Minimal Shelter

An Investigation on Architecture of Diffuse Boundaries

Theresa Kjellberg

Chalmers School of Architecture

examiner: Morten Lund
tutor: Kengo Skorick

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MPARC / Master thesis / 2017

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Content.

hard - soft

clear - ambiguous

sharp - blurred

impermeable - permeable

territory - environment

solid - diffused

Abstract.

Through investigations into the idea of diffuse boundaries, designed to question the way we perceive thresholds in architecture; I want to propose the notion of a softer interface between two environments rather than a solid boundary between spaces. Traditionaly the aim was to create an isolated space defined by a clear boundary that would protect the interior space from the surrounding environment. Today we tend to connect the interior with the exterior visually, but formally the focus is still very much on the solid shell of the building and its increasing impermeability, in doing so, this creates a nearly constant level of comfort that is dependent, very little, on the actual context.

The diffuse boundary is a tool to transform one environment into another by using it as a filter; no longer would one boundary protect us from all possible discomforts but rather individually from a specific one, for a limited extent of time.

This proposal for a minimal shelter illustrates the importance of creating an environment with a performative interface in the context of unique natural forces - rarely we experience nature's darker facets, e.g. rain and wind. The minimal shelter allows one to embrace the weather and its inconveniences, offering an ambiguous moment of presence, refining the most significant discomfort and thus allowing the visitor to relinquish their body's subconscious defenses to be present in the given environment. The moment of presence sharpens the senses and one is able to experience the sensations present in the environment (acoustic, visual, etc.). It's an experience limited to a specific constellation.

When returning to the original environment one's mind is then focused.

Introduction.

At the beginning of the project there was an aim to investigate architecture as something that doesn't necessarily have to have clearly defined boundaries as we're used to experience them. Is it possible to isolate some particular phenomenons in an abstract space to make a stronger connection with the present moment?

Since the beginning of my studies I've felt a strong connection of architecture and nature. Architecture for me is being a part of the environment rather than an object that is superior to its context. This concern has led me towards a deep interest in sustainability issues. For me sustainability is a state of mind that has to permeate the architecture from the frst idea to the fnal result and even after. It's not something we solve as the last thing, by adding some high-tech solution. It's a state of mind that affects the project in every step.

In today's world we are in every moment stimulated with an tremendous variety of impulses. It's getting harder to live in the present and to really focus. The amount of various information we're facing is so big that it's hard to process and we're therefore forced to largely flter it. The expectation of us as individuals are set high and the need to fulfll these anticipations are sometimes overwhelming. The interconnection of the global world we're living in is hard to grasp. On one side we're closer than ever, the information flow is faster than we could ever imagine, the distances are getting shorter, but on the other hand it also brings us the responsibilities for bigger things than we can take in. And that's I think is the point where people tend to deny the presence of these impending facts.

Therefore I think it's really important to have the chance to refect on things. In the daily life there is hardly a possibility to pause and feel the senses, the connection to the context on different scales. If we want to transit to a more sustainable world I believe we need to find this connection again, we need to fully experience the things that are happening around us.

We need to hear, feel, see, touch and smell the natural cycles that are always changing around us and that we tend to forget about.

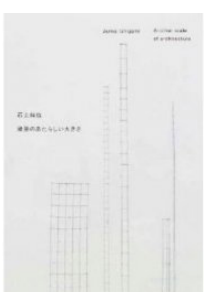
We need to re-establish a connection.

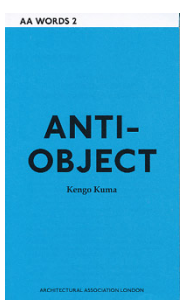
A change of mindset.

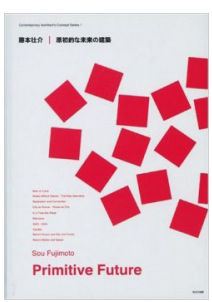
In search of indefinitive boundaries.

Where does architecture start and where does it end? Is there always a clear boundary or is it more diffuse? Is it always something palpable, or could it be something ambiguous that exceeds the physical borders? How does our senses react to space? How does the context affect the architecture and how do they communicate? These questions was the starting point for my master thesis.

The literature I've been studying is dealing with boundaries and what determines its definition. Junya Ishigami describes boundaries as something that is dependent on scale and in that sense the natural environment and the built environment can not be separated. Kengo Kuma says that the definition of the boundary is dependent on the degree of connection to the context. Sou Fujimoto argues that architecture is not about the exterior and the interior it's about how these environements blurrs together.



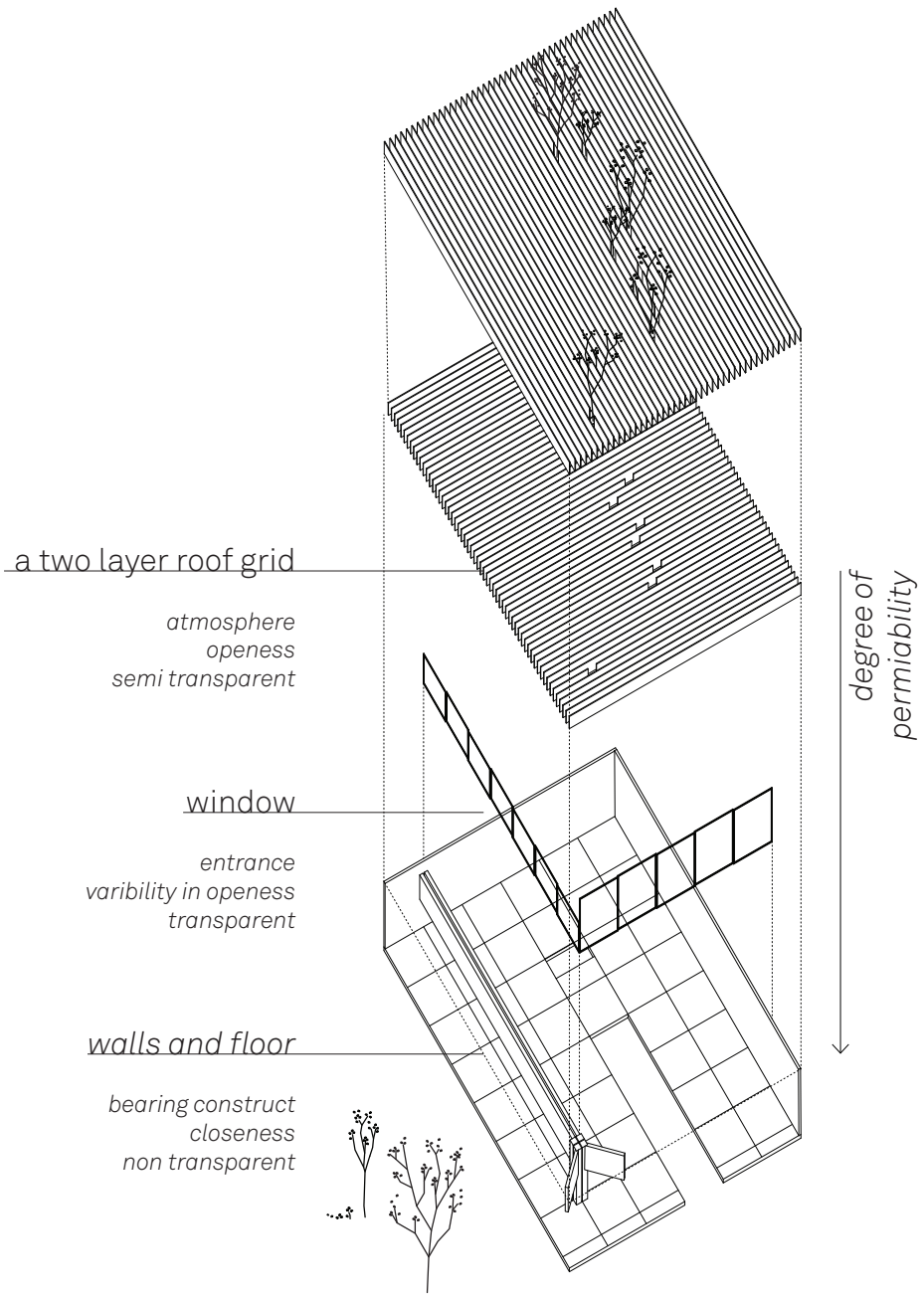




[1] Ishigami, Junya. ANOTHER SCALE OF ARCHITECTURE, Japan: Seigensha Art Publishing, Inc., 2010

[2] Kuma, Kengo. ANTI-OBJECT: The dissolution and disintegration of architecture, London: Architectural Association, 2008

[3] Fujimoto, Sou. PRIMITIVE FUTURE, Lixil Publishing, 2009



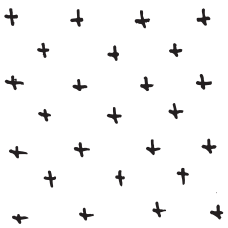
^ *Nordic Pavilion*

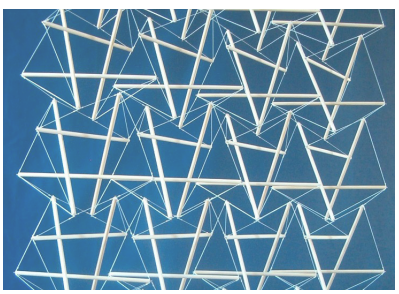
A reference study.

As a reference project I chose the Nordic Pavilion by Sverre Fehn built in Venice in 1962. The pavilion consists of a sequence of boundaries in both the horizontal and vertical direction. In the section one can clearly read the clearity of definition of the boundaries from one side to another. From a clearly defined, strong boundary forming a corner materialized in a concrete wall, that is defining a space by holding back the terrain; to a more subbtle boundary towards the other two sides materialized in the form of big sliding windows that are placed inside the perimeter of the pavilion to enhance the unclearity of inside and outside.

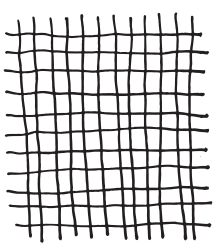
The roof consists of a regular two layer grid of slender beams that is disrupted by openings for trees. The roof functions as a filter that catches and diffuses the strong meditarrian sun into a nordic light. By using the angle of the sun (summer solstice in Venice, 62,5 °), the geometry of the elements, the materiality and color, Fehn is able to achieve an indefinite mass that functions as a

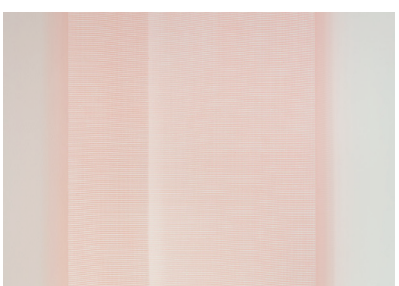
points



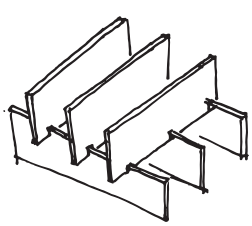


lines

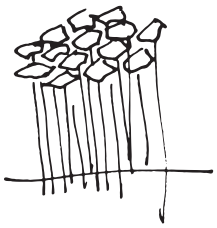




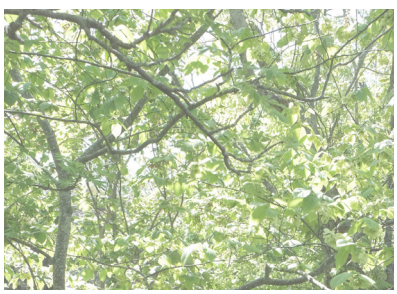
volumes



^ What elements can a boundary be made of?



keeping a distance

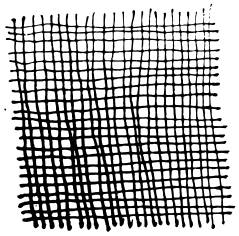


layering

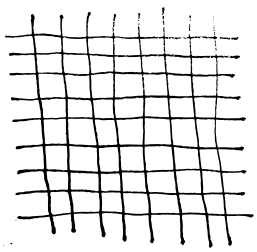
intersecting

^ How does the spacial organization of the boundary affect it's definition? How can a boundary be blurred?

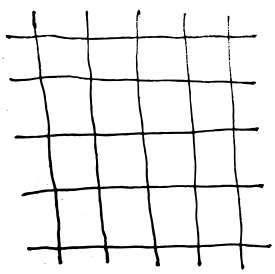
density



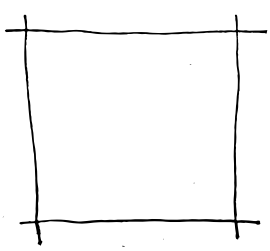
the observer is perceiving the boundary as a blurry surface with a indefinite dimension, that is permiable by micro scale imputs (light, fog, air ...)



the observer is perceiving the boundary as a planar surface, that is permiable by small scale imputs (moss, rain drops)



the observer is perceiving the boundary as a grid of a definite dimension, that is permiable by large scale imputs (vegetaion, animals, people)

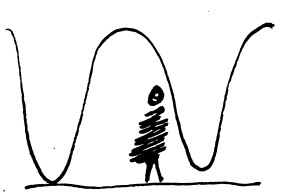


the observer is standing in the grid, he's a part of it and therefore there is no clear boundary of the space

^ How does the relation between the density and the distance influence the boundary ?

1d

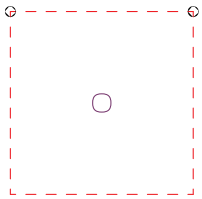
2d



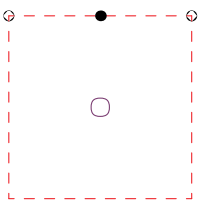
3d

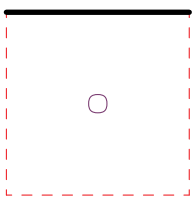
^ How does the position of the observer change the percievance of the boundary?

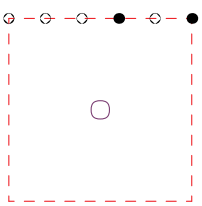
1. The observer is perceiving the boundary from a distance
2. the observer is passing through the structure
3. the observer is part of the structure

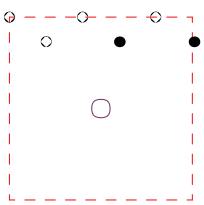


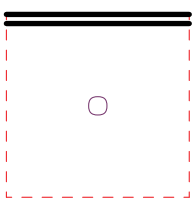
> *A study on bluring the boundaries visually.*

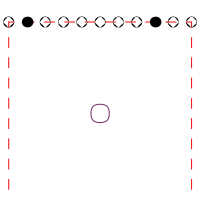


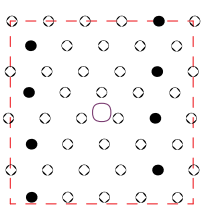


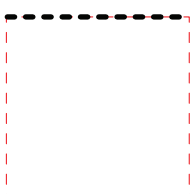


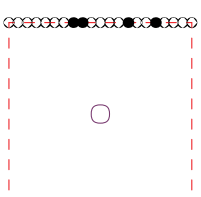


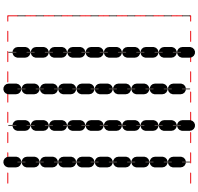


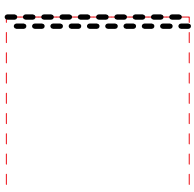


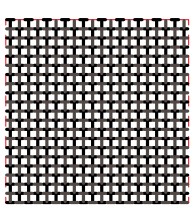


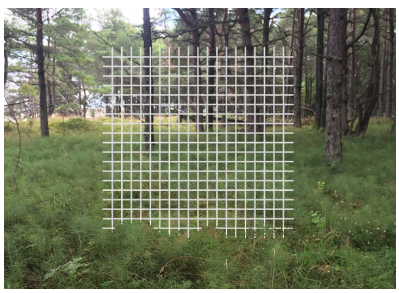


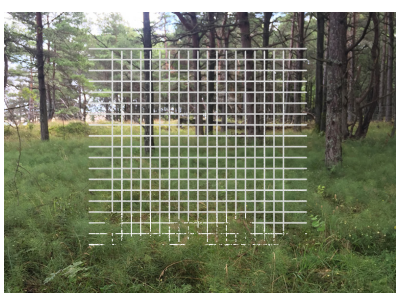


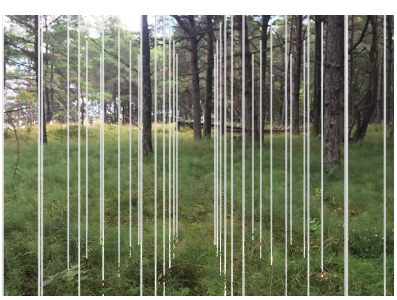


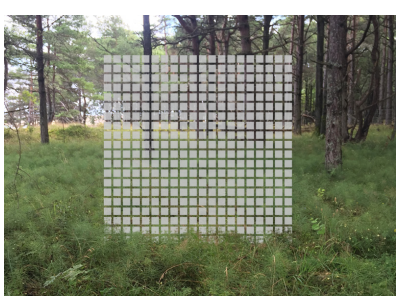


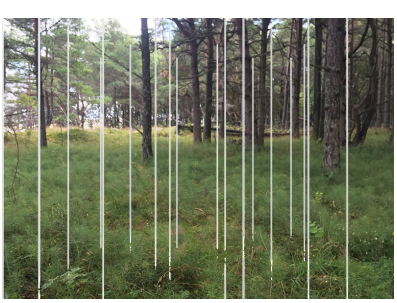


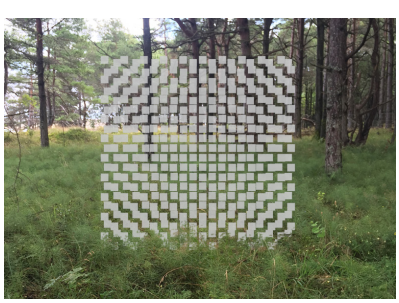


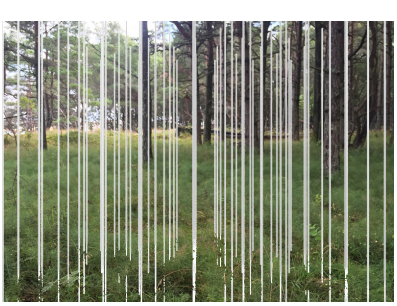










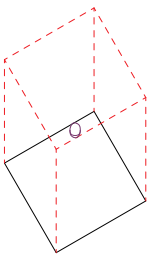


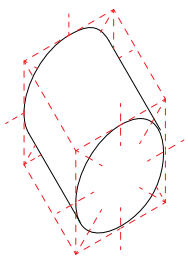
the degree of clarity of boundary

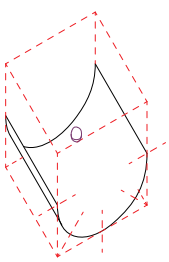
^ The traditional way of defying a boundary - floor, roof, wall. A definite boundary.

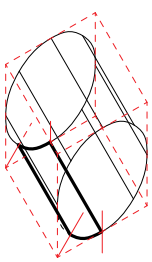
^ *Blurrying the boundary by deforming the definiton of the floor, roof and walls.*

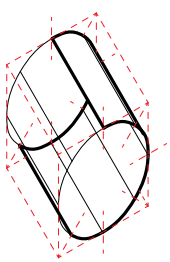
[1] *a soft boundary between the horizontal (floor) and the vertical (walls) - boundary is defined by the radius, materiality (roughness or slipperiness), the equilibrium of the user*
[2] *a clear boundary towards the top - the openess towards the ground depends on the materiality (permiability) of the floor*
[3] *a clear boundary between the inside and the outside - a soft boundary of the space perceive from the inside*

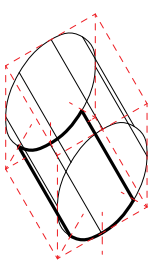


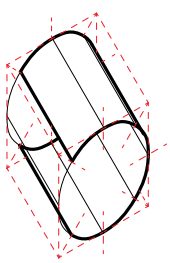


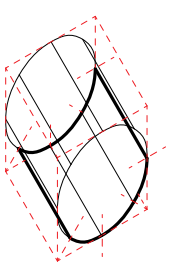


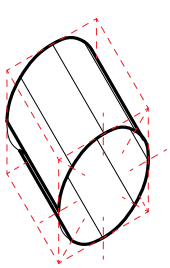


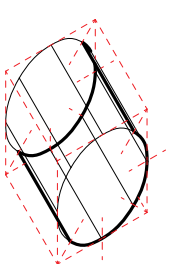


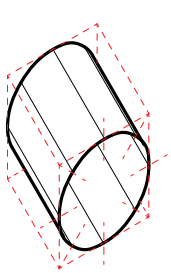












Floor.

An investigation on the degree of definition of a boundary depending on its spatial position.

1/8

visual: low

light: no

5/8

visual: mid-high

light: mid-high

2/8

visual: low

light: low

6/8

visual: high

light: high

3/8

visual: low-mid

light: low-mid

7/8

visual: high

light: high

4/8

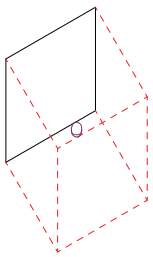
visual: mid

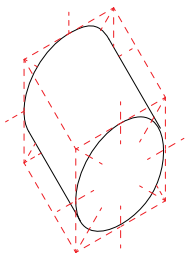
light: mid

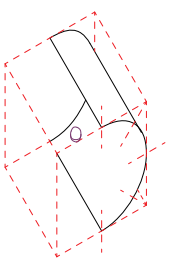
8/8

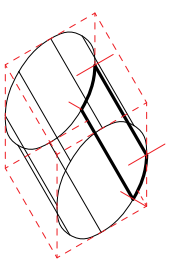
visual: high

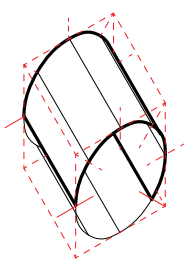
light: high

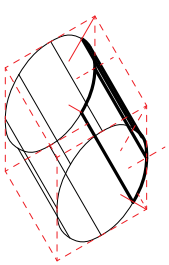


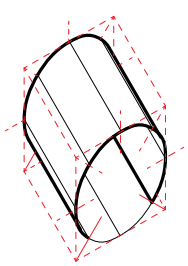


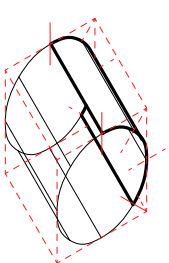


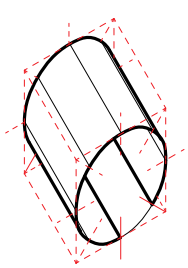


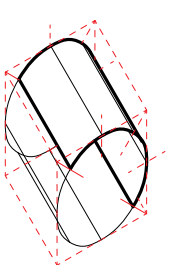


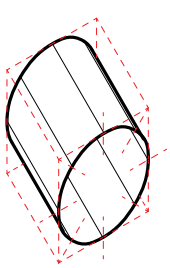












Wall.

