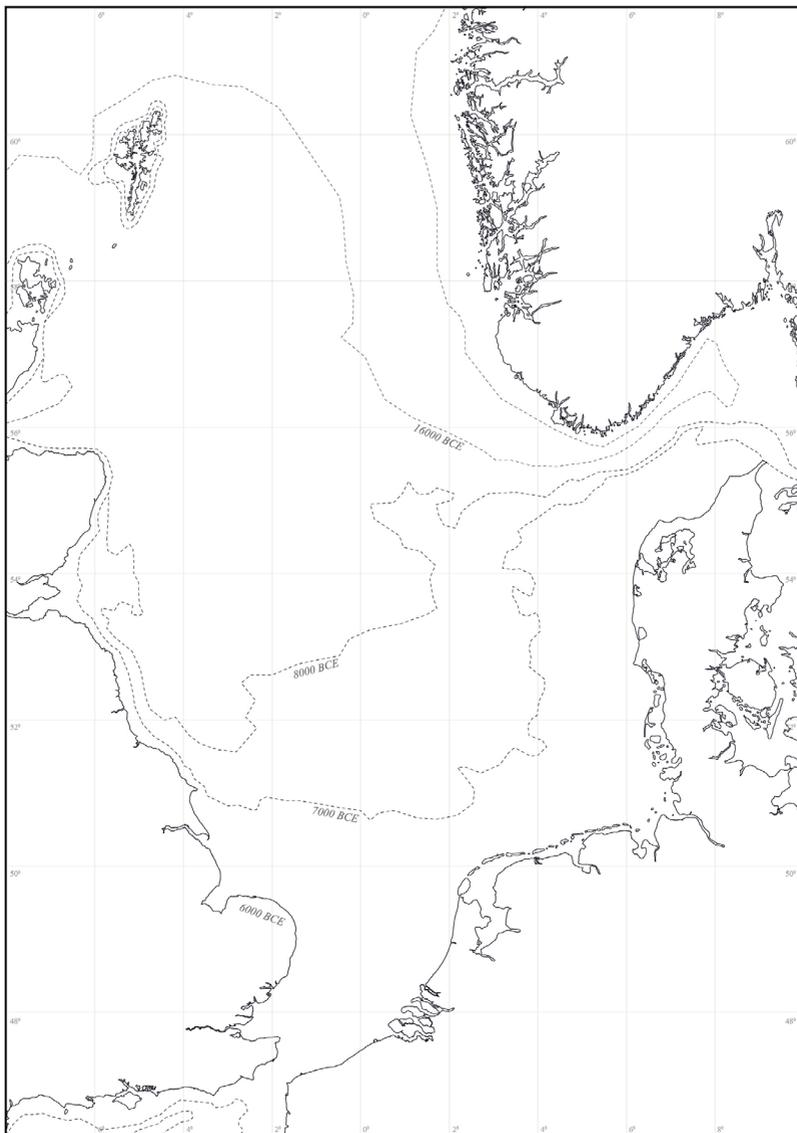


## ***GEOMORPHOLOGY***

When the last Ice Age came to an end 12000 years ago, the area now known as the United Kingdom appeared from the thawing ice as a peninsula attached to the European continent. The historical record shows evidence of hunter-gatherers moving east into this newly revealed landmass following their prey. This connection was not to last, however, as 8000 years after that the peninsula was separated from the mainland by a large flood, possibly caused by a tsunami near Norway. The water inundated the shallow strip of land connecting the two, turning what used to be marshland into what is known today as the English Channel. And thus the British Isles emerged from the sea, severed from the European continent. In the current situation where sea levels rise in response to climate change, it seems inevitable that the distance between the two will only grow.

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*Opposite: The British Isles Emerge*



## ***HISTORY OF THE NORTH SEA***

Once the British Isles emerged from the North Sea following the end of the last Ice Age, it was the Roman who would invade first. In 43 AD, they conquered the uninhabited island and assimilated England into their Empire. It was the Vikings who filled the vacuum left by their collapse. Control of the water was essential to their territorial ambitions, and they took control of the island by travelling up rivers and along its coast.

Next came the North Sea Empire; a one man show run by King Cnut. Originally from Denmark, he united this diverse geographical area. Next came the historic invasion of 1066 by the Normans. Like the Vikings, intermarriage was quite common, and the official language was altered from a version of Old English to Old French. Henry II continued this French tradition, and the years under the Plantagenet House that followed saw him sit on the throne in both France and England.

After the Break from Rome in the 1530s and the defeat of the Spanish Armada in 1588 came a turning point: the rise of the naval dominance of the UK and arguably the beginning of British exceptionalism because of religious freedom. Fast forward to WWI - the Royal Navy was so powerful it was able to blockade the entire North Sea as a way of starving the Germans from importing crucial supplies. It was only once resources were found in the North Sea that the 1982 UN Convention on the Laws of the Sea was created and the seabed divided up into Exclusive Economic Zones.

There is a clear relationship between history and waves of migration. Each new conqueror brought with them their own followers, diversifying the country over centuries in terms of demographics, language, and religion. Despite being an island, the United Kingdom has always been significantly influenced by Europe.



Romans, c. 300



Vikings, c. 700



Empire of the North Sea, 1016



Normans, 1100



Henry II & the Plantagenets, 1200



Golden Age, 1600



WWI, 1914



EEZ, 1982

## **TERRITORIAL EDGES**

Despite being an island, the territorial edges of the United Kingdom are many-layered and, as the Brexit referendum showed, contentious. Its island nature gives rise to a paradox regarding access to its territory: there is an assumption that the North Sea acts as a gatekeeper, filtering out the unwanted through sheer inhospitality, however, its lengthy unguarded coastline is at the same time an easy target for those trying to enter the country. Even while the UK seeks to disengage from a continent which views it with increasing suspicion, the sea between them ensures that the border separating the two will always be porous.

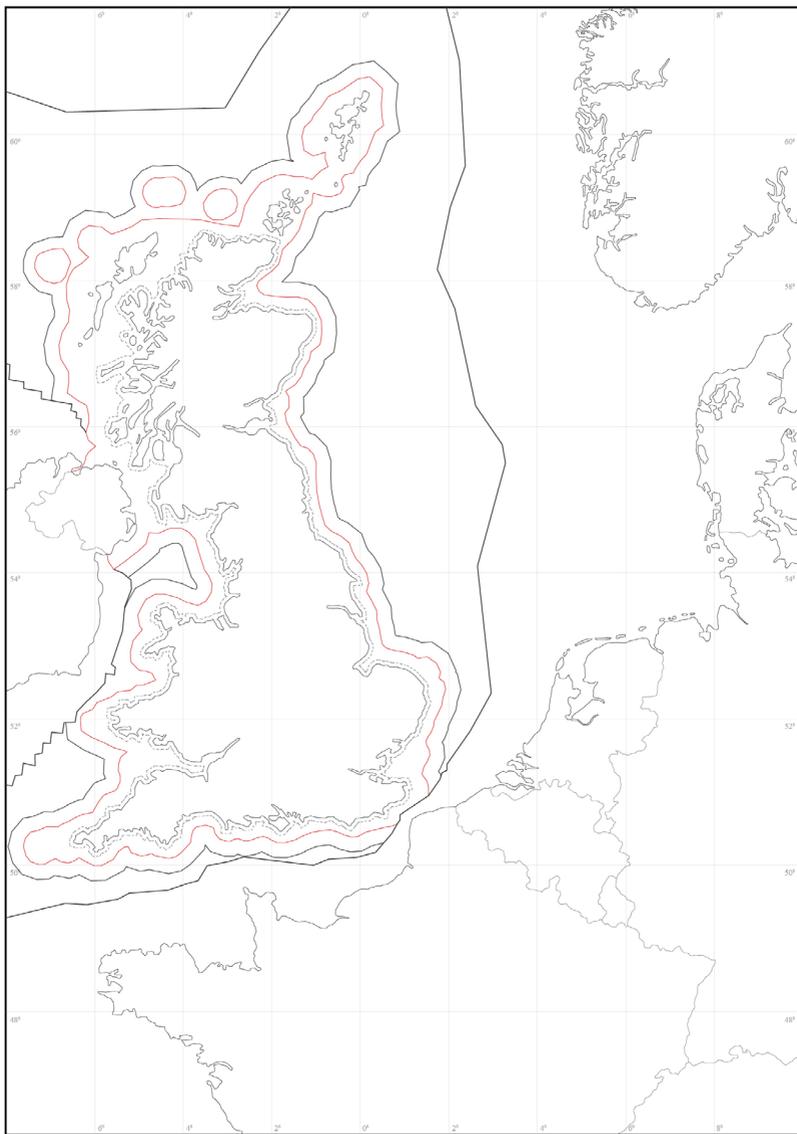
Likewise, the physical edges of the island are not fixed and are beyond human control. Due to the shape of the North Sea and tidal currents, significant parts of the eastern seaboard of the UK are eroding. The erosion and accretion of sediment along its coast is part of a natural tidal system

which supersedes its political jurisdiction. This in turn affects its political borders and economic rights as, for example, its Exclusive Economic Zones are defined by offsetting physical borders.

When the first Romans landed in England, they established their territorial control over the island not by fortifying its physical edges but by extending their system of posthouses found across the Empire at the time. While this served a logistical purpose as they enabled access and trade, the act of siting a physical intervention marked their presence in a permanent way, such that many roads in the UK today are based on Roman routes. While there remain architectural ruins of those built on land, only stories remain of their maritime equivalent which were built across the Channel.

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*Opposite: Territorial Borders of the UK  
Following: Coastal Change in the North Sea  
Roman Road Network in Britannia*

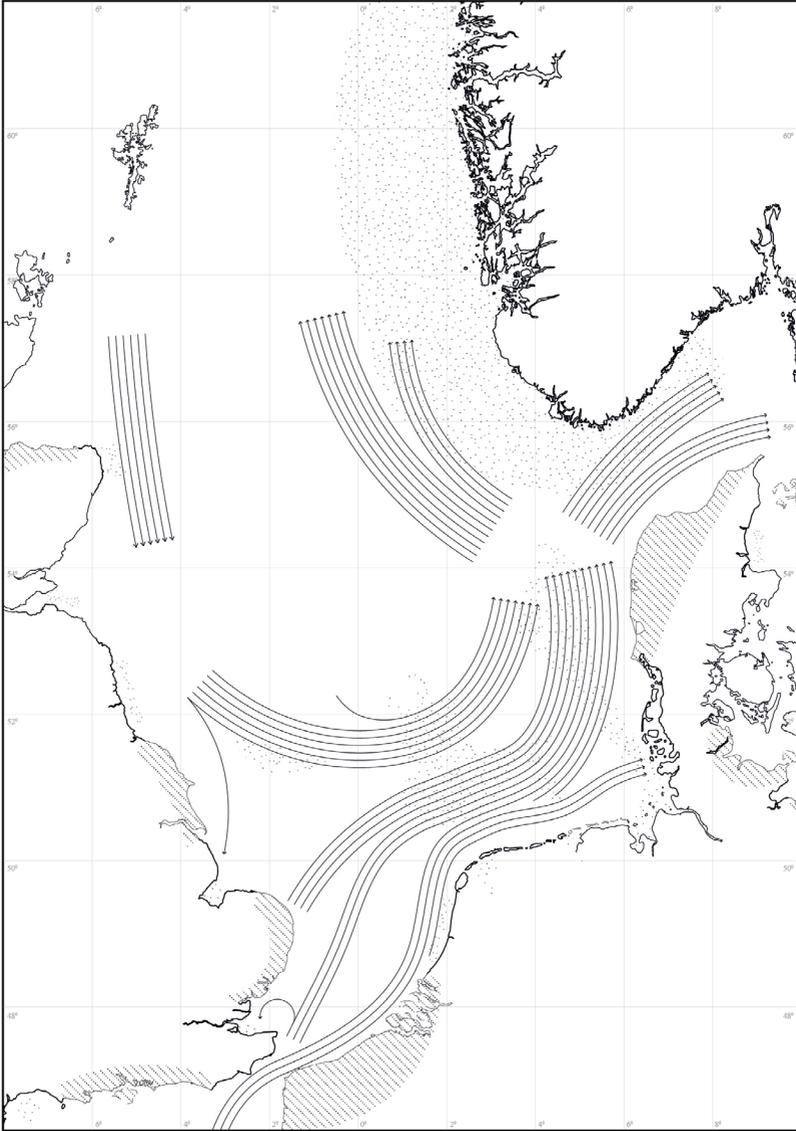


— Exclusive Economic Zone (EEZ)

— Contiguous Zone

— Territorial Waters

..... Historical Cannon Shot Border

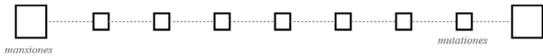


 Erosion

 Accretion

 Stable Coast

 Sediment Flow



— ~ 5-10km — ~ a days journey (40km)

## ***HISTORICAL FLOWS***

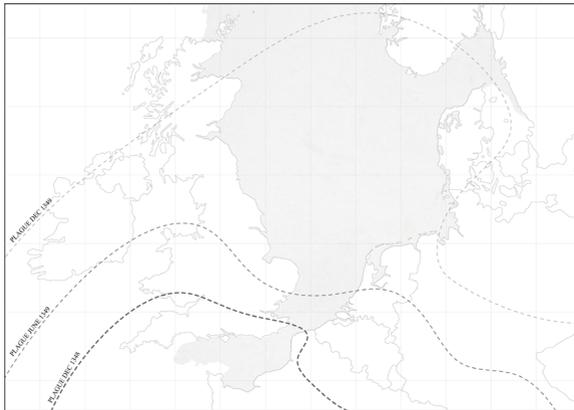
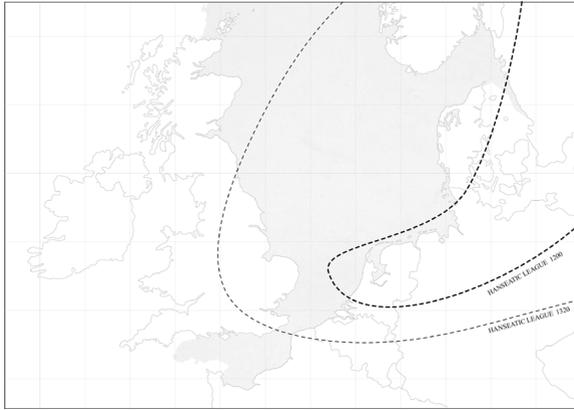
Having established that the United Kingdom has been heavily influenced by foreign forces and ideas, it is worth investigating the path these flows travel in.

By mapping the spread of the plague, the printing press and the Hanseatic League to Britain, patterns of movement of people, ideas, and goods can be established.

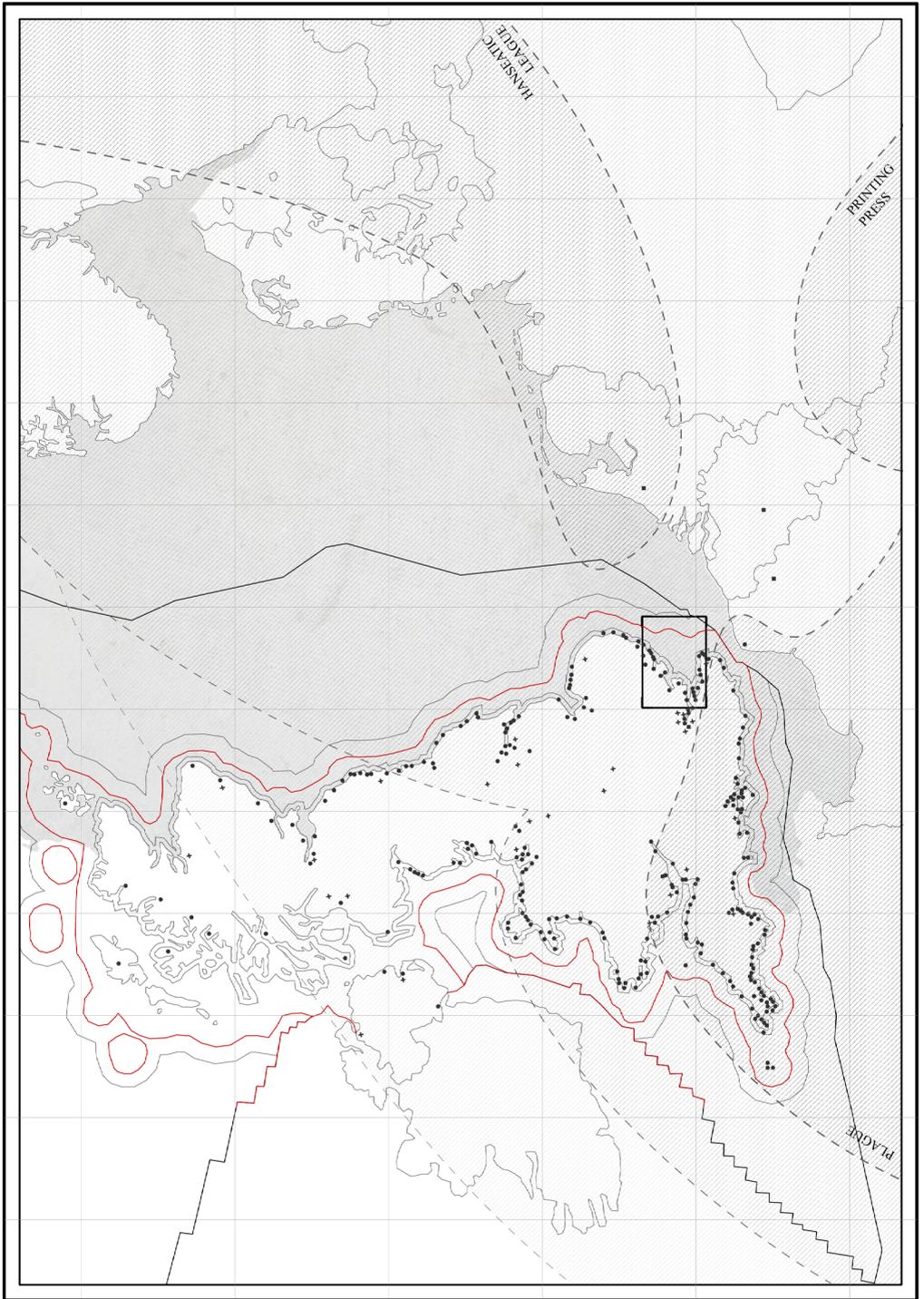
When overlaid together these layers reveal that the Thames Estuary is the key point of reception to the island where new flows of information and goods are invited into the country. The English annexation of Calais until 1558 certainly aided in this process, but it is not surprising that the point of exchange between the two landmasses is at the point where they are physically closest.

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*Opposite: (T-B) Spread of the Printing Press  
Spread of the Hanseatic League  
Spread of the Plague*







## ***THAMES ESTUARY***

The Thames Estuary is an inlet located along the South-Eastern coast of the United Kingdom. It is a major shipping route as well as a highly protected marine environment, two forces which often come into conflict.

It is characterised by relatively shallow water less than 30m deep and intertidal mudflats which surface at low tide. Navigating the Estuary is not an easy task, and the hundreds of shipwrecks which lie beneath the waves are testament to this fact.

