Reykjavíkurborg

Reykjavík, 5. desember 2023
MSS23110023

Borgarráð

Gufunesbryggja – Lóðarvilyrði – Re-Inventing Cities– Þorpið vistfélag ehf.

Óskað er eftir að borgarráð samþykki hjálagt lóðarvilyrði til Þorpsins vistfélags ehf., kt. 641018-0230, vegna uppbyggingar á umhverfisvænu húsnæði á lóðinni hafnarhverfi E Gufunesbryggja. Afmörkun lóðarinnar er að finna í fylgiskjali 1 með hjálögðum drögum að lóðarvilyrði en hún er til viðmiðunar og er ekki bindandi fyrir endanlega útfærslu lóðarinnar.

Greinargerð:
Á grundvelli niðurstöðu dómnefndar í samkeppninni *Re-inventing Cities* var teyminu Þorpið boðið til viðræðna um uppbyggingu á umhverfisvænu húsnæði á lóðinni hafnarhverfi E Gufunesbryggja. Um er að ræða lóðarvilyrði til Þorpsins vistfélags ehf., kt. 641018-0230, vegna uppbyggingar á umhverfisvænu húsnæði á lóðinni Gufunesbryggja. Framsal samkvæmt lóðarvilyrðinu er óheimilt nema með samþykki borgarráðs. Lóðarvilyrði er háð því skilyrði að uppbygging á lóðinni verði unnin í samræmi við tillögu og gögn sem teymið sendi inn í samkeppnina. Komi til úthlutunar er verð byggingaréttar 45.000 kr. fyrir hvern heimilaðan fermetra af íbúðarhúsnæði og 20.000 kr. fyrir hvern heimilaðan fermetra af atvinnuhúsnæði, enda sé uppbygging á lóðinni í samræmi við markmið um umhverfisgæði**.** Framangreint fermetraverð er bundið byggingarvísitölu desembermánaðar 2020 (149,2 stig) og skal það framreiknað í samræmi við þróun vísitölunnar til greiðsludags. Lóðarhafi mun greiða gatnagerðargjald skv. gildandi samþykkt um gatnagerðargjald í Reykjavíkurborg. Standist uppbygging á lóðinni ekki markmið um umhverfisgæði á byggingartíma greiðist viðbótargreiðsla fyrir byggingarétt í samræmi við kafla 4 í lóðarvilyrðinu. Hafi breytt deiliskipulag fyrir lóðina ekki verið samþykkt innan tveggja ára frá gildistöku þessa lóðarvilyrðis vegna atvika sem rekja til lóðarhafa fellur lóðarvilyrðið niður. Sama gildir ef ekki er óskað eftir úthlutun lóðarinnar innan eins árs frá staðfestingu deiliskipulags fyrir lóðina með auglýsingu í B-deild Stjórnartíðinda.

Ívar Örn Ívarsson
Skrifstofa borgarstjóra og borgarritara

Hjálagt:
Drög að lóðarvilyrði fyrir lóðina hafnarhverfi E Gufunesbryggja ásamt fylgiskjölum.

Reykjavíkurborg, kt. 530269-7609, vegna Reykjavíkurborgar eignasjóðs, kt. 570480-0149, Ráðhúsi Reykjavíkur, 101 Reykjavík („Reykjavíkurborg“) veitir Þorpinu vistfélagi ehf., kt. 641018-0230, („Þorpið”) (í sameiningu nefndir „aðilar“) eftirfarandi:

-LÓÐARVILYRÐI-

1. Inngangur

1.1. Um er að ræða vilyrði fyrir úthlutun lóðarinnar hafnarhverfi E Gufunesbryggja („lóðin“) ásamt byggingarrétti. Afmörkun lóðarinnar má finna í **fylgiskjali 1** en hún er til viðmiðunar og er ekki bindandi fyrir endanlega útfærslu lóðarinnar í breyttu deiliskipulagi.

1.2. Lóðarvilyrði þetta er háð því skilyrði að uppbygging á lóðinni verði unnin í samræmi við tillögu og gögn (saman „tillagan“) sem teymið Þorpið sendi inn í samkeppnina *Re-inventing Cities* og lá til grundvallar úrskurði dómnefndar sem var gerður opinber í ágúst 2022. Tillagan er **fylgiskjal 2**. Gert er ráð fyrir að á lóðinni verði blönduð byggð íbúðar- og atvinnuhúsnæðis, s.s. félags-, atvinnu- og samgöngumiðstöð, líkamsrækt, baðaðstaða auk veitingastaðar, leikskóla, verslunar-, skrifstofu- og atvinnuhúsnæðis.

1.3. Samkvæmt gildandi deiliskipulagi fyrir Gufunes er gert ráð fyrir að aðalumferð svæðisins geti tímabundið verið beint frá kvikmyndaverinu RVK studios á meðan á tökum standi, en það skuli ekki hafa neikvæð áhrif á aðkomu annarra svæða. Tillagan og lóðavilyrði þetta byggir á því að lokun umferðar vegna starfsemi RVK studios muni ekki hafa neikvæð áhrif á starfsemi á lóðinni eða skerða markmið gildandi deiliskipulags um hlutverk lóðarinnar sem miðstöð samgöngu- og afþreyingar, þar sem m.a. komi saman grænir samgöngumátar, stoppistöð fyrir vatnastrætó og aðstaða fyrir hjólaleigu. Gildandi deiliskipulag staðfestir þetta og er forsenda lóðavilyrðis þessa. Jafnframt er forsenda vilyrðis þessa að réttur almennings til umferðar og útivistar verði óraskaður.

1.4. Stærð og staðsetning lóðarinnar, byggingarmagn o.fl. verður nánar ákveðið í breyttu deiliskipulagi í samræmi við tillöguna. Endanleg mörk lóðarinnar geta færst til lítillega eftir samþykkt breytts deiliskipulags, t.d. vegna gatna, göngustíga og/eða lagna.

1.5. Hafi breytt deiliskipulag fyrir lóðina ekki verið samþykkt innan tveggja ára frá gildistöku þessa lóðarvilyrðis og rekja megi tafir á samþykkt til vanefnda af hálfu Þorpsins fellur lóðarvilyrðið niður. Sama gildir ef ekki er óskað eftir úthlutun lóðarinnar innan eins árs frá staðfestingu deiliskipulags fyrir lóðina með auglýsingu í B-deild Stjórnartíðinda.

2. Umhverfisgæði

2.1. Lóðarvilyrði þetta er háð því skilyrði að fyrirhuguð uppbygging á lóðinni verði í sérflokki hvað varðar umhverfisgæði.

2.2. Til þess að mæla árangur í umhverfisgæðum uppbyggingar á lóðinni verður stuðst við kröfulýsingu sem verður nýtt til þess að meta endanlega greiðslu fyrir byggingarrétt í verkefninu. Í kröfulýsingunni verða tilgreind atriði sem stuðla að því að umhverfisgæði uppbyggingar á lóðinni séu í samræmi við markmið samkeppninnar. Um er að ræða atriði sem, eftir því sem við á, gilda á hönnunartíma, framkvæmdartíma, og/eða eftir lok uppbyggingar á lóðinni. Kröfulýsing skal fylgja með tillögu til borgarráðs um úthlutun lóðarinnar.

2.3. Aðilar skulu koma sér saman um óháðan sérfróðan úttektaraðila til þess að taka út eftirfylgni lóðarhafa á atriðum kröfulýsingar. Lóðarhafi skal bera allan kostnað af starfi úttektaraðila, nema annað komi fram í þessum kafla. Lóðarhafi skal veita úttektaraðila allar upplýsingar og gögn sem hann óskar eftir í tengslum við eftirlit sitt.

2.4. Við umsókn um byggingarleyfi á lóðinni skal liggja fyrir niðurstaða úttektaraðila um eftirfylgni lóðarhafa á atriðum á hönnunartíma. Lóðarhafa er ljóst að forsenda fyrir útgáfu byggingarleyfis er að niðurstaða úttektar sé að lóðarhafi hafi náð a.m.k 80% af markmiðum um umhverfisgæði á hönnunartíma. Lóðarhafi skuldbindur sig til þess að sækja ekki um byggingarleyfi fyrr en fyrir liggur að lóðarhafi hafi gripið til aðgerða á hönnunartíma sem tryggja að framangreint lágmark

sé uppfyllt. Sé niðurstaða úttektar sú að lóðarhafi hafi ekki uppfyllt a.m.k. 80% af markmiðum um umhverfisgæði á hönnunartíma og lóðarhafi hefur ekki gripið til aðgerða til þess að bæta þar um innan sanngjarns frests fellur úthlutun lóðarinnar niður.