An investigation on the degree of definition of a boundary depending on its spatial position.

1/8

visual: low

light: no

5/8

visual: mid-high

light: mid-high

2/8

visual: low

light: low

6/8

visual: high

light: high

3/8

visual: low-mid

light: low-mid

7/8

visual: high

light: high

4/8

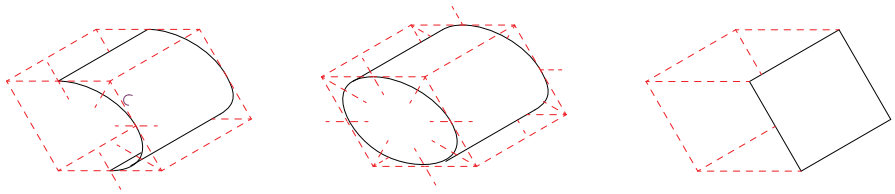
visual: mid

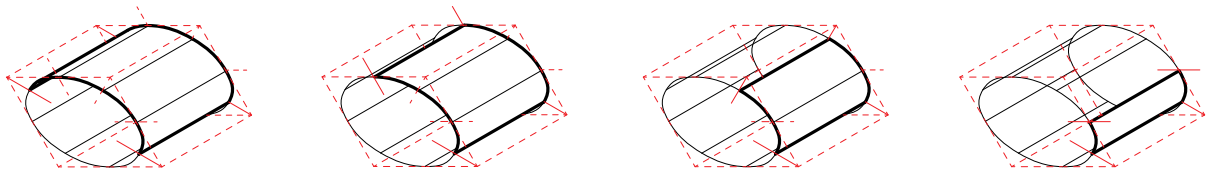
light: mid

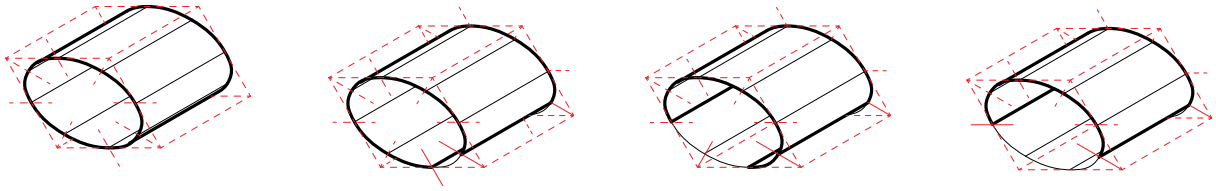
8/8

visual: high

light: high







Roof.

An investigation on the degree of definition of a boundary depending on its spatial position.

1/8

visual: low

light: low

5/8

visual: mid-high

light: mid-high

2/8

visual: low

light: low-mid

6/8

visual: high

light: mid-high

3/8

visual: mid - low

light: mid

7/8

visual: high

light: mid-high

4/8

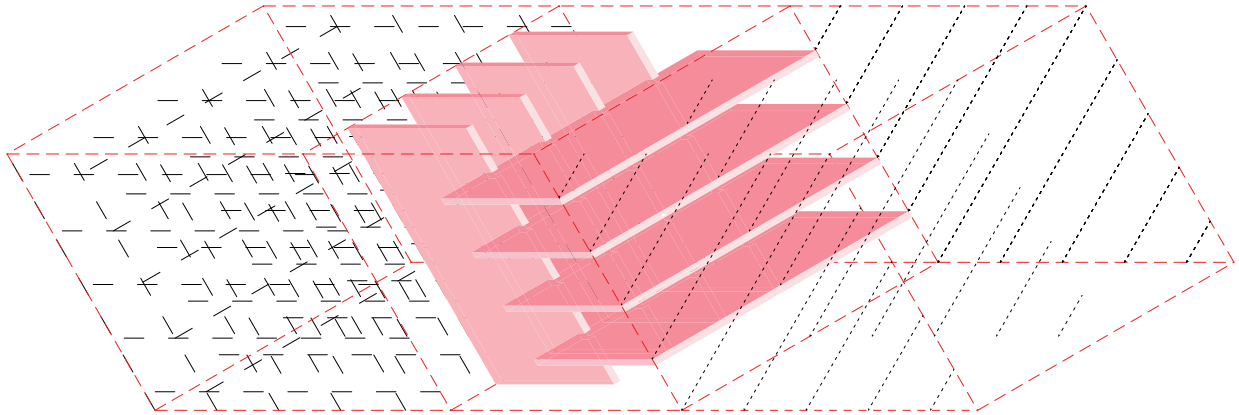
visual: mid

light: mid-high

8/8

visual: high

light: high



environment 2 ← diffuse boundary ← environment 1

Base architectural system.

The diffuse boundary is a tool to transform one environment into another by using it as a filter; no longer would one boundary protect us from all possible discomforts but rather individually from a specific one, for a limited extent of time.

< Nordic Pavilion

Transforming the intensity and direction of light through a diffuse boundary.

Natural forces.

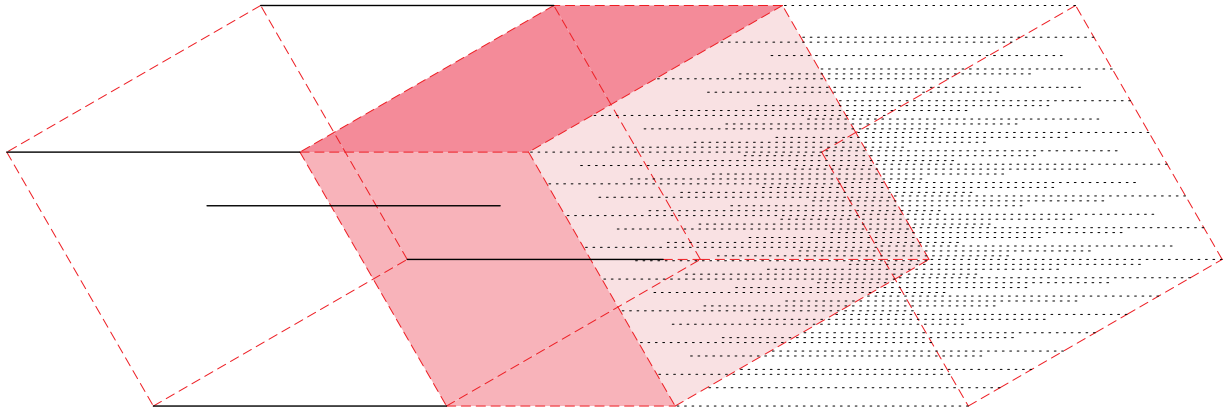
The natural forces, the wind and the rain, were chosen based on their significant presence in the context of Göteborg and the region.

The climate in the region of Västra Götaland is affected by the Gulf stream and the main characteristic of the wheather is the amount of rain and wind present. The long and cold period of darkness is replaced by lightness, but the wind and rain prevails. A picture from a sunny summer day could create an impression of a warm day, but the reality is often different, the wind is so strong and cold that one's only interested is where to find a place of shelter. The same applies to the rain.

Rarely do we experience nature's darker facets, e.g. rain and wind. The minimal shelter allows one to embrace the weather and its inconveniences, offering an ambiguous moment of presence, refining the most significant discomfort and thus allowing the visitor to relinquish their body's subconscious defenses to be present in the given environment. The moment of presence sharpens the senses and one is able to experience the sensations present in the environment (acoustic, visual, etc.). It's an experience limited to a specific constellation.

While being present in a context we are, whether we like it or not, forming it in some way. Therefore we are not able to experience e.g. the acoustic sensations at its purity. By being present we're creating new sounds; the way we move and the way the droplets fall on our clothes generates stronger sounds than the original ones present in the environment and these are thus restrained. Instead of being able to hear the various sounds created by the size of the droplets falling on different materials, we're deafened by the most agressive one.

That's where the idea of the minimal shelter came from. A shelter that gives us the minimal amount rest to be able to experience the orginal sensations in the context. The shelter would be made of a sound absorbing material to make space for the pure acousting experience.



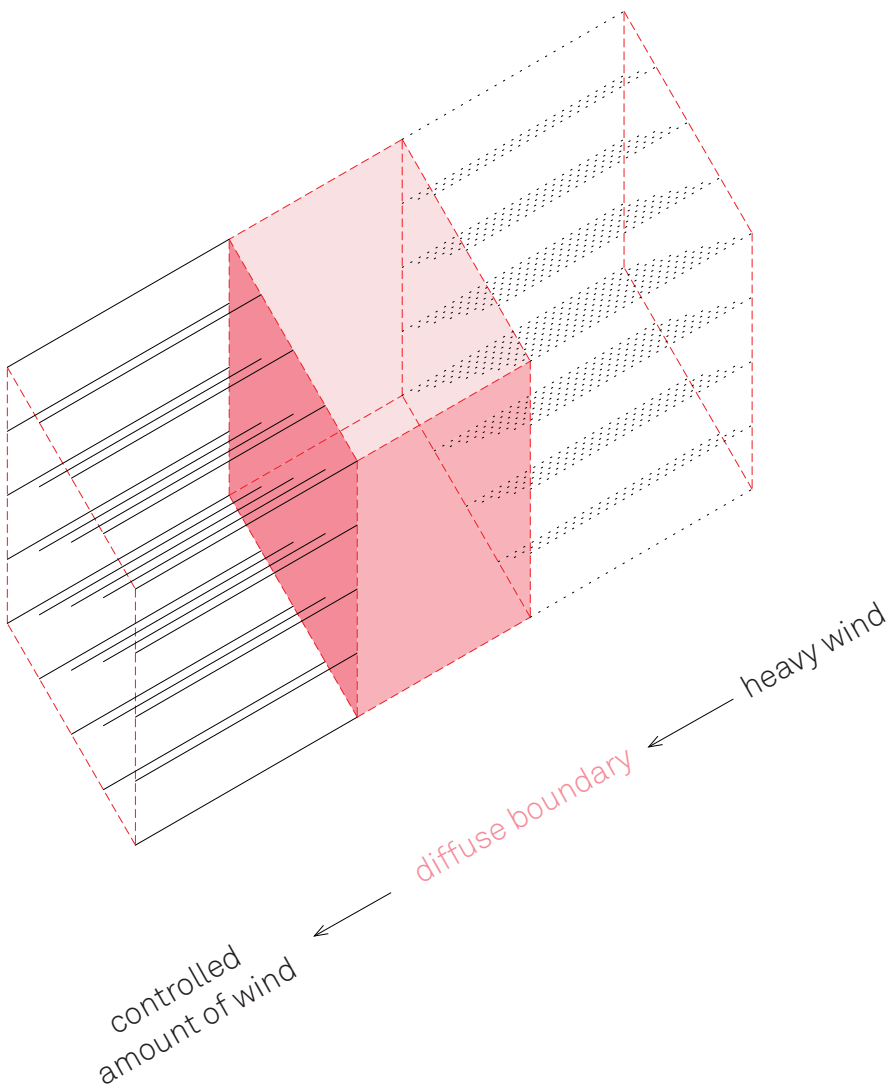
controlled
amount of rain

diffuse boundary

heavy rain

Rain.

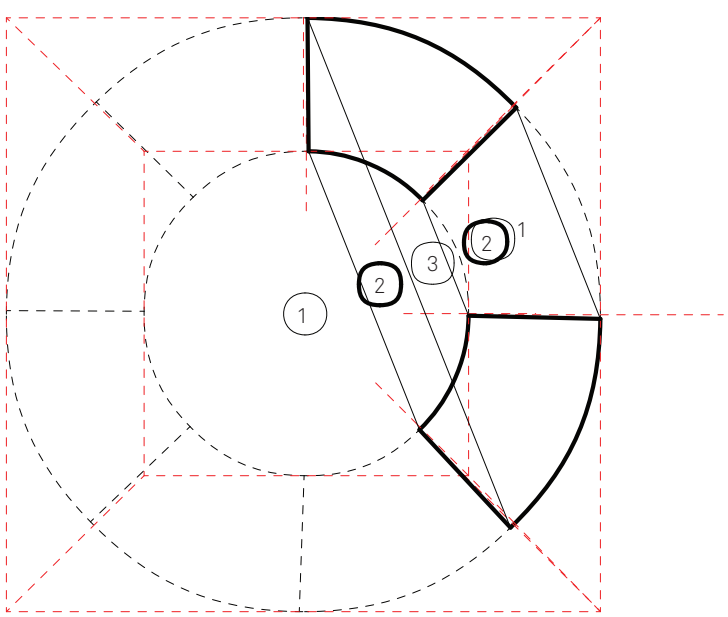
Changing the properties of an environment from heavy rain to a controlled amound of rain that allows us to still be present in the environment and experience it.


heavy wind
diffuse boundary
controlled
amount of wind

Wind.

Changing the properties of an environment from heavy wind to a controlled amound of wind that allows us to still be present in the environment and experience it.

Bluring the boundaries.

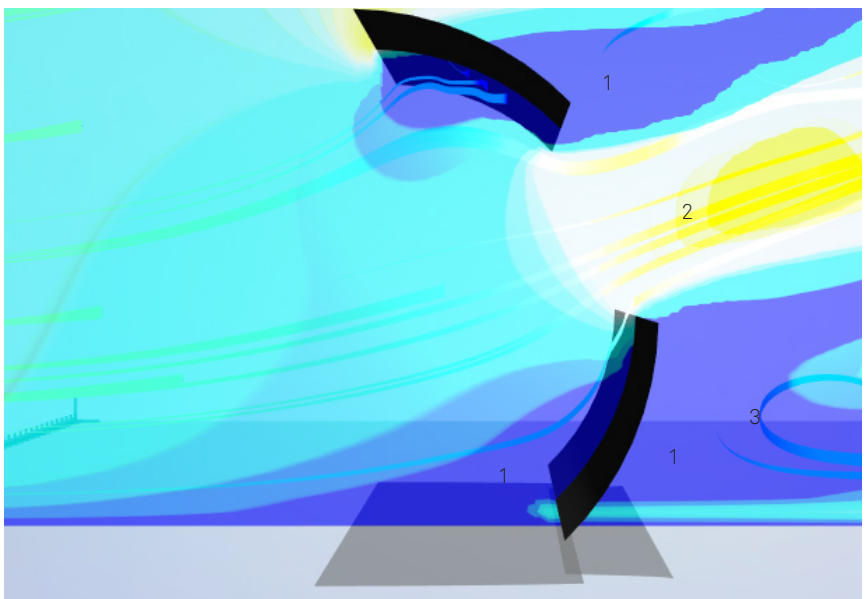


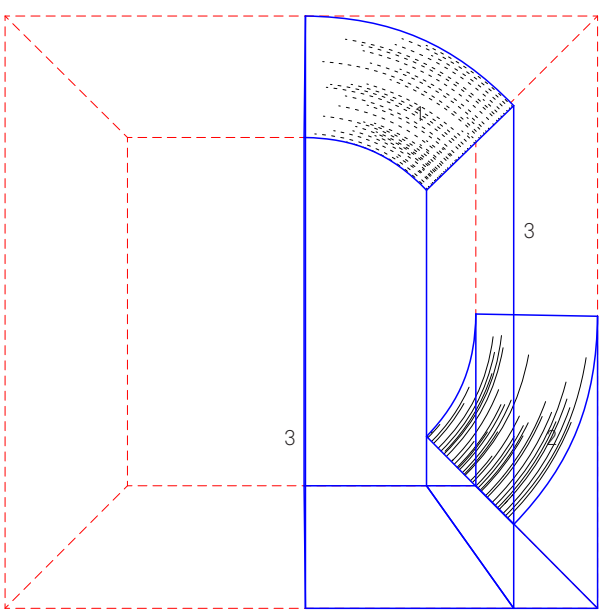
[1] outside
[2] on the edge
[3] inside

The position of the observer.

Wind shelter. *

[1] the weakest wind
[2] the strongest wind
[3] turbulences



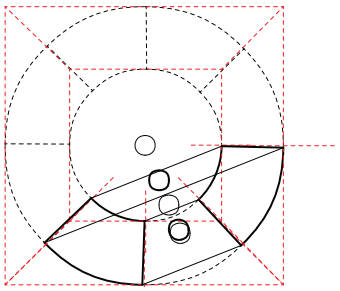
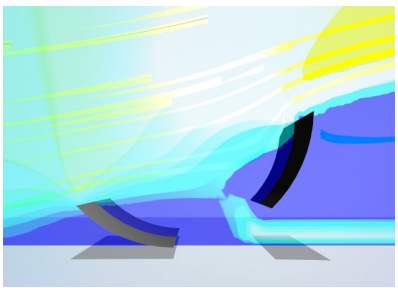
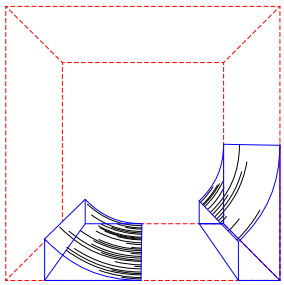
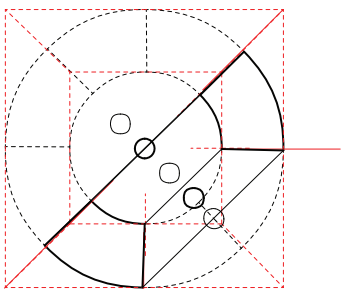
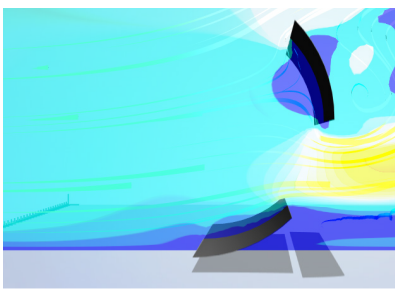
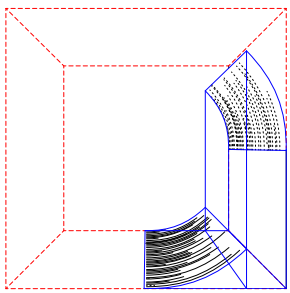
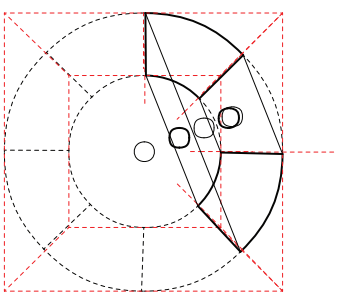
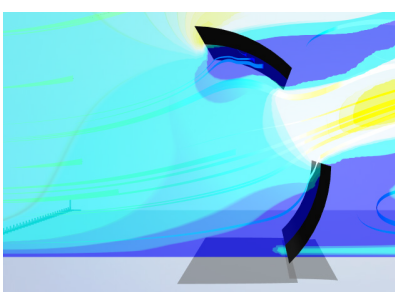
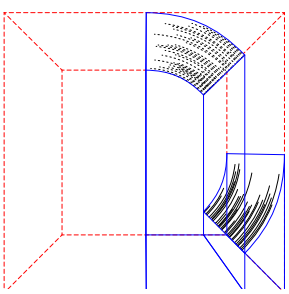
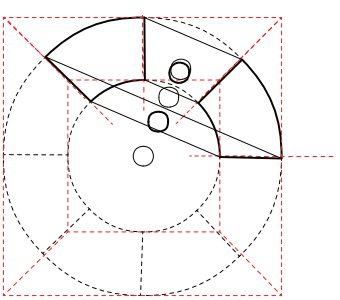
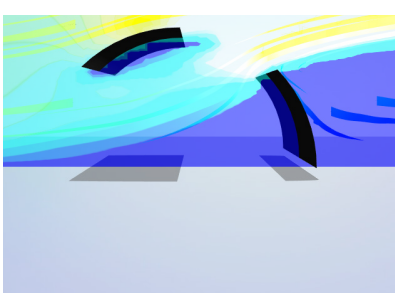
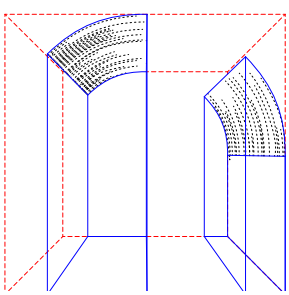
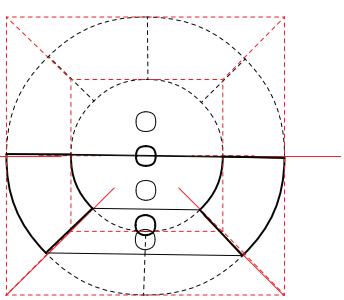
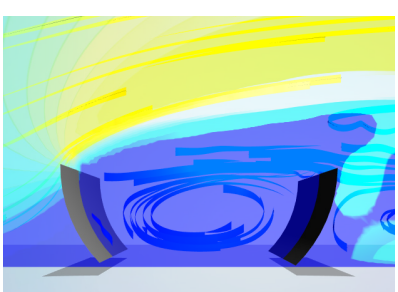
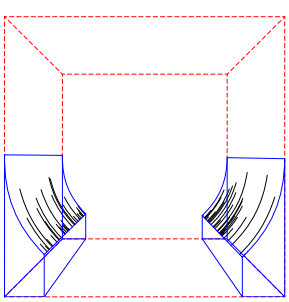
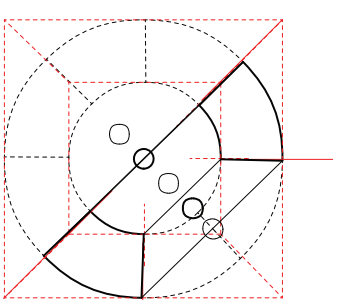
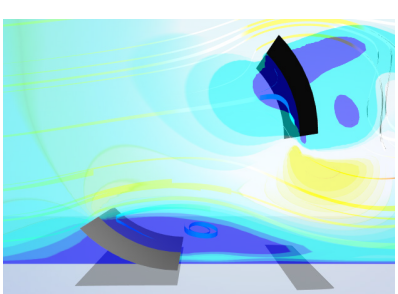
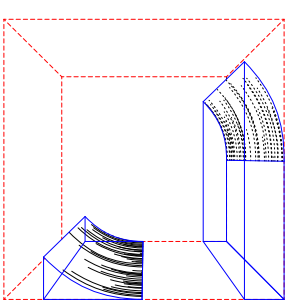