The low-lying nature of the Estuary and coastal areas means there are few visual markers as vessels approach. To add to this, the mudflats are constantly shifting due to tidal movements. The mudflats themselves are home to many different bird species because the constant inundation of the land provides a rich source of food. It is estimated that as many as 300,000 migratory birds visit the Estuary

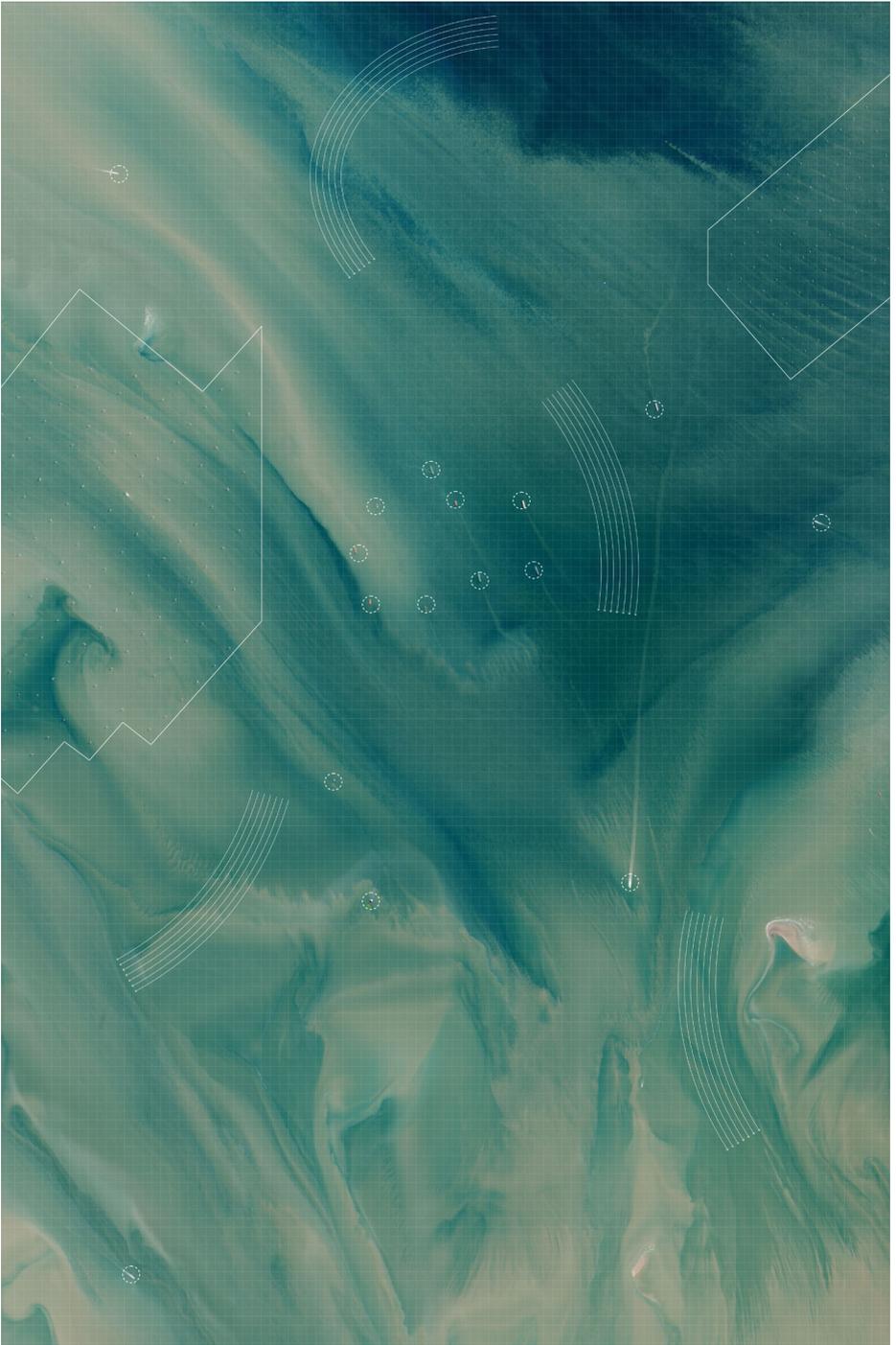
every year. It is currently a Special Protected Area under EU regulations because of this.

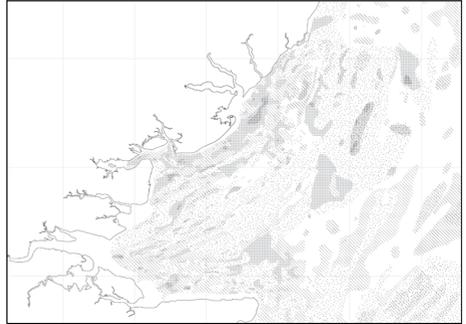
As the historical entrance to the UK's primary port, the Estuary has long been a strategic point of defense. On its shores exist multiple castles as shows of symbolic strength, and from within its waters emerge naval defences such as the Maunsell Forts.

Today the Estuary maintains its strategic position, though more so as a site of economic production rather than for defence purposes. Wind farms and dredging operations compete for space with wintering fowl and cargo-laden ships in one of the world's busiest waterways.

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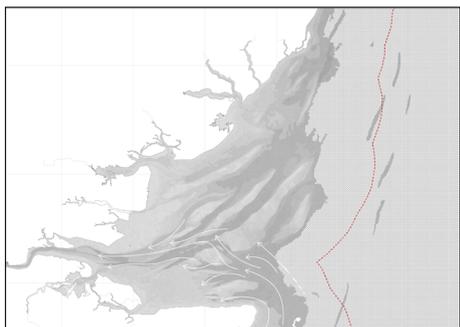
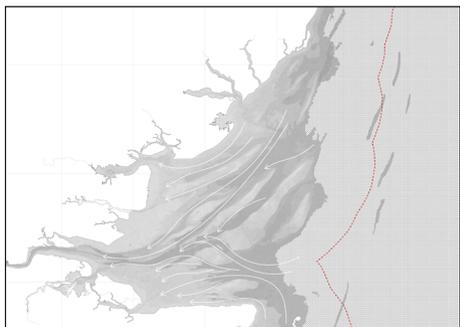
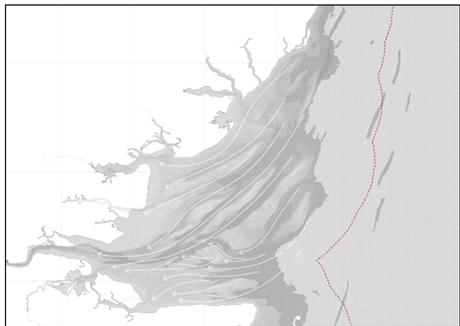
*Opposite: Traces of Infrastructure in the Thames Estuary*





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*Thames Estuary Site Analysis*  
*T-B: Visual Landmarks*  
*Soil Types*  
*Special Protection Areas*  
*Shipping Lanes*



**BREXIT**

The Eastern seaboard of the United Kingdom has long been where it meets the world - its largest trading ports both historical and contemporary such as Newcastle-upon-Tyne, Felixstowe and London are located along this stretch, as well as this being the side of the island closest to a large landmass.

Despite this position as its public face it is worth noting, however, that data from the Brexit referendum shows that the seaside communities along the North Sea coast were the most unequivocal in voting to leave the European Union.

One of the key issues at hand during the referendum was that of immigration into the UK, and their choice to vote leave reflects the unpopularity of the freedom of movement principle espoused by the EU.

*Opposite: Brexit data showing where most people who voted to Leave the European Union live*

The number of immigrants nowadays should be...?

**REDUCED (77%)**

Are migrants causing problems in your own neighbourhood?

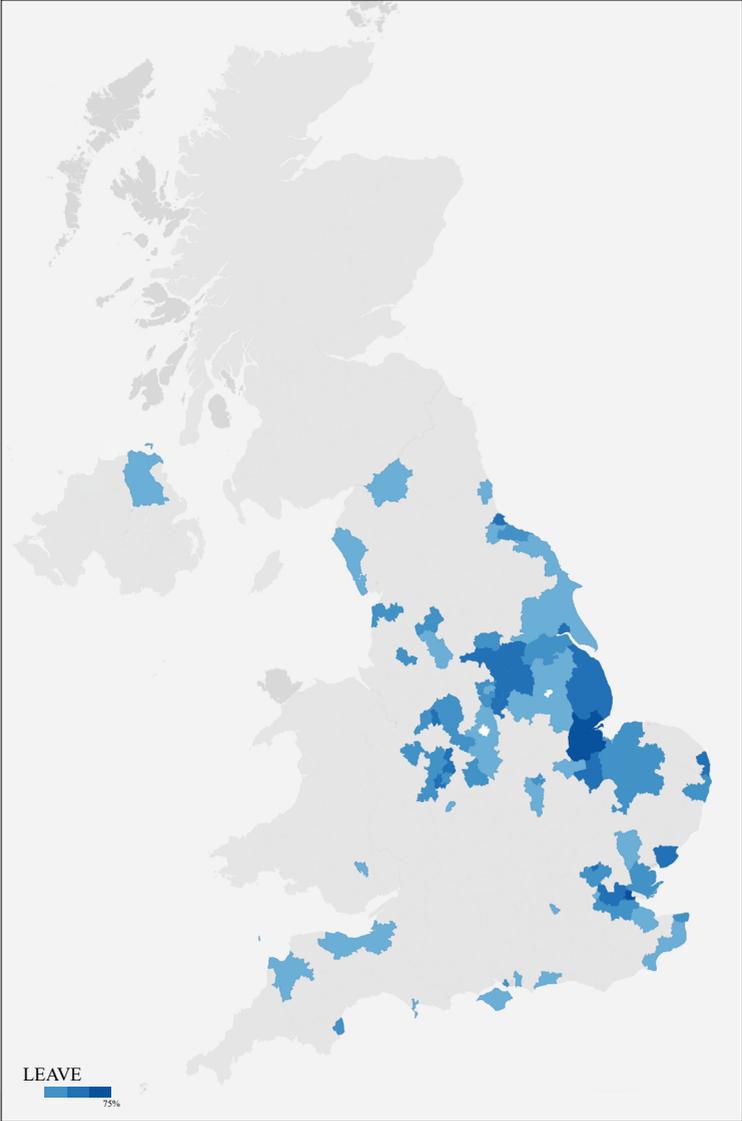
**NO (85%)**

\*UK Government definition of a migrant: Stays for longer than 12 months in the UK  
\*Public consensus on a migrant: Intends to stay permanently



*"...if you believe you're a citizen of the world, you're a citizen of nowhere"*

*RT. HON THERESA MAY*







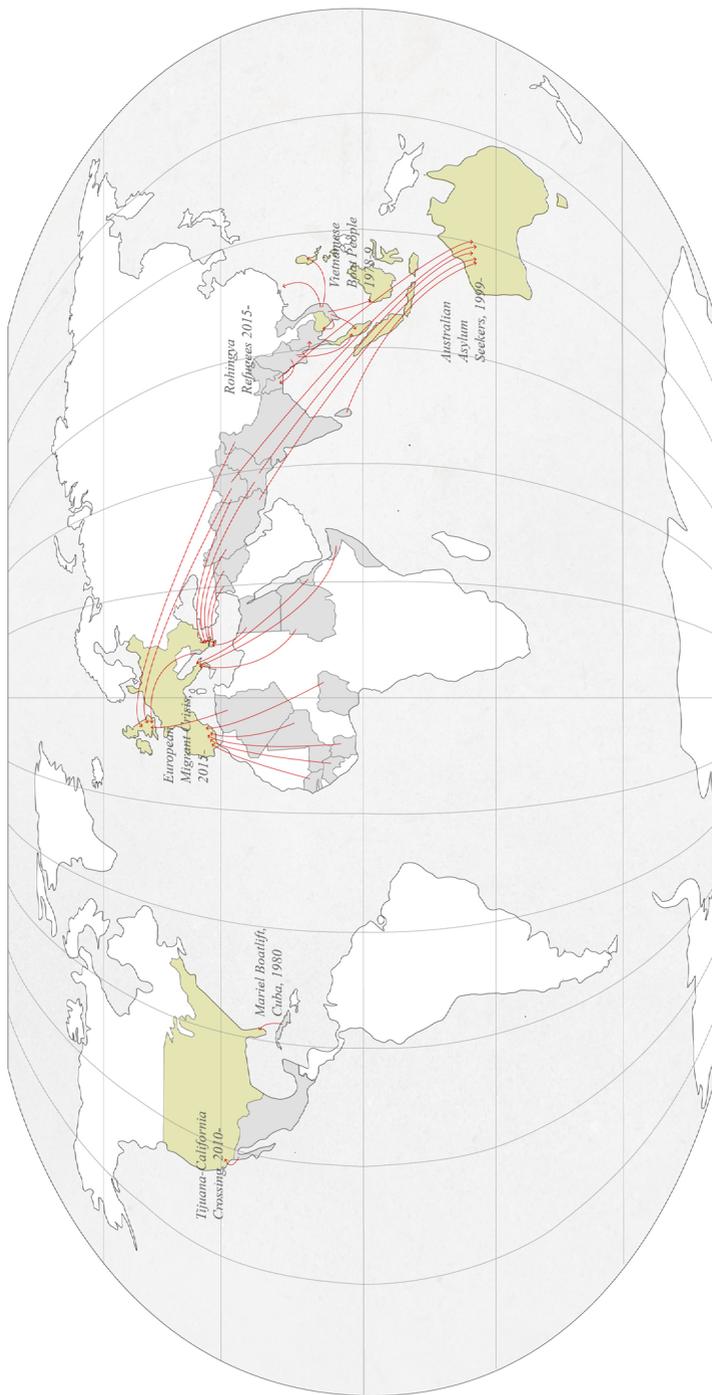
## ***MIGRATION***

Since the rise of the air plane commoditized travel, for society at large ships now connote either trade or leisure. They have lost their utilitarian purpose to all but those in the most desperate and dangerous situations.

Within the last fifty years, most migration events can be seen to have been in response to specific push factors - the Vietnam war, and economic downturn in Cuba. In contrast, the trend today is shifting towards a stream of steady migration, not just in response to a catastrophe but also for economic reasons - people in search of a better life. In other words, people are motivated by both push and pull factors and therefore it is no surprise that most of these flows end up in a few specific developed destinations - Australia, America, and Europe.

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*Opposite: Global flows of migrants, 1970s-present*



**CROSSING THE CHANNEL**

There is irony in the fact that just as Theresa May’s rallying cry was about “taking back control of our borders,” the decision to leave the EU will result in policies which restrict the movement of European nationals and therefore give rise to an even worse irregular migration problem than that which already exists.

Albanians are currently the number one national group seeking entry through illegal means, but once Eastern Europeans workers are excluded from the British labour market, the UK Coastguard and seaside towns which sought to leave behind the problem of unwanted migrants will increasingly find them landing ashore right at their doorstep. Many of them are desperate enough to risk their lives trying to cross the Channel in makeshift boats.

*Detected Illegal Entrants to UK 2008-2016*

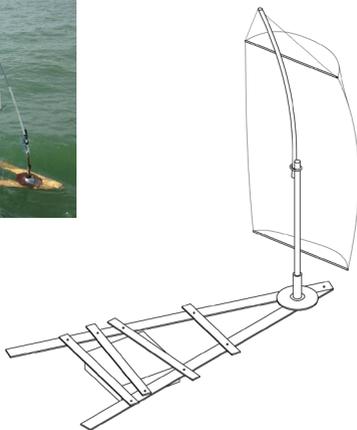
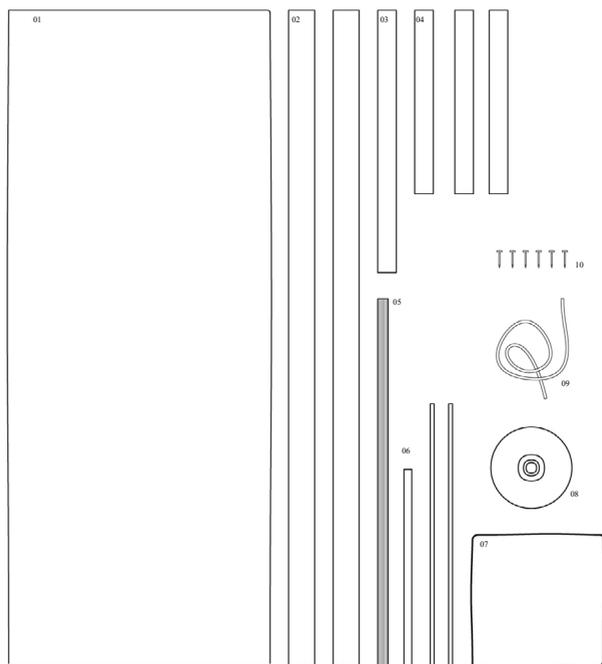
Albanians	981
Afghans	425
Algerians	424
Iranians	348
Indians	322
Palestinians	129
Vietnamese	124

*Foreign Born Residents in UK 2016*

Poland	907,000
India	809,000
Pakistan	523,000
Ireland	398,000
Romania	340,000
Germany	299,000
Bangladesh	247,000
South Africa	245,000
Italy	220,000

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*Opposite: An Afghan migrant’s raft made of found objects starts to take water*



- 01. Bedsheet
- 02. 2000x20mm wood plank (2)
- 03. 750x20mm wood plank (1)
- 04. 500x20mm wood plank (2)
- 05. Flag pole
- 06. Curtain rod (3)
- 07. Air cushion
- 08. Flag pole base
- 09. Twine
- 10. Nails (6)

## WASTE IN THE NORTH SEA

*“The use of waste material as a secondary resource is one of the first actions that businesses could consider to improve both their economic and environmental performance. Value chains are often cross border in nature and so require trans-border shipment of secondary resources.”*

*NORTH SEA RESOURCES ROUNDTABLE AGREEMENT*

Detritus, or that which is not wanted, has long been dumped in the sea because it will be soon be forgotten and washed away. The high seas are the best example of the concept of the tragedy of the commons where lack of ownership leads to exploitation.

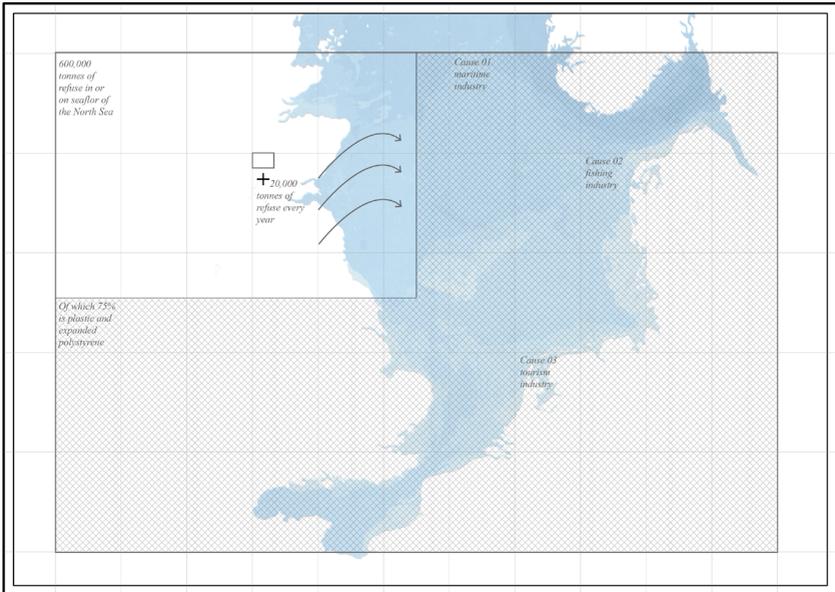
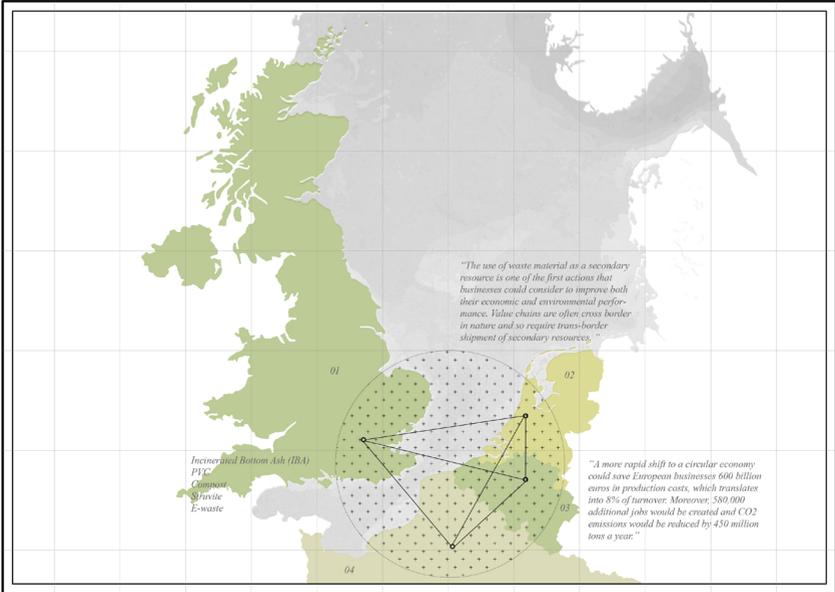
Within the EU however there has been a push to encourage the use of already used materials as a secondary resources. The North Sea Resource Roundabout was signed in 2016 between Great Britain, the Netherlands, Belgium, and France which aims to make it easier to recycle different

materials by aligning regulatory mechanisms. At the top of the list for re-use is incinerator bottom ash, which is the waste of waste - what is left over when municipal solid waste has been burnt.