2.5. Samhliða lokaúttekt byggingafulltrúa skal gerð úttekt á eftirfylgni lóðarhafa á atriðum á framkvæmdartíma. Það fer eftir niðurstöðu þessarar úttektar hvort að lóðarhafa beri að standa skil á sérstakri greiðslu til viðbótar við greiðslu, sbr. grein 3.1. Um viðbótargreiðslu og forsendur hennar er fjallað um í greinum 4.2. og 4.3.

2.6. Eftir lok byggingartíma er Reykjavíkurborg heimilt að fela úttektaaðila að gera úttektir á eftirfylgni lóðarhafa á atriðum körfulýsingar sem gilda eftir lok byggingartíma. Sé niðurstaða úttektaraðila að eftirfylgni sé ábótavant skal lóðarhafi bæta úr. Hefjist lóðarhafi ekki handa við að bæta úr annmörkum innan sanngjarns frests er Reykjavíkurborg heimilt að láta framkvæma úrbætur á kostnað lóðarhafa. Reykjavíkurborg skal bera kostnað við úttektir nema ef niðurstaða úttektar er að eftirfylgni lóðarhafa á atriðum eftir byggingartíma sé ábótavant, en í þeim tilvikum skal lóðarhafi bera kostnaðinn.

3. Greiðslur

3.1. Verð byggingaréttar á lóðinni er 45.000 kr. fyrir hvern heimilaðan fermetra af íbúðarhúsnæði og 20.000 kr. fyrir hvern heimilaðan fermetra af atvinnuhúsnæði, enda sé uppbygging á lóðinni í samræmi við markmið um umhverfisgæði**.** Framangreint fermetraverð er bundið byggingarvísitölu desembermánaðar 2020 (149,2 stig) og skal það framreiknað í samræmi við þróun vísitölunnar til greiðsludags. Komi til úthlutunar lóðarinnar til lóðarhafa á grundvelli lóðarvilyrðis þessa verður fjallað um gjalddaga greiðslu byggingaréttarins í úthlutunarskilmálum.

3.2. Þorpið mun greiða gatnagerðargjald skv. gildandi samþykkt um gatnagerðargjald í Reykjavíkurborg.

3.3. Lóðarhafi mun greiða önnur skipulags-, bílastæða-, framkvæmda-, byggingarleyfis- og tengigjöld vegna fyrirhugaðrar uppbyggingar á lóðinni.

4. Viðbótargreiðslur

4.1. Ef niðurstaða úttektar, sbr. grein 2.5., er að lóðarhafi hafi náð a.m.k. 80% af markmiðum um umhverfisgæði á byggingartíma greiðir lóðarhafi samkvæmt tilboðsverði sem fram kemur í grein 3.1.

4.2. Ef niðurstaða úttektar, sbr. grein 2.5., er að lóðarhafi hafi náð á bilinu 70-80% af markmiðum um umhverfisgæði á byggingartíma skal lóðarhafi greiða Reykjavíkurborg fjárhæð til viðbótar við tilboðsverð, sbr. grein 3.1. Viðbótarfjárhæðin skal nema mismuninum á annars vegar tilboðsverðinu og hins vegar reiknuðu meðaltali af tilboðsverðinu og markaðsverði byggingarréttarins eins og hann hefur verið metinn af einum löggiltum fasteignasala, tilnefndum af Reykjavíkurborg. Framangreind viðbótarfjárhæð er bundin byggingarvísitölu nóvembermánaðar 2023 (116,4 stig) og skal það framreiknað í samræmi við þróun vísitölunnar til greiðsludags.

4.3. Ef niðurstaða úttektar, sbr. grein 2.5., er að lóðarhafi hafi náð minna en 70% af markmiðum um umhverfisgæði á byggingartíma skal lóðarhafi greiða Reykjavíkurborg fjárhæð til viðbótar við tilboðsverð, sbr. grein 3.1. Viðbótarfjárhæðin skal nema mismuninum á annars vegar tilboðsverðinu og hins vegar markaðsverði byggingarréttarins eins og hann hefur verið metinn af einum löggiltum fasteignasala, tilnefndum af Reykjavíkurborg. Framangreind viðbótarfjárhæð er bundin byggingarvísitölu nóvembermánaðar 2023 (116,4 stig) og skal það framreiknað í samræmi við þróun vísitölunnar til greiðsludags.

4.4. Ef mat fasteignasala á markaðsverði byggingarréttar reynist lægri en verð lóðarhafa, sbr. gr. 3.1., mun ekki koma til viðbótargreiðslu. Við þær aðstæður á lóðarhafi ekki kröfu um endurgreiðslu á mismun á matsverði byggingarréttarins og þess verðs sem fram kemur í gr. 3.1.

4.5. Komi til þess að gerð verði tillaga til borgarráðs um úthlutun lóðarinnar á grundvelli lóðarvilyrðis þessa skal lóðarhafi leggja fram fullnægjandi tryggingu að mati borgarinnar þar sem

Reykjavíkurborg eru tryggðar greiðslur, sbr. 4.2. og 4.3., komi til slíkra greiðslna. Trygging skal liggja fyrir áður en tillaga er gerð um úthlutun lóðarinnar til lóðarhafa. Lóðarhafi skuldbindur sig til þess að hafa slíka tryggingu í gildi þar til niðurstaða um greiðslur, sbr. 4.2. og 4.3., liggur fyrir.

5. Kvaðir

5.1. Eftirfarandi kvaðir gilda að lágmarki um úthlutun lóðarinnar og sölu byggingarréttar hennar.

5.1.1. Kvöð um viðbótargreiðslu lóðarhafa ef vikið er 20% eða meira frá markmiðum um umhverfisgæði.

5.1.2. Kvöð um að lóðarhafi hafi í gildi fullnægjandi tryggingu að mati Reykjavíkurborgar þar sem Reykjavíkurborg eru tryggðar viðbótargreiðslur frá lóðarhafa fyrir byggingarétt á lóðinni komi til slíkra greiðslna.

5.1.3. Bann við sölu/framsali lóðarréttinda og fasteigna á lóðinni, að hluta eða heild, nema með heimild borgarráðs, þar til lóðarleigusamningur hefur verið gefinn út.

5.1.4. Kvöð um að hafi lóðarhafi ekki hafið framkvæmdir tveimur árum eftir úthlutun lóðarinnar þá áskilji Reykjavíkurborg sér rétt til að afturkalla úthlutunina nema Reykjavíkurborg telji að lóðarhafi geti sýnt fram á málefnalegar ástæður fyrir töfum.

5.1.5. Kvöð um heimild Reykjavíkurborgar til að láta framkvæma úttekt á eftirfylgni lóðarhafa á atriðum samkvæmt kröfulýsingu eftir lok byggingartíma, kvöð um úrbótaskyldu lóðarhafa og skuldbinding lóðarhafa um að greiða kostnað vegna úrbóta sem Reykjavíkurborg kann að láta framkvæma í þeim tilvikum sem lóðarhafi hefur ekki bætt úr annmörkum.

5.2. Kvöðunum skal þinglýst á lóðina auk þess sem þær skulu tilgreindar í eignaskiptayfirlýsingu, kaupsamningum, afsölum og lóðarleigusamningum.

5.3. Kvöðunum verður ekki aflýst nema með samþykki Reykjavíkurborgar sem annast gerð og þinglýsingu kvaðaskjals á lóðina.

6. Samþykki fyrir veðsetningu og framsali

6.1. Þorpinu skal heimilt að veðsetja lóðarréttindi sín til að fjármagna þróun verkefnisins og framkvæmd enda séu gatnagerðargjöld og byggingarréttargjald að fullu greitt. Ef það er ekki raunin getur veðleyfi aðeins komið til greina hafi það að geyma skilyrði um greiðslu á gatnagerðar- og byggingaréttargjaldi með andvirði láns.