[1] flowing water on the outside surface
[2] flowing water on the inside surface
[3] dripping water

Rain shelter. **

* all wind studies made in Autodesk Flow
** all rain studies made in eVe Rain / Rhinoceros Plug-in

Position of observer. *Wind.* *Rain.*

Abstraction of space.

visual: low-mid

wind: low

rain: no

visual: low-mid

wind: low

rain: low

visual: low-mid

wind: low-mid

rain: low-mid

visual: low-mid

wind: low

rain: low-mid

visual: low-mid

wind: low

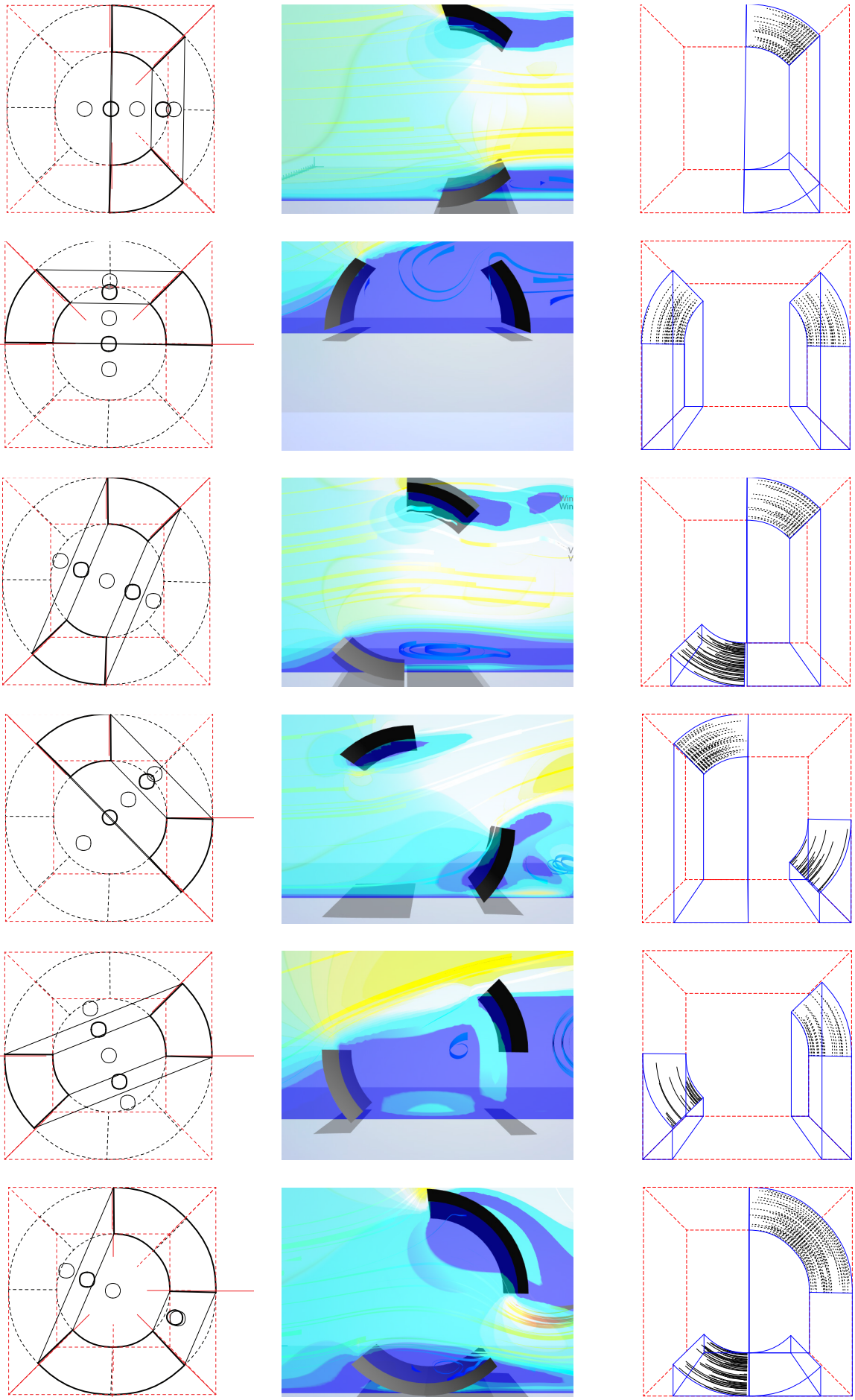
rain: no

visual: low-mid

wind: low

rain: low

Position of observer. *Wind.* *Rain.*



Abstraction of space.

visual: low-mid

wind: no

rain: low

visual: mid

wind: low-mid

rain: low

visual: low-mid

wind: no

rain: low

visual: low-mid

wind: low

rain: low

visual: low-mid

wind: low

rain: low

visual: low-mid

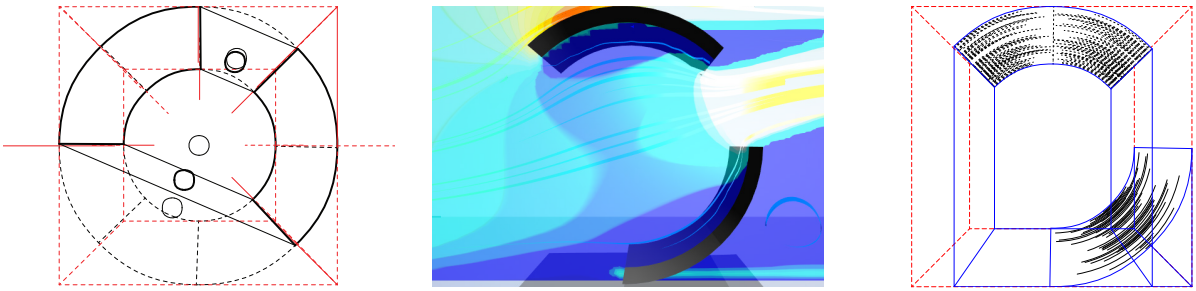
wind: low-mid

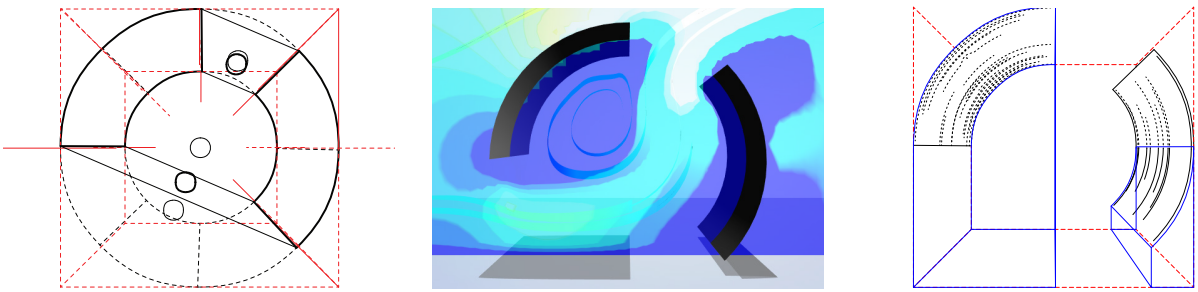
rain: low-mid

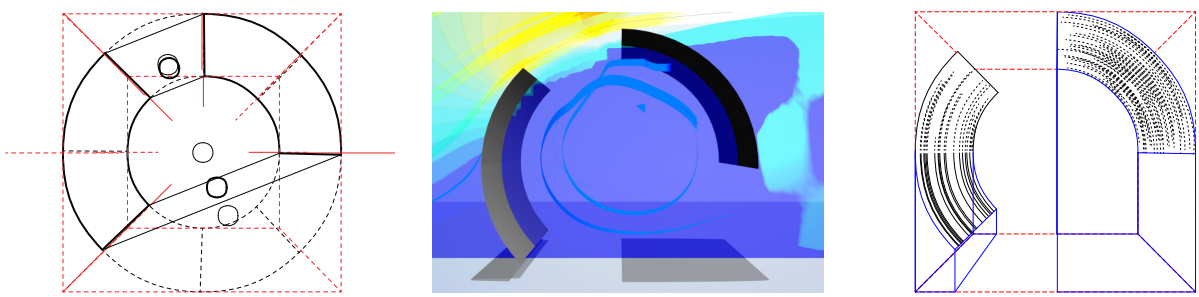
Position of observer. *Wind.* *Rain.*

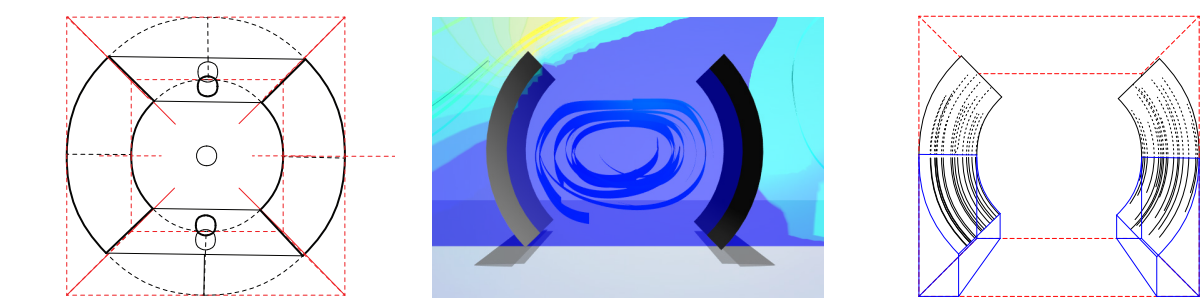
boundaries

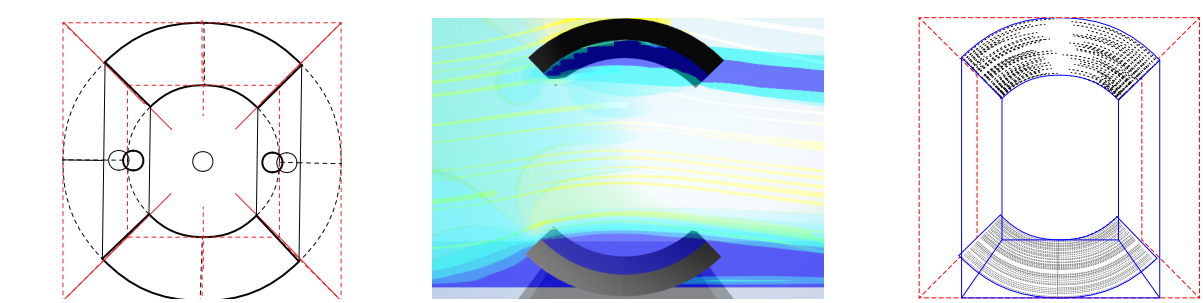
PROTOTYPE

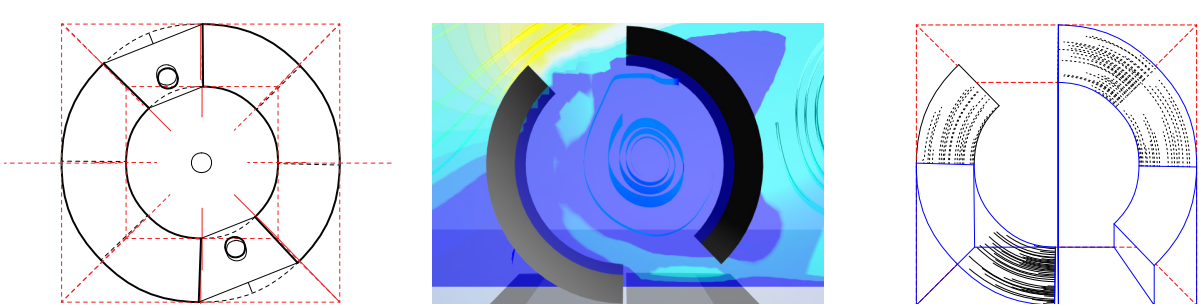












Abstraction of space.

visual: low-mid

wind: low-mid

rain: low-mid

visual: mid-high

wind:mid-high

rain: mid

visual: mid-high

wind:mid-high

rain: mid

visual: mid-high

wind:high

rain: no

visual: low-mid

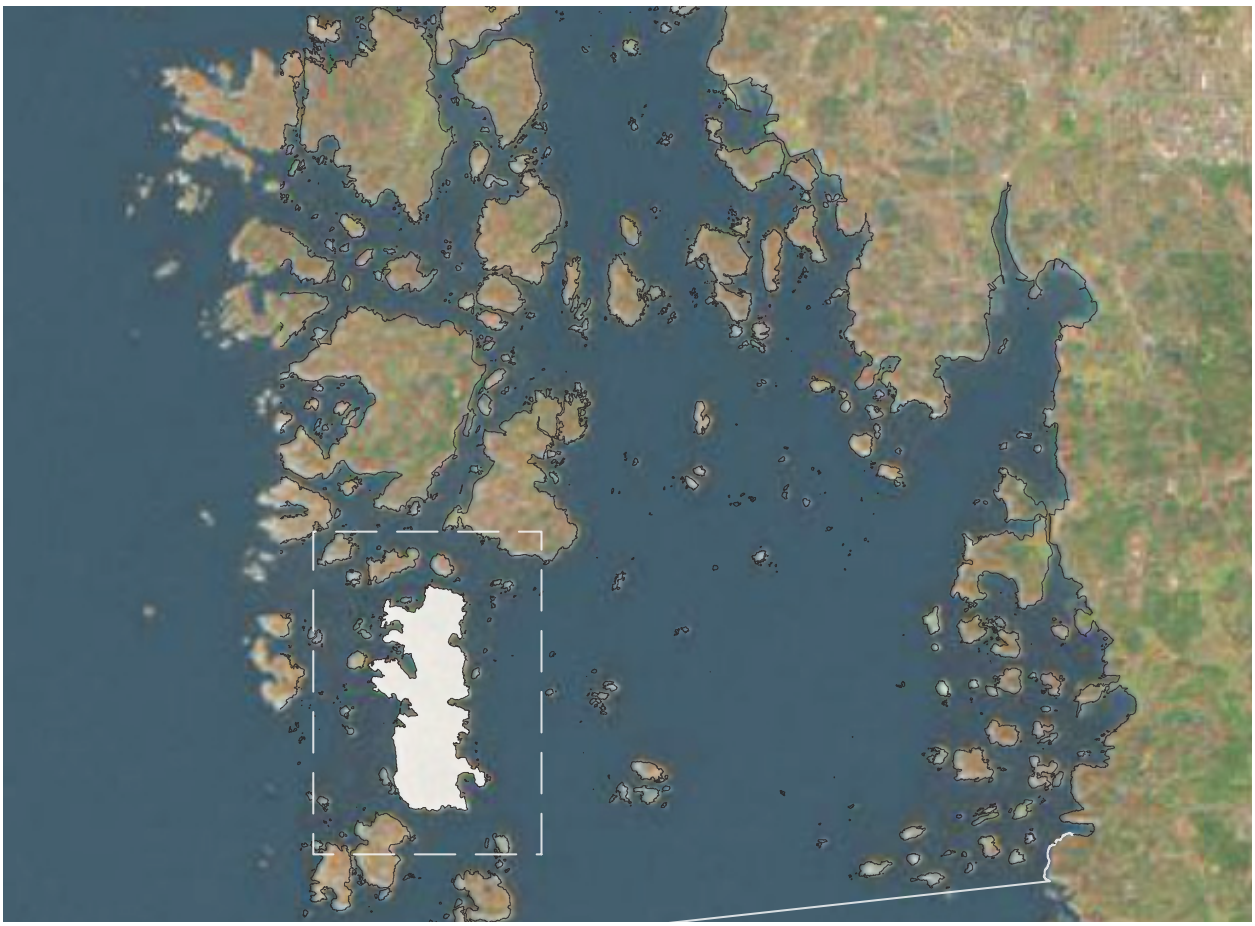
wind: no

rain: mid-high

visual: high

wind: high

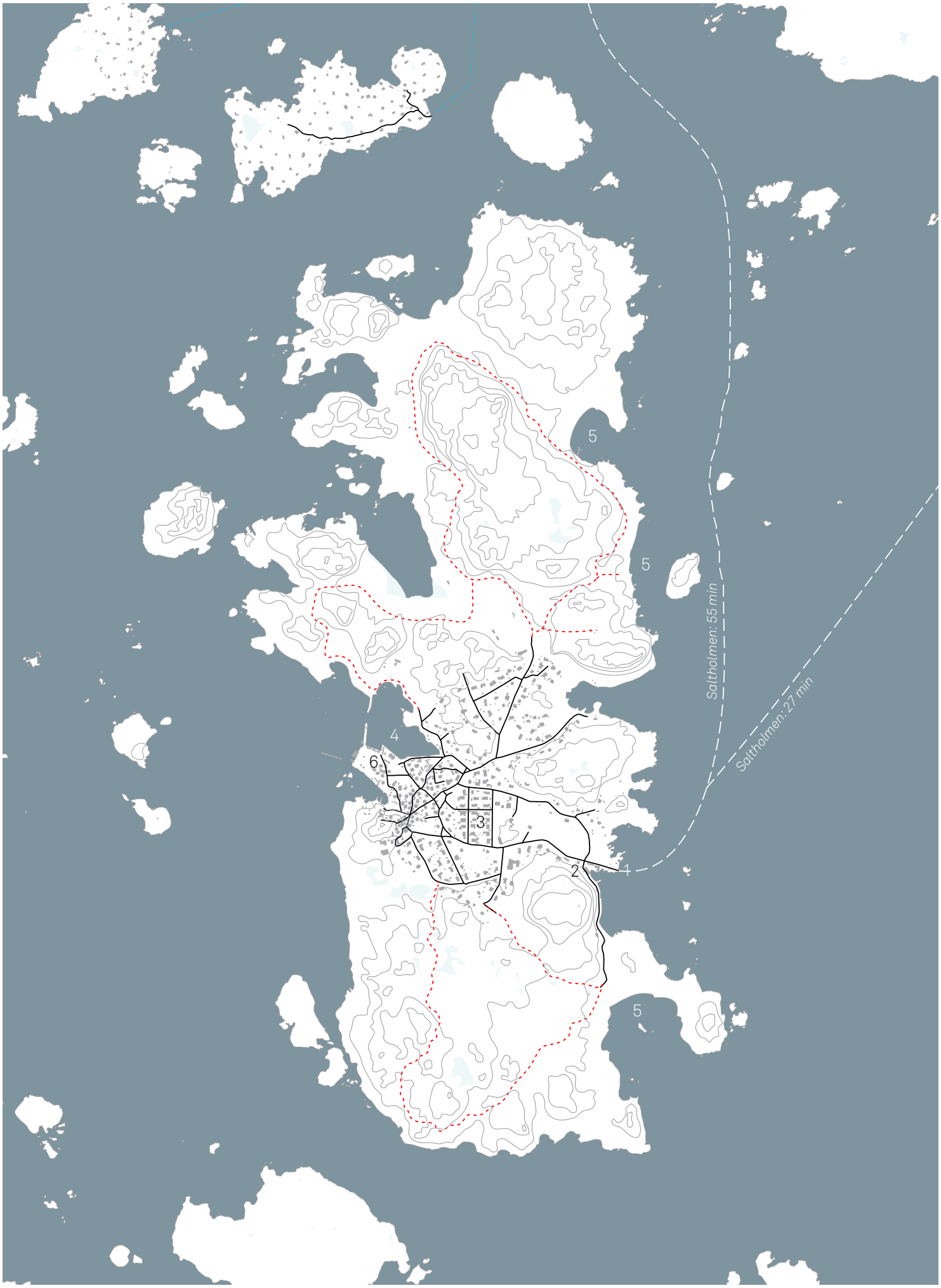
rain: low.mid



Södra Skärgården - Vrångö

The most southern island of Gotherburg's south archipelago. Historicaly Vrångö was a fishing town and an important point for navigating ships into the Gothenburgs harbour (1600 - 1930).
Nowadays *Vr*ångö is inhabited by around 400 people all year around and 150 summer residents. During the summer it's a popular tourist spot thanks to its pure nature that allows for hiking and swimming.

1 ferry stop
2 café
3 village
4 fishing port
5 beaches
6 restaurant and shop


5
5
4
6
3
2
1
5
Saltholmen: 55 min
Saltholmen: 27 min

natural forces

natural context

FORMATION

discomfort

brigtness of senses

connection to the context through filtering out some of the natural forces that are limiting us from experiencing the present

Base organizational system.

While walking around in the nature, away from the paved paths, one is forced to be present in the moment. Not only by being careful but also by analysing the possible route to a destination.

Athough it seems like there are endless possibilities to reach a selected point, in reality one will be guided through tries and fails to paths that has already been found. The scales of the cliffs leads one into the same but almost invisible routes in the heath. The presence of these small traces of people are fascinating.

The shelters are placed in the open landscape with this in mind. The journey to reach the shelter is considered as part of the contextual experience, by intuitively finding a path, one have to be fully present and focused on the natural context and the forces around. When reaching and entering the space the senses are already bright and prepared for the experience.

As illustrated on the next pages, the organizational strategies for the wind and the rain differs.

FORMATION

motivation

view

journey

destination

highest points

shore

journey

discomfort

wind

allows us to stay in a place for a limited time depending on the speed and direction of the wind in combination with other climate influences

wind analysis

journey

filter

minimal shelter

filters out the wind to a certain extent - expands the time spent on the site

added value

presence

allows one to get rid of the feeling of immediate discomfort

opens up for other senses to be more active than they would be at that time and point

acoustic
vision

topography
proximity to shore

< Organizational strategy.

Wind.