At the same time, in addition to waste on land, the sea is vast and already home to vast volumes of rubbish as well. The North Sea alone contains 600,000 tonnes of waste, 75% of which is plastic. These are generated by the shipping industry, fishing industry, and tourists. Despite increased regulation against dumping such waste in the sea, the volume of plastic in the sea is only growing and inflicting increasing harm on marine wildlife.

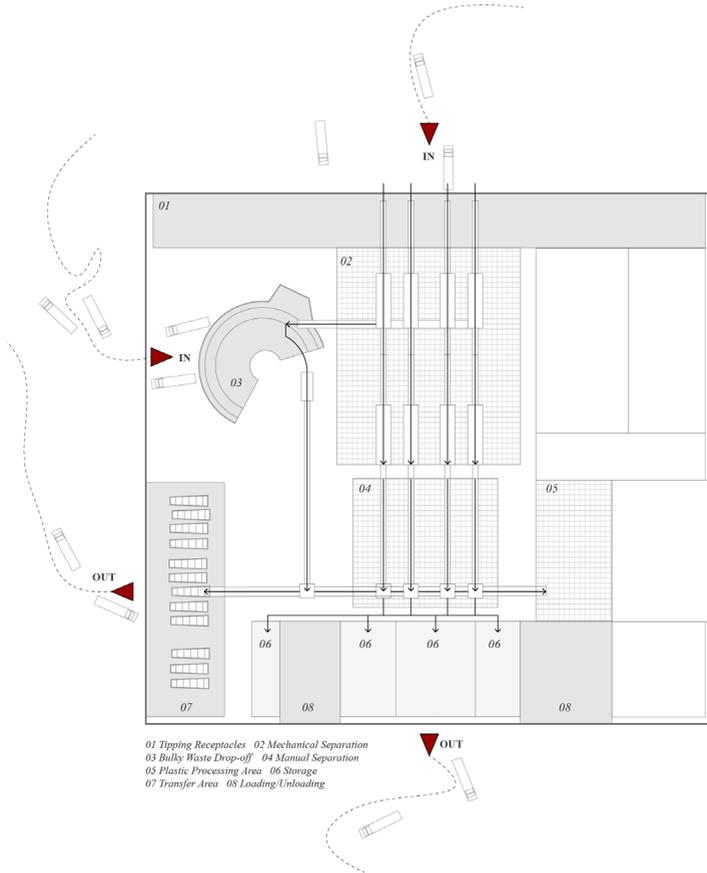
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*Opposite: North Sea Resources Roundabout  
Plastic Waste in the North Sea*



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*Opposite: Analysis of case study recycling plant in Madrid by Abalos & Herreros*



01 Tipping Receptacles 02 Mechanical Separation  
 03 Bully Waste Drop-off 04 Manual Separation  
 05 Plastic Processing Area 06 Storage  
 07 Transfer Area 08 Loading/Unloading

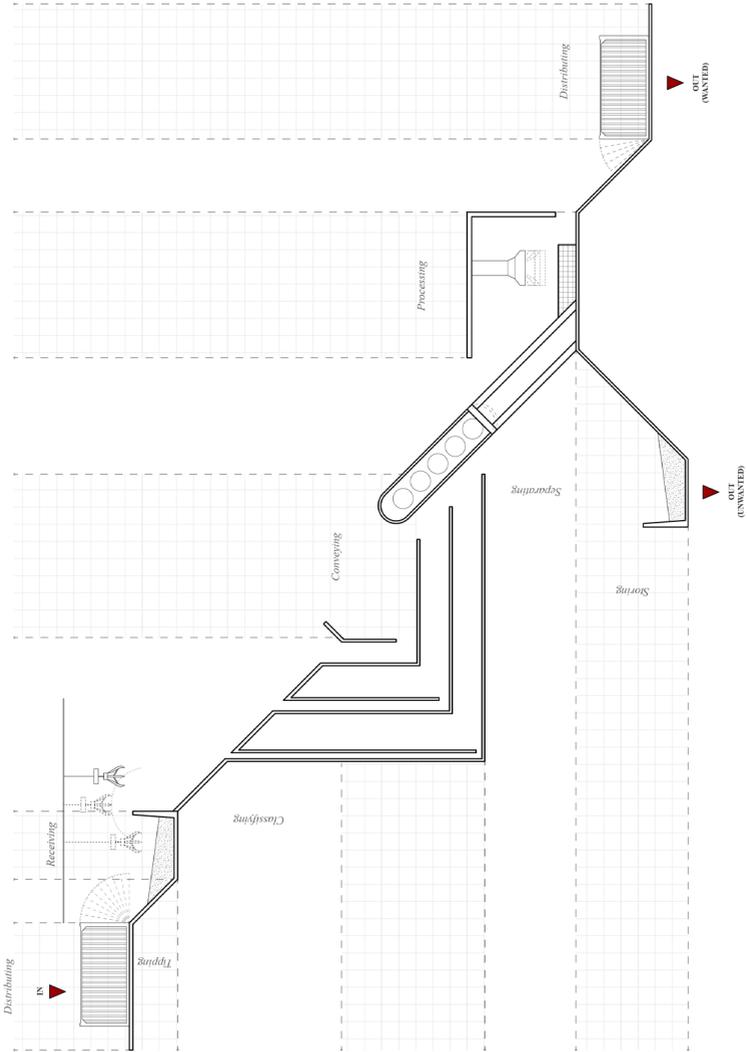
WASTE PROCESSING SERVICES	7100m <sup>2</sup> 55%	Mechanical Separation		Loading/Unloading		Tipping Receptacles	
		1500m <sup>2</sup>		1350m <sup>2</sup>		1000m <sup>2</sup>	
ANCILLARY SERVICES	1130m <sup>2</sup> 9%	Manual Separation		Transfer Area		Storage	
		900m <sup>2</sup>	900m <sup>2</sup>	750m <sup>2</sup>	400m <sup>2</sup>	300m <sup>2</sup>	
ADMIN	1200m <sup>2</sup> 9%	Parking		Workshops		Lockers	
		500m <sup>2</sup>	330m <sup>2</sup>	300m <sup>2</sup>			
PUBLIC SPACES	1500m <sup>2</sup> 12%	Offices		Auditorium			
		1000m <sup>2</sup>		200m <sup>2</sup>			
CIRCULATION	2000m <sup>2</sup> 15%	Museum		Patio			
		850m <sup>2</sup>		650m <sup>2</sup>			
		Circulation					
		2000m <sup>2</sup>					

### ***RECYCLING PLANT DECONSTRUCTED***

Even though recycling facilities deal with the distribution of materials and therefore occupy large spaces in plan, they also often create an artificial gradient because the process of separating waste is largely gravitational and taking advantage of this reduces energy costs.

It begins with the tipping of materials into an unloading dock, where they are then classified according to size as larger objects could jam the machinery. Following this they are once again separated, this time according to material. This is usually achieved with the use of an eddy current separator which uses magnets and gravity to distill metals from other materials.

In the end, one large heap of used material is separated into two - that which is wanted, which is baled and sold onwards, while the unwanted is sent to a landfill for disposal.



### ***ROMAN CONCRETE 2.0***

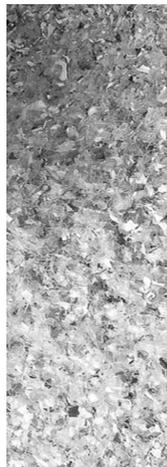
The Romans used pozzolan, or volcanic ash, to create a concrete mix that was used to build structures which lasted for millennia. The material properties of the ash reacted well with water and lime to tightly bind the substance. When exposed to sea water the chemical bonds thrived, meaning the material strengthened over time. This knowledge was lost for years, however, and even the modern replacement using Portland cement is not an exact substitute as it has not proved as durable.

What then if it was reinvented with a modern twist? Burnt ash possesses similar characteristics as volcanic ash, and shredded plastic can act as the aggregate. When mixed in a specific ratio with sea water, a new material made entirely out of recycled inputs is created. This new concrete would also be relatively lightweight as due to the plastic and air gaps, and like the original Roman concrete, would be able to strengthen over time.

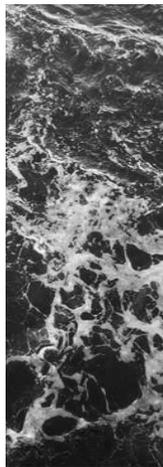
*bottom ash*  
2/3



*shredded plastic*  
1/3



*sea water*  
as required



*Recycled Concrete*



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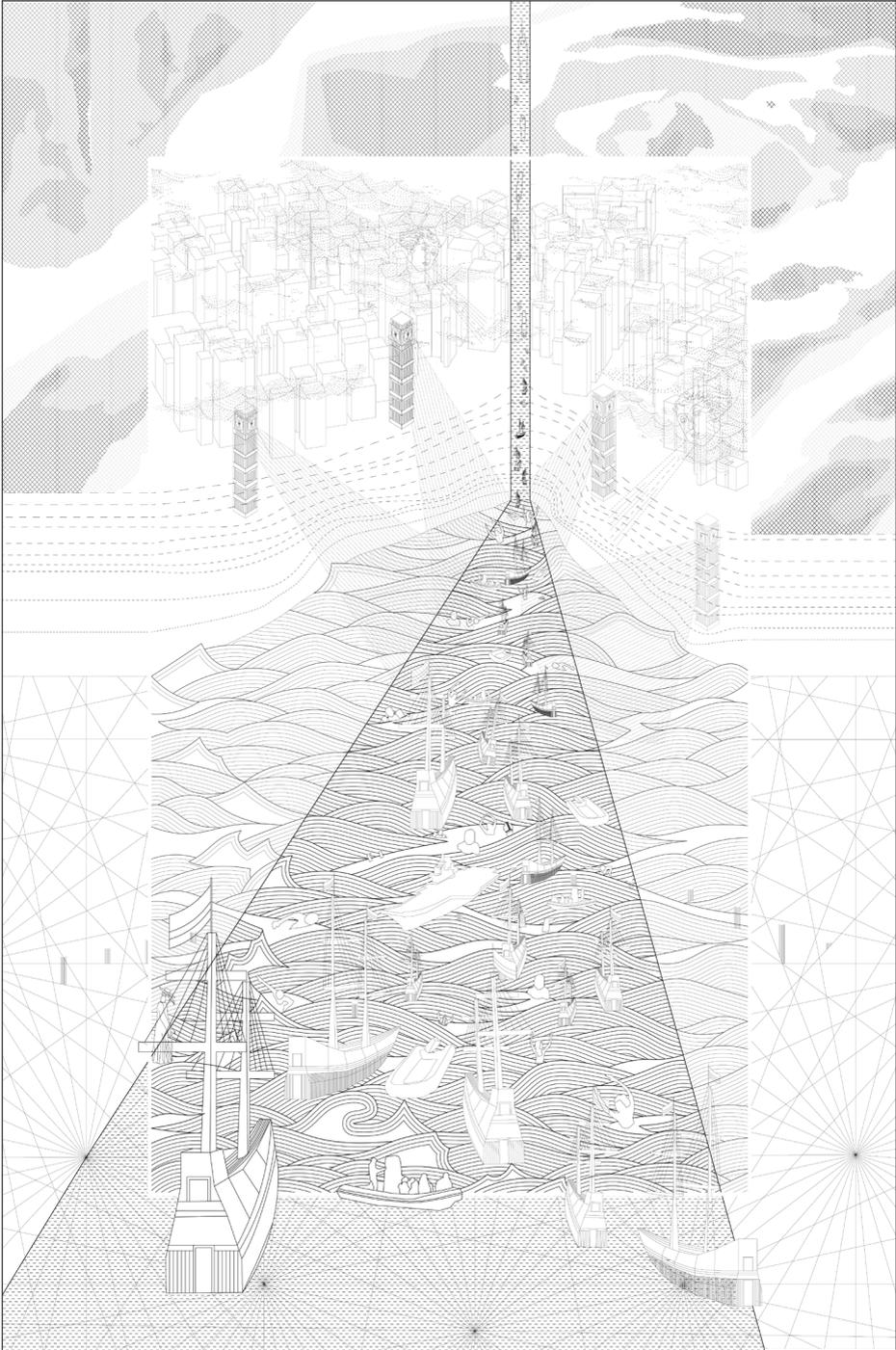
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*“One day they discovered that if they swam in unison - in regular synchronized laps from one end of the pool to the other - the pool would begin to move slowly in the opposite direction... They had to swim away from where they wanted to go, toward what they wanted to get away from.”*

*THE STORY OF THE POOL, Rem Koolhaas*



### ***Problem Statement***

*Britain's traditional position as an integrated extension of the European continent has been forgotten over time, resulting in the current political reality of Brexit. While the North Sea has historically been a conduit of cultural exchange, it is now being used as a barrier to further insulate the island from the world.*

### ***Research Questions***

- 1. How can traces in the sea be used to reveal the history of the relationship between the UK and the continent?*
  - a) How can this history be manifested in a physical form?*
  - b) What architectural techniques can be employed to bridge the perceived gap between the two coasts?*
- 2. How can people in a state of transit be provided with a spatial anchor in a highly dynamic environment?*

## ***THE PROJECT***

In the shallow waters just off the coast of the United Kingdom, a machine emerges from the sea. It is a hybrid in many ways - it is floating but partially submerged, it looks like a platform but could be a ship, it is industrial but also incorporates spaces for inhabitation.

Its location, however, is not a coincidence. Britain's traditional position as an integrated extension of the European continent has been forgotten over time, resulting in the current political reality of Brexit. The North Sea has historically been a conduit of cultural exchange, but it is now being used as a barrier to further insulate the UK from the world because it is the only physical border it has.

In a post-Brexit scenario where supply chains between the island and the continent are interrupted, the contiguous zone just twelve nautical miles from the coast of the UK provides an ideal economic grey

zone. A free-floating object in occupying this territory is not subject to the UK's visa or customs regimes, nor is it at the mercy of the high seas.

The project thus capitalizes on its position to subvert the exclusionary act of Brexit. Tapping into existing flows of secondary resources across the North Sea, the project manifests as a recycling plant which utilizes waste to produce a new raw material. Detritus, or that which is not wanted, has long been dumped in the sea because it will be soon be forgotten and washed away. Within the EU however there has been a push to encourage the use of already used materials as a secondary resource. At the top of the list is incinerator bottom ash, what is left over when municipal solid waste has been burnt.

At the same time, the sea is vast and already home to vast volumes of rubbish. The North Sea alone contains 600,000

tons of waste, 75% of which is plastic. Burnt ash possesses similar characteristics as volcanic ash, and shredded plastic can be used as an aggregate, and so the machine combines the two to create a new concrete that is lightweight and able to strengthen over time due to its reaction with sea water. This material is moulded into modular islands which are given birth to by the machine; thereby using unwanted matter generated in a terrestrial context to create a productive landscape in the middle of the sea.

In addition to welcoming material flows the building also welcomes people. For most of history, the sea has been how people travelled long distances. Where previously it was the only option for everyone, ships have now lost their utilitarian purpose as a means of transport to all but those in the most desperate and dangerous situations. To those arriving from above by helicopter, such as workers, the scale

of the building is understood immediately from their vantage point. But for those arriving by boat, it is discovered piece by piece as they ascend.

Taking cues from the appearance of monolithic oil rigs, the machine is imagined as a solid block of infrastructure, structured according to the new production process it relies on. In contrast to the aloof nature of oil rigs, however, inhabitable spaces are carved through it to reveal processes which are often hidden from the public eye.

These occupiable spaces gravitate towards the periphery for want of light, leaving the central area dense with machinery. The peak of the spectator's journey is reached at the top of the observation tower, allowing visitors to reflect on the process they have undertaken, a moment of pause before the inevitable resumption of their journey back down towards the sea.

## ***SITING***

The floating machine has the flexibility to operate within bounds defined by multiple factors. Most important of these is the territorial boundary of the United Kingdom, which under international law is determined to be 12 nautical miles from its coast. The project is nestled near the crook of this abstract line, as close to London as possible.

The physical realities of existing at sea means it is also in close proximity to infrastructure and marine traffic. The existence of a major submarine cable and three important shipping lanes defined a window the project could occupy. To further narrow this vast area, tidal flows and the depth of the seabed were considered. In turn a site was chosen where an existing topographical feature complemented the typical North-South movement of the daily tide. The depth of the chosen area varies from 30-50m, which directly affected the scale of the building.