6.2. Kvaðir sem þinglýstar verða í lóðarleigusamningi, kaupsamningi eða afsölum um einstaka eignarhluta halda gildi sínu þó að til komi nauðungarsala á veðandlaginu að hluta til eða öllu leyti.

6.3. Framsal samkvæmt lóðarvilyrði er óheimilt nema með samþykki borgarráðs.

7. Lóðarleigusamningar

7.1. Lóðarleigusamningur fyrir lóðina verður gerður þegar kaupverð byggingarréttar og öll gjöld sem lögð hafa verið á lóðina frá úthlutun hennar, þ.m.t. gatnagerðargjöld, fasteignagjöld og önnur sambærileg gjöld, hafa verið greidd.

Lóðarvilyrði þetta var samþykkt á fundi borgarráðs þann xx.xx.xxxx.

Reykjavík dd.mm 2023.

f.h. Reykjavíkurborgar	f.h Þorpsins vistfélags ehf.

Fylgiskjöl:

1. Afmörkun lóðarinnar (viðmið).

2. Vinningstillaga Þorpsins.

DRÖG

Fylgiskjal I:
Afmörkun reitsins (drög)





Þorpið vistfélag ehf. proposal for Reykjavík's
competition Reinventing Cities:

CONNECTIONS – THE GUFUNES PIER

The idea as such is based on the pier and the connections it creates:
... to the city centre and surrounding areas as transport centre
... between people, companies, society and the city
... between man and the ocean and the environment

YRKI arkitektar · Þorpið vistfélag · Consulting Engineers Vatnaskil · exa nordic · environice · EYKT · TRUENORTH · Kjarnasamfélag reykjavíkur · A/F · Elding The Whale Watching Pioneers · World Class Iceland

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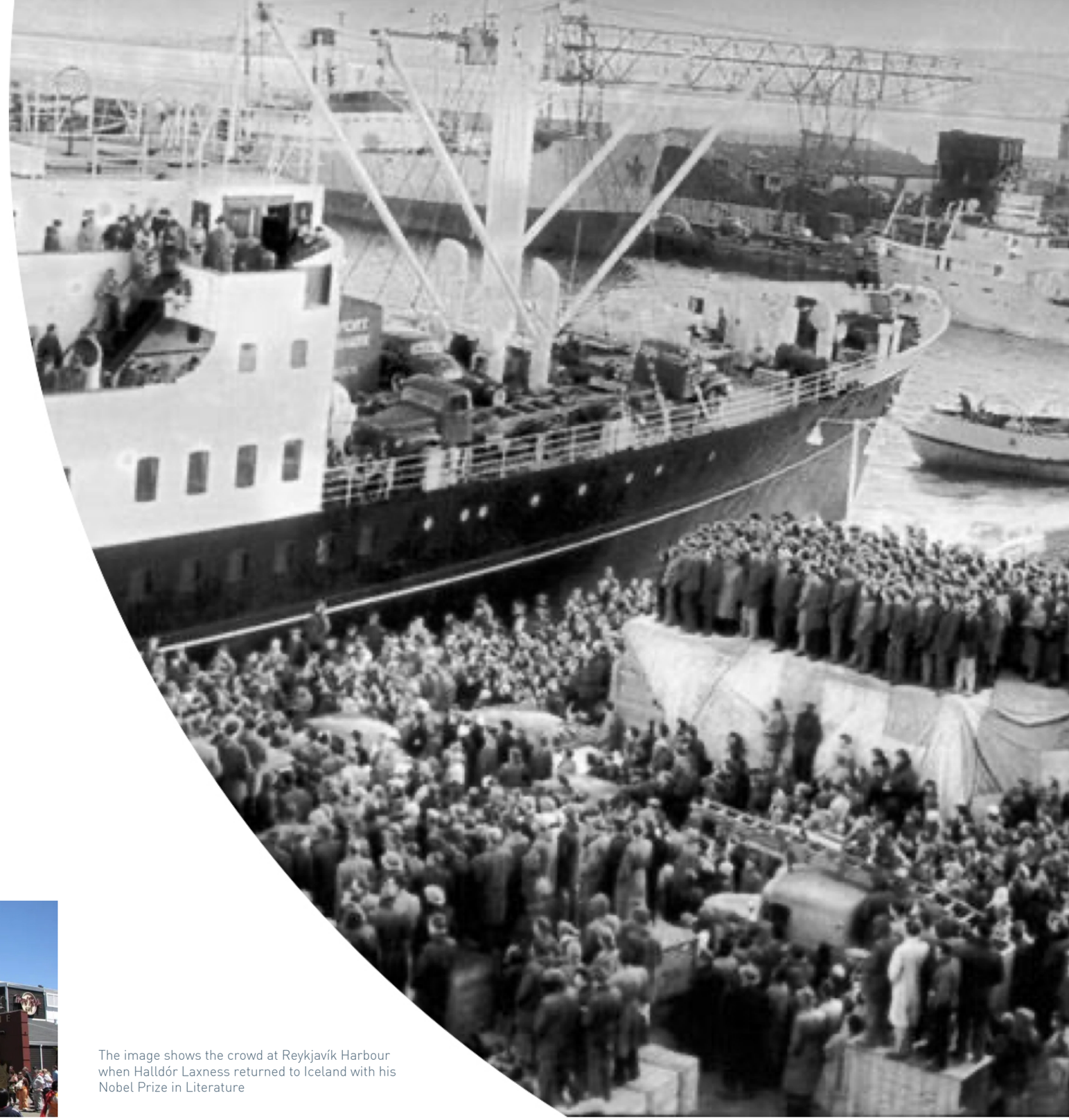
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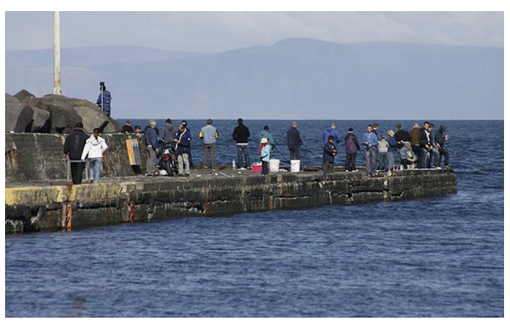
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WHAT IS A PIER?

- Transport Centre
  - -A large part of the country's transport goes through piers; freight, people and tourists on ferries and cruise ships
- Employment Centre
  - -A large part of job growth takes place on piers; fish, people and tourists
- Community Centre
  - -Piers have always been centres in the adjecent communities. People come to meet, chat and fish
  - -Around the world, old piers have become magnets for culture and vibrant life



The image shows the crowd at Reykjavík Harbour when Halldór Laxness returned to Iceland with his Nobel Prize in Literature





30-11-2021


City centre
Viðey
Gufunes

CONNECTIONS #1

-THE PIER AS CENTRE FOR TRANSPORT

The Pier and building will be:

- Grafarvogur's and Gufunes´s connection to the city centre.
- Viðey Island's connection to land.
- The building will transform Gufunes into a centre for new transport possibilities instead of being the end of the line for the bus and the private car's street plan.