The biggest exposure towards wind is naturally at the highest points and at the shore. That is the destination. The motivation to go here is usually the open landscape and its view. The discomfort of the wind allows one to stay there for a limited amount of time. The minimal shelter filters out the wind to a certain extent and allows one to stay present for a longer time. By getting rid of the immediate discomfort one can experience presence and be open to other phenomenons (acoustic, vision).

wind

1

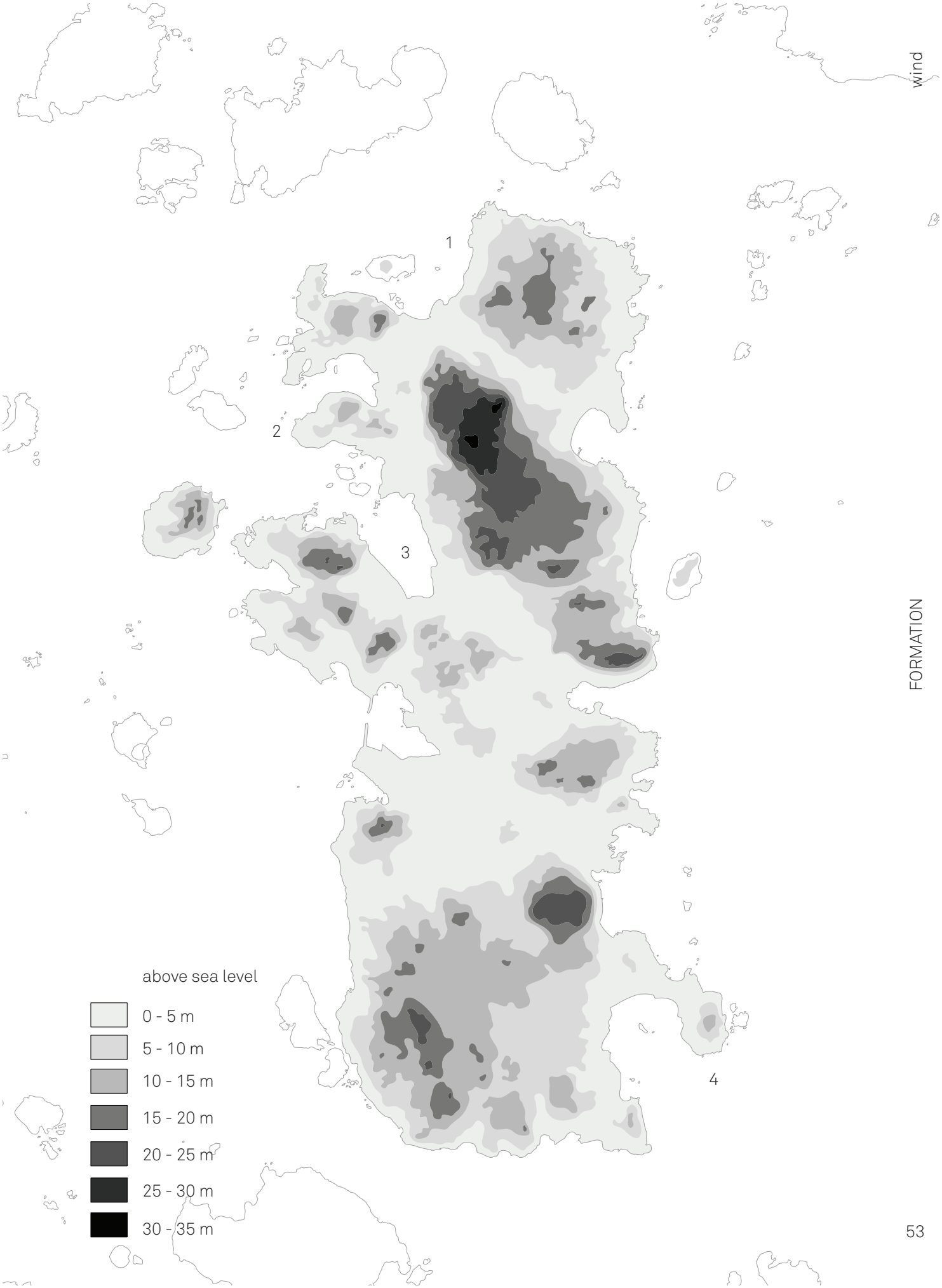
2

3

4

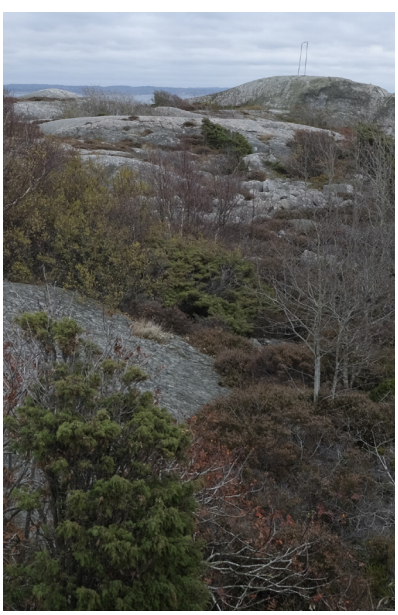
FORMATION

Highest points. Strongest wind.

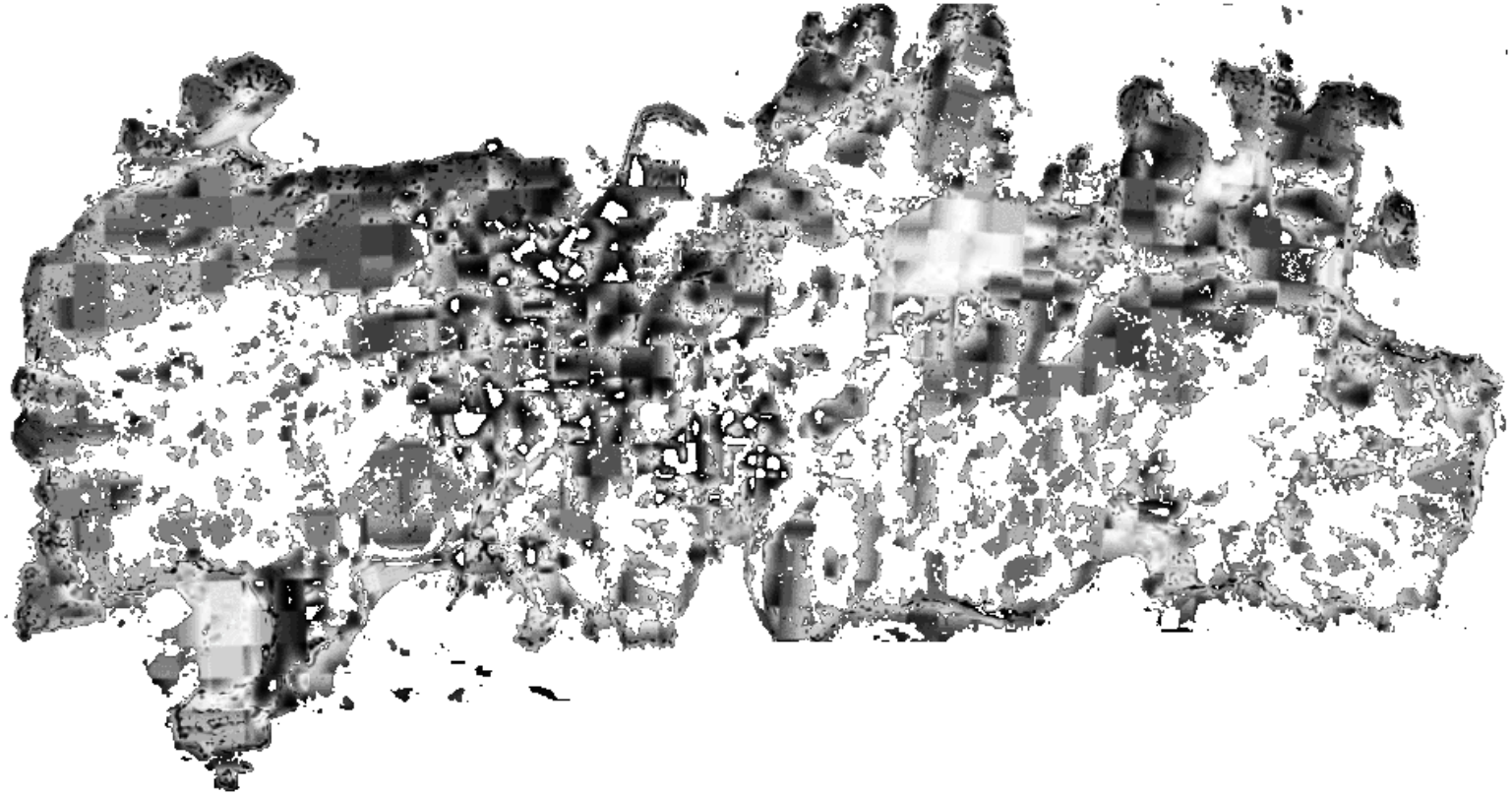

1
2
3
4
above sea level
0 - 5 m
5 - 10 m
10 - 15 m
15 - 20 m
20 - 25 m
25 - 30 m
30 - 35 m

wind

FORMATION



Cliffs. No shelter.



wind

1

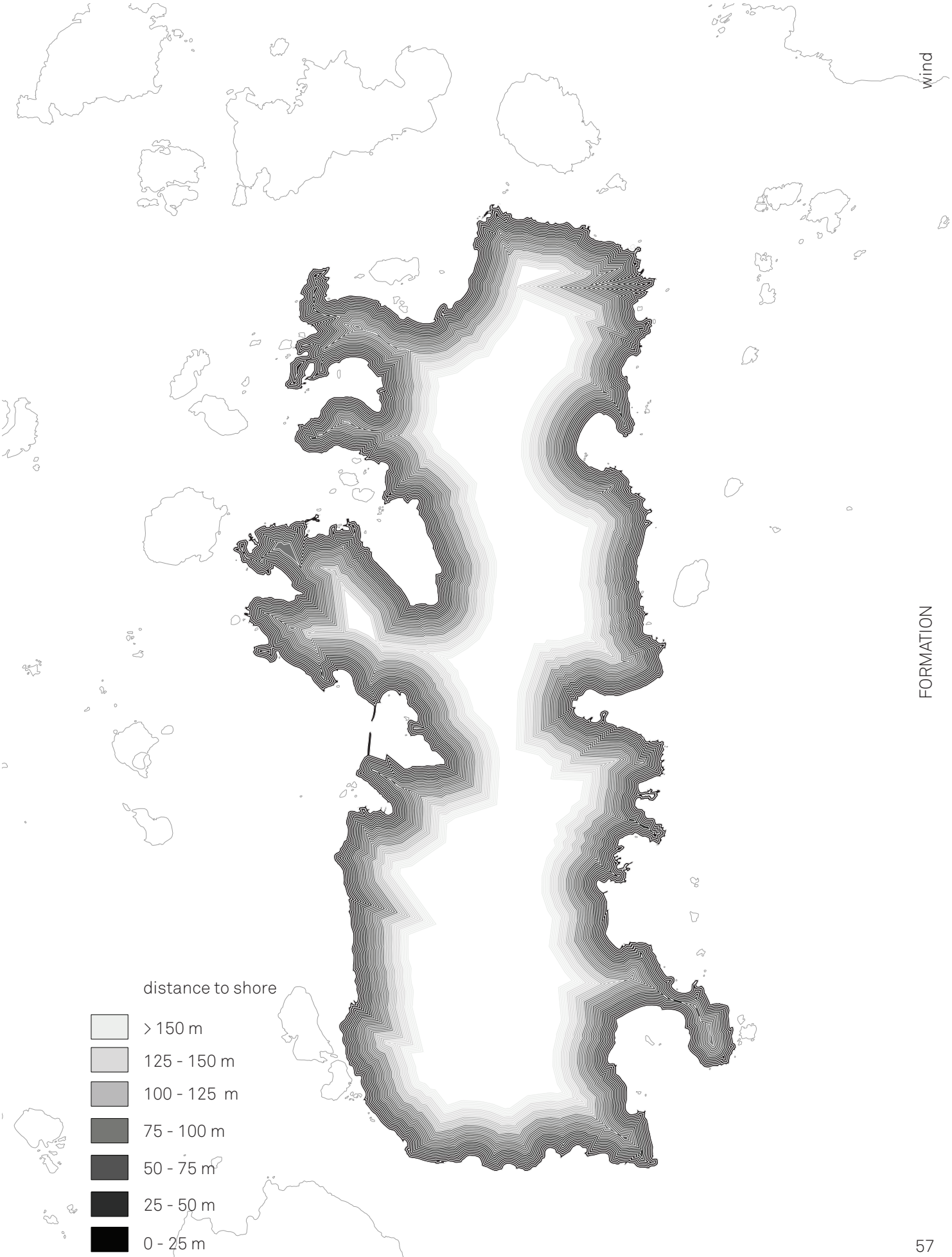
2

3

4

FORMATION

Proximity to shore. Strongest wind.


distance to shore
> 150 m
125 - 150 m
100 - 125 m
75 - 100 m
50 - 75 m
25 - 50 m
0 - 25 m

station

Vinga
1961 - 1990
1990 - 2004

Göteborg
1961 - 1990
1990 - 2004

Måseskär
1961 - 1990
1990 - 2004

The wind close to the ground is affected by buildings, vegetation and topography. This allows wind direction and wind speed being different in the average in various places in Sweden.

Sweden is located in the so-called west wind belt, which means that the most frequent wind direction of the undisturbed wind is westerly or southwesterly. On the west coast, there is not much that bothers the wind, allowing the most common wind direction is right westerly or southwesterly.

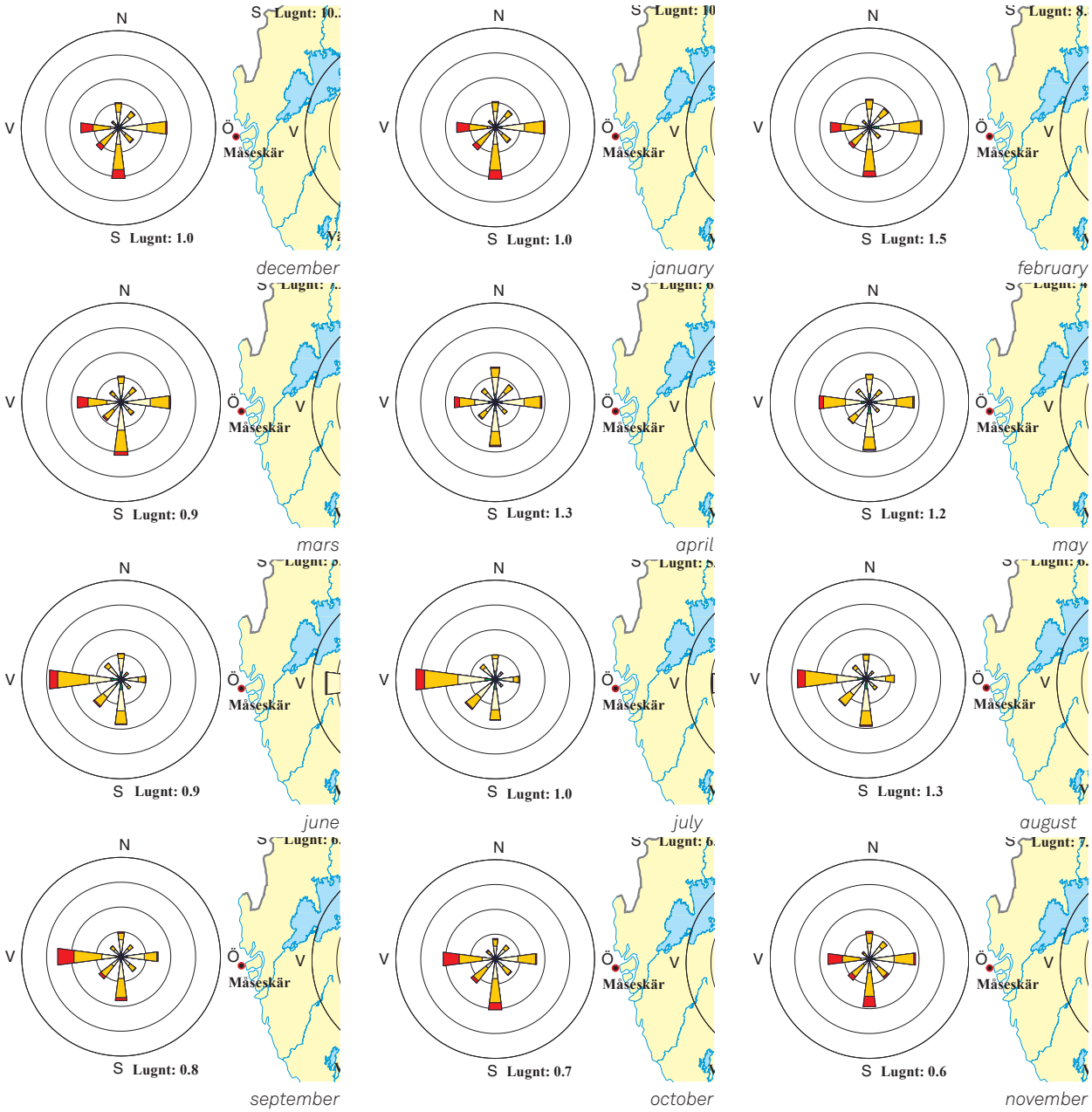
Wind.

Average wind speed (m / s) 1961 - 1990

jan	*feb*	*mar*	*apr*	*may*	*jun*	*jul*	*aug*	*sep*	*oct*	*nov*	*decyear*
8,6	*7,4*	*7,3*	*6,5*	*6,0*	*6,2*	*6,4*	*6,6*	*8,2*	*8,7*	*9,4*	*9,0 7,5*
7,7	*7,5*	*6,8*	*6,0*	*5,5*	*5,9*	*5,2*	*5,5*	*6,3*	*7,5*	*7,4*	*7,4 6,6*
4,4	*4,0*	*4,2*	*3,8*	*3,8*	*4,1*	*4,1*	*3,8*	*4,1*	*4,2*	*4,4*	*4,2 4,1*
3,8	*4,1*	*3,8*	*3,4*	*3,5*	*3,7*	*3,3*	*3,3*	*3,3*	*3,5*	*3,4*	*3,5 3,5*
8,6	*7,5*	*7,6*	*6,7*	*6,3*	*6,5*	*6,7*	*6,7*	*8,3*	*8,7*	*9,0*	*9,0 7,6*
8,7	*8,5*	*7,9*	*6,9*	*6,4*	*6,7*	*6,2*	*6,6*	*7,3*	*7,8*	*8,3*	*8,6 7,5*

The frequencies of wind direction (%) for the year during the station's measuring period

station	*N*	*NE*	*E*	*SE*	*S*	*SW*	*W*	*NW*	*calm*
Vinga	*10,1*	*9,6*	*10,0*	*9,2*	*18,4*	*16,0*	*16,8*	*8,7*	*1,3*
Göteborg	*7,7*	*11,4*	*7,9*	*13,1*	*16,8*	*14,5*	*15,9*	*7,5*	*3,7*
Måseskär	*9,6*	*9,0*	*14,8*	*7,9*	*17,0*	*14,0*	*19,3*	*7,2*	*1,2*

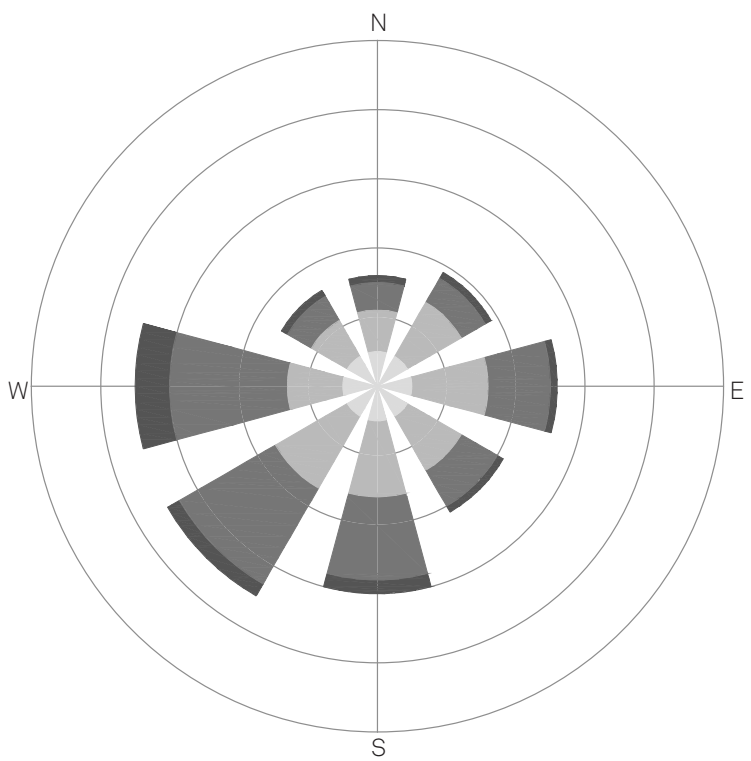


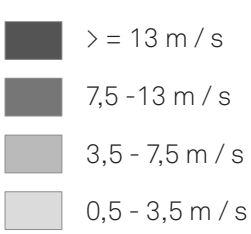
FORMATION

Sweden is located in the so-called west wind belt, which means that the most frequent wind direction of the undisturbed wind is westerly or southwesterly. On the west coast, there is not much that bothers the wind, allowing the most common wind direction is right westerly or southwesterly.

Wind.

The strongest wind in Södra Skärgården comes mainly from the south, south-west and west direction. Whereas the context of Vrångö being an island suggests there are no main obsticles that could cause significant wind shadow.





source: smhi.se

calmness: 0,5 %

measured at 10 m above ground

FORMATION

motivation

a walk

an exploration

journey

discomfort

rain

← rain analysis

journey

destination

search for shelter

allows us to stay in a place for a limited time depending on the force of the rain in combination with other climate influencess

← proximity to shelter
vegetation / man made shelter

journey

filter

minimal shelter

filters out the rain to a certain extent - expands the time spent on the site

added value

presence

allows one to get rid of the feeling of immediate discomfort

opens up for other senses to be more active than they would be at that time and point

→ acoustic
vision

< Organizational strategy.

Rain.