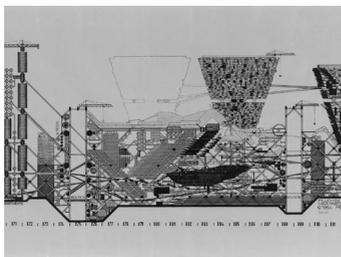




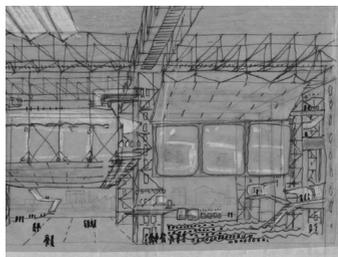
*Dnepropetrovsk Manganese Mine/ Ukraine*



*Cliff Head Rig/ Australia*



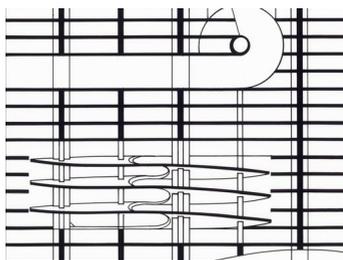
*Archigram/Peter Cook*



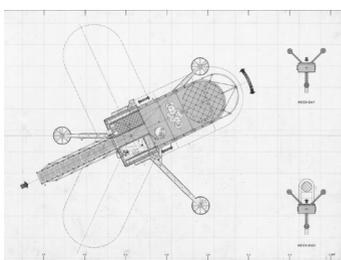
*Fun Palace/ Cedric Price*



*Bernard Tschumi*



*OMA/Rem Koolhaas*



*Future Systems Architecture/Jan Kaplicky*



*Leo Ludwig*

## ***PRODUCTION PROCESS***

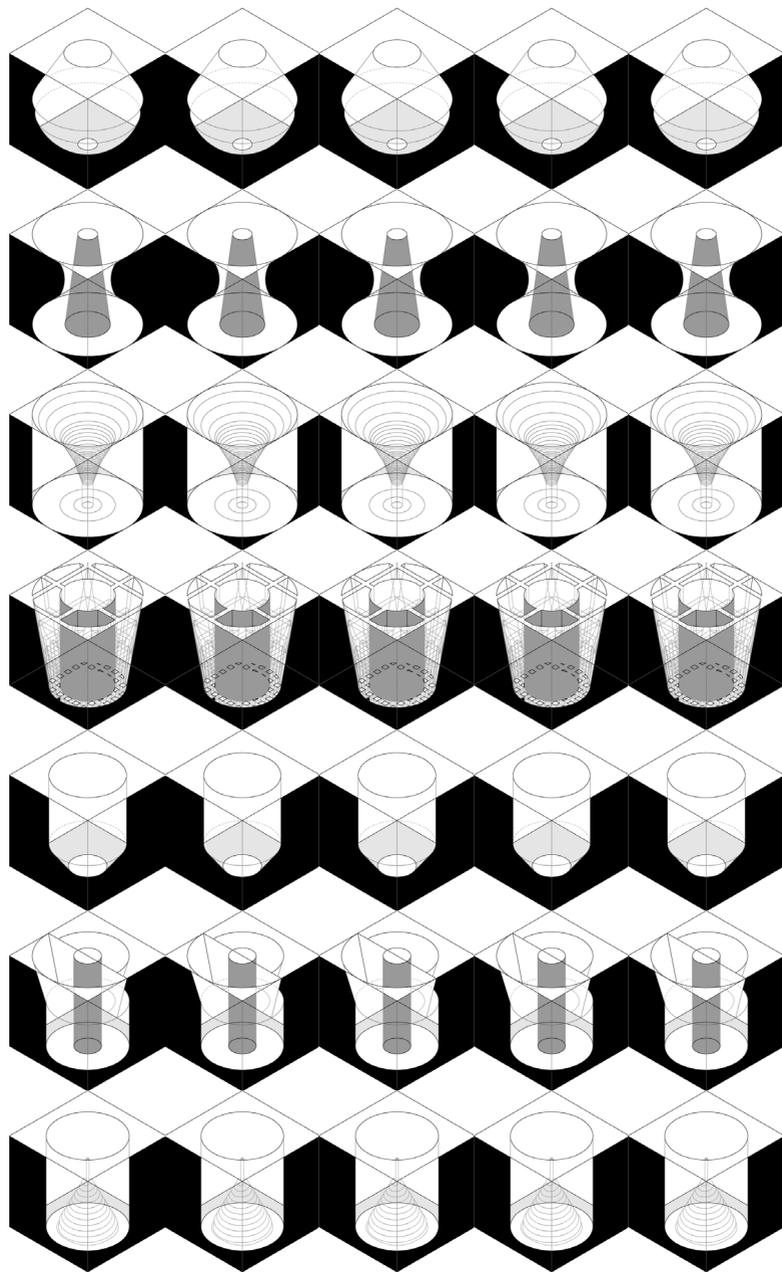
The building is conceived as a machine which receives bottom ash and plastic, processes it, and then produces a new material. This process is broken down into a series of discrete actions that are arranged vertically to harness the gravitational mass of the materials and allow them to flow down the building.

In the beginning the two materials are kept distinct from each other as the difference in their size and texture requires specific processing machinery. After this procedure they are stored and mixed in specific ratios to form the new concrete mix, which is then utilised in the fabrication chamber.

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*Opposite (T-B):*

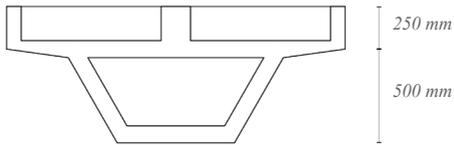
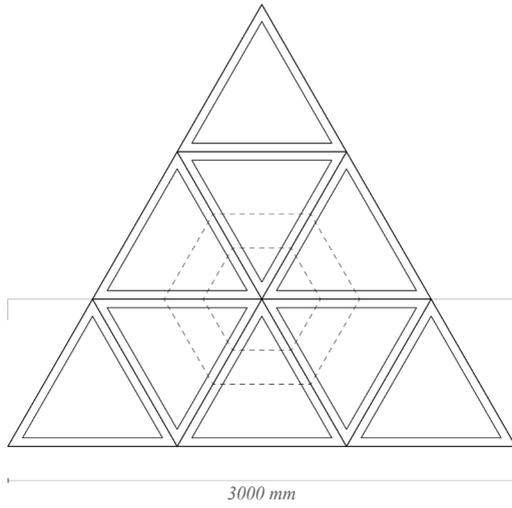
- 01. Tipping*
- 02. Crushing*
- 03. Separating*
- 04. Shredding*
- 05. Storing*
- 06. Mixing*
- 07. Pouring*



### ***ISLANDS IN THE SEA***

The modular islands created by the machine are then floated out to sea and combined to create a new, growing piece of land in the middle of the Thames Estuary. They are attached to the leg of the machine as an anchoring point, from which they proceed to expand across the surface of the sea. The two possess a symbiotic relationship wherein neither can exist without the other. The machine becomes the nucleus of the new territory as it exists to create the islands, while the islands rely on the stability of the machine to accumulate a critical mass, without which they would disperse and be destroyed by the sea.

The proposal uses unwanted matter generated in a terrestrial context, namely bottom ash and plastic, to create a productive landscape in the middle of the sea. It completes the cycle of circular use by giving a new lease of life to material that would otherwise be disposed of, or in the case of plastic, cause harm to the environment.



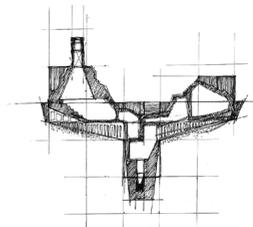
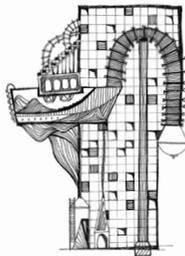
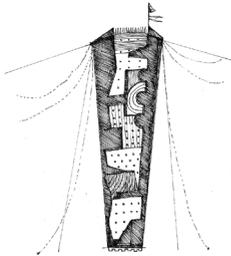
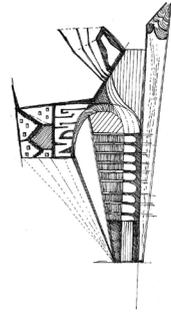
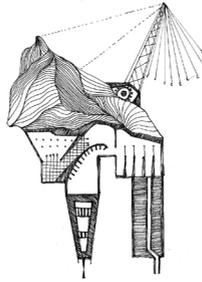
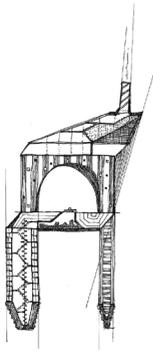
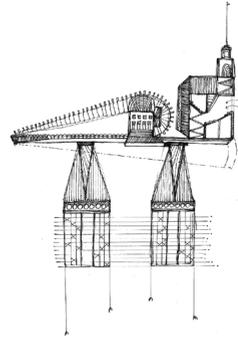
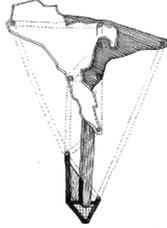
### ***DESIGN EXPLORATION***

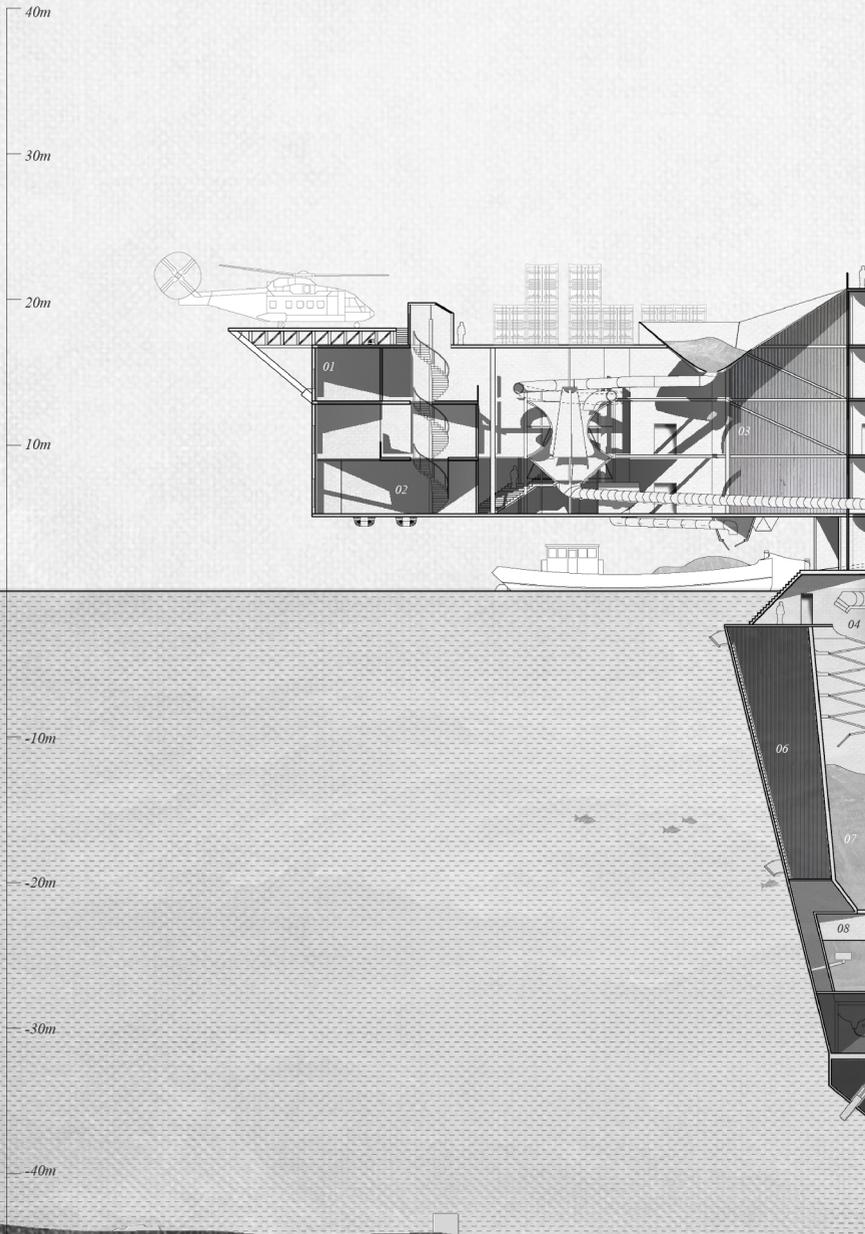
The design process was initiated by a series of drawings depicting imagined sections of the building. This process was informed by the idea of flows - the machine is conceptualised as a sequence of spaces organised around the process of recycling. The sketches also portray the hard edges of an industrial machine being mediated by the topographical lines of nature, the two forces in conflict with each other.

Based on the discovery that recycling plants rely as much as possible on gravity to move items through their facilities, this exploration resulted in designs which often privileged the vertical axis. This idea was carried through to the final design, the section of which was generated by the industrial process the machine sought to implement.

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*Opposite: Section sketches  
Following: Final Section drawing*

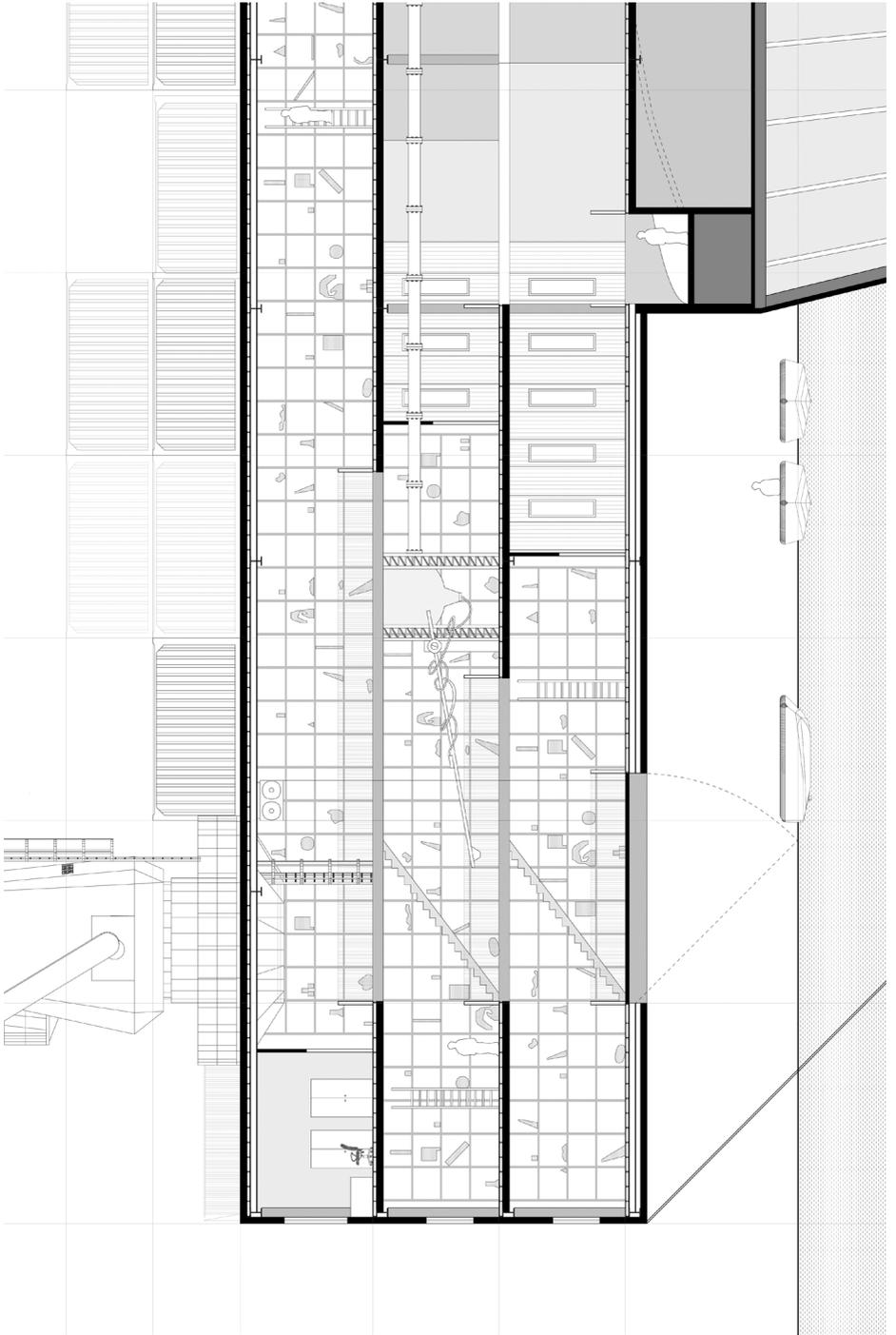


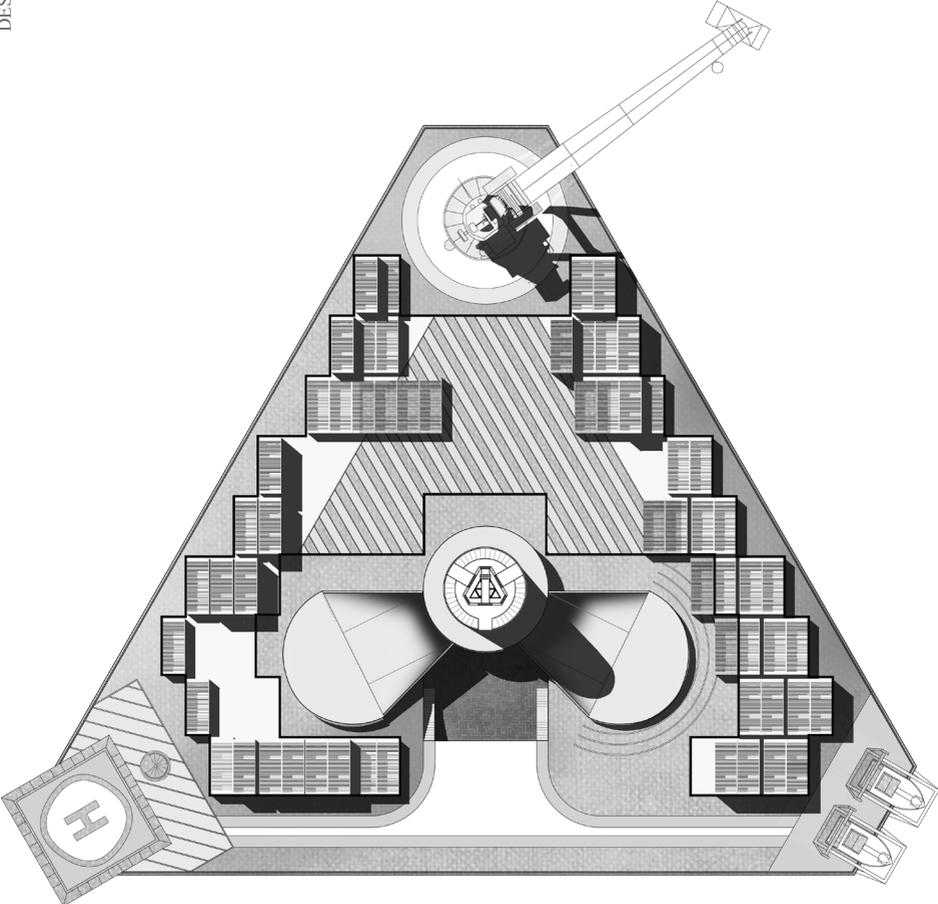


- 01 Accomodation
- 02 Diving
- 03 Machine Hall
- 04 Scaffolding
- 05 Maintenance Decks
- 06 Water Ballast
- 07 Material Storage
- 08 Mixing
- 09 Formation
- 10 Airlock
- 11 Iron Ballast