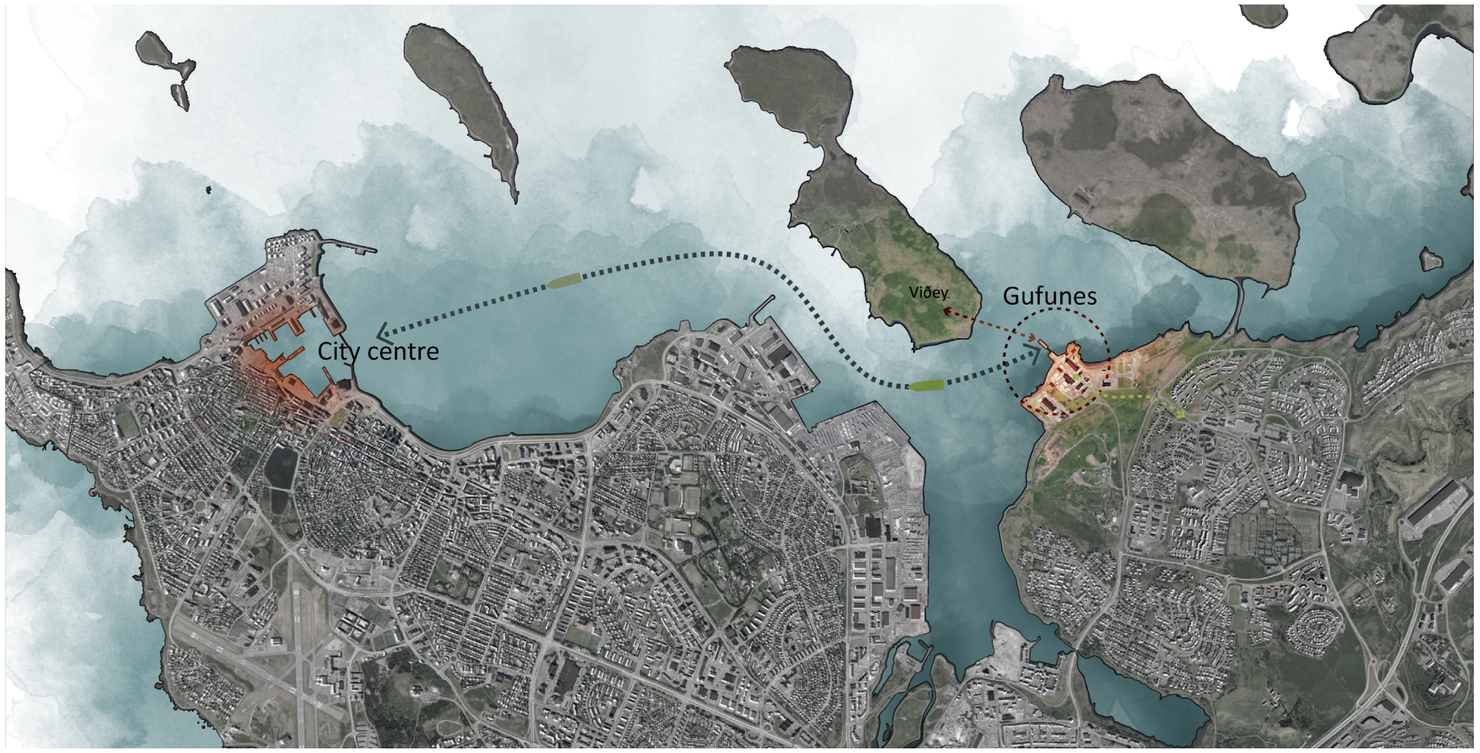


A centre for new connections of green and blue transport





The Pier connects to Viðey island via a footbridge

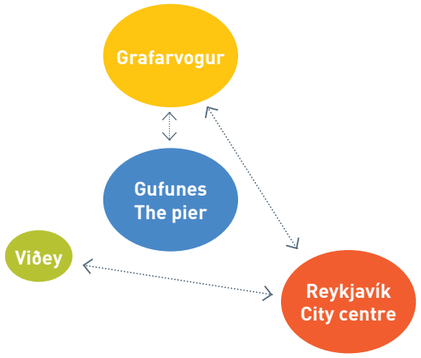




Panorama views from the Pier house rooftop. Viðey island is on the left.

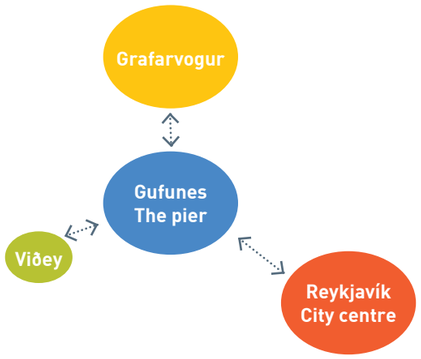
CONNECTIONS #2

-THE PIER AS A CENTRE FOR ECONOMY AND SERVICE



The present transport system sees Gufunes as the end of the line for private cars and buses. The commute between Grafarvogur and the city centre during rush hour is time consuming.

Transport between Viðey island and the city is limited to a ferry from Skarfabakki.



The proposal suggests making Gufunes the centre of green public transport between the city centre and Grafarvogur with a considerably shorter commute than in the present system.

A footbridge of 600 metres connects Viðey island to Gufunes.



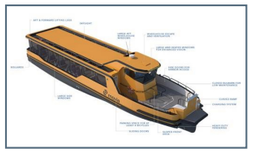




Self driving buses can connect Spöngin, the centre of Grafarvogur (pop. 18.000), with the Pier in a few minutes...
https://navya.tech/en/autonom-shuttle/
https://www.2getthere.eu/







...and from the Pier to the centre of Reykjavík with electric ferries in 18-22 minutes.
On bike via „bus and boat“ the travel time would be around 30 minutes between Grafarvogur and the city center.

https://ipt-technology.com/ships-ferries/
http://www.bbgreen.eu/
https://products.damen.com/en/ranges/ferry/damen-ferry-2306-e3

The building will be an economic centre:

- It connects the film industry to the society and the city by housing:
- Truenorth headquarters
- Pegasus headquarters
- It is a centre for service in the district and connects Reykjavík City to companies and people in Gufunes.
- The district kindergarten on the ground floor in the harbour building
- A restaurant on the pier, entrance from the pier building but the restaurant itself beneath the pier, below sea level
- “The Corner shop”, an organic store on the 1st floor of the Harbour hose



CONNECTIONS #3

-THE PIER AS MAN'S CONNECTION TO THE OCEAN AND THE BEACH

- **Connection between land and sea**

  Heated beach

  Sea swimming

  Sauna

  Wellness centre

  Kayak and sailing centre

- **World Class** Fitness Center

CONNECTIONS #4

-THE PIER AS A CONNECTION BETWEEN PEOPLE AND COMPANIES, INHABITANTS AND ECONOMY

Raw and minimalistic apartments on the upper floors:

- Student accommodation for the film school
- Studio apartments for artists
- Lofts and communal areas for young people and others seeking new and creative living options, based on sharing solutions, collaboration and partnership between people and the environment
- Vegetables grown in roof gardens, heated greenhouses on roofs
- Sharing solutions for living and transport

CONNECTIONS #5

-FUTURE AND PAST, BUILDINGS AND ENVIRONMENT

Building design should echo the spirit of the place and the environment, focusing on ecological solutions with recycled and repurposed materials:

- The harbour house is built on a landfill, with recycled concrete and CLT-units and driftwood-cladding.
- The pier house is built on the footprint of an old pier. Wood from the old pier is used as cladding for the new building.
- Commercial and service activities on lower floors apartments and studios above. Having apartments and employment/studies near each other decreases need for commuting.
- The objective is for pier and buildings to be green and built from sustainable wood.
- The project's carbon footprint will be offset, as will the whole management of the place.
- A self-driving bus and water bus are electric and the electricity's origin certified.
- Residents and staff have access to electric sharing cars.
- Roofs will have sun cells and cultivation for restaurants and residents.
- The project's focus is sociological, with integration of services such as kindergarten, organic no-wrap food store, organic restaurant by student apartments and new, creative accommodation solutions.
- The focus of the design of apartments, accommodation and commercial housing will be that it is easy to transform, enlarge, reduce, based on changeable units.
- Sewage disposal is based on using nutritions from the drainage system; that sanitary water never mixes with black water, but is drained with surface water and green surface water solutions.



The Beach.



The roof gardens of Harbour house.

CONNECTION #6

-THE TEAM

Partners and Teams

- Yrki architects
- Environice - environmental consulting
- Truenorth
- World Class
- Elding
- Eykt
- Arctica Finance
- Vatnaskil
- Exa Nordic
- Kjarnasamfélag Reykjavíkur- Reykjavik Cohousing



The Pier and Harbour houses.

CARBON REDUCTION AMBITION

Carbon neutrality is a central goal of the project, both during its construction, and later on during its operation. This goal will be achieved by choosing the most climate-friendly solutions available within the constraints imposed by technical factors and the requirements of laws and regulations on buildings. Included in this is reuse of building materials and design of innovative alternative materials, low-emission mobility strategies and full utilization of energy and resource streams.

It is clear that under the current circumstances, some greenhouse gas emissions will inevitably occur during the development of the area, despite measures to keep emissions to a minimum. Once every effort has been made to minimize greenhouse gas emissions from the project, countermeasures will be taken to achieve the goal of carbon neutrality. This will be done by sequestering carbon or preventing emissions elsewhere, such as through land reclamation, soil creation, afforestation, wetland restoration and other landscape remediation. All carbon offsets will be based on the purchase of certified carbon credits, domestic or foreign, taking into account ICROA's (International Carbon Reduction and Offset Alliance) criteria[1]. Examples of carbon credits of this type are those offered for sale on the Gold Standard website[2].