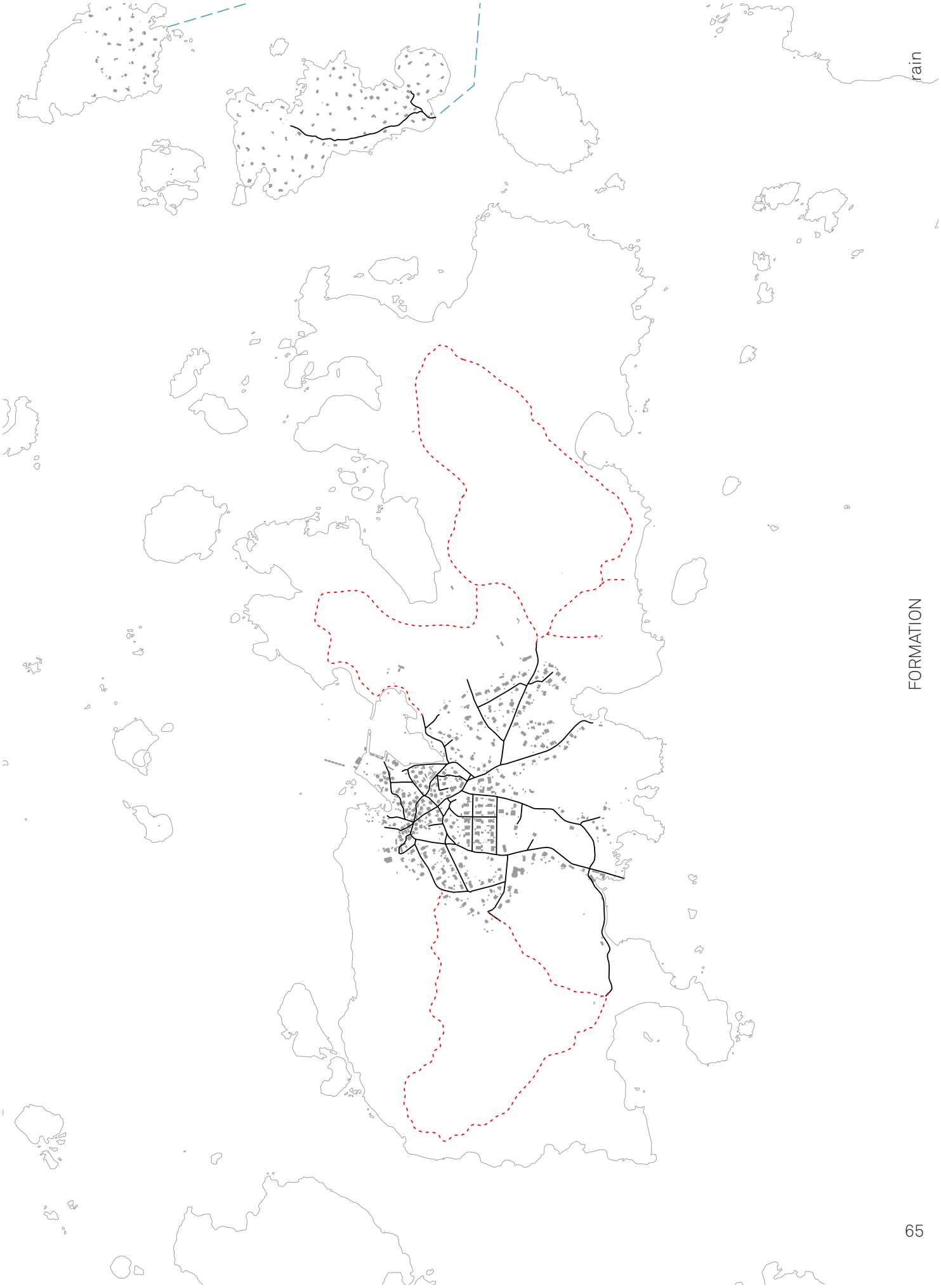
The exposure towards rain is the same everywhere in the given context. Therefore the motivation is simply an exploration. The discomfort of the rain forces one to search for an shelter, that is the destination. The minimal shelter filters out the rain to a certain extent and allows one to stay present for a longer time. By getting rid of the immediate discomfort one can experience presence and be open to other phenomenons (acoustic, vision).

The discomfort and the destination is swapped compared to wind.

rain

FORMATION

^Paths, proximity to shelter.



Forests, proximity to shelter.

rain

FORMATION

station

Vinga
average
days of rainfall
depth of snow

Göteborg
average (mm)
days of rainfall
max depth of snow

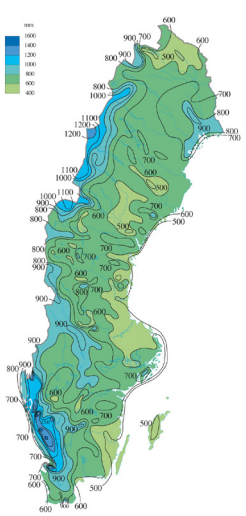
Måseskär
average
days of rainfall
depth of snow

Rainfall

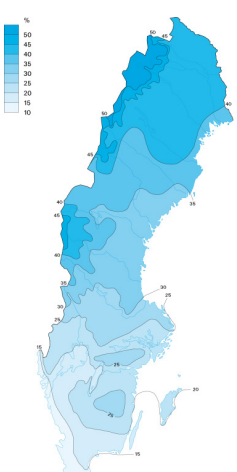
jan	*feb*	*mar*	*apr*	*may*	*jun*	*jul*	*aug*	*sep*	*oct*	*nov*	*dec*	*year*
35	*27*	*35*	*32*	*42*	*44*	*51*	*61*	*65*	*68*	*57*	*53*	*572*
16	*16*	*12*	*18*	*9*	*11*	*13*	*15*	*8*	*6*	*19*	*24*	*177*
-	-	-	-	-	-	-	-	-	-	-	-	-
87	*40*	*49*	*41*	*49*	*59*	*68*	*75*	*80*	*83*	*82*	*72*	*758*
18	*16*	*14*	*18*	*8*	*16*	*18*	*18*	*9*	*5*	*18*	*23*	*184*
210	*30*	*70*	*10*	-	-	-	-	-	-	-	*60*	-
40	*26*	*34*	*34*	*42*	*48*	*49*	*63*	*65*	*70*	*62*	*46*	*580*
19	*13*	*12*	*14*	*10*	*12*	*13*	*16*	*8*	*5*	*17*	*23*	*174*
-	-	-	-	-	-	-	-	-	-	-	-	-

1 average precipitation in a year (mm)

2 percentage of snowfall out of all precipitations

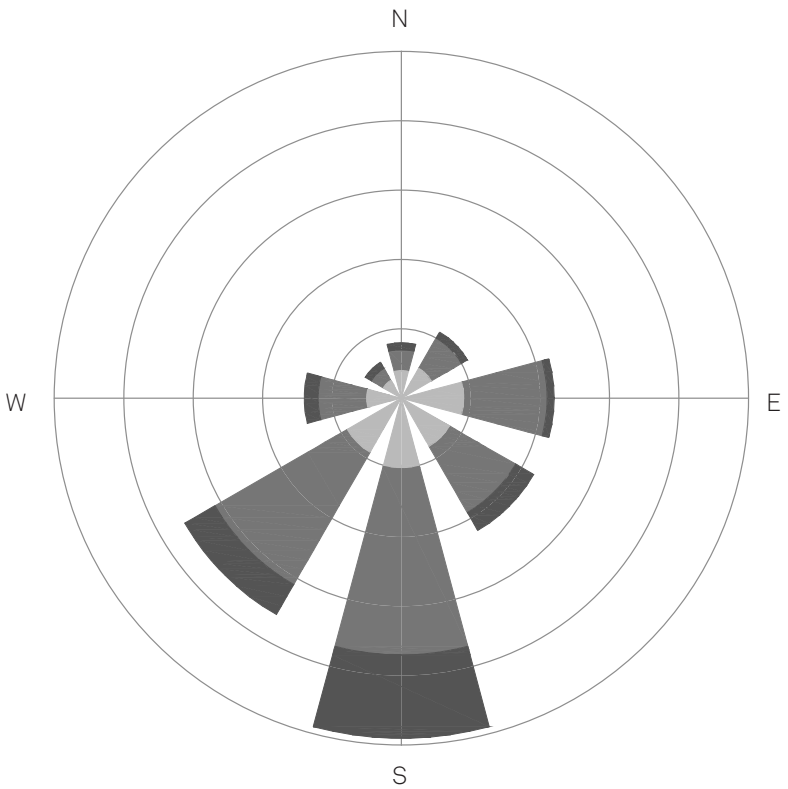


1



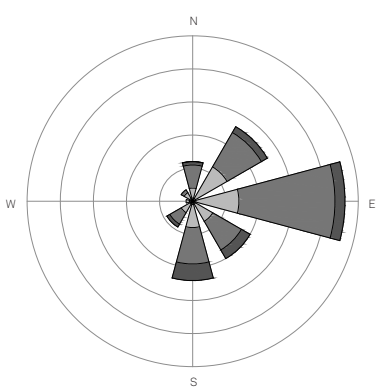
2

source: smhi.se



Rainfall.

Wind speed and direction during precipation.



Snowfall.

> = 13 m / s

7,5 -13 m / s

3,5 - 7,5 m / s

0,5 - 3,5 m / s

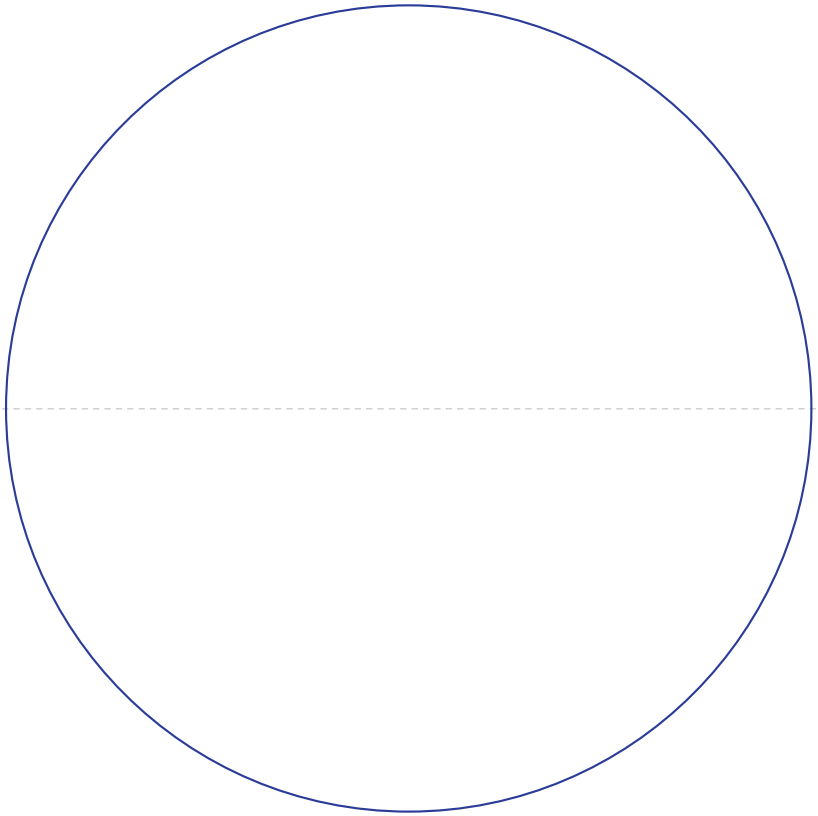
calmness: 0,5 %

measured at 10 m above ground

Droplets.

Size of raindrops and their speed, 10:1.

source: smhi.se

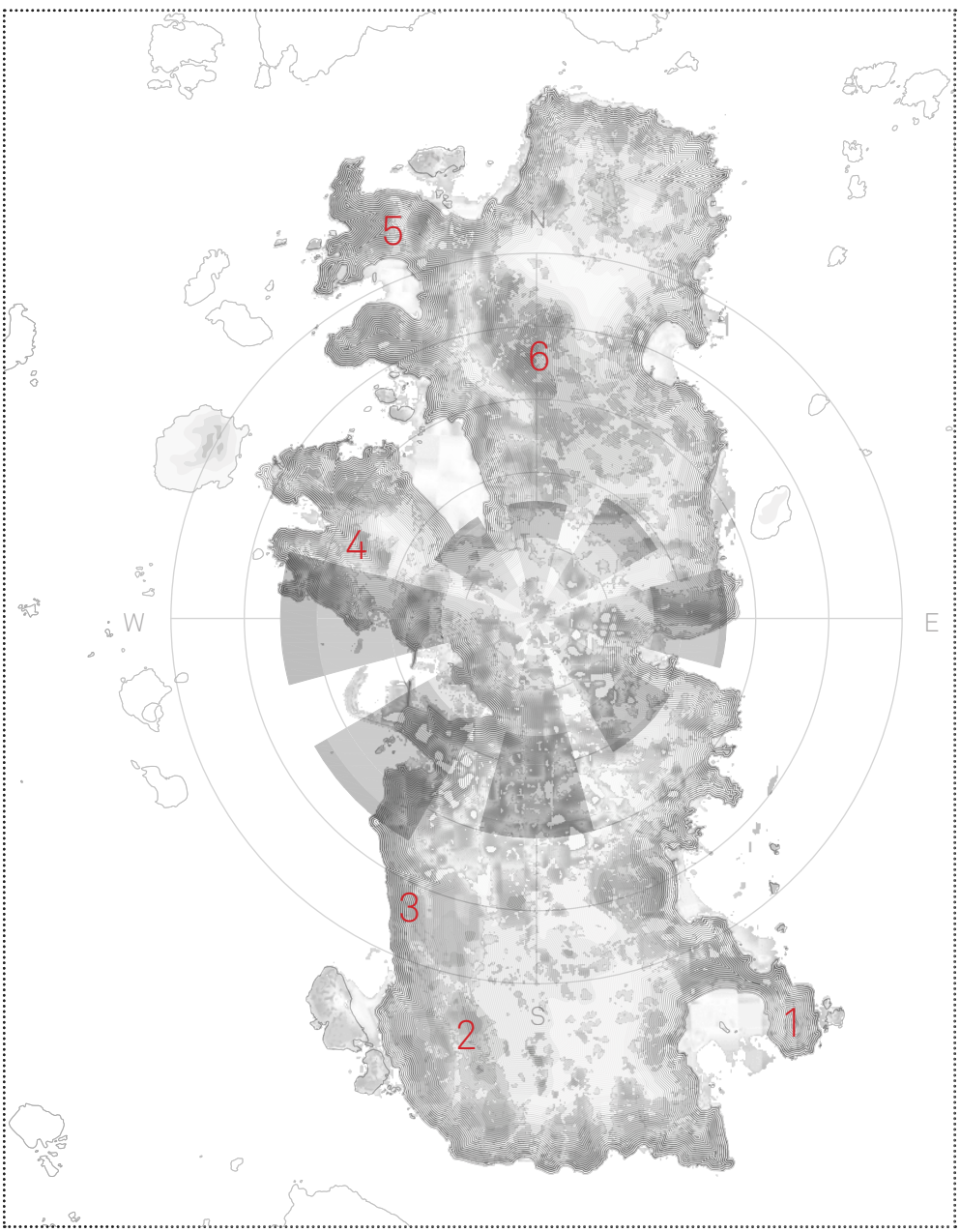


9 m / s > *d 5 mm >* *raindrops*

< 2 m / s > *< d 0,5 mm >* *raindrops*

< 0,25 m / s > *< d 0,1 mm >* *drizzledrops*

< 0,01 m / s > *< d 0,01 mm* *cloud droplets*



all wind layers on top of each other

1:25 000

Identifying possible sites

1 a tip with a height of approximately 15 m above sea level, exposed to N, E, S, W, an open view

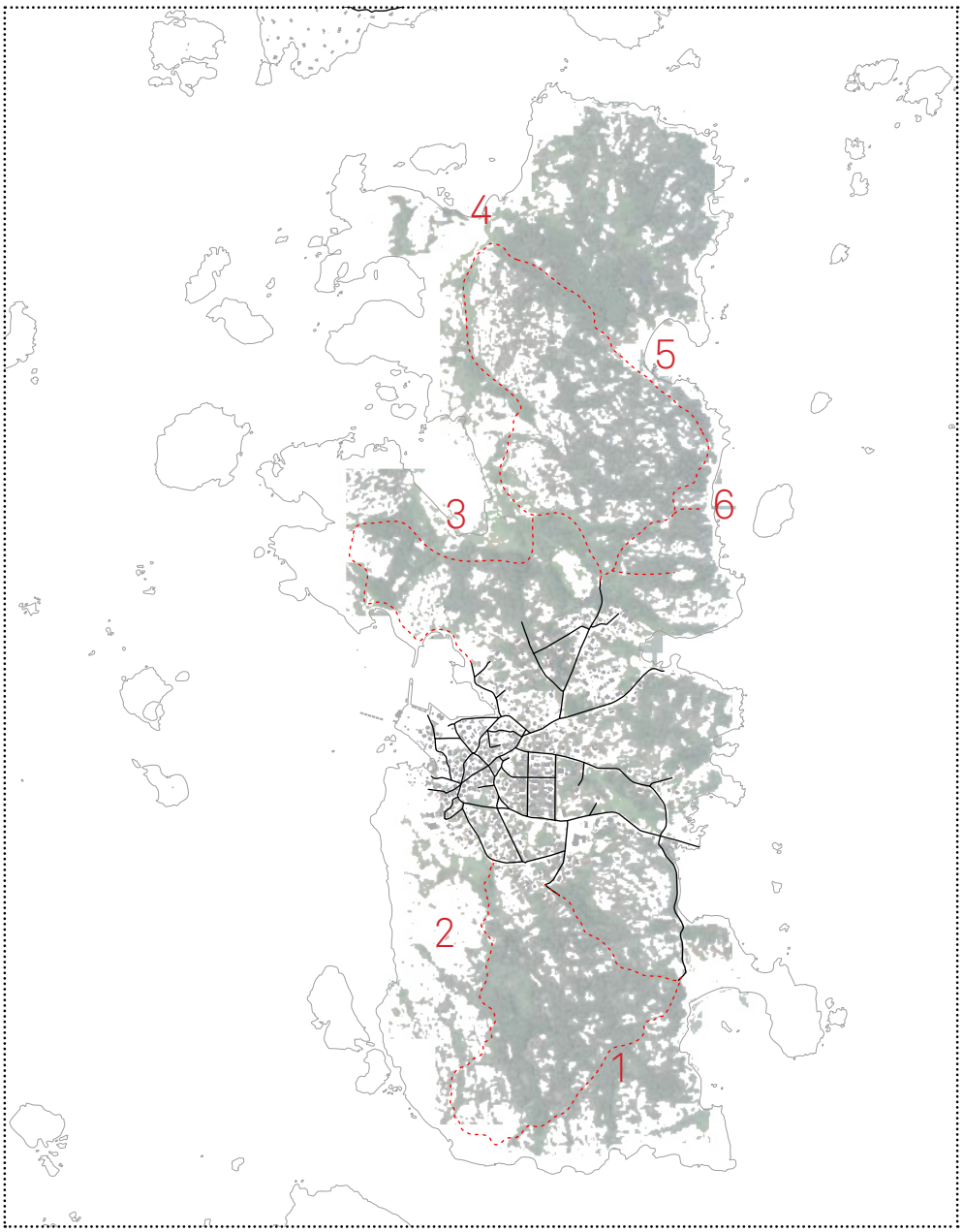
2 a height of 25 m a around 125 m from the shore, mainly exposed to S and W, a rocky site with a difficult journey due to the cliffs topography

3 right at the shore with an undisturbed long distance view, height 0 - 5 m above sea level, due to the diverse topography of the cliffs and rocks places with wind shelter can occur localy

4 close to city, height about 25 - 30 m above sea level, exposed to N, E, S, W, there is already a building

5 open view, furthermost from the city, unsheltered from any side, height of 25 - 30 m above sea level

6 inland, highest point, exposed to N, E, S, W, local shelter depends on the small scale topography and vegetation



all rain layers on top of each other

1:25 000

Identifying possible sites

1 proximity to existing path, placed in the context of a forest, partially sheltered from above by tree crowns, sheltered from wind

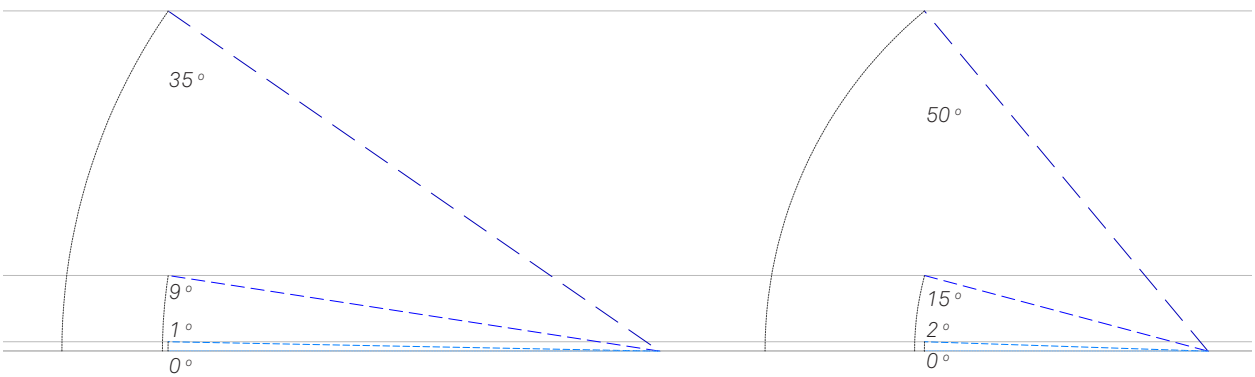
2 proximity to path, unsheltered from wind, open view, cliffs

3 perspective view from path, tidal area, swamp, reeds, sheltered from wind from E, S, W

4 proximity to path, beach, reeds, open to W and N

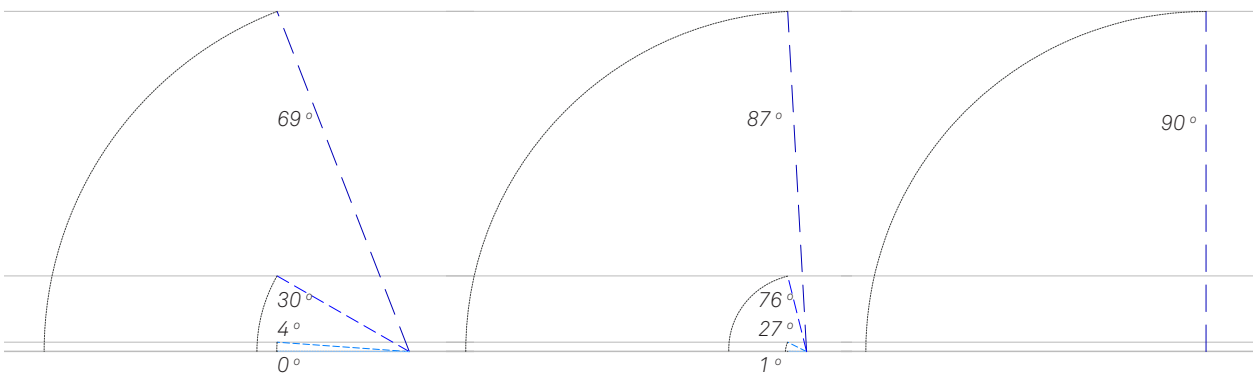
5 proximity to path, view through forest, beach, partially sheltered from S,W,N, “hidden” beach

6 proximity to path, view through forest, sand beach, sheltered from W, widely known place of interest (swimming)



13 m / s

7,5 m / s



Rain + wind.