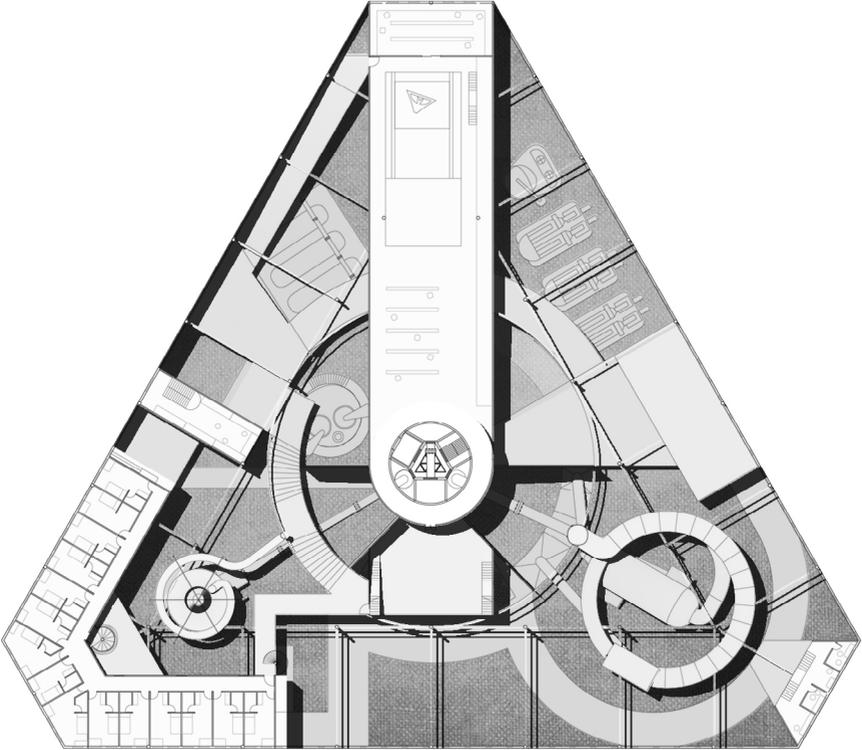


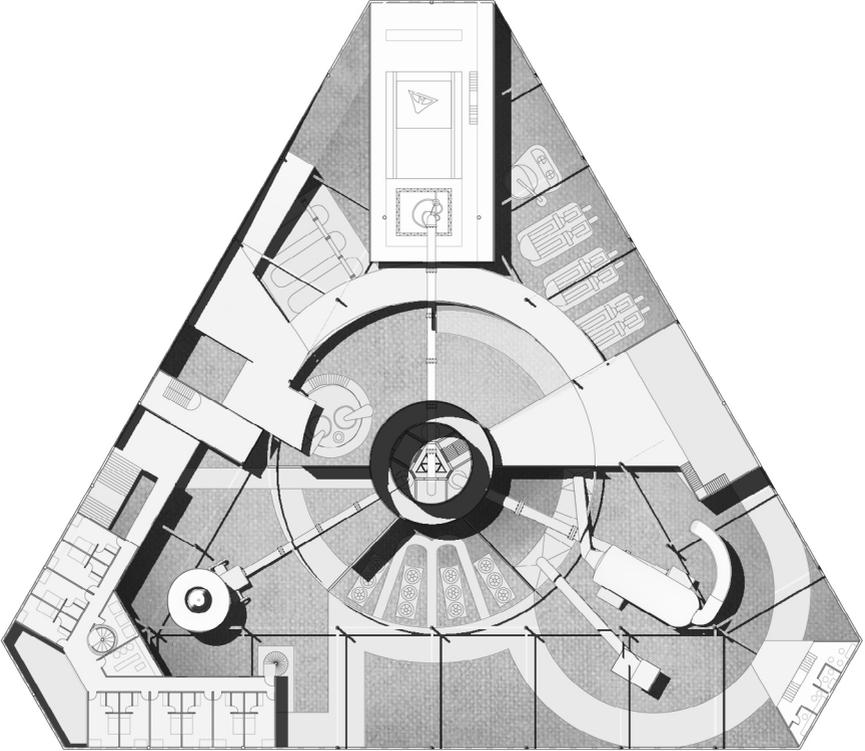






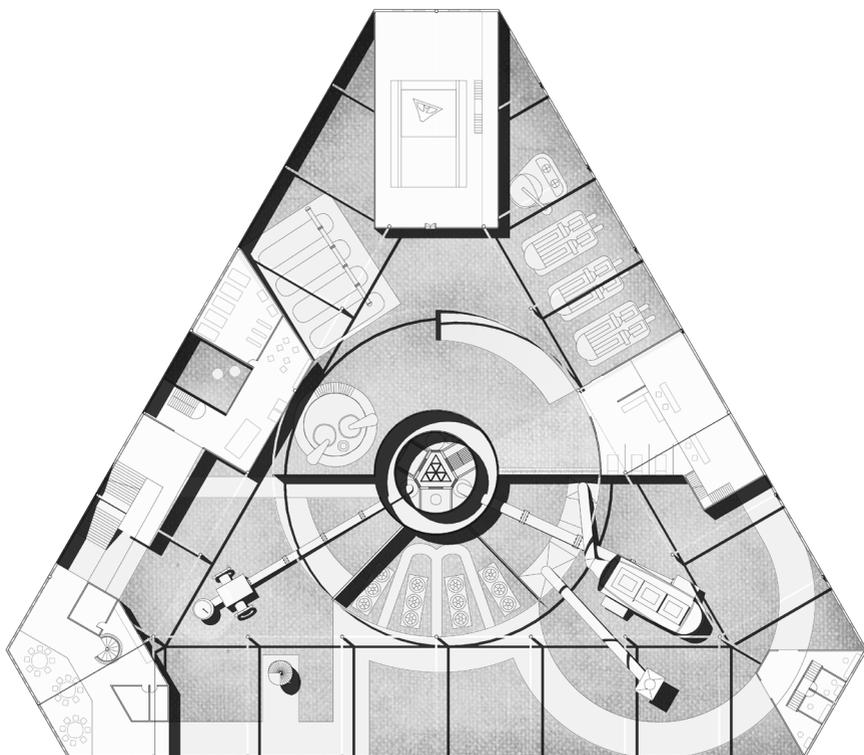
Rooftop Deck Plan, +16m

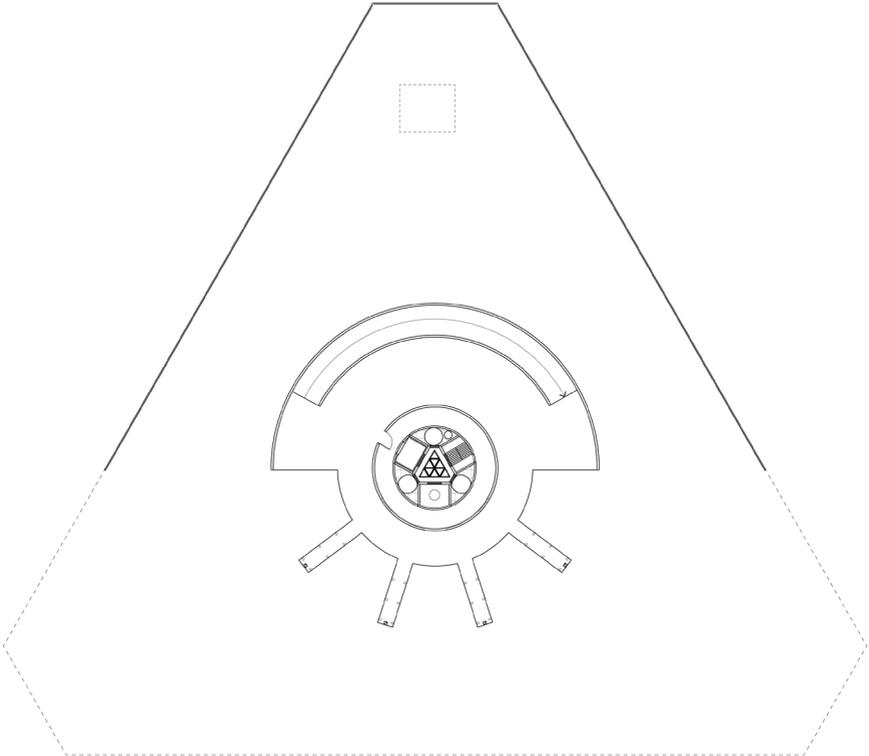




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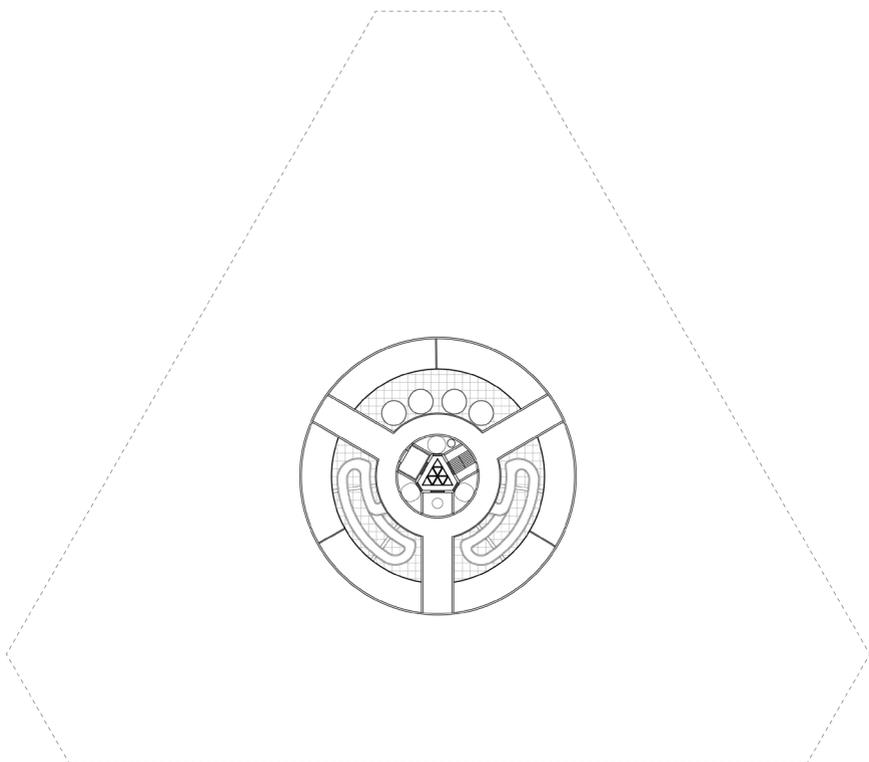
Deck Plan 02, +7m

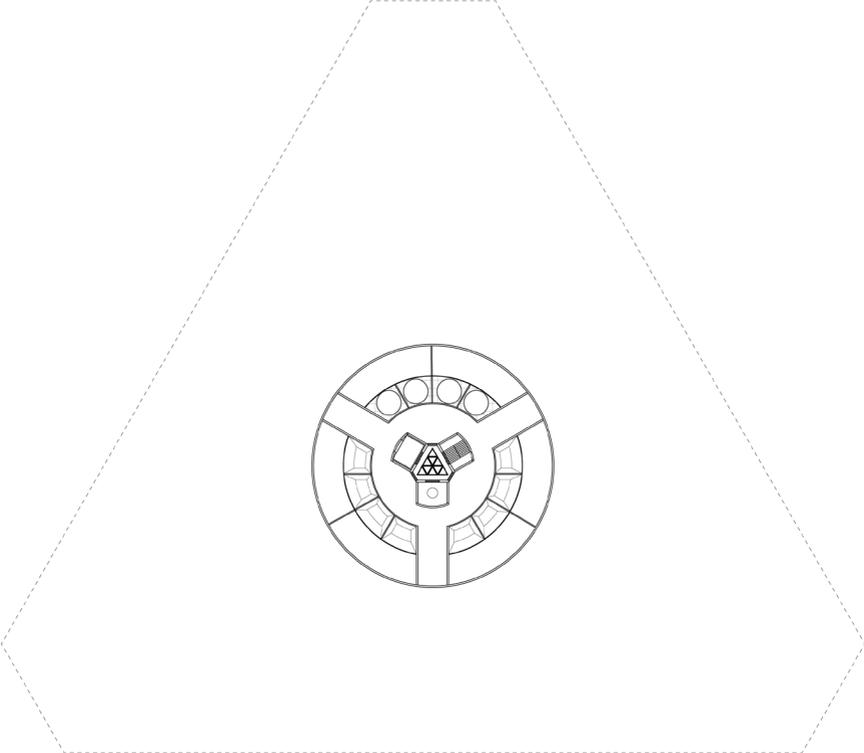


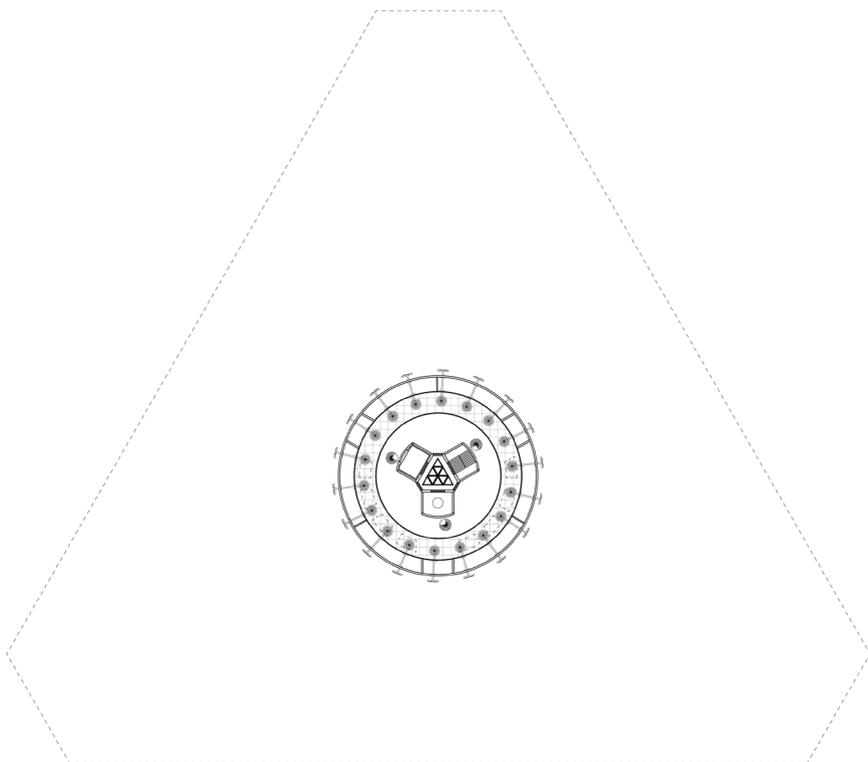


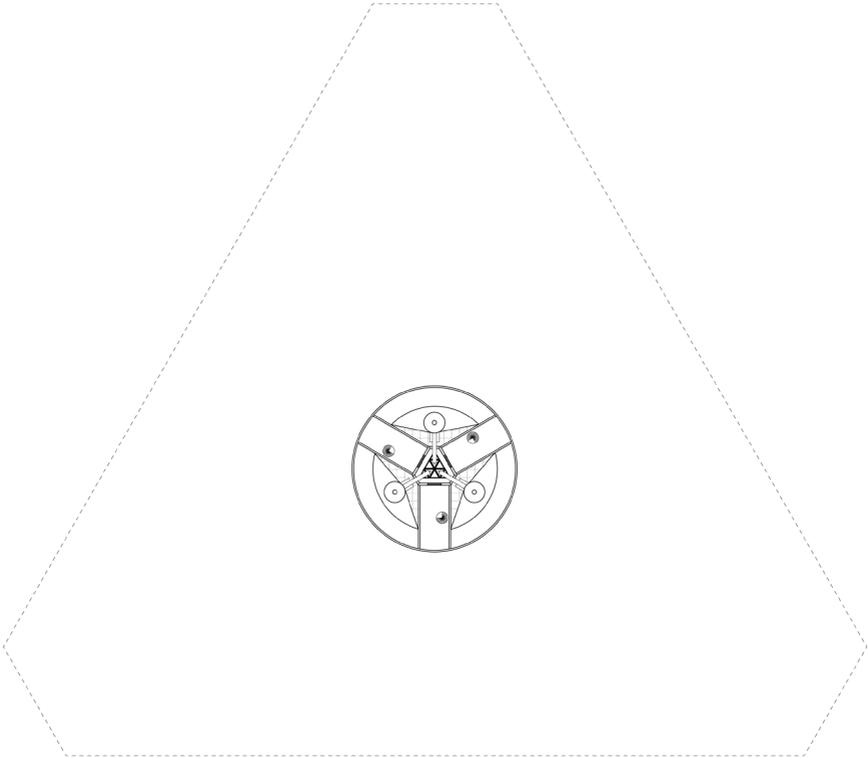
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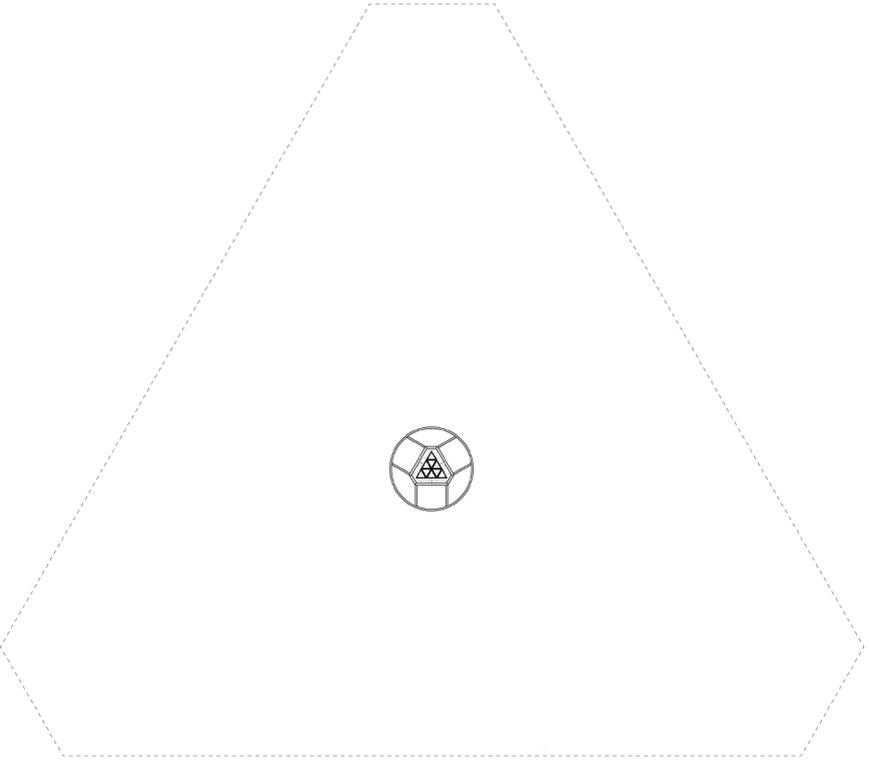
Entry Deck Plan, +1m

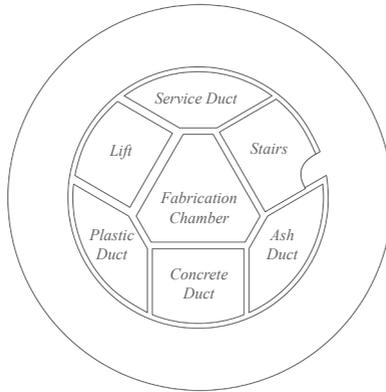






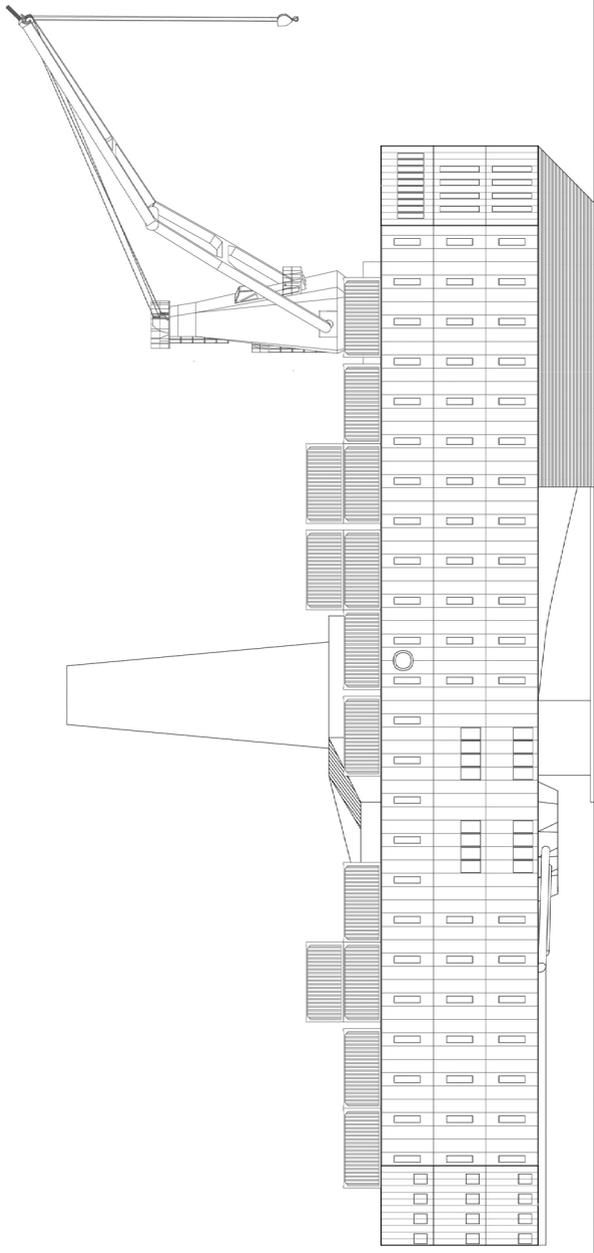








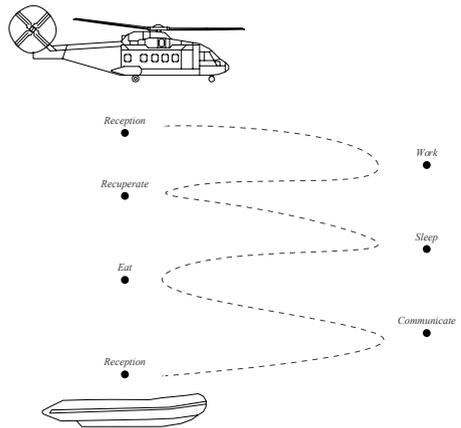


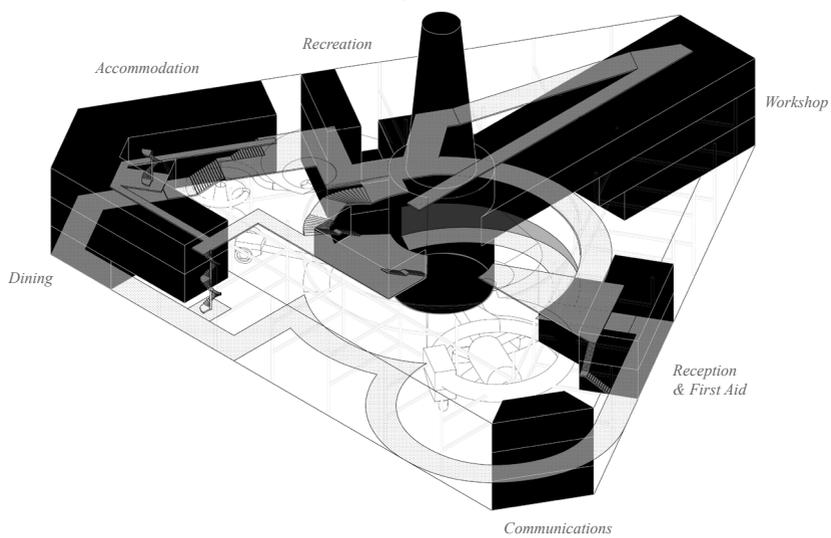


**CIRCULATION**

The building is conceptualized as a solid block of infrastructure with spaces to be occupied carved out from its mass. The space must be experienced by moving through it in a process of discovery. Multiple circulation routes exist for the different groups of people who will use the building. It is anticipated to be used by both actors and spectators of the machine, who arrive either by helicopter and descend or by boat and then ascend.