Decisions aimed at reducing the carbon footprint of a particular activity must be based on reliable statistical information on the size of the footprint. In this respect, the so-called GHG-Protocol will be used as a basis[3]. This protocol, developed by the World Resource Institute in consultation with the United Nations Framework Convention on Climate Change, is intended for companies that want to keep track of their emissions, i.e., calculate their carbon footprint. This company protocol is used by companies around the world to calculate emissions within three different scopes depending on where the emissions take place in the value chain, (Scope 1-3). Scope 1 covers direct emissions from owned or controlled sources, Scope 2 covers indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company, and Scope 3 includes all other indirect emissions that occur in a company's value chain, both upstream and downstream.

Where possible, the carbon footprint calculations in the project will be based on the above-mentioned protocol, using emission factors from The Environment Agency of Iceland (Umhverfisstofnun)[4], as well as from the Icelandic National Inventory Reports (CRF and NIR).[5] Official UK emission factors will also be considered.[6] This applies equally to the construction and the operation phases of the project. Suppliers will also be required to provide information on the carbon footprint of the goods and services they contribute to the project.

Information on greenhouse gas emissions during the development of the area, and on mitigation measures to compensate, will be published in the project's first annual report. Detailed information on carbon footprints will then be published in annual reports, where, e.g., the development of individual environmental performance indicators can be seen from year to year.



Aerial photo: LUKR/Borgarvefsjá.

1. ICROA, 2021: *ICROA Code of Best Practice*. https://www.icroa.org/code.
2. Gold Standard, 2021: Offset Your Emissions. https://marketplace.goldstandard.org/collections/projects.
3. World Resources Institute, 2004: *The Greenhouse Gas Protocol. A Corporate Accounting and Reporting Standard. Revised edition*. https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf.
4. Umhverfisstofnun, 2021: *Losunarstuðlar*. https://ust.is/loft/losun-grodurhusalofttegunda/losunarstudlar.
5. The Environment Agency of Iceland, 2021: *National Inventory Report. Emissions of greenhouse gases in Iceland from 1990 to 2019. Submitted under the United Nations Framework Convention on Climate Change and the Kyoto Protocol*. https://ust.is/library/Skrar/NIR%202021_15%20april_UNFCCC_submission_FINAL.pdf.
6. UK Department for Business, Energy & Industrial Strategy, 2020: *Greenhouse gas reporting: conversion factors 2020*. https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020.

1. ENERGY EFFICIENCY AND AND LOW-CARBON ENERGY CONSUMPTION

1. Energy Origins and Green Certificates
Almost all electricity (99.98%) produced in Iceland comes from renewable sources (hydropower 68.79%, geothermal 31.16%, wind 0.03%).[7] Furthermore, the capital region benefits from the geothermal resources in Reykjavík and its vicinity that have been exploited to produce electricity and direct heating. Therefore, only renewable electricity and heating will be used in construction and operation of the whole project, with the exception of machinery that still cannot be operated without fossil fuel. In spite of that, green certificates will be obtained in relation to all electricity purchasing.

All retail electricity utilities in Iceland receive guarantees of origin (GOs) from their electricity suppliers, equal to the number of GWh they buy.[8] These GOs are in all cases cancelled by the utilities, which means that the electricity they sell on the retail market is 100% renewable by definition. This means that the utilities can give their customers reliable confirmation in form of green certificates to prove that all the electricity they buy is from a renewable source. These certificates are handed over free of charge and in the project in question all purchased energy must be accompanied by this kind of certificate.

2. Energy Efficient Design
The choice of building materials and alternatives in the design take energy savings specially into account. This is reflected for instance in the selection of insulation materials, window sizes, inclination of glass surfaces (to manage the utilization of sunlight), selection of glass, utilization of heat from ventilation systems, etc. Particular care will be taken to ensure that the emphasis on energy savings in design is not at the expense of other environmental issues.

In order to minimize the energy needs of buildings, energy calculations will be performed at the design stage. This will be done by using computer programs approved by the BREEAM certification system and by the Nordic Swan. Two models are then prepared, one with values reflecting the usual requirements of building regulations and standards, and the other with the design values of the designers. At the implementation stage, more specifically when the moisture protection layer has been installed, air tightness tests will be performed by professionals. This is done to verify that no energy is being wasted. The goal for this project is that the energy consumption of the buildings is compatible with the Nordic Swan criteria, requiring that energy consumption in residential housing does not exceed 70% of the average energy consumption. However, this does not fully apply to the buildings at the site in question, as these are intended for different uses.

Energy efficiency will be further improved by better insulation of district heating pipes during infrastructure construction. This includes better insulation of pipes connecting individual houses to the grid, as well as efforts to minimize the lengths of such pipes.

3. Energy Efficiency of Equipment and Appliances
When choosing electronic equipment, the main emphasis will be on energy efficient appliances, more specifically equipment falling in the top categories (A and B), cf. Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 setting a framework for energy labelling and repealing Directive 2010/30/EU, see also the information in the EPREL database.[9,10] This applies in particular to washing machines, dryers, dishwashers, televisions, electronic screens, light sources and refrigerators and freezers (including wine coolers and other beverage coolers).

In addition to the emphasis on energy efficiency, equipment that runs on electricity or other forms of energy and is purchased for the project, must be certified by the Nordic Swan or the EU Ecolabel. This way it can be ensured that the choice of equipment is based on life cycle considerations, thus eliminating the risk that emphasis on one specific environmental issue, such as energy efficiency, comes at the expense of the overall environmental and social impact caused by the production, use and end-of-life treatment (recycling or disposal) of the device in question. This applies to all categories of devices where criteria have been defined for the Swan or the EU Ecolabel, i.e.:

- Office equipment (printers, scanners, copiers, etc.)
- TVs and screens
- Projectors
- Chargers/energy banks
- Garden tools

Prior to decisions on any purchase of equipment, the possibility of functional purchases will be explored, i.e., the possibility of buying the service provided by this type of equipment instead of buying the equipment as such (Product Service System (PSS)), and whether such an arrangement is preferable from an environmental, social and financial point of view.

The points above will be documented in the project's special procurement policy.

In addition to energy efficient design with respect to lighting needs, energy efficient lighting equipment will be prioritized to minimize energy consumption for lighting, as well as light control that turns off lighting when it is not needed, especially in shared spaces. Outdoor lighting will be controlled by sensors (a sundial).

4. Smart Energy Meters
All electricity usage in the buildings will be monitored through smart energy meters. The installation of these serves three purposes:

1. Smart energy meters make it possible to monitor real time energy usage in different parts of the buildings.
2. Smart energy meters allow for smart purchases of electricity, such as during the night when prices are lower. Currently, there is no hourly differentiation in electricity pricing in Iceland, but the installation of smart energy meters from the beginning will prepare the developer for using opportunities that will open up as the domestic market moves towards a more demand-driven pricing.
3. Smart energy meters allow for a more economic use of electricity in electrified transport in the future.

In relation to the installation of smart energy meters, a feasibility study will be done regarding the installation of power banks (power walls) to further improve energy management and support increased energy efficiency and more economic use of electricity.

Use of district heating water will also be monitored through smart energy meters. As for the electricity, the use of these will give the potential to improve energy efficient use of the geothermal resource and fully utilize the energy and resource streams. The heating facility Veitur will be consulted to prepare for the installation and use of these meters.

Possible use of waste heat will be explored in detail, including waste heat from the project buildings, neighbouring buildings, district heating network and commercial operations. Successful use of waste heat minimizes the exploitation of natural resources and supports the sustainable development of the area.

5. Solar Cells and Wind Turbines

The plan is to install solar cells on the roofs of the buildings and even in the proximity, i.e., where it is not contradictory to other uses, such as green roofs. Even though electricity from solar cells will be a minor part of the total energy consumption, the ambition is to be a forerunner in this field in Iceland and to pave the road towards further development in co-operation with national and international experts in energy solutions. However, having the renewable origin of electricity in Iceland in mind, solar cells or other efforts to enhance in-house green electricity production will not affect the share of renewable energy at all.