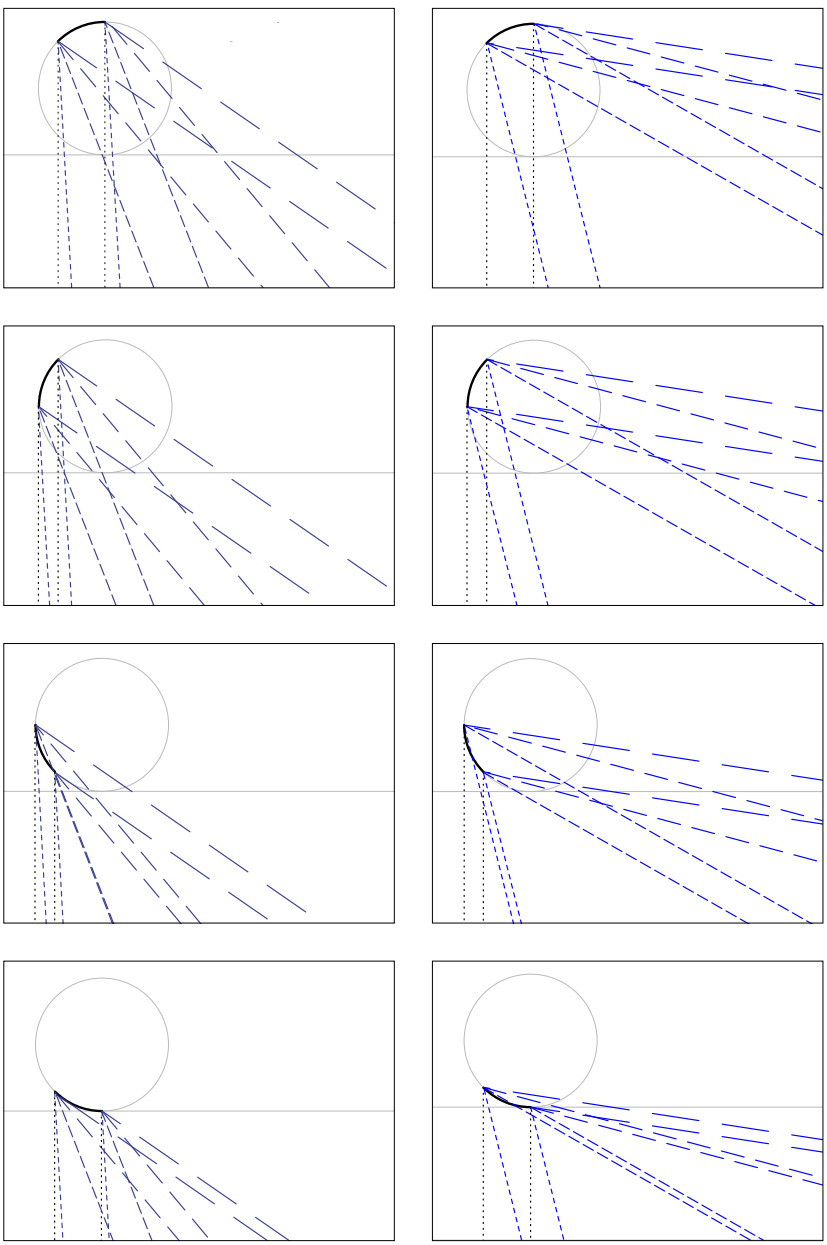
From the previous research of the rain and wind phenomena at the given context it became apparent that the presence of each of them differs. While wind can be present as a solitaire, rain rarely is. Rain is strongly connected with wind. Therefore the next part of the formation phase focuses on the forces together; aplied on the prototype.

Rain angle.

Rain angle depends on size of droplet and the speed and direction of the wind.

Rain angles.

FORMATION



wind speed

raindrops d 5 mm >

raindrops < d 0,5 mm >

wind speed

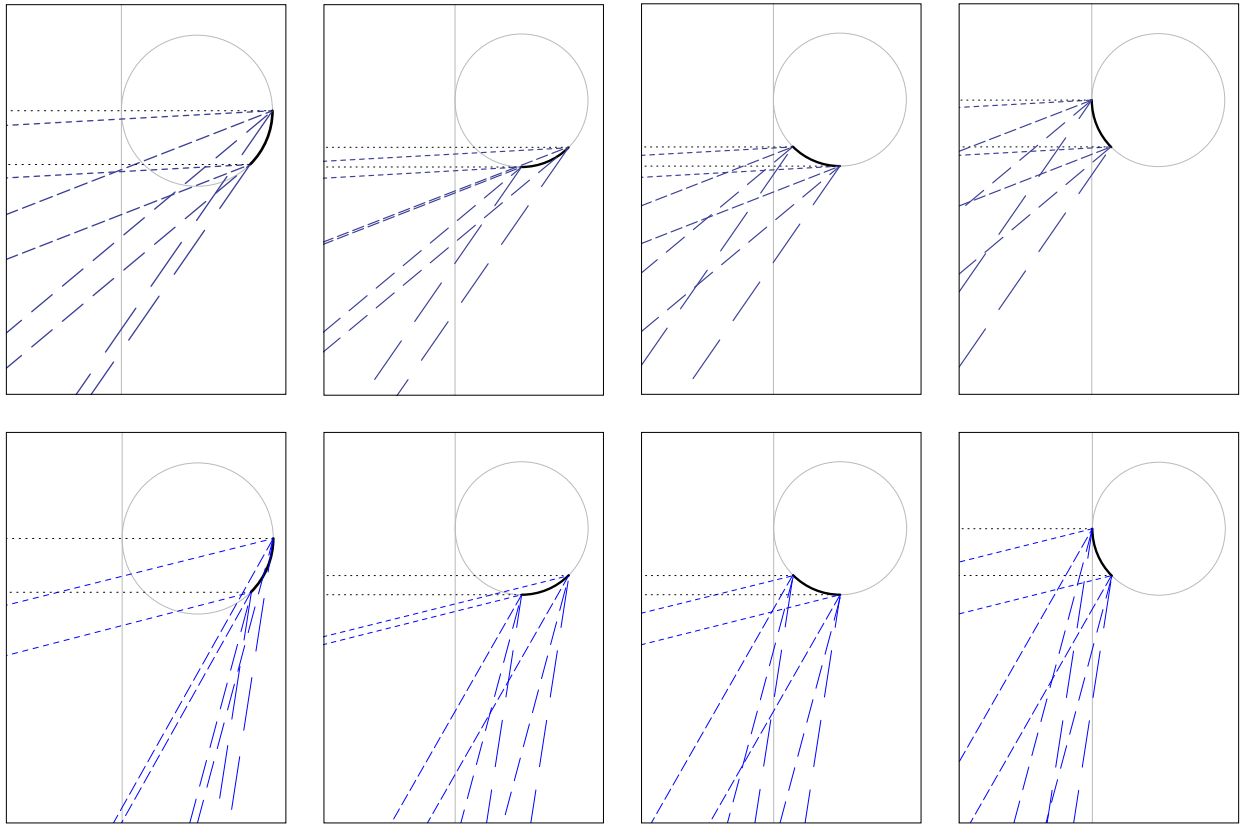
FORMATION

drizzledrops < d 0,1 mm >

cloud dropplets < d 0,01 mm

raindrops d 5 mm >

raindrops < d 0,5 mm >



wind speed

wind speed
FORMATION
drizzledrops < d 0,1 mm >
cloud dropplets < d 0,01 mm

Concept.

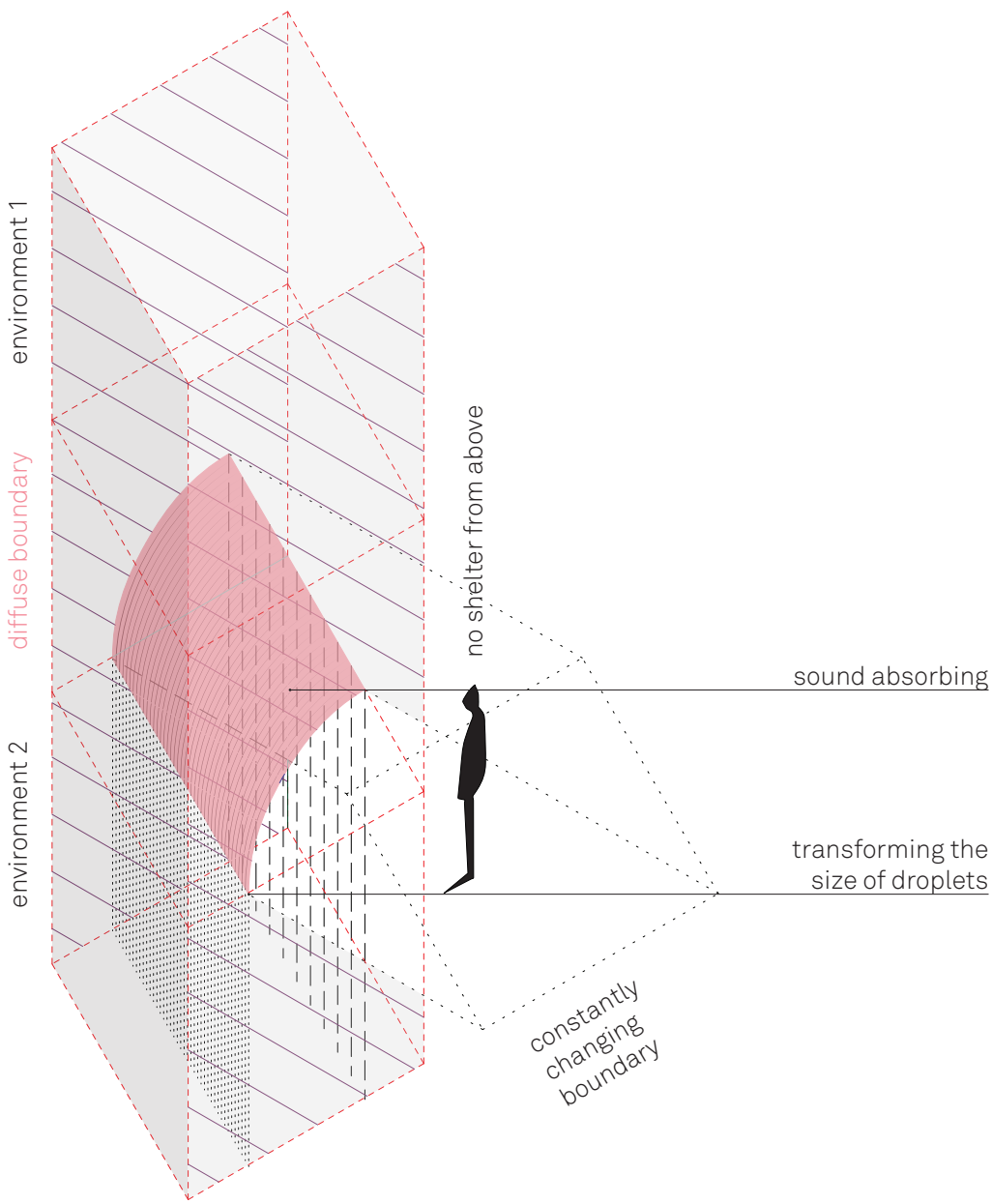
The aim is to create a porous structure compiled from the findings in the prototype phase that allows one to find a shelter that differs depending on the actual contextual forces. It's a shelter that through the positioning of its elements keeps an openess but still manages to give a minimal shelter.

Conceptual model.

< a more probable scenario

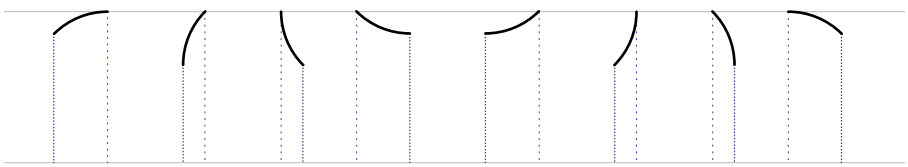
> rare scenario

Conceptual scheme.

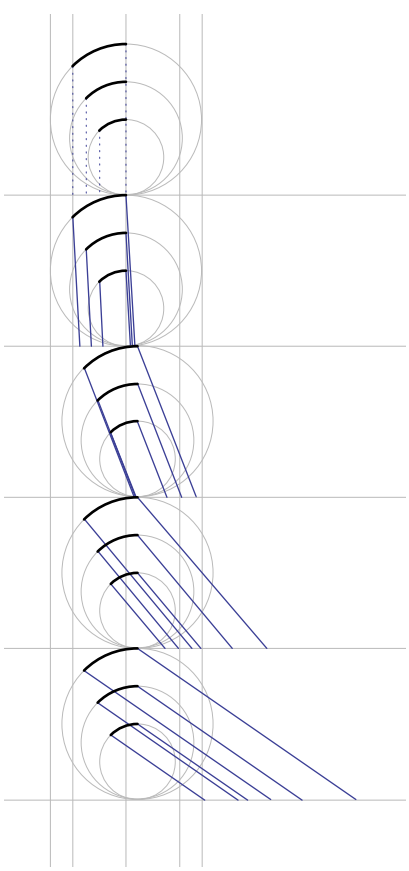


Design principles.

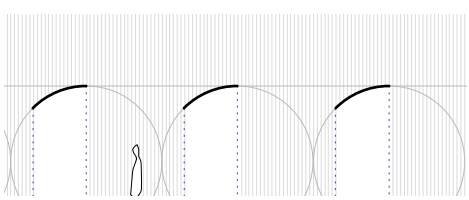
Orientation



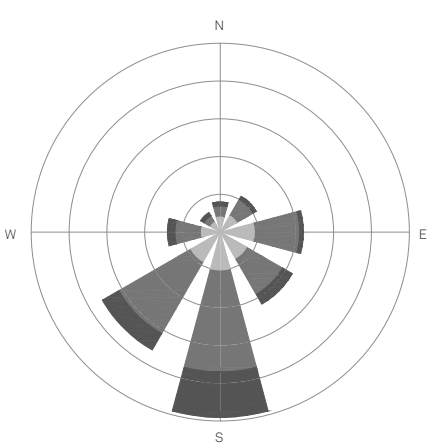
Size and height



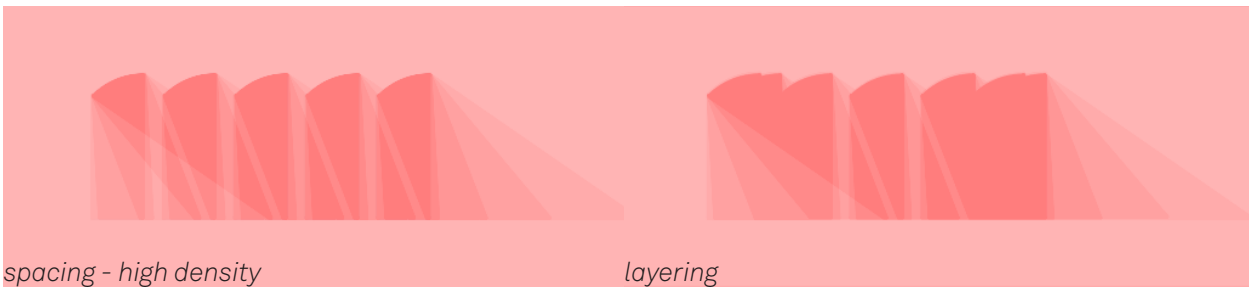
Spacing



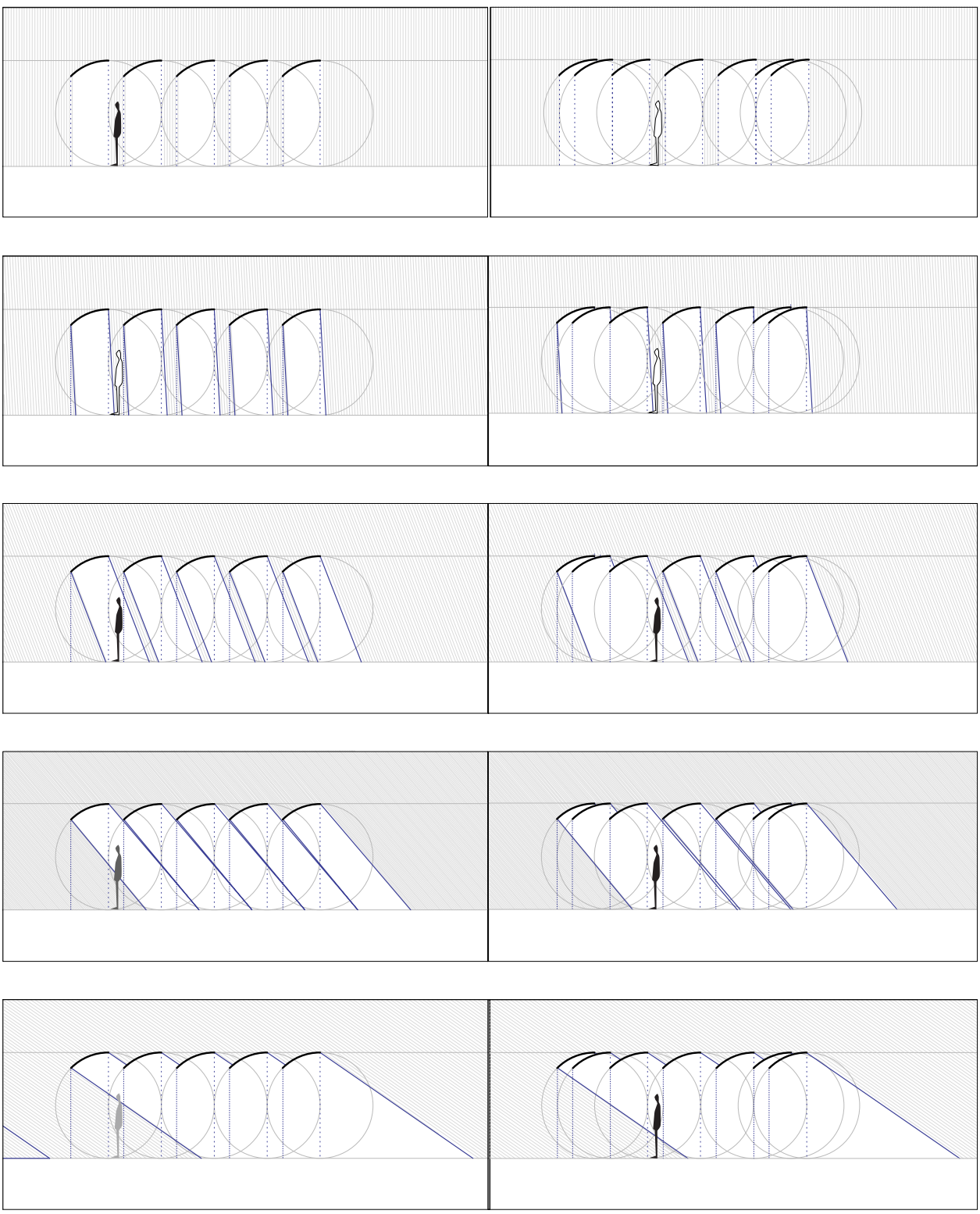
Orientation towards wind



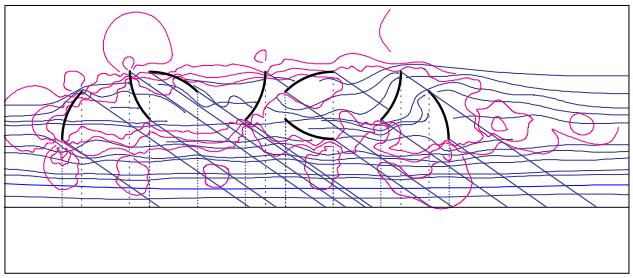
rain + wind



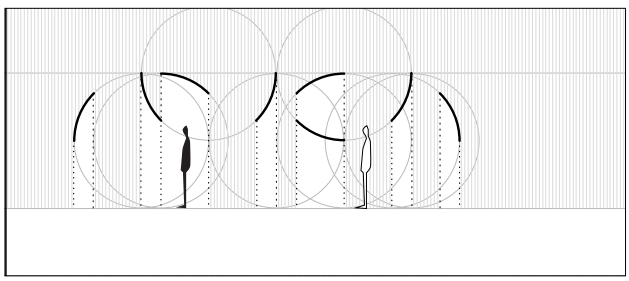
FORMATION

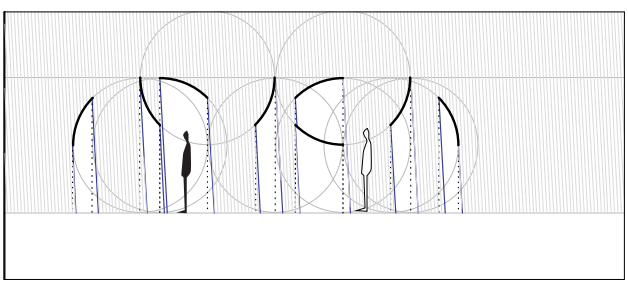


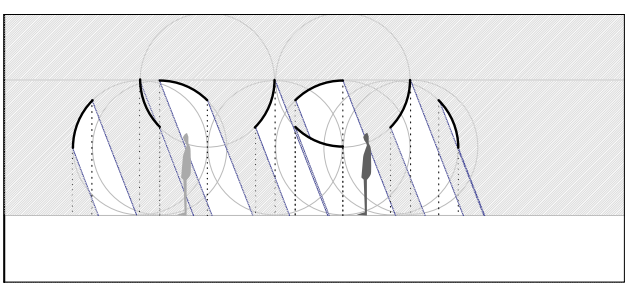
spatial configurtion

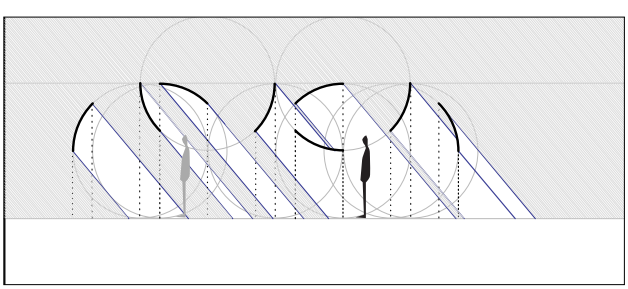


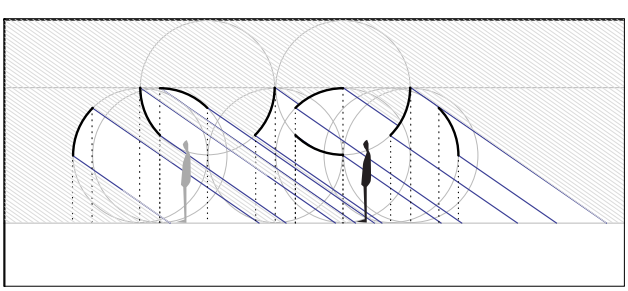
< Schemes of the wind turbulences in a wind tunnel (Autodesk Flow). The exact impact on the curvature of the axis of the droplets would be a subject for further investigations.