Employees who work in the building are a clear case of the former, while visitors who come to see the recycling in action are of the latter group. Occupying a grey area between the two are migrants who can use the space as a moment of pause before resuming their journey, while also using their time there to participate in the process of production by working in the workshop. While arriving as spectators, they leave as actors, implicit in the operation of the machine.



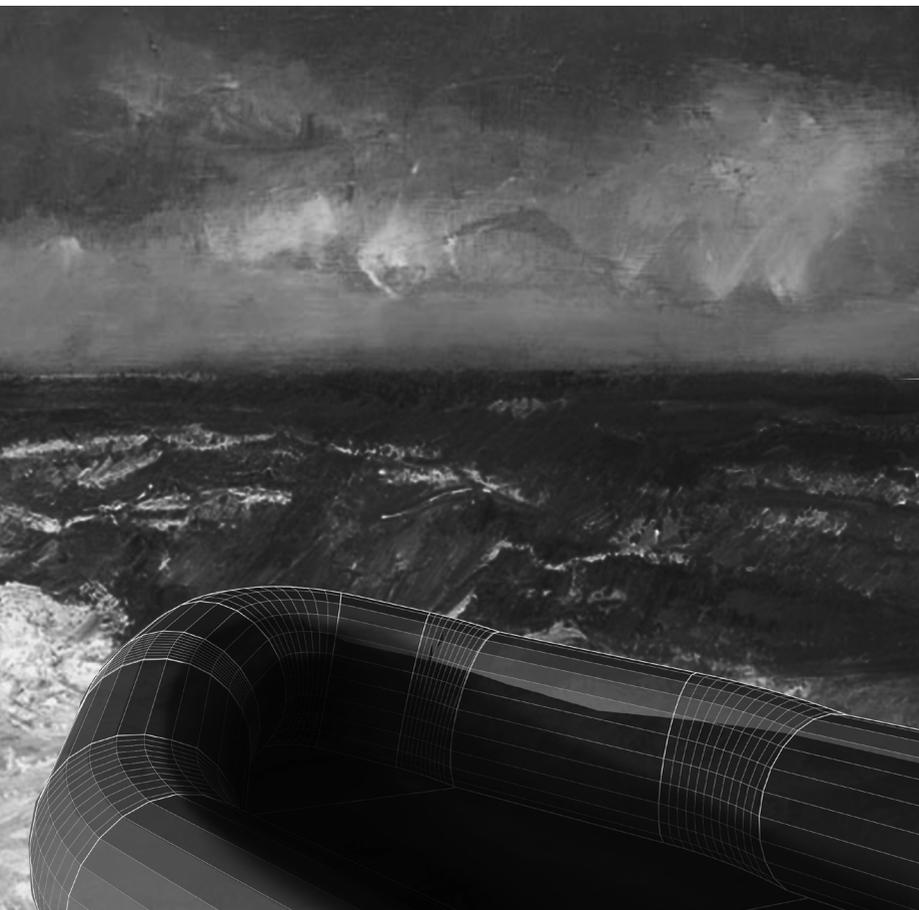




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#### FIRST SIGHTING

*A structure reminiscent of an oil rig emerges from the waves, but unlike an aloof towering rig its facade touches the water - acting as an invitation.*

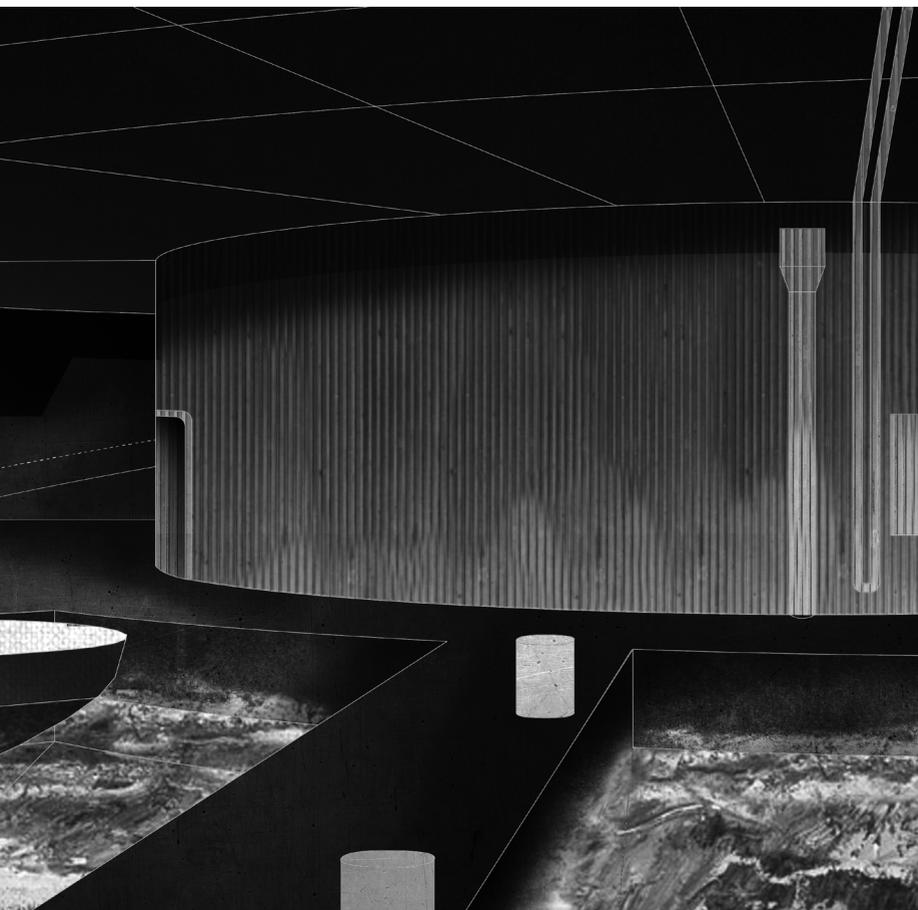




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#### THE LANDING

*A series of jetties extend from a platform, presenting a modicum of stability amidst the waves. There is then a choice to be made - the door or the ramp.*





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*THE MACHINE IS ALIVE*

*Proceeding up the building, the sound of the waves  
is drowned out by the whirring of machinery;  
time is regulated by the metronome of falling ash.*





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#### *BARE NECESSITIES*

*Humans compete for space with the arterial infrastructure required to service the machine - pipes, conduits, control cabinets.*

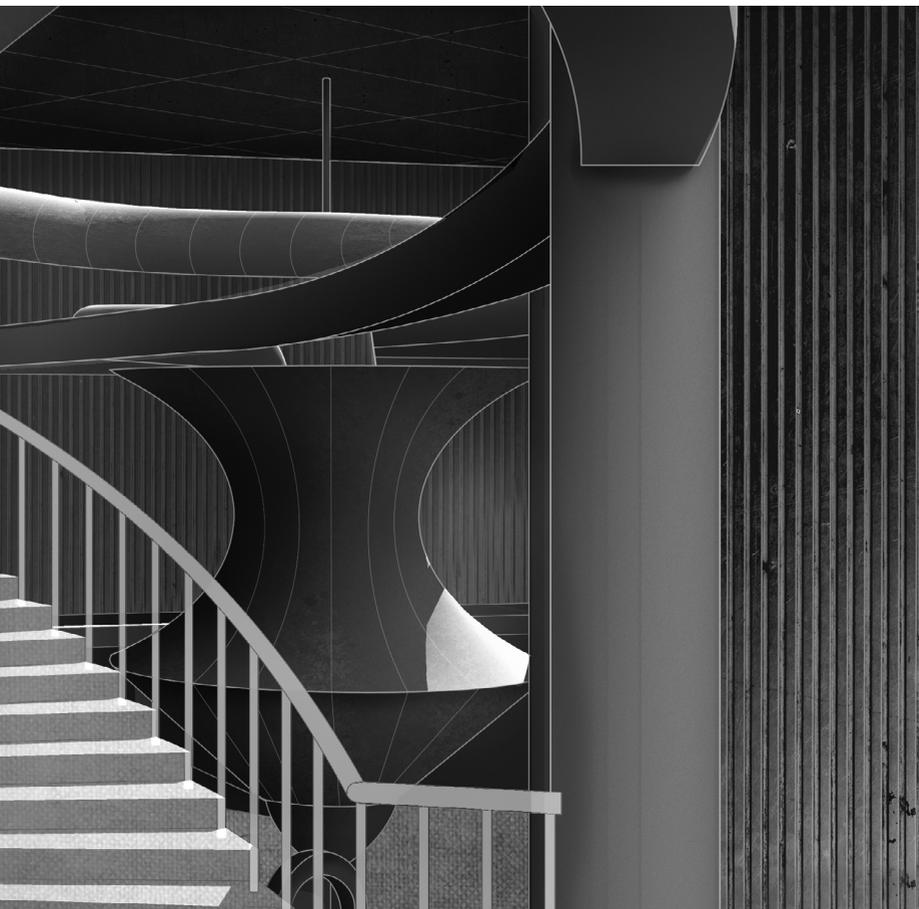


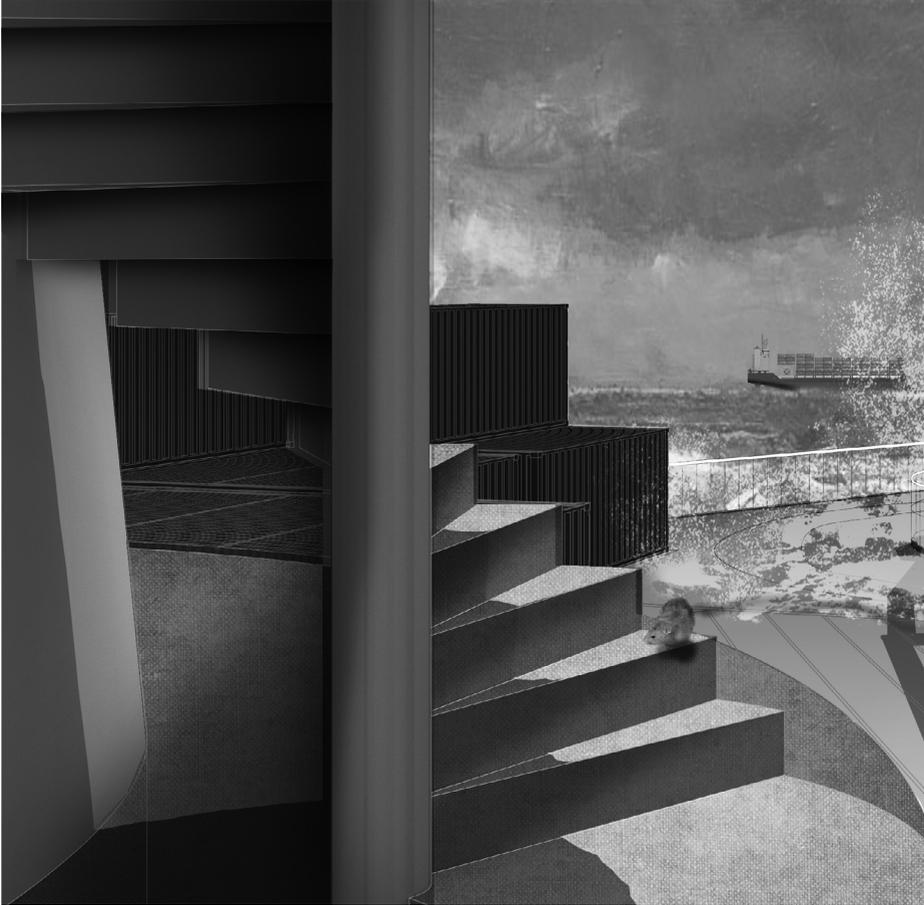


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#### INTO THE MACHINE

*The higher one ascends the more one becomes aware how overwhelmingly large the machinery is, there are pipes that could easily host a human.*

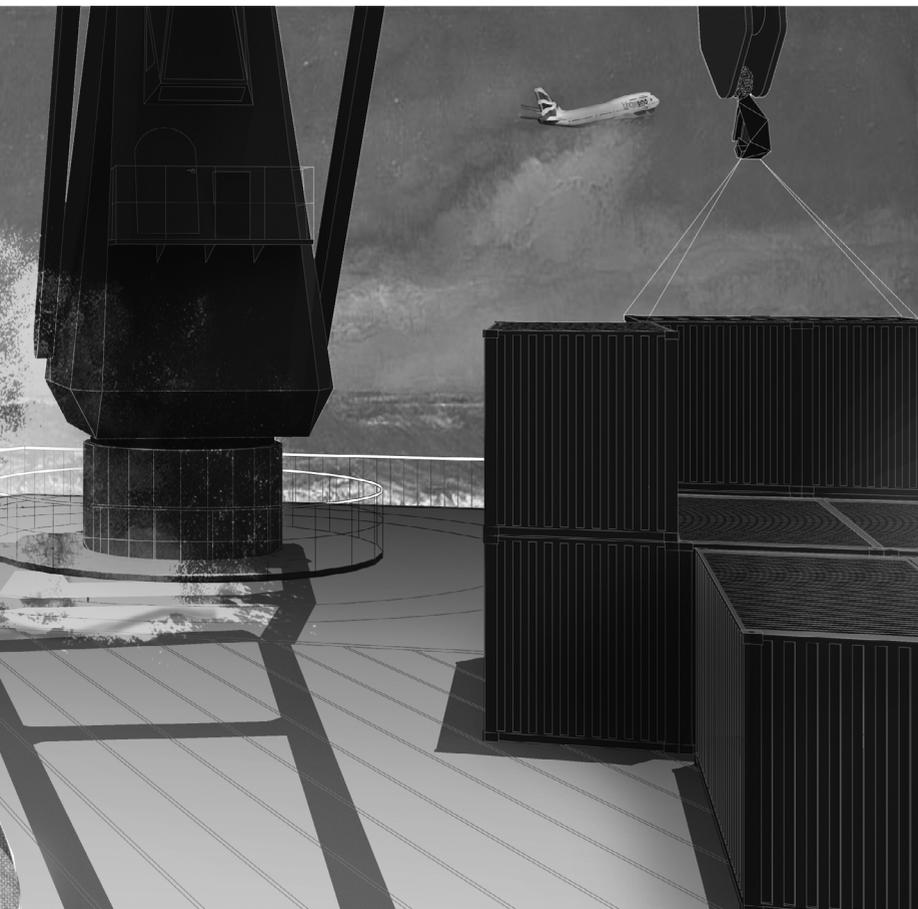




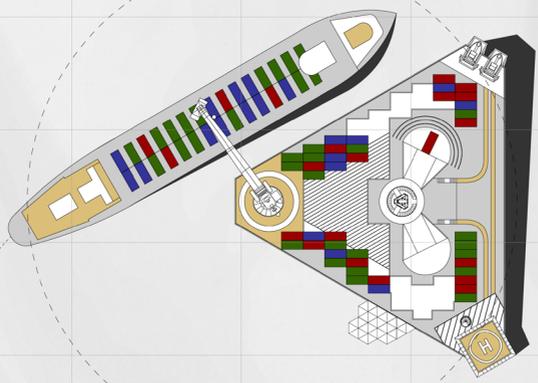
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#### *FRESH AIR*

*At long last the visitor reaches the roof deck from where they can see two things - where they came from, and where they are going.*

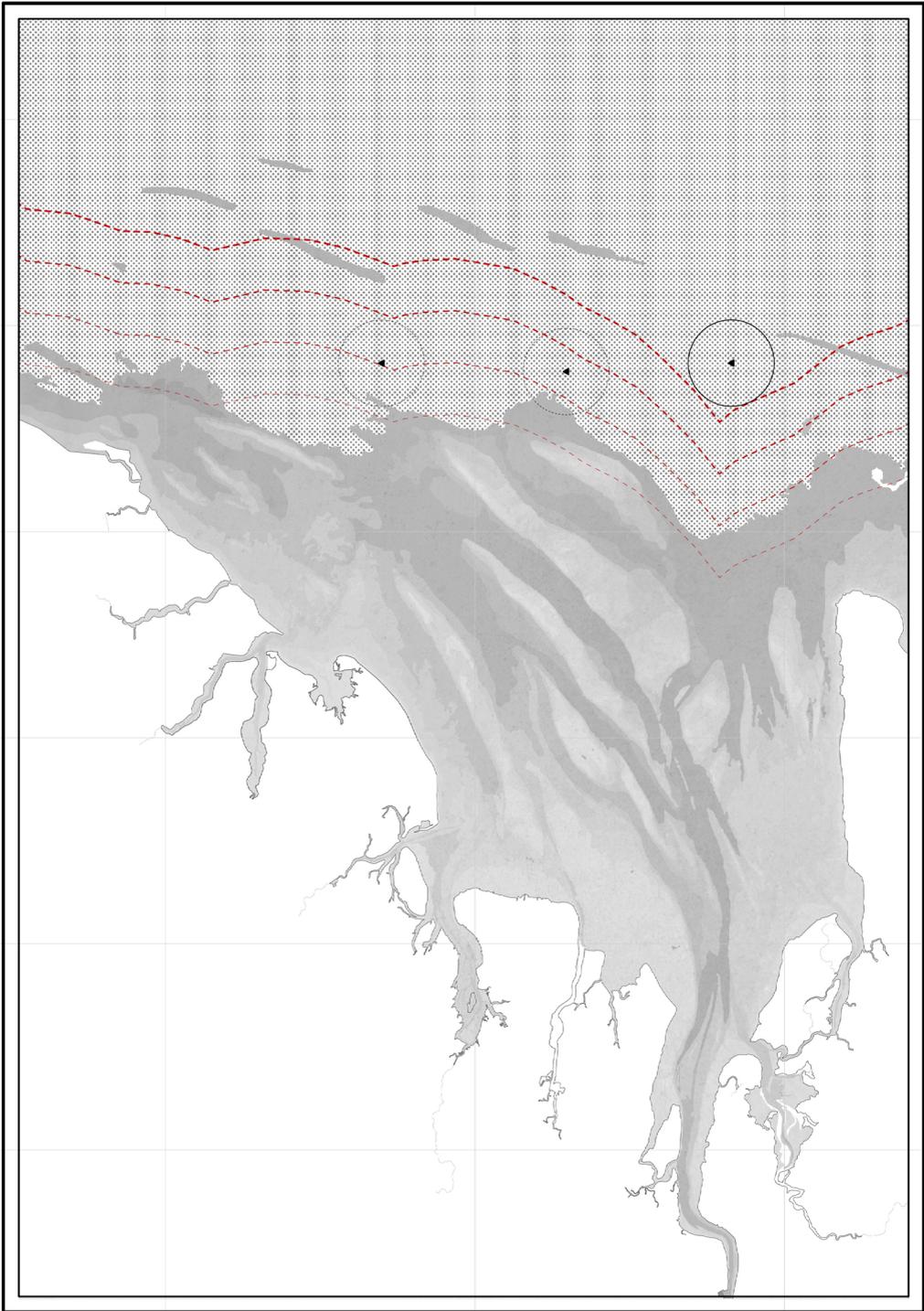






UK 12NM TERRITORIAL WATERS











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## ***AUTARKY***

By positioning itself outside the jurisdiction of national governments, the machine strives to maintain its independence from external sources. As a result, it is an autarkic structure that generates what it needs in terms of energy, food, water, and heating.