In addition to solar cells, the possibility to install vertical axis wind turbines on the roofs will be explored. These turbines are designed and produced by an Icelandic start-up company and can be mounted directly on rooftops.[11] They are not space demanding, having a diameter of approximately 1 m and hight of 1.5 m with installed capacity of up to 500W each. The design is suitable for extreme conditions with wind resistance up to 135 mph (60 m/sec), still being able to deliver power, even in the harshest conditions. The annual electricity production of each turbine is projected to be 1000-1500 kWh. These installations will, obviously, not power the whole buildings. However, the developers of the Gufunes project see this as an opportunity. Here, as with the solar cells, the aim is not only to produce green electricity but also to pave the road for new and innovative solutions. Furthermore, pioneering such mixed green energy generation and utilization elevates the awareness of the local inhabitants for sustainable living and motivates the resilient coastal community.



11. https://icewind.is.

7. Orkustofnun, 2021: *Talnaefni Orkustofnunar OS-2021-T009-01*.
8. See Directive 2009/28/EC of The European Parliament and of The Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.
9. Húsnæðis- og mannvirkjastofnun: *Nýjar orkumerkingar*. https://www.hms.is/rafmagnsoryggi/rafmagnsoryggi/nyjar-orkumerkingar.
10. https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/product-database_en.
11. https://icewind.is.

2. LIFE CYCLE ASSESSMENT AND SUSTAINABLE CONSTRUCTION MATERIALS

1. Materials
The main principles for the choice of material for the buildings are as follows:

1. Life Cycle Approach, taking into account the carbon footprint of the materials and the sustainability performance in general, with an aim of achieving carbon neutrality of the buildings.
2. LCA-software will be used to assist in the choice of materials.
3. BREEAM- and Swan compatible.
4. Special emphasis on health impacts.
5. Durable and low-maintenance materials.
6. EPD requested.

Buildings at the site will be BREEAM-certified. Certification by the Nordic Swan will be sought for the apartment part and the preschool, as Swan criteria exist for these parts of the buildings only. All choice of material will take the Swan criteria for buildings into account (Swan-licenced material or material allowed in Swan-labelled buildings), even in cases where the criteria are not applicable to the building component in question. The criteria for the Nordic Swan are in all cases built on life cycle considerations. Requirements regarding health issues, endurance, high quality and low-carbon footprint are at the core of the criteria.

Given the buildings' proximity to the ocean, they run the risk of being exposed to high levels of salinity and even salty seawater, especially the buildings on the pier. These site-specific conditions influence the choice of material with special focus on tolerance against water and alkalis.

Foundations and perimeter walls at first levels will be constructed with precast concrete elements made from "green concrete". Green concrete refers to concrete mixtures that realize a much-reduced carbon footprint by utilizing waste or residual materials from other industries and smaller quantities of cement. The use of precast elements also has several benefits. Manufacturing of precast elements consumes much less energy than elements cast in-situ. Excess concrete that generally becomes waste material when cast in-situ can be collected and stored in a controlled environment and later crushed and used as aggregates for new concrete. Also, prefabricating concrete allows the material to properly cure in a controlled environment, rather than exposing it to unfavourable weather conditions while curing at a construction site. As a result, the prefabrication minimizes cracking and structural faults within the concrete that could lead to premature demolition, thus promoting longer duration and reducing waste at the same time. The primary structural material at upper levels will be cross-laminated timber (CLT) made out of spruce from sustainably managed sources, either certified by the Nordic Swan or allowed for use in Swan-labelled buildings. It has been demonstrated that utilisation of CLT can reduce the carbon footprint of building projects up to 80%. At the same time, CLT is very strong for its weight and fosters great acoustic, fire, seismic, and thermal properties. CLT panels are prefabricated with high precision which reduces generation of waste and promotes a safer construction site. Elevated pool at the pier will be cast in-situ.

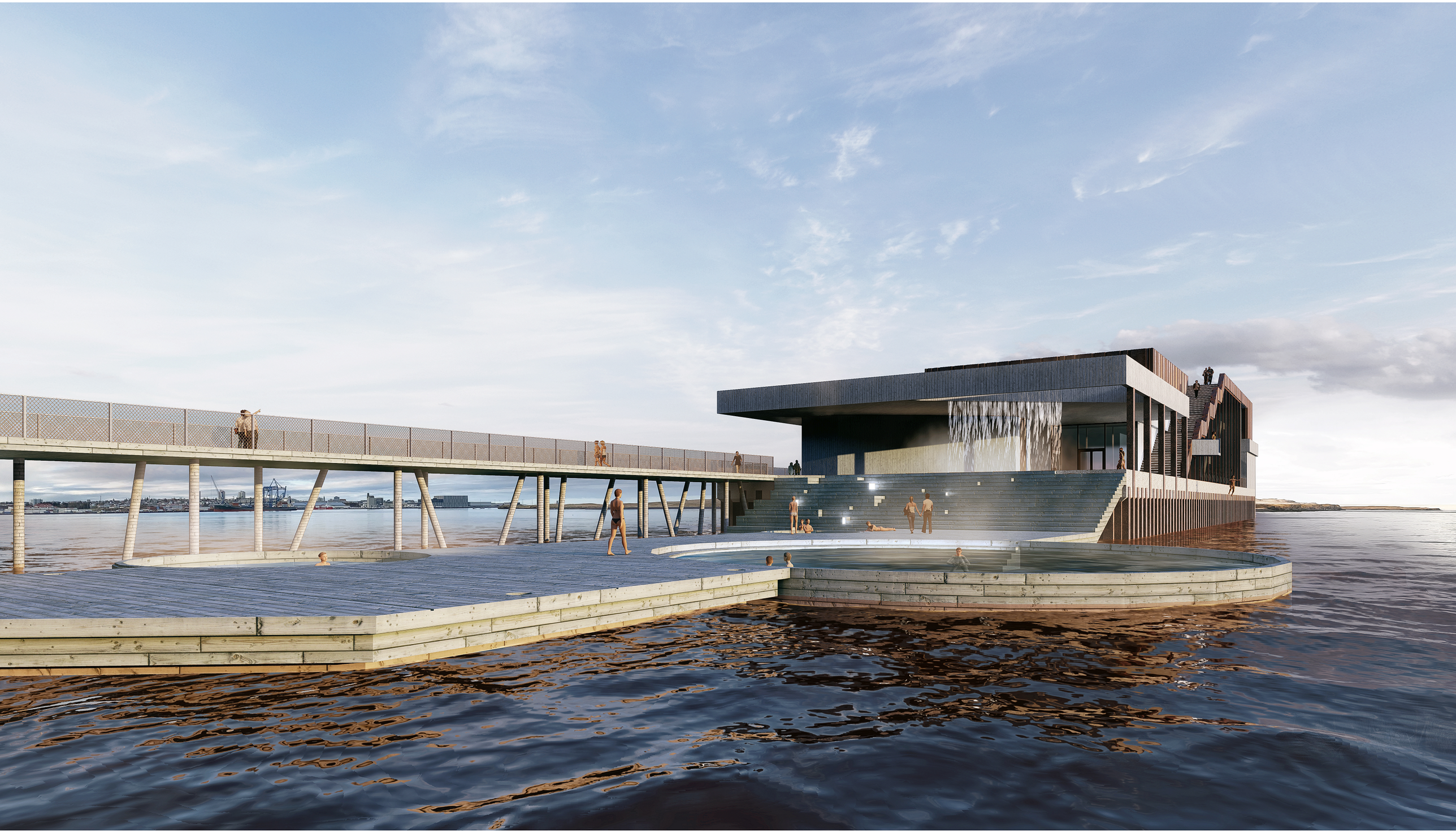
Anywhere concrete will be used, efforts will be made to reduce the carbon footprint to the extent possible, such as through:

- Using low-carbon concrete in co-operation with Icelandic and Nordic R&D institutions
- Using recycled concrete to the extent possible to reduce the use of virgin materials
- Exploring new alternatives to steel wiring in concrete

Domestically produced stone wool will be used as insulation material for the buildings, mostly 150 mm thickness. This material (Icerock) is produced by Steinull, The Icelandic mineral fiber insulation factory in Sauðárkrókur on the northern coast of Iceland.[12] The raw material for this production is mainly locally sourced basalt sand and crushed seashells, including a proportionally small amount of dust binding oil and other ingredients. The fibre itself consists mainly of silicon oxide with a number of other metallic oxides. It is bio-soluble and the limiting temperature is above 1000°C. Only renewable electricity is used in the melting furnace of the factory and the curing oven is derived from natural sources. Because of the melting method used, emissions of waste gases from the manufacturing plant are negligible, compared to conventional insulation plants. According to information from the manufacturer, Icerock is characterised by consistent texture, low shot, low thermal conductivity, excellent resilience, low dust levels, and significantly improved handling characteristics. The 150 mm thickness results in a very high insulation value, leading to a high energy efficiency level within the buildings.