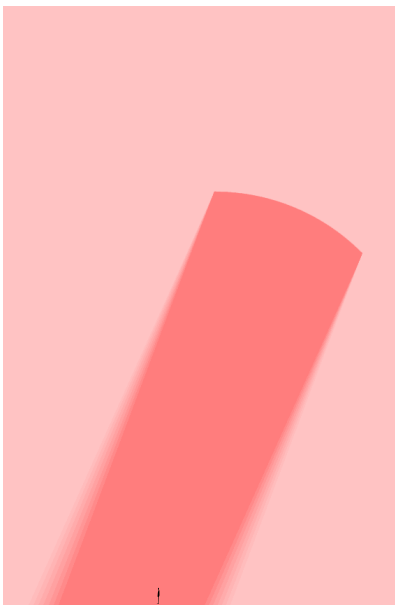
< Schemes of different constellations at a specific moment in time.

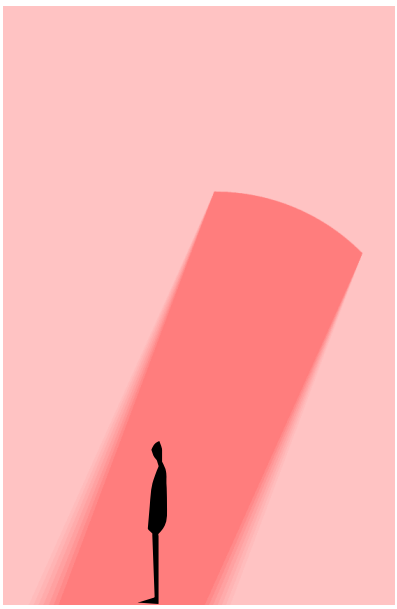
RAIN wind.

The idea of the minimal shelter deals with the prevailing contextual force at the given context. The aim is to mitigate the most predominant discomfort. The other force is considered as secondary, but is still present. Therefore the RAIN wind shelter works primarly against rain.

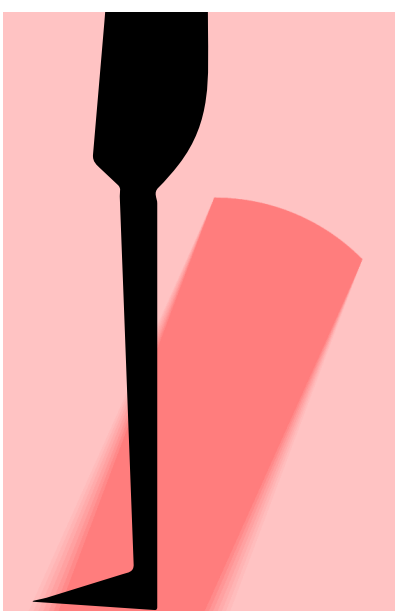
The schemes are capturing the shelter's function at specific constellations of rain and wind. The bigger discomfort , the more extensive shelter. The picture below layers these experiences over a longer period of time.

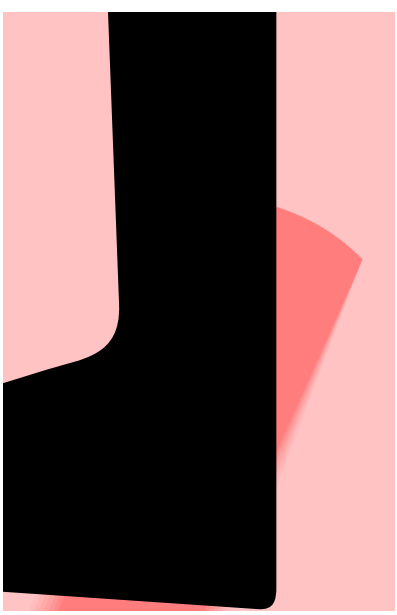
rain + wind





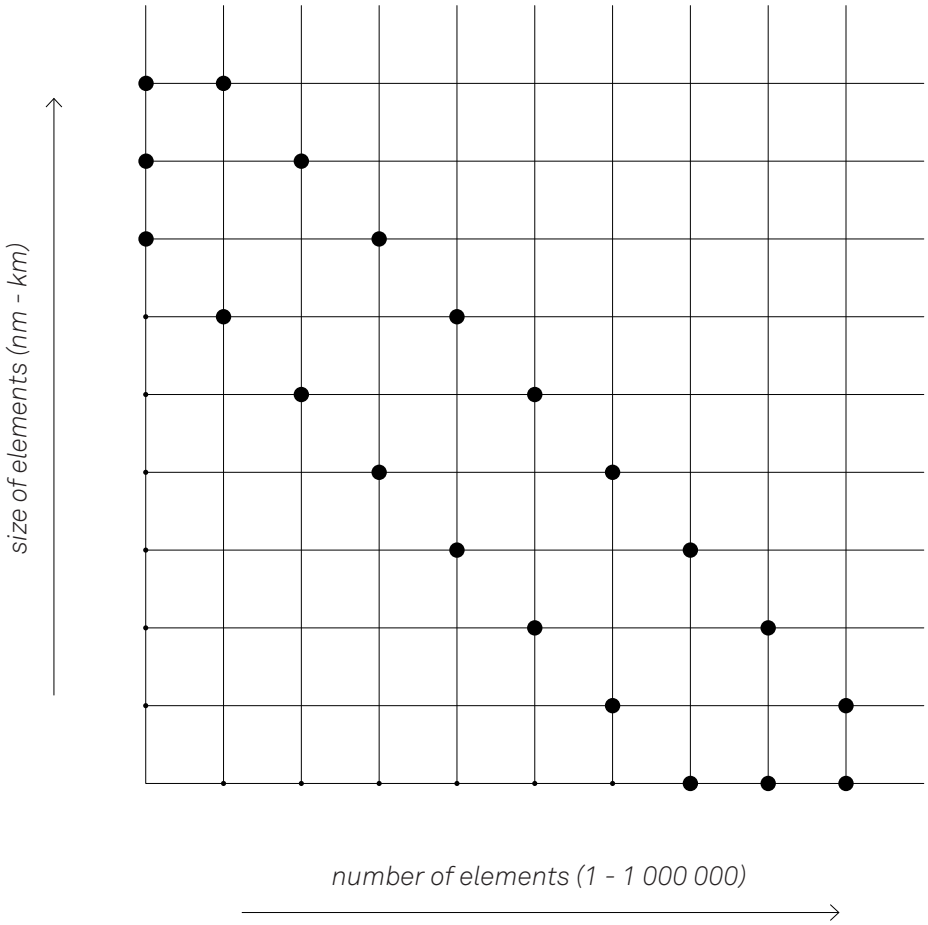
PROPOSAL





Scale.

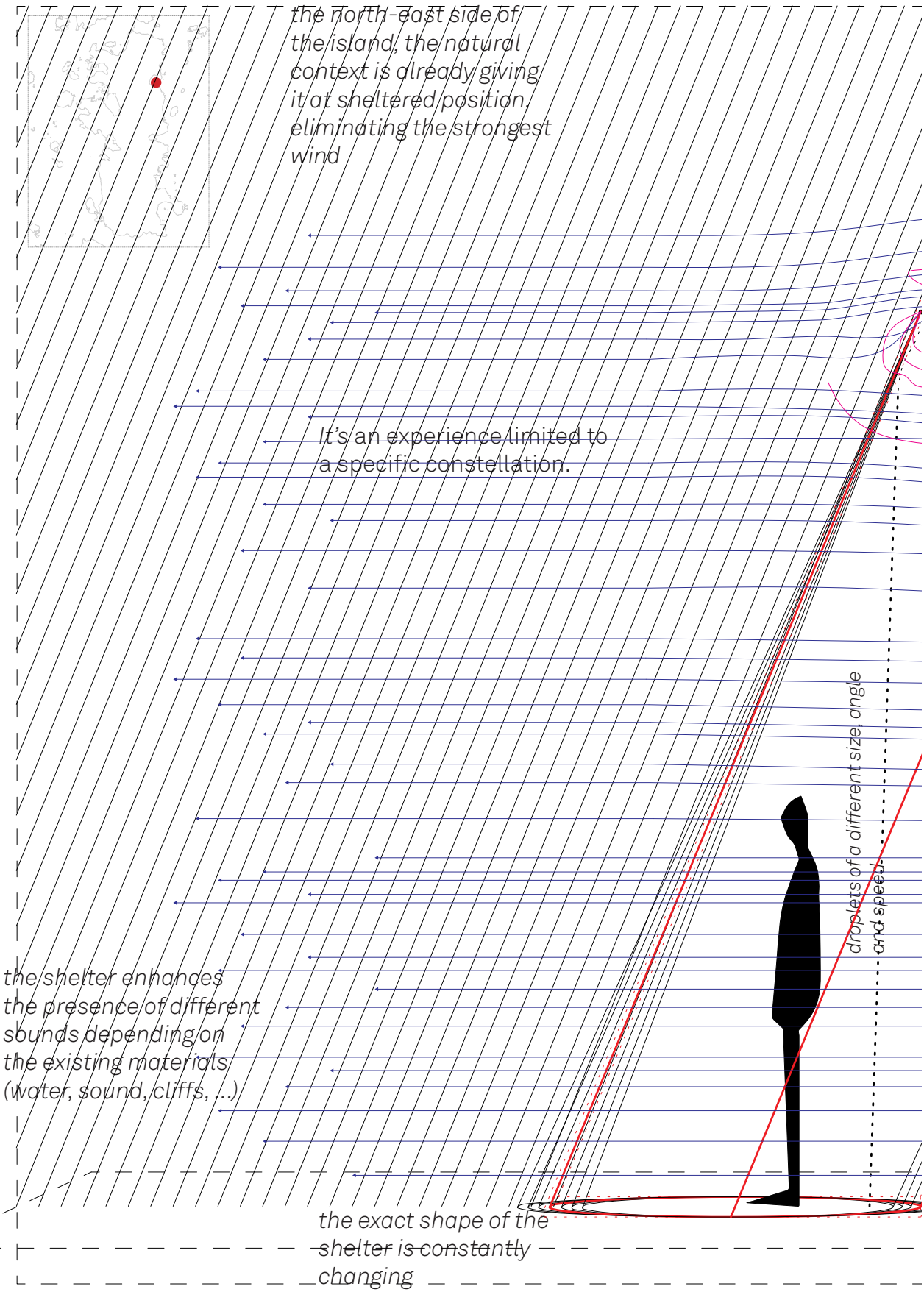
[1] a cloud
[2] human
[3] tree
[4] fog

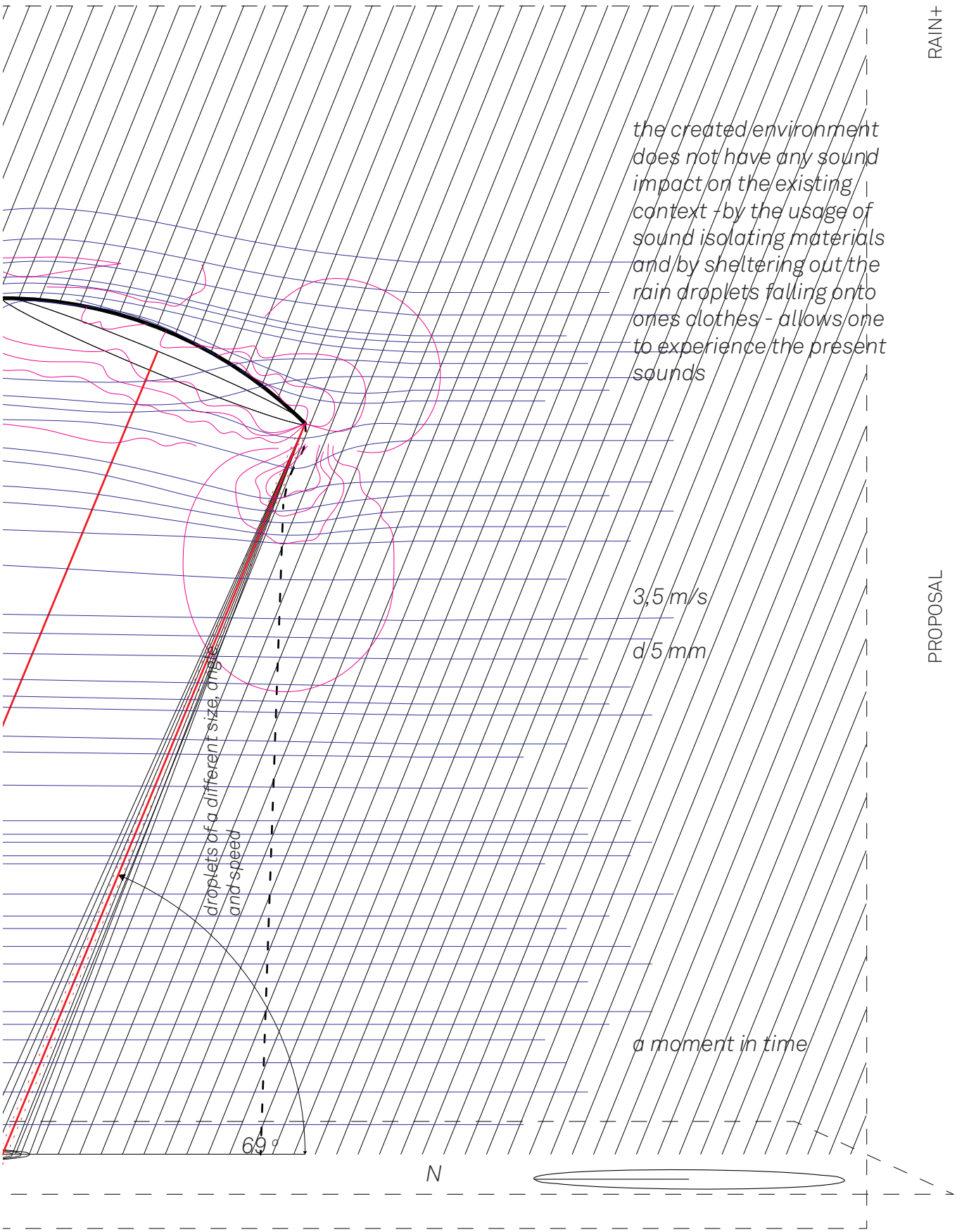


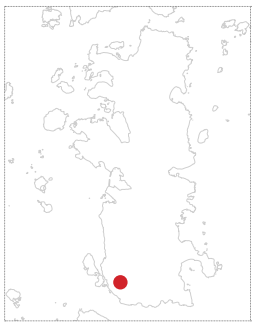
Introducing scale.

The idea of diffused boundaries can be introduced in all scales. Depending on the scale and number of elements used the interface is percived differently but its essential properties remains. The aim is to create a permiable boundary that works as a tool to filter certain natural forces. It's a performative boundary that changes one environment into another.

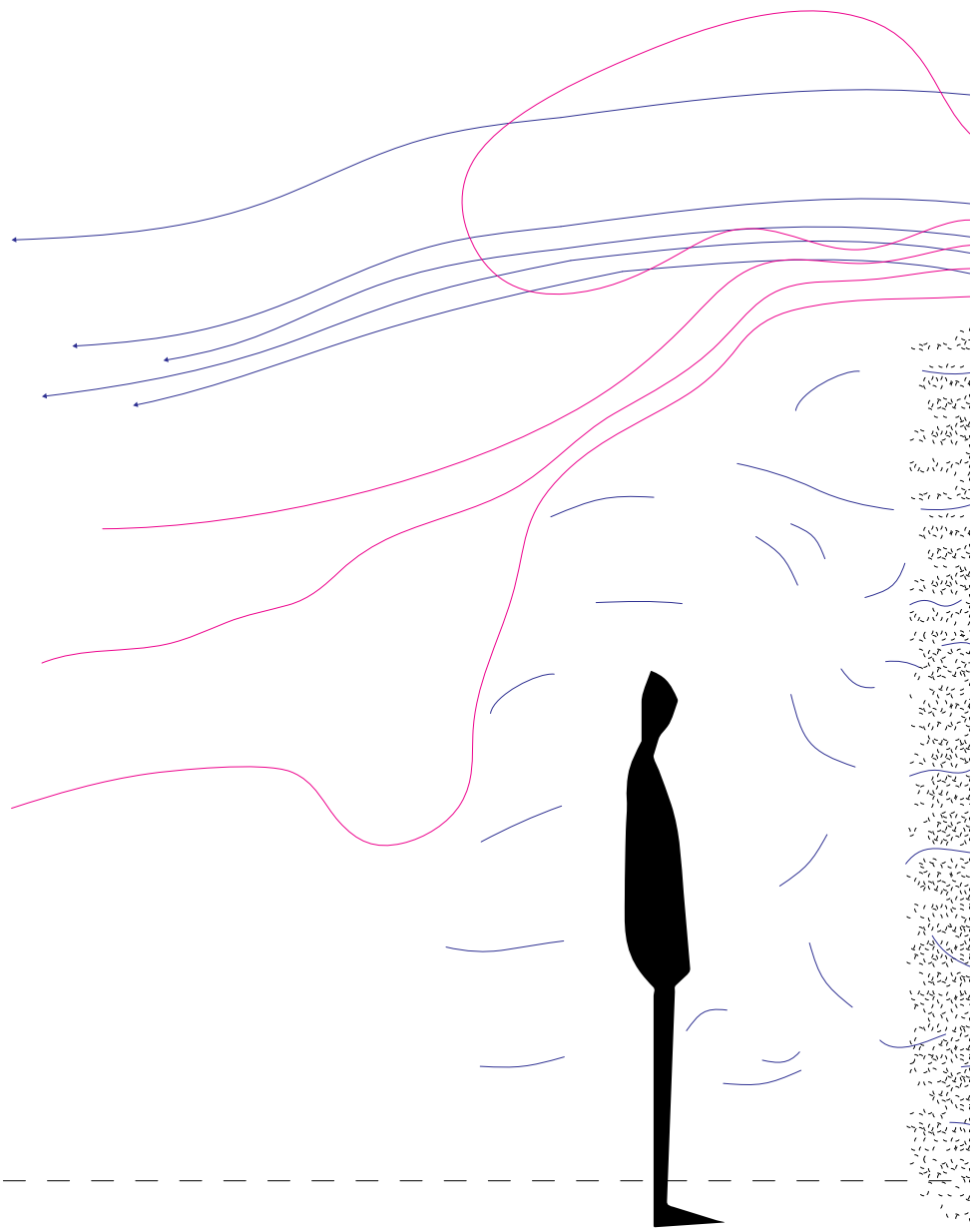
The given examples that are visualized are two of endless possibilities that can be achived with this system. To show the possibilities I choose its extreme limits.


the site is located at the north-east side of the island, the natural context is already giving it at sheltered position, eliminating the strongest wind
It's an experience limited to a specific constellation.
droplets of a different size, angle and speed.
the shelter enhances the presence of different sounds depending on the existing materials (water, sound, cliffs, ...)
the exact shape of the shelter is constantly changing

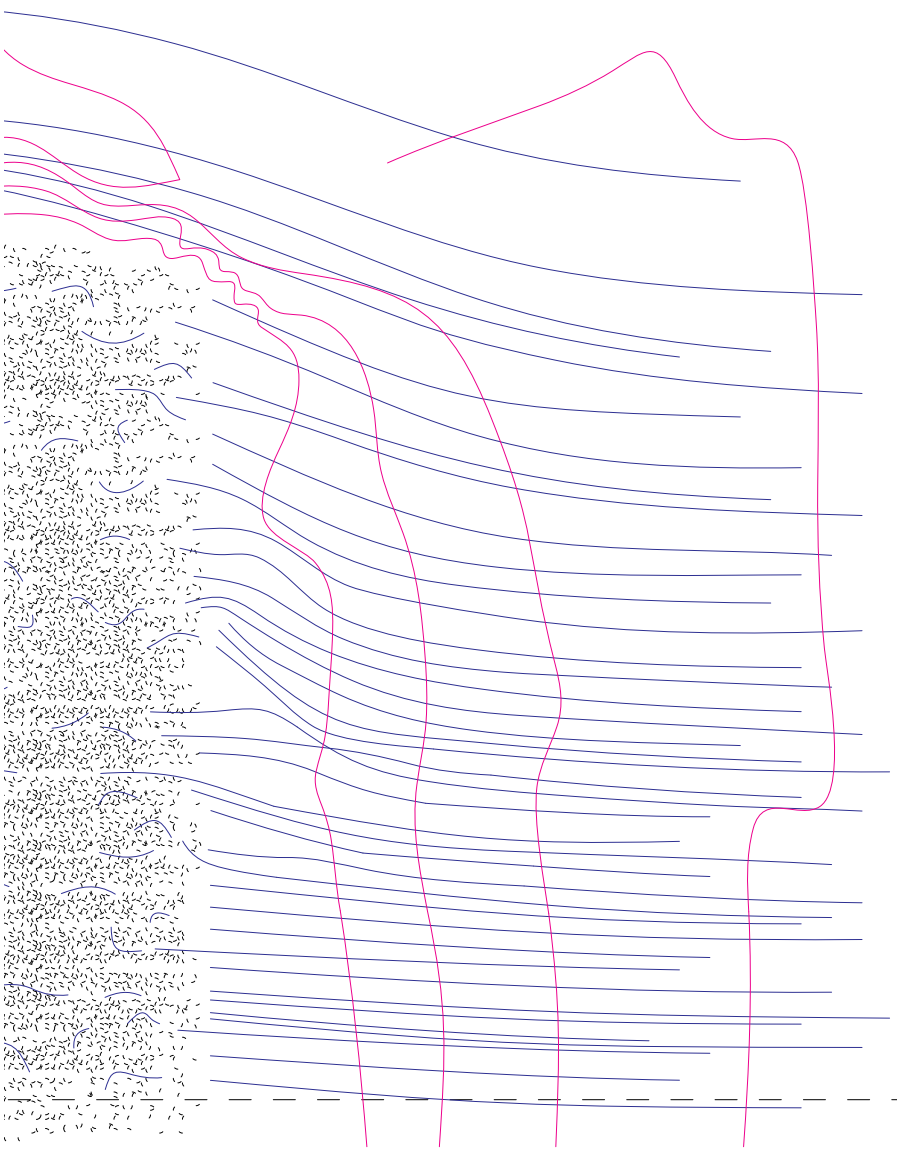

the created environment does not have any sound impact on the existing context -by the usage of sound isolating materials and by sheltering out the rain droplets falling onto ones clothes - allows one to experience the present sounds
3,5 m/s
d 5 mm
droplets of a different size, angle and speed
ø moment in time
69°
N



the site is located at the south - west side of the island facing the strongest wind and the furthest view



the shelter works with the smallest scale and the biggest number of particles, as a fog