The primary means of energy production is through harnessing tidal energy. Water flowing through underwater turbines attached to the structure generates electricity, and as the waves are constantly in motion it is more reliable than other forms of renewable energy.

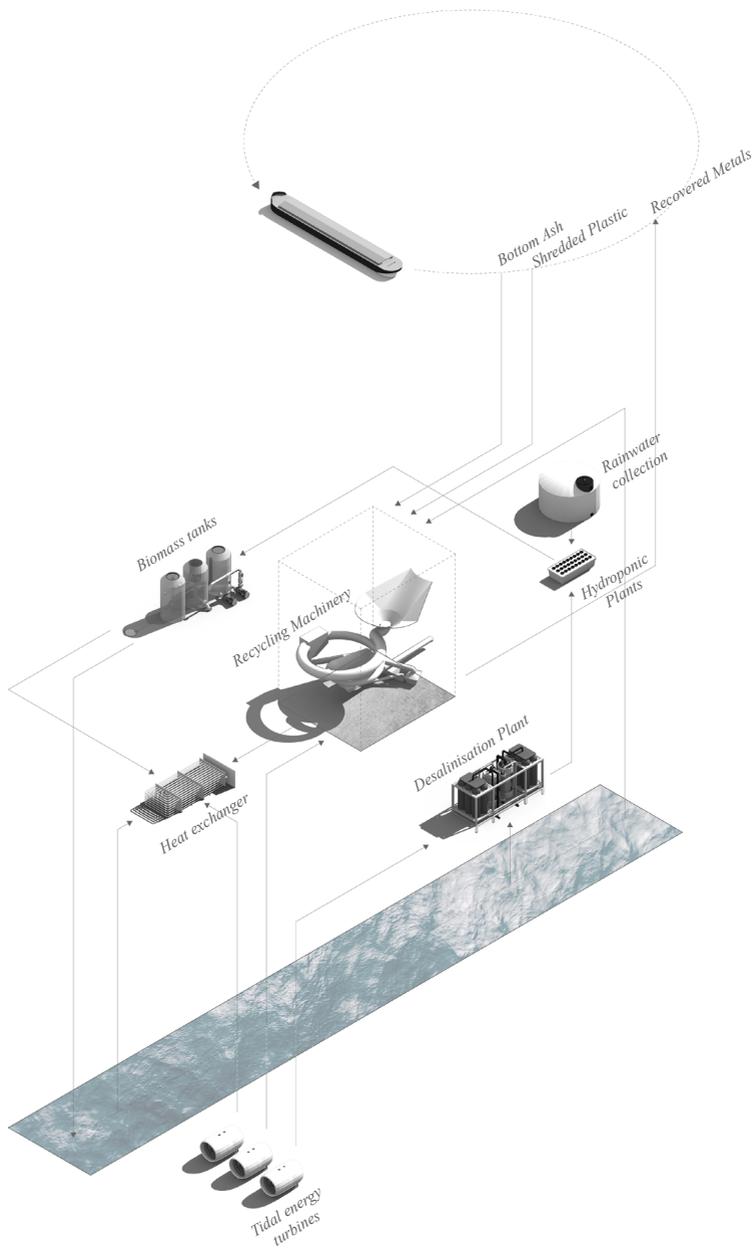
In terms of water, sea water is pumped up and desalinated within the building for human usage. This is supplemented by rainwater collection systems on the deck. After usage, grey water is filtered and returned back to the sea, while black water is held in storage tanks as the treatment process takes more time.

After processing the liquid is pumped overboard, while the solid sludge is used as biomass resource. This is a supplementary source of energy whereby methane produced by the sludge can be recovered and used as fuel. In addition, the heat generated by this process is distributed throughout the building as needed.

To sustain its population, the machine has a hydroponic room to grow its own food. Organic waste is then added to the biomass tank in addition to the sludge.

Other types of waste are also reused as far as possible. Plastic is input into the machine, while cardboard, paper, and wood are added to the biomass tank. Valuable materials that have resale value such as metals are sent back to shore for revenue.

Lastly, the heat generated by the machinery is used as a passive means of space heating through a heat exchanger.

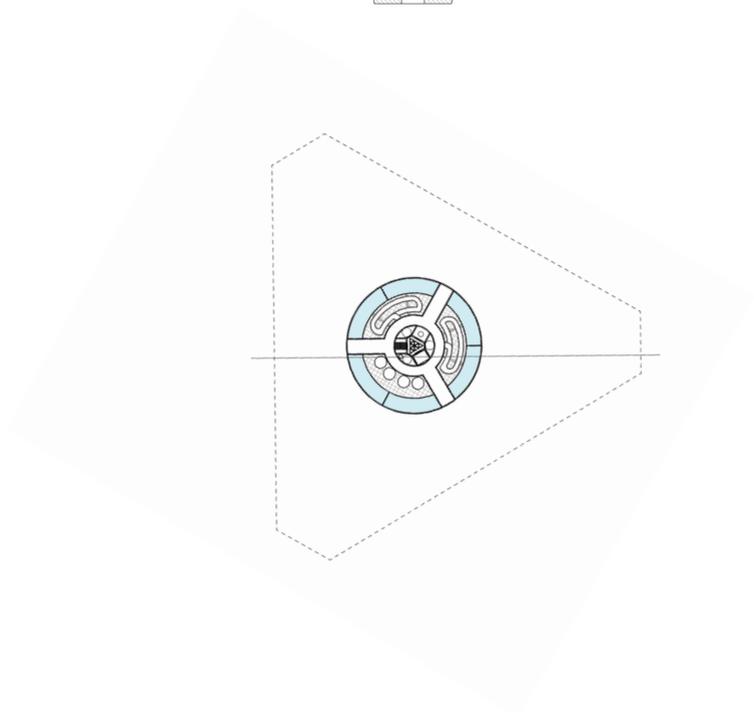
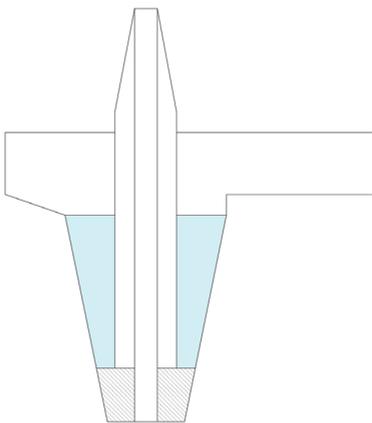


## ***BUOYANCY***

As Archimedes realised, when a body is immersed in a liquid, an upward thrust, equal to the weight of the liquid displaced, acts on it. In order to float then, the weight of displaced water should be equal to the weight of the object at hand.

In order to achieve this, large chambers are built into marine vessels that increase their volume and thus displace more water, resulting in a larger upward thrust. Because the weight of ships are subject to variation due to changes in cargo loads, these ballast chambers can also be filled with water when necessary to improve stability.

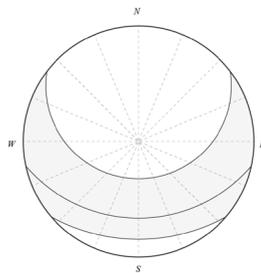
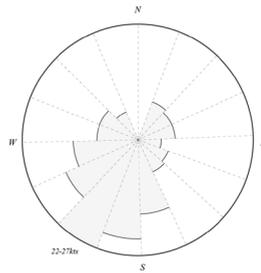
As the machine needs to float to avoid being subject the UK laws, its core contains a series of ballast chambers to achieve the same effect. There is a permanent ballast chamber at its bottom filled with iron, while on its sides are chambers which can be filled with sea water as necessary to counteract wind and wave loads.

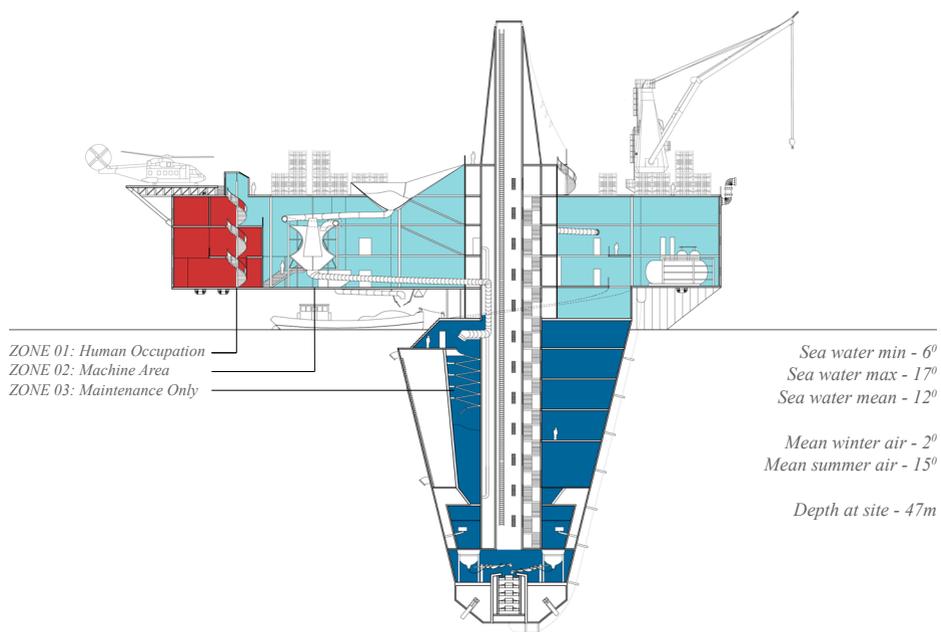


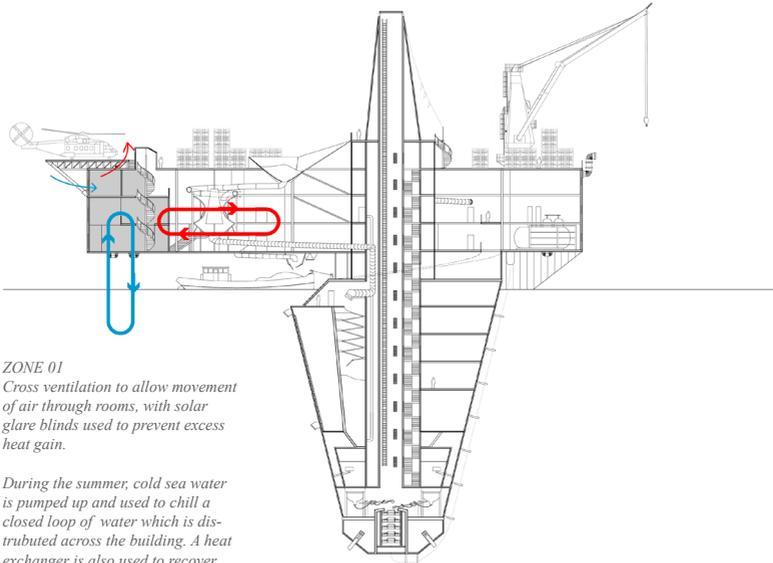
## CLIMATE

The North Sea has a notoriously harsh climate, with frequent gales and storms. Though its temperature varies by  $13^{\circ}$  from winter to summer, but it is important to note that it on average during the summer the temperature does not exceed  $15^{\circ}$ . As a result, the interior spaces need to be protected from the elements and well insulated since heating is a much bigger concern than cooling.

To address this issue, the building is divided into three climatic zones according to their usage, with their interior environment varying accordingly. The first of these are the human occupied spaces, which are along the facade due to their need for light. Second is the central machine area, which needs to be well ventilated and temperature controlled due to the equipment. Lastly, there are the submerged industrial spaces within the core which do not require frequent human access but do require ventilation as well.



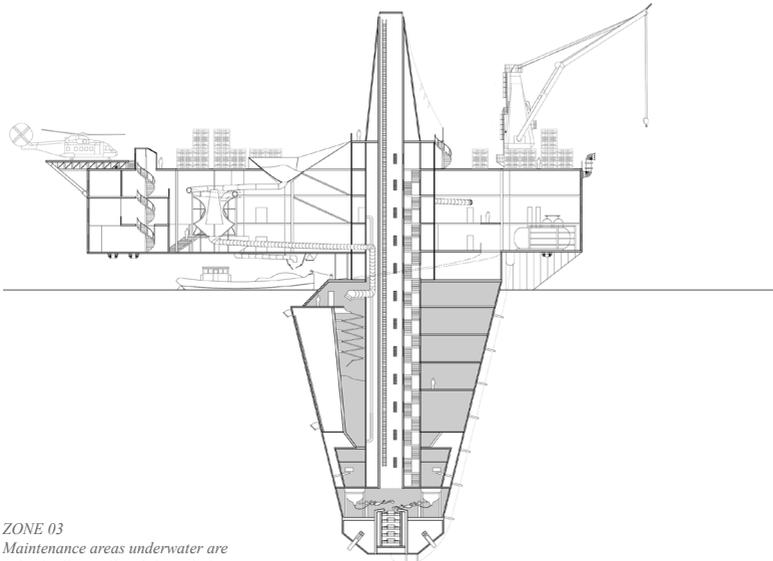




#### ZONE 01

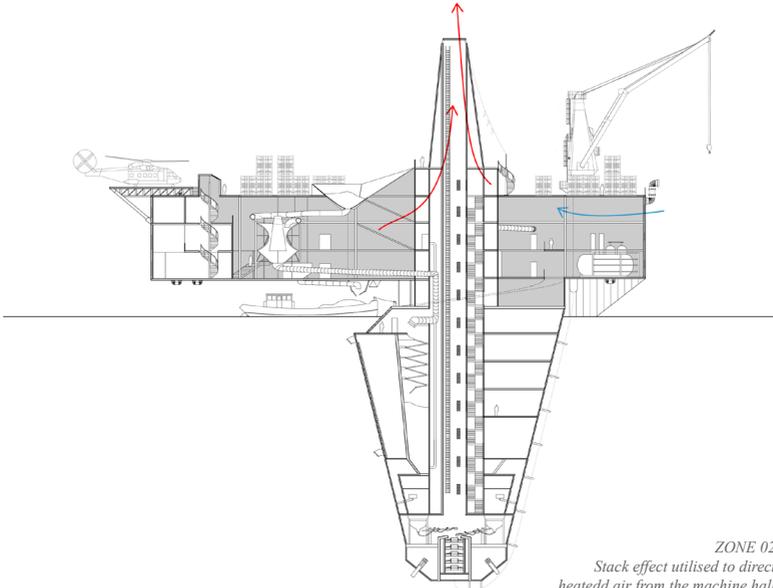
*Cross ventilation to allow movement of air through rooms, with solar glare blinds used to prevent excess heat gain.*

*During the summer, cold sea water is pumped up and used to chill a closed loop of water which is distributed across the building. A heat exchanger is also used to recover the heat from the machine hall to warm water in pipes, which are then used for radiant heating*

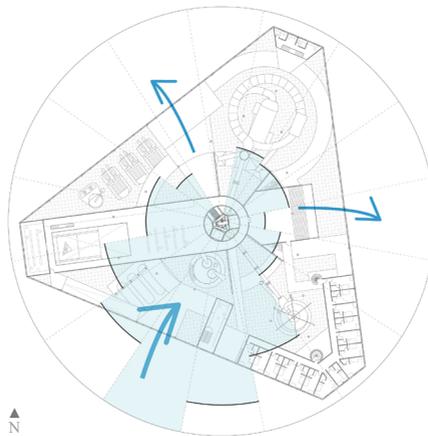


#### ZONE 03

*Maintenance areas underwater are mechanically ventilated through the shafts in core*



**ZONE 02**  
 Stack effect utilised to direct heated air from the machine hall upwards and out of the building. When necessary, mechanical ventilation systems can be used.

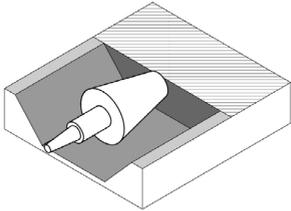


**ZONE 02**  
 Using the wind catcher effect: Three inlets on the sides of building allow air flow. Wind enters SW inlet and leaves from the other two due to the pressure differential

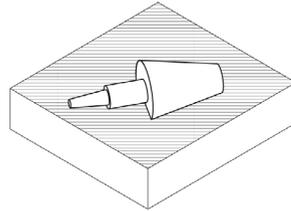
### ***CONSTRUCTION PROCESS***

Construction of the structure occurs in two phases. The core is built first in a dry dock and floated to site, where water is let in to specific ballasting chambers resulting in the core turning itself upright. After this, the topside is positioned on top of the vertical core, having also been constructed offshore. The modular elements used for much of the deck structure means it can be constructed quickly in a normal dock without the need for specialised equipment.

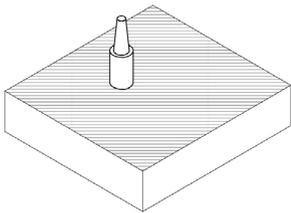
Once assembled, the building comes into a life of its own. Its horizontal surfaces begin to be occupied, physically depicted by the containers lifted and stacked onto its deck. In the vertical axis, once a critical mass of materials have accumulated, they gravitate down through the machinery to initiate the production process. This culminates in the machine giving birth to its islands which are floated up to the surface, resulting in territorial expansion.