The materials for the facade of the buildings will be carefully selected to meet the highest sustainability standards, such as regarding dimensional stability, durability and maintenance need, including minimal need for surface coatings, even in harsh weather conditions.

Reclaimed wood from the pier will be used for outdoor surfaces to the extent possible and where it gives the highest aesthetic value. This underlines the connection to the past, while at the same time the use of this material contributes to a low-carbon footprint of the whole project. Reclaimed wood from other sites may also be used, as well as driftwood from the Strandir region in north-western Iceland. Driftwood used to be a valuable resource, as a lot of it washed upon the shores in the north, coming all the way from Siberia. In later years, this flow of timber has been diminishing and industrial



The Pier house - view from the seabaths.

timber products taking over at the same time. Driftwood is naturally impregnated, having rolled around in the salty ocean for years or decades. Using it for the buildings in Gufunes is yet another reminder of the use of local resources in the past. All other wood must be FSC-certified and be permitted in Swan-labelled buildings.

Stone facade panels with a surface of aggregated natural stones may also be an option where extra weather resistance is needed. Furthermore, recycled concrete might be used for exterior cladding to some extent.

Swan-labelled windows will enter the market at the beginning of year 2022. These will have extraordinarily high insulation values at approximately U=0,82 W/m^{2}K. Swan-labelled windows will be chosen to the highest extent possible, see also chapter on energy efficiency.

Reclaimed wood will be used for indoor flooring, depending on the availability. This material is lightweight and might need some reinforcement and additional treatment to reduce potential problems related to insects and degradation. Hemp claddings will also be used in the buildings to the extent feasible. However, the supply of this material is still somewhat limited. Hemp concrete blocks may even be used. These are lightweight, dramatically reducing the energy used to transport the blocks. Furthermore, Hempcrete is sturdy, has good thermal and acoustic insulation qualities and is fire resistant. Additionally, it is meant to be CO2 negative, meaning it absorbs more CO2 than it emits. Hemp itself is a fast-growing and renewable resource.

Outdoor floors, roof gardens and stairs are clad with Icelandic basalt and bluestone tiles.

Recycled fishing gear will be used to the extent possible in railings, to frame in the play area around the kindergarten on the 1st floor of the Harbour House. These will be specially produced by melting and moulding wasted fishing gear, collected from Icelandic harbours. The purpose of this is not only to extend the lifetime of the material, thereby supporting the circular economy, but also to underline the importance of the ocean for the history of Iceland and to educate about the interaction between people and the ocean, including the preservation of marine life and the prevention of ocean pollution and acidification caused by climate change.

2. Other Construction-Related Issues

The site is located within a former industry area with a fertilizer production plant as the main actor. The operation of this plant ceased in 2002. In 1967 to 1992, a landfill site for waste from the whole Reykjavík area was operated in Gufunesvogur, close to the shore south of the site. Contamination from these activities, especially from the fertilizer plant, might still be present in the soil. Research on possible contamination will be performed prior to the construction. If contamination is found in the area, it will be removed by the developer and transported to an appropriate disposal facility. The results from the research and documentation on the disposal of contaminated soil will be disclosed.

At the core of the project is the ambition to transform old direct and indirect assets or qualities of the area, as it used to be in the times of the fertilizer plant, to new assets or qualities accessible for everyone in the present, as well as for future generations.

The project has the ambition to influence the development of the capital area and other areas as well, by setting good examples and paving the way for innovative and sustainable solutions. This entails that educational values must be taken into account in all phases of the project. As a part of these efforts, suppliers will be requested to explain how they are going to minimize their carbon footprint while working on the project. An environmental policy and a carbon footprint projection should be attached to offers and carbon pricing will be used to give suppliers who are partly or fully using zero-emission cars and machines higher ratings.

The perimeter of the existing pier is constructed from steel sheet piling with a concrete cap beam and encloses large volumes of materials that would otherwise need to be transported to the site to create a harbour for the water taxis. In addition, this creates good conditions to drive steel piles directly through the landfill for foundations for the new pier building that will offer unique and exciting experiences. The integrity of the existing steel sheet piles will need to be evaluated and possible rehabilitating measures undertaken. In that case, excessive corrosion can be removed, and the steel sheet piles can be reused as formwork.

As noted above, material from existing structures on the site will be used for the buildings to the extent possible. If some of this material cannot be used at the site, despite fulfilling quality requirements, this will be quantified and moved to central material inventories.

12. https://steinull.is.

3. LOW-CARBON MOBILITY

Climate challenges in Iceland and low-density population has resulted in high car dependency. This can be partly alleviated through proper design strategies focusing on sustainable travel measures. Prioritising such measures allows for suitable connections in the transportation network that supports walking and cycling first, then public transport and accommodates essential travel through car use.

Low-carbon mobility is at the heart of this project. This is reflected in:

- Carbon pricing being used in choosing suppliers
- Absence of fossil fuel infrastructure
- Micro-mobility design
- Electric mobility infrastructure
- Electric or methane fuelled public transport at sea (ferry to downtown Reykjavík)
- Shared economy solutions (electrical zip-cars etc.)
- Design of bicycle- and pedestrian paths

The proposal transforms Gufunes from being the final stop, to the centre of transportation. Today, the area is at the end of the public transportation system and poorly connected to the centre of Reykjavík. There are no connections to the city's bus system, and as a result, staff and residents largely depend on private vehicles for transportation.

By redefining the area at the pier as a centre for public transport, the location of the neighbourhood changes from the outskirts to the centre, connecting the northern part of the Capital region (Mosfellsbær, Grafarvogur, Úlfarsholt, Grafarholt) to Reykjavík's city centre.

Currently, methane is being harvested from food and green waste from the Capital region at a landfill site, about 5 km distance from the project site. The methane is being used for relatively few cars, garbage collection vehicles, buses and for a couple of industrial companies in the Capital region.

The pipe-infrastructure for the methane transport lies only 500 m from the project site, which gives the opportunity to utilize this resource for the public transport system within and in connection to the project. Methane has about 28 times the global warming potential of CO_2 over 100 years (GWP100). Turning the methane into CO_2 by burning, even just by flaring at the landfill site, significantly reduces the carbon footprint of the waste management. Still more total reduction is achieved when the methane replaces fossil fuel which otherwise would have been used to power car, tractors, trucks or construction machinery of any kind. Feasibility study will be performed as well as a comparative assessment of the life cycle carbon footprint from methane- and electric fuelled vehicles prior to the selection of the main energy source for the public transport systems. Other available local resource streams for potentially sustainable and ecological fuel for transportation will be explored for a multi-fuelled approach for the area for more resilient energy usage.

The proposal considers:

- Water bus in the form of an electric or methane fuelled ferry that connects the pier in Gufunes with Miðbakki in Reykjavík harbour. The transport time between locations will be within 15 minutes
- Connection of the pier with mid-Grafarvogur neighbourhood above Gufunes with its 15-20 thousand residents, via self-operating electric bus

The above plans will make the Gufunes Pier the core of a new transportation revolution for the large district of Grafarvogur, where public transport will become a much more efficient means of transportation than private vehicles. This will be reflected in shorter commuting times. An individual will be able to travel from the centre of Spöngin in Grafarvogur to the city centre in less than half an hour by bicycle, self-operating bus and ferry, while the private vehicle takes much longer to travel the same distance in the morning and afternoon via Gullinbrú and Ártúnsbrekka. The ferry will be designed to take bicycles onboard, making it easy to bike from the harbour in downtown Reykjavík to workplaces in city centre.

Residents and staff at the site will have access to electric sharing cars, operated in collaboration with car sharing organisations. Parking lots with charging stations will be dedicated to these cars. Infrastructure for charging electric bikes and scooters will also be provided.

The area in question is not large, which means that the design of transport infrastructure is less extensive than the design of large residential areas or cities. For instance, the design of a system of walking and biking paths is not a part of the project. However, the area is supposed to become the centre of a proportionally large adjacent residential area and the design principles will be useful as guiding lights in spatial planning elsewhere. The people living and working in the area, as well as guests who use the premises within the area, will be affected and hopefully bring the message forward within their networks (ripple effect), causing a widespread drift in attitudes and behaviours.

To assess the project's success in promoting low-carbon mobility, an annual survey will be performed to map transport behaviours and the use of the low-carbon infrastructure. Results will be published in the annual report. Examples of indicators will be km driven in electric sharing cars, kWh consumed at charging stations, number of ferry passengers and the division between different modes of commuting.

4. CLIMATE RESILIENCE AND ADAPTATION

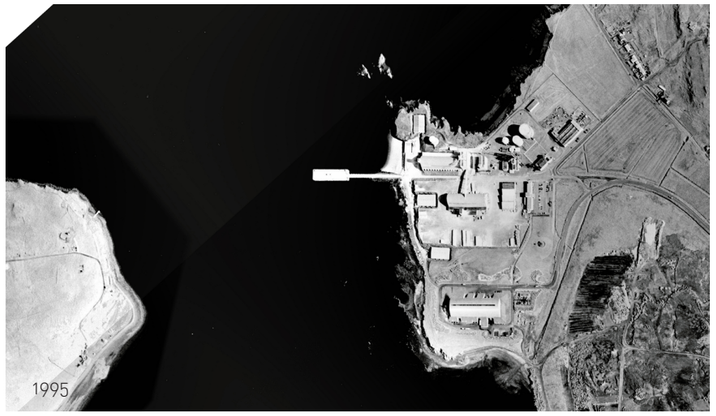
The Icelandic climate varies drastically at different times and reflects the country's high latitude in the Northern Atlantic Ocean. The sun altitude is relatively low all year round and seasonal variations in daylight illuminance result in near constant daylight near summer solstice but low and short light conditions during winter. Frequent low-pressure systems move through the area, which is governed by relatively high ocean temperatures provided by the North Atlantic Current. The relatively temperate climate for its latitude experiences seasonal variations in monthly average air temperatures from about 1 °C to 12 °C with a few degrees' variance for each month. Moreover, air temperature frequently oscillates around freezing point in winter resulting in frequent freeze-thaw sequences, affecting pedestrian and transport safety.

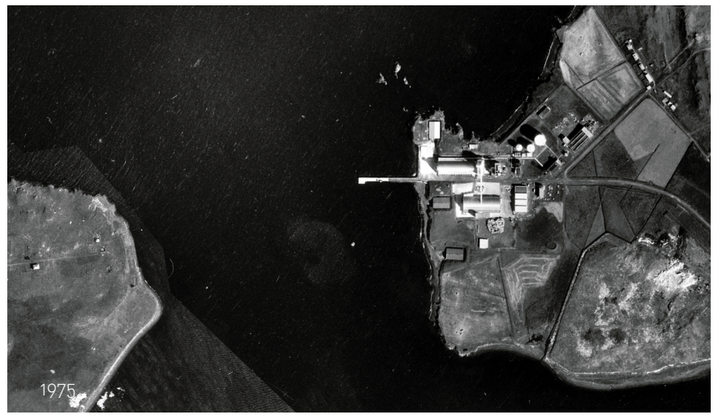
In response to global climate change, temperature in Iceland is expected to increase and possibly have greater variations. Furthermore, precipitation is expected to increase and have different frequency and intensity. Extreme conditions are expected to be more frequent and even more pronounced. Sea level is expected to rise, and harsher wave conditions can be expected. Flora and fauna may change as a response to the changed climate.

1. Climate Resilience

The design strategies of the project embrace the climate and geological conditions in the region that shape the natural environment. Furthermore, the design recognises the resilient urban and rural development that has dealt with climate and environmental characteristics within the region and in other parts of the country. The harsh climate has shaped the Icelandic landscape for millennia and its habitants for centuries, giving rise to a highly adaptive community that has adopted modern international measures for building the urban and rural environment while









Aerial photo 1954: National land survey of Iceland.
Aerial photo 1975-2015: LUKR/Borgarvefsjá.



maintaining the advantages of long-term local knowledge and craftmanship.

The design approach will challenge the climate variables to equalize their effects against comfort and safety and to secure increased habitability of the area, its overall attractiveness and longevity in response to climate change. Furthermore, the design will concurrently build on the resilient general strategies applied in Iceland for addressing climate challenges and modern international strategies for sustainable urban living.

Planning and design arrangements will consider thermal comfort of the urban environment during both summer and winter and avoid hazardous conditions for pedestrians during frequent freeze-thaw sequences in winter. To mitigate icy conditions in pedestrian areas and parking lots, return flows from residential buildings' heating systems, as well as waste heat from the district heating system, will be utilized for snow melting systems. Design and implementation strategies will consider the overall energy utilization in the area, including opportunities to fully utilize resource and energy streams in a sustainable manner. Urban drainage based on blue-green infrastructure will be applied with that in mind and to provide urban flood resilience and minimize utility system capture of precipitation.

The design process allows for a robust and detailed analysis of the wind climate using Computational Fluid Dynamics (CFD) numerical modelling methodology. The team has already been successful in implementing such analysis in Icelandic conditions to support planning arrangements and individual building designs as well as strategizing and designing proper mitigating measures, such as building arrangements, vegetation, landscaping and sheltering walls.

Similarly, detailed analysis of the expected sea-level rise will be performed as well as for other coastal responses to climate change, such as wave climate. This will underpin mitigation measures specific to the coastal site in question and ensure precedence to sustainable coastal development in the Capital area.

Flexibility will be incorporated into the design to ensure resilience towards environmental and social changes, both in response to climate change and any possible economic and demographic developments in the area. The importance of mitigating for factors such as age structure, social views and interests is recognized and how it may balance variable demand for residential and commercial spaces, as well as leisure opportunities.

From an environmental point of view, the resilience includes ensuring to the highest extent possible a positive long-term development of the area, despite climate change. To cope with this, the design will take rising sea-levels into account, while embracing flexibility when it comes to new technical solutions that might be unknown at present.

2. Transportation and Climate Constraints

For residents and local companies, it is important to address climate constraints. Furthermore, non-restricted or at least little restricted transport within the area with respect to climate must be facilitated, particularly during winter months, to fulfil the same objective. The means of transport within the area supporting that would also preferably mitigate other constraints such as noise pollution, visual pollution and environmental impacts.

In Iceland, the private car has been largely favoured in the past and most of the local transport infrastructure has focused on that. This allows, for the most part, people to get around fairly safely and comfortably in harsh weather conditions.

Other means of transport have gained popularity in recent years, for example bicycling, and there is an increased focus on improved public transportation. These alternative means of transport are more affected by climate conditions and for people to utilize them they need to be as safe and comfortable as possible. For bicycling, mitigating strategies for strong winds along main bike paths must be considered. Also in the built environment, abrupt changes in wind, for example when passing corners or edges of larger buildings, must be avoided. For public transportation, such as buses, people are more likely to use those if they do not have to walk long distances to catch a bus, if their route to the bus stop is not prone to hazardous winds, and if the bus stops themselves are a comfortable and safe environment.

Overall, since local residents are likely to travel frequently within the region, their safety and comfort during their local travels is just as important as in their residential dwellings and recreational areas. The role of local transport in mitigating climate and other constraints can thus be very significant, so that residents feel comfortable and safe and are willing to live and work in the area. Future means of transport should be considered, since emerging technologies may play a role, and the general design and planning of the region, including landscaping, may support local transportation that benefits local residents from a climate perspective as well as other factors that may influence the attractiveness of the area, such as noise and visual pollution.

3. Risk Assessment

The project's emphasis on resilience includes the development of a special risk assessment as a part of the design process, both for the area as a whole and individual structures and activities. This risk assessment is intended to shed a light on the primary environmental risks in coming years and decades that could potentially affect the condition