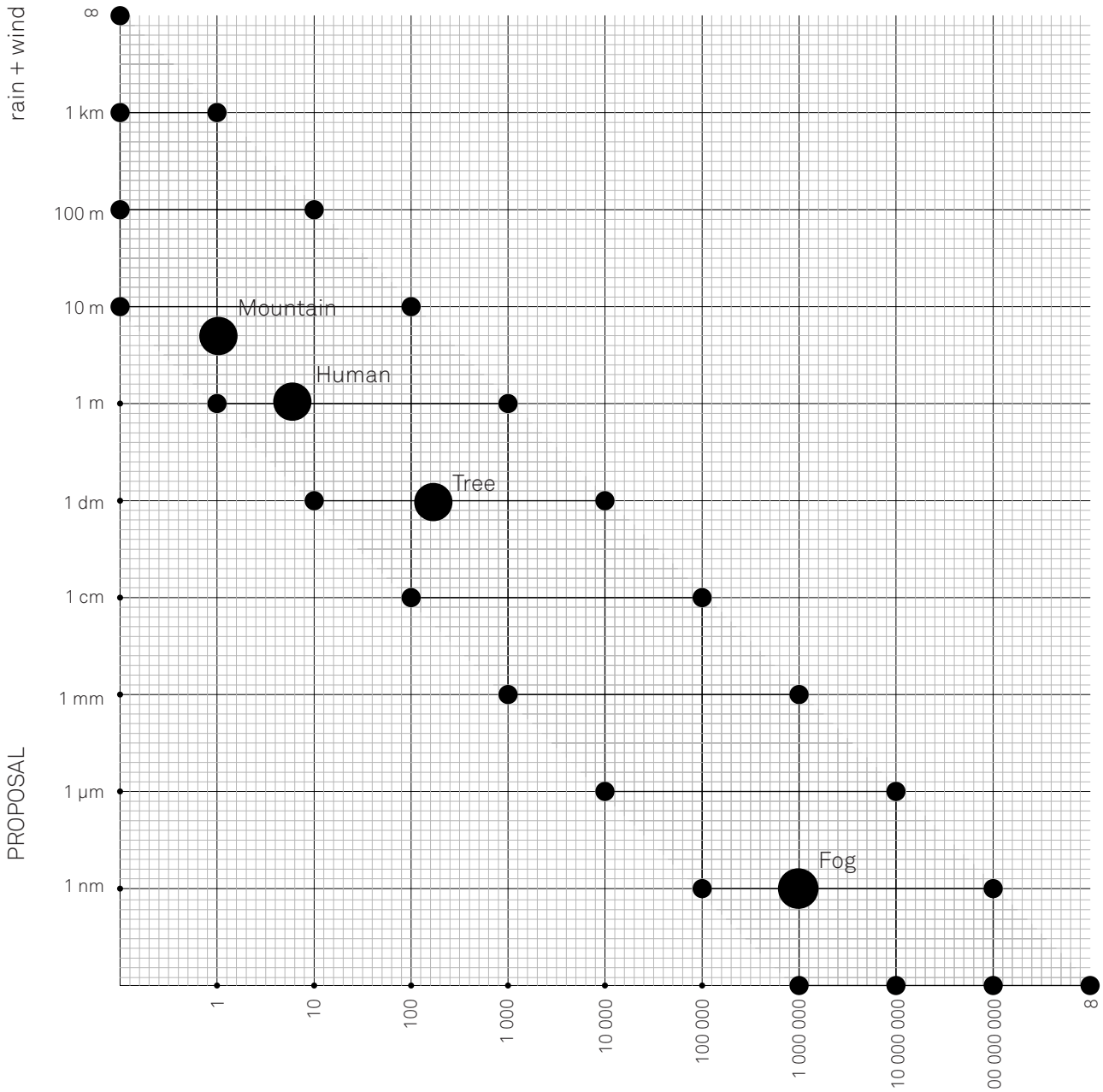


a moment in time

> 13 m / s <

slowing down the wind using the turbulences created when passing the interface (created by the position of the particles)

N



Scale.

The introduction of scale serves as a proposal for further investigations into the possibilities of design.

Scale.

Four scales are proposed.

The design is dependent on the number of elements and the size of each elements.

Mountain. Human. Tree. Fog.

Mountain. The size of the element is physically creating a rain shadow, like a cloud is creating a shadow in terms of light. It's positioned at a high height. In terms of wind it's functioning like a wind deflector. It's working with units. The perimeter of the sheltered area is huge, but the reason is not clearly visible.

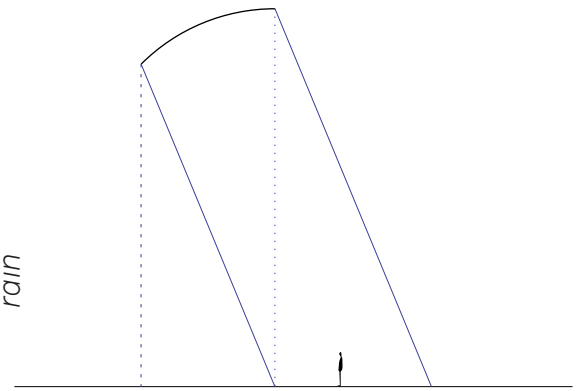
Human. The shelter consists of two to dozens of elements. It's creating a shelter at the scale of a human. The wind is guided through the aerodynamics of the elements. By using the knowledge of the rain angles the design is made. The rain is collected and transformed. One's standing in a porous structure yet sheltered from the rain or the wind.

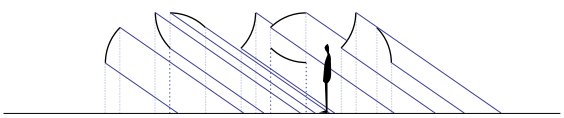
Tree. The shelter consists of dozens to thousands of elements, like leaves on a tree. It creates a permiable filter that changes the size and direction of rain drops. The elements transforms the speed of the wind by creating vortexes in between the units.

Fog. The shelter is created by thousands to milions of elements at the smallest sizes posible. It's capturing the rain drops of the smallest size and transforming them into bigger drops. The wind is filtered through and slowed down.

1 *Number of elements.*

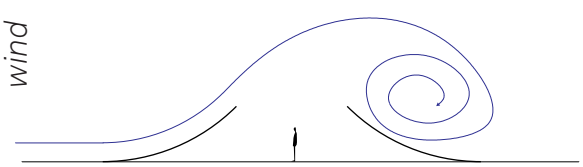
rain

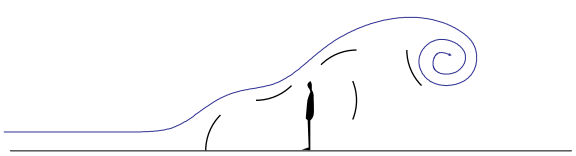




PROPOSAL

wind



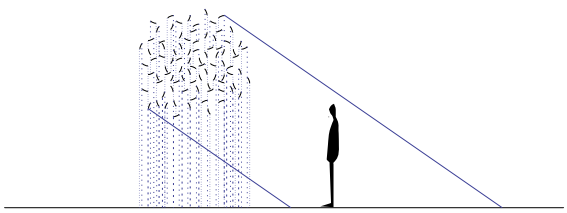


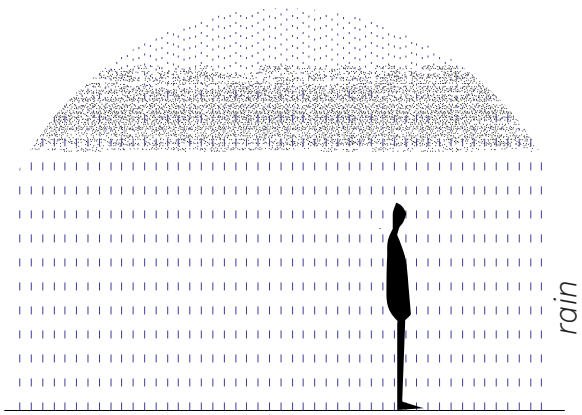
Mountain *Human*

Scale.

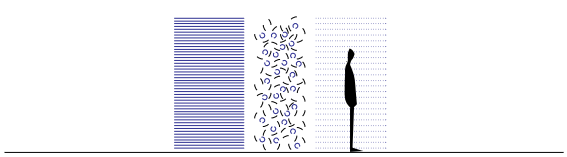
Number of elements.

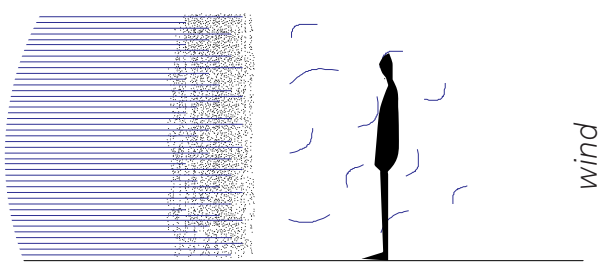
8





rain



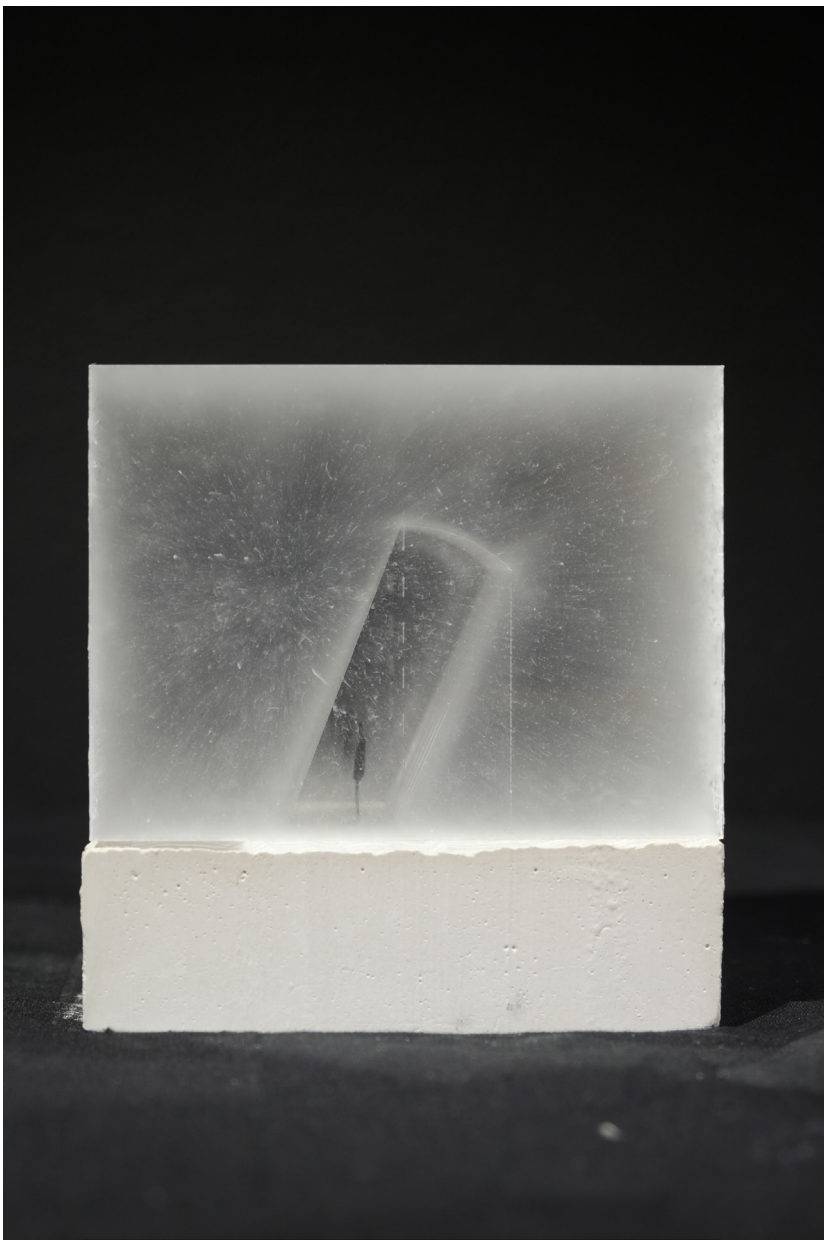


wind

Tree

Fog

Scale.



^ *Rain model.*

Plexiglass, plaster.
100 x 100 x 100 mm

A change of mindset.

The project aims to be considered as a reflection upon the tradional way architectural boundaries are percieved. It's a framework for future design rather than a final design proposal. Through investigations into the physical properties of rain and wind a toolbox has been formed than can be used as design principles at different scales.

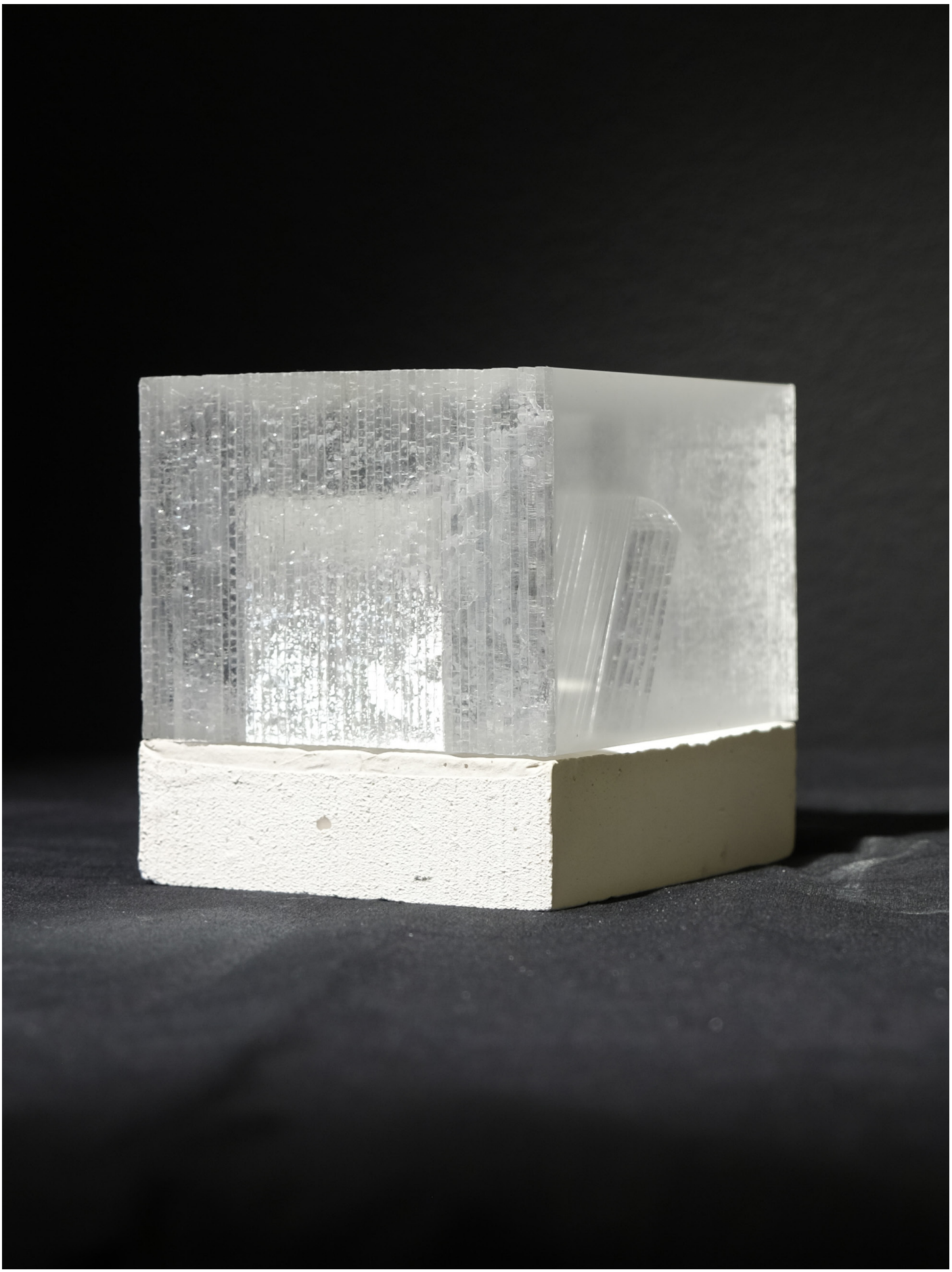
But more importantly the project aims for a change of mindset. It's questioning the way we percieve architecture as something static, permanent and impearmable with clearly defined threasholds. It questions our fundamental needs, as human beings, the importance of a constant level of comfort offered by contemporary architecture. On the contrary the minimal shelter proposes an space that is constantly changing depending on something as unstable as rain and wind. The perimeter of the shelter is moving as the wind and rain is. One has to be constantly present to the change to remain sheltered.

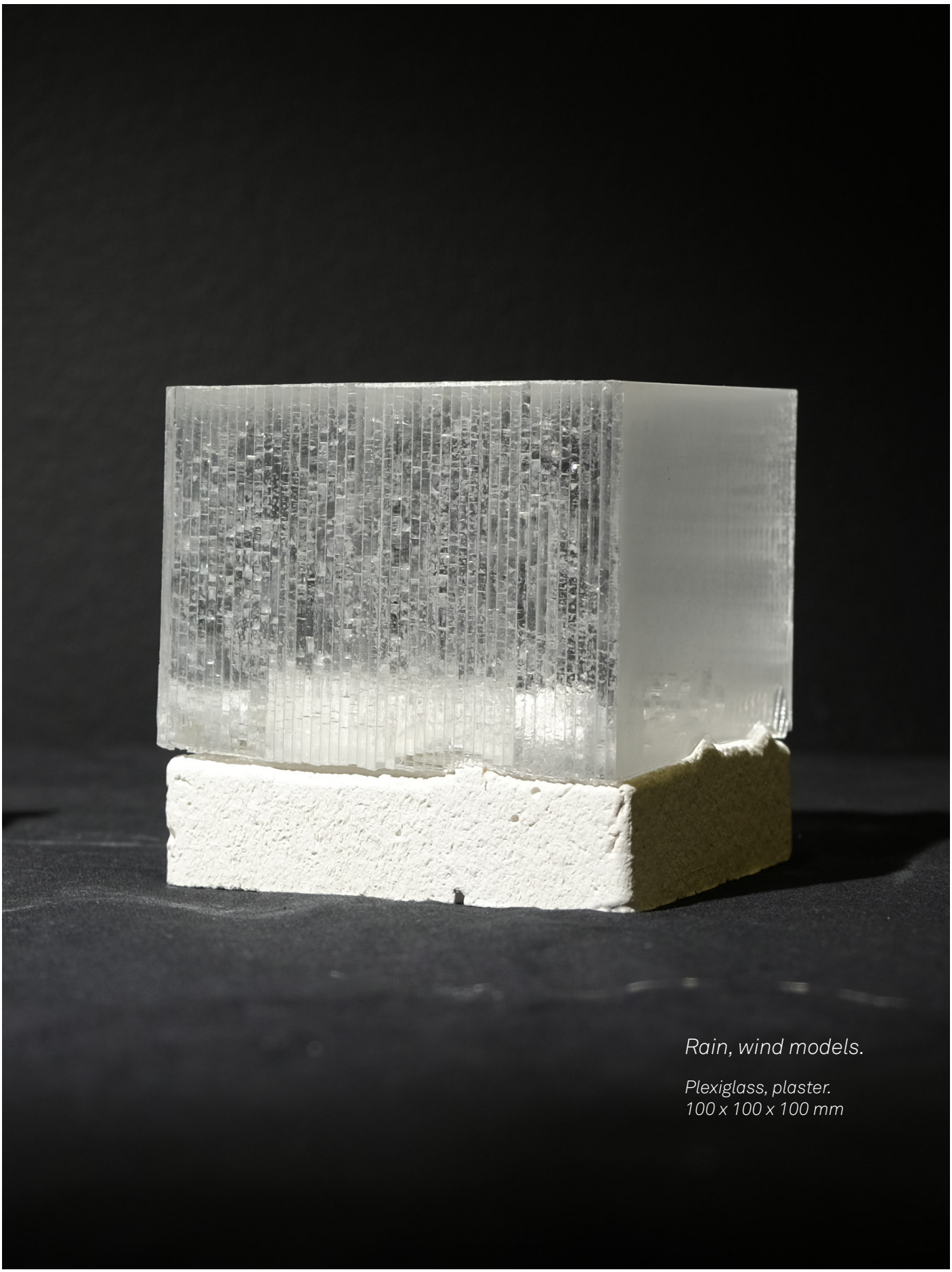
It's an aim to propose an interface that allows one to really experience the present moment with its natural forces. Being in the rain /wind but at the same time not. Observing without being influenced by the body's subconscious defenses. Hearing the sounds of raindrops falling on different materials. One step to the side and it's gone.

By allowing one to be present in nature at it's darker sides, the connection is re-establish. A new dialogue is established.

I believe these are fundamental questions that can help to form architecture enriched with new atmospheres and experiences.

The project introduces the idea of diffuse boundaries through the examples of rain and wind. But other possible phenomenons investigated could be developed with other natural elements, e.g. light, smell, cold, etc.





Rain, wind models.

Plexiglass, plaster.
100 x 100 x 100 mm

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All wind studies were made in Autodesk Flow.

All rain studies made in eVe Rain / Rhinoceros Plug-in.

All other pictures taken by the author.

All schemes, drawings and visualisations made by the author.

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Minimal Shelter

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Chalmers School of Architecture

MPARC / master thesis / autumn semester 2016-2017

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tutor: Kengo Skorick

Chalmers University of Technology

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