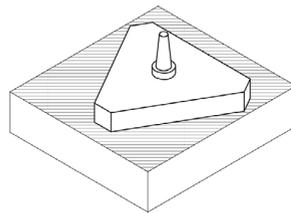
*01. Core constructed  
in dry dock*



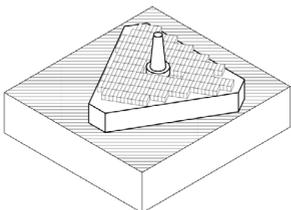
*02. Core floated out  
to site*



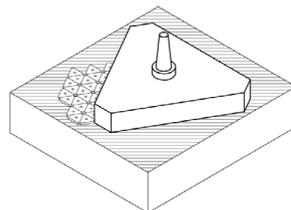
*03. Core ballasted  
upright*



*04. Topside installed*



*05. Machine occupied  
with material*



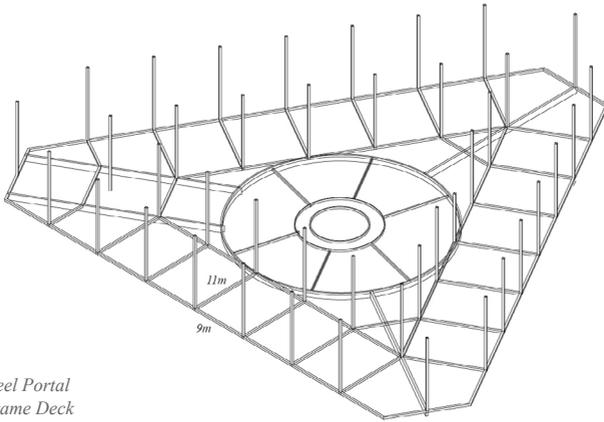
*06. Island expansion*

## ***STRUCTURE***

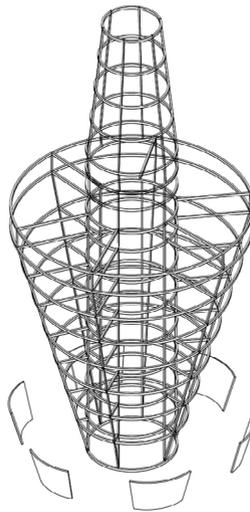
The structure is divided into two interlocking composite parts - the core and the topside - which are built separately using different structural systems.

The core is composed of steel plate construction, which is used in the ship-building industry. 15mm thick plates are welded together and reinforced from the interior with lateral stiffeners. The choice of steel was made over concrete because it requires less material than concrete to achieve the required strength. Similarly, steel can be welded ensuring even stress distribution, unlike an alternative composite material which can only be bolted together.

As for the topside, it is built using a conventional post-and-beam construction method with a grid of circular columns supporting the beams. The exterior is then infilled using structural insulated panels which are lightweight and modular.



*Steel Portal  
Frame Deck*



*Welded steel  
plates with  
stiffeners*

## ***MATERIALITY***

The architecture of the project strongly references that of the existing infrastructure found out at sea such as oil rigs. As a result, many of its material choices are also a reflection this aesthetic.

The intention is to have a structure which reflects the ravages of the environment it exists in, but one which is physically able to cope with it as well. The choice of stainless steel external finish was a compromise between functionality and aesthetic as its surface will eventually accumulate grime and change colour but its physical properties reduce the need for maintenance in relation to conventional steel panels as it is corrosion resistant.

The project also serves as a visual landmark for those at sea, a point of reference against the horizon. For this reason, the steel structural elements would be brightly painted to stand out against the gloomy seascape



### ***STRUCTURAL INSULATED PANEL***

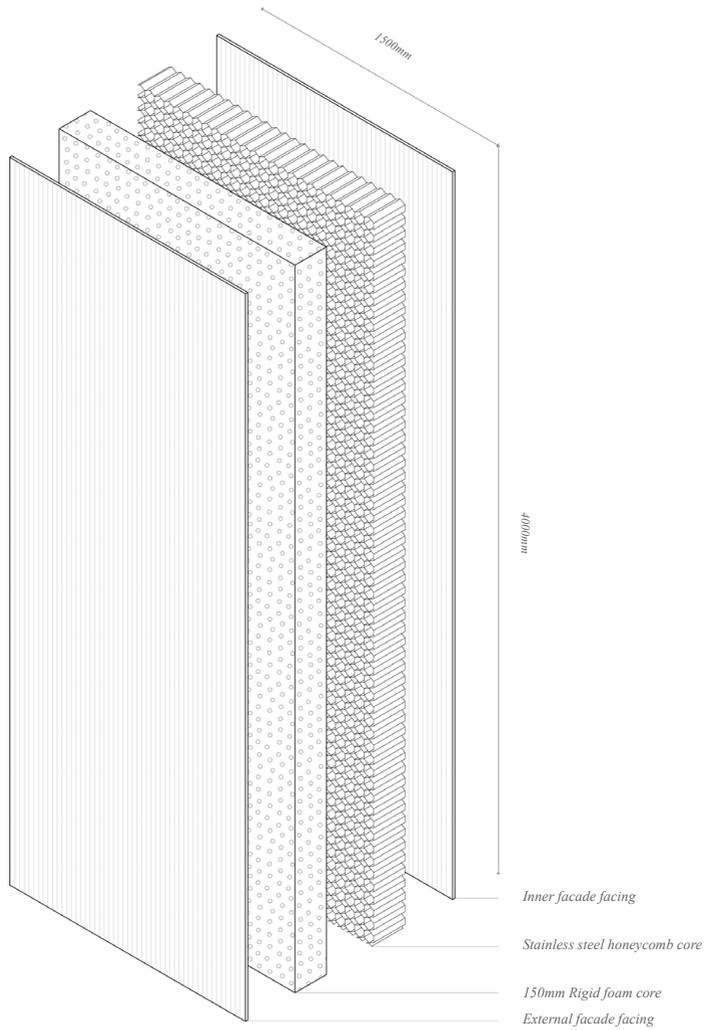
Structural Insulated Panels (SIP) are relatively new materials which are gaining popularity due to their ease of use. Their modularity allows for quick assembly and does not require skilled labour.

In addition, their sandwiched layers contains insulation within, which negates the need to add in extra layers when using conventional steel construction. This also reduces their overall weight while maintaining rigidity, making them ideal for use in the topside of the machine structure, which has to be as light as possible.

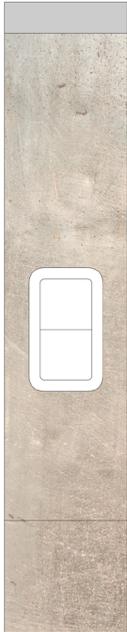
Furthermore, the customisation of the facing finishes allows for a flexible aesthetic. On the external facade of the deck the panel is faced with stainless steel which weathers well, while the interior is clad in corrugated aluminium.

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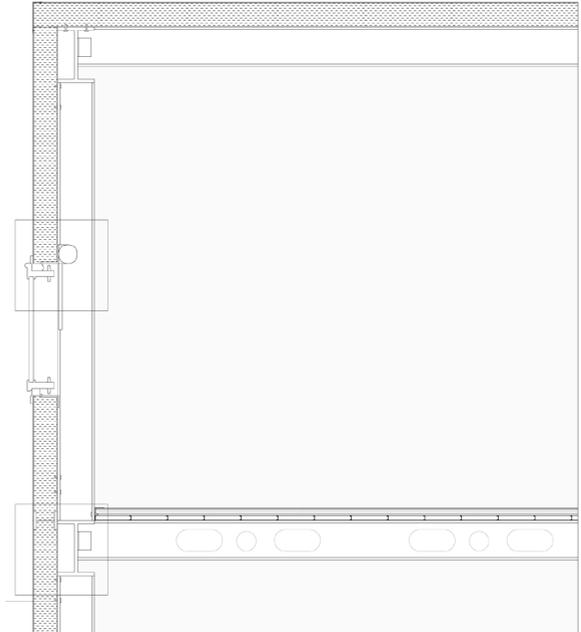
*Opposite: Exploded Structural Insulated Panel*







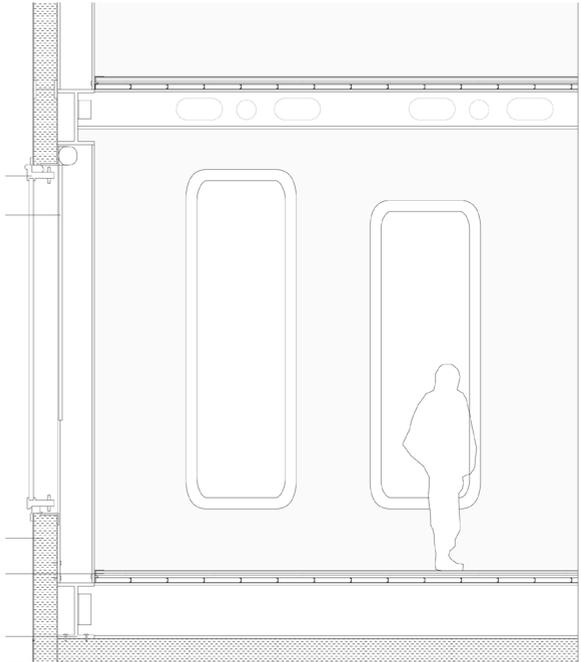
Stainless steel nail

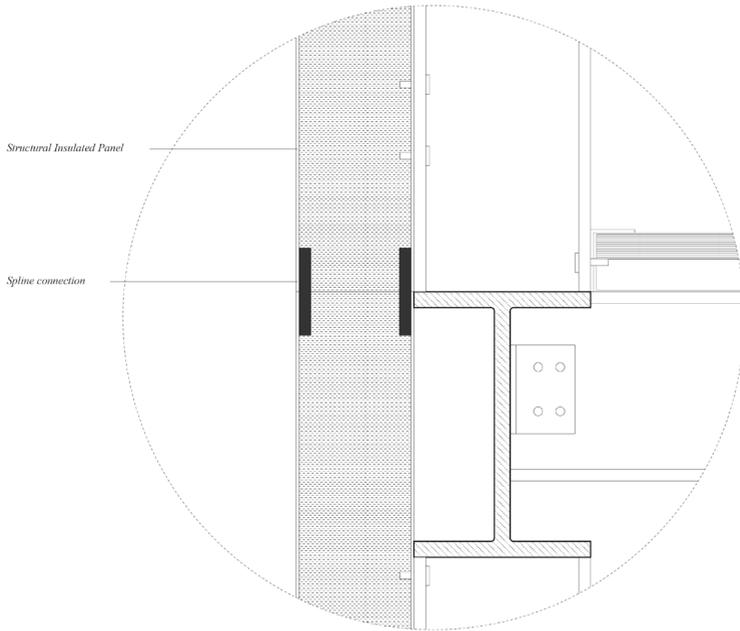


Aluminium window frame with trickle vent  
Anti-glare solar screens

Stainless steel faced  
Structural Insulation Panel  
Resin-faced floor panel

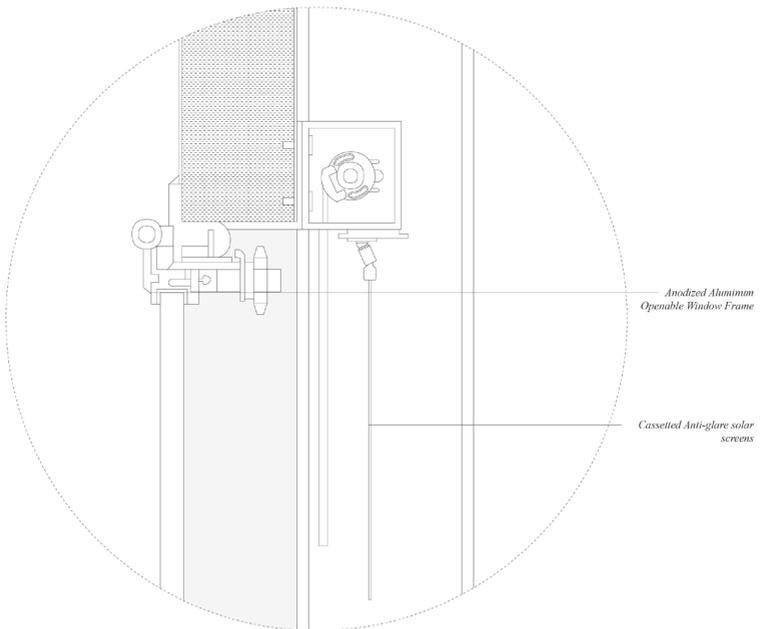
Structural I-beam  
Flashing





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Wall to Beam Connection Detail (1:5)





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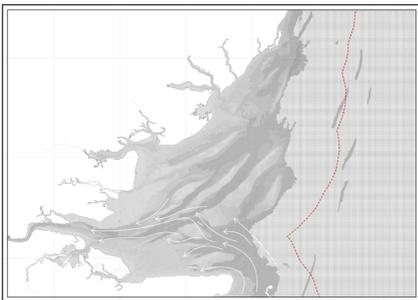
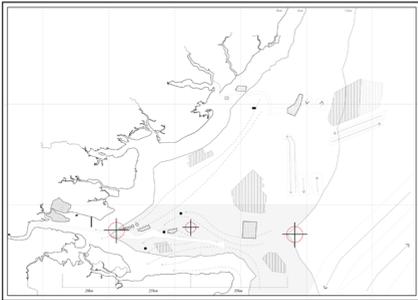
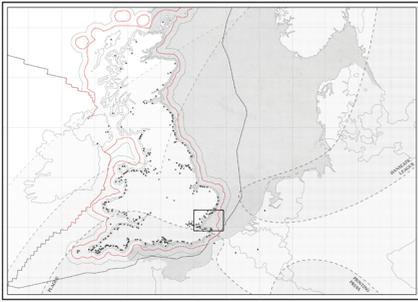
### ***01. RESEARCH AND DESIGN***

The research aspect of my project began with a broad investigation of flows and exchanges across the North Sea, identifying the historical position of the UK in relation to its surroundings. Based on this research I concluded that throughout history the two have been intrinsically linked, with the British Isles considered to be an appendage of the European continent.

The strategy of designing a posthouse in the sea stems directly from the precedent I uncovered of the Romans doing the same while consolidating Britannia into their Empire. Following on from this, I mapped the specific conditions of the Thames Estuary to identify a site for my intervention. I would argue that the process of site selection is part of the design process because of its intentional nature driven by a specific agenda. Here too then the research feeds clearly into the design as the knowledge gathered in the research phase informed the criteria I selectively chose to map.

This relationship became much less straightforward, however, when it came to the development of a specific architectural proposal. It became more important to develop a cohesive narrative to bridge the two, allowing me to tie together tangential threads of investigation into a spatial result. This specifically related to the introduction of waste recycling as a program for my project, which addresses my research questions in both a literal and metaphorical way.

I have also realized that the process is not a linear one where the end of research marks the departure point for design. Instead, as the design developed further, certain aspects such as the process of waste recycling had to be revisited and further strengthened with more information. Given the performative nature of my project where the building acts as a machine, the deconstruction and analysis of industrial processes was an important means of translating existing systems into an invented design. What was particularly



challenging for me was striking a balance between being limited by what exists and conceiving a new hybrid typology. Widening my research allowed me to uncover other examples of how diverse functions can coexist within the same structure, such as in monasteries.

## **02. GRADUATION TOPIC AND STUDIO BRIEF**

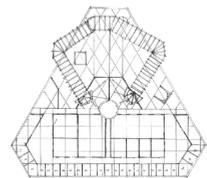
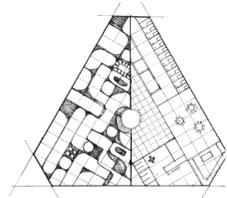
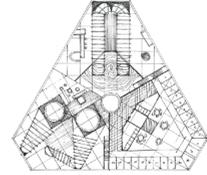
The Delta Interventions studio this year focused on the North Sea as a 'landscape of coexistence'; investigating the tensions between land and sea that influence this territory. The sea as a territory remains the last frontier, with much of it still unmapped and unoccupied by humanity, our efforts largely thwarted by its impermanence and constant movement.

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*Left: Mapping the Estuary as a means of establishing argumentation for the choice of site*

My project delves into this by exploring how the territorialisation of the sea can be achieved, and how this process would occur in relation to land-based ideas of control. It is important to note that the project is only able to function as it does precisely because it is located at sea within a specific zone beyond the territorial waters of the UK. Its lack of tethering means it is not subject to national jurisdiction, but no such juridical equivalent exists on land.

Furthermore, by proposing a machine which creates a floating island in the middle of the sea the project contests the North Sea's current role as a site of extraction. To further emphasize this point the new land will be built of recycled waste, highlighting the irony of using unwanted matter generated in a terrestrial context to create a productive landscape in the middle of the sea.



Right: Plan arrangement sketches

### ***03. METHODS***

A number of research methods were employed during the course of my graduation project, varying according to the scale being tackled. When dealing with the North Sea in its entirety, mapping was my primary tool of investigation as it efficiently visualizes diverse types of information in a consistent format. In addition, the overlaying of these maps was a useful analytical exercise, revealing information that would not have been apparent had they remained as data sets.

The availability of information was initially a limiting factor in this process but due to reading literature such as James Corner's Agency of Mapping I began to understand the power of the map as not just a research tool but also as a means of design. I came to realize that maps are not infallible representations as I had imagined, and the use of an educated guess to fill in gaps in knowledge does not automatically negate the accuracy of the entire result.

At the scale of the architectural project, the focus shifted from mapping to a more intuitive way of working. I found that remaining within the rational and precise realm of visualizing and analyzing my research limited my ability to create something new; therefore I experimented with a series of imagined hand-drawn sections. While not yet architectural these sketches led to a more exploratory design method that I was more satisfied with. Crucial in this process was the exposure to multiple reference projects which inspired me visually and helped me understand the extent of what my design could be, such as drawings by Jan Kaplicky and Peter Cook.

The idea of flows, which formed an essential part of my research mapping, also helped me to design at the architectural scale. The two major functions of my project consisted of a machine which would recycle waste and spaces tucked within it which would host people. Finding a way to integrate the two spatially required balancing the design objective of connecting

them with safety and liveability aspects. Breaking down both programs into a series of actions or flows of movement allowed me to develop a design which combined the two. By arranging the machine spaces in a vertical sequence as necessitated by their gravitational functions, the core of the building came to be formed. In turn, the arrangement of inhabitable spaces were then organized in anticipation of what someone seeking shelter would need - beginning with first aid, followed by other services such provision of food and communication, and ending with a place to sleep. By separating these functions to the corners of the triangular deck, the circulation between spaces is emphasized as a means of ritualizing the process - creating a moment of stability amidst the unpredictability of the open seas.

#### **04. WIDER IMPLICATIONS**

Within the larger context of the environment and the growing importance of ideas

like the circular economy, the recycling of waste to create something new directly relates the project to a lot of research being carried out globally regarding the use of secondary resources. The re-use of bottom ash, for example, is a crucial issue for densely urbanized settlements as even when they incinerate their trash the remnants need to be disposed of.

By placing my project afloat at sea there is an instant comparison with a similar existing typology - oil rigs. This was a valuable counterpoint in the design process as the intentions of my project run directly in opposition to them and therefore I found it important that my architectural decisions reflected this.

Regarding the question of wider societal relevance, increased globalization has made the movement of people a way of life; however, this process is easier for some more than others. Especially as climate change intensifies and makes more people vulnerable, the issue of how people

exercise their freedom of movement and how they are received is one of increasing importance.

Lastly, in terms of my own professional development as a designer, creating a cohesive story out of the many layers of the project has been a new challenge for me. While initially the addition of the waste-recycling aspect seemed a dilution of my core concept regarding the movement of people, I have come to appreciate the complexity and different levels of metaphor that this adds to the project. Despite the learning curve, this is a useful skill to have in order to communicate complex ideas in a professional setting.

### **05. ETHICAL ISSUES**

Ethical issues I have encountered in the process of research have related to the status of migrants. One aim of the studio as a whole was to investigate the contested nature of the sea and the question of how to

define a territory. Within this context, my project touches on how humans specifically access the various layers of the North Sea, both physical and invented. Given the recent exodus of people from Northern Africa across the Mediterranean Sea into Europe, this is a contentious topic with no clear or easy solution.

A key aim of the project is to highlight the plight of those in transit with limited access to territory, and the ease with which they are forgotten because they are quite literally 'out of sight, out of mind.' The use of architecture to document their existence and territorialise their experience is an important idea underpinning the project. The project is by no means a proposition which will solve the problem, rather it capitalizes on the physical presence that a building provides to provide a gesture of stability to those with none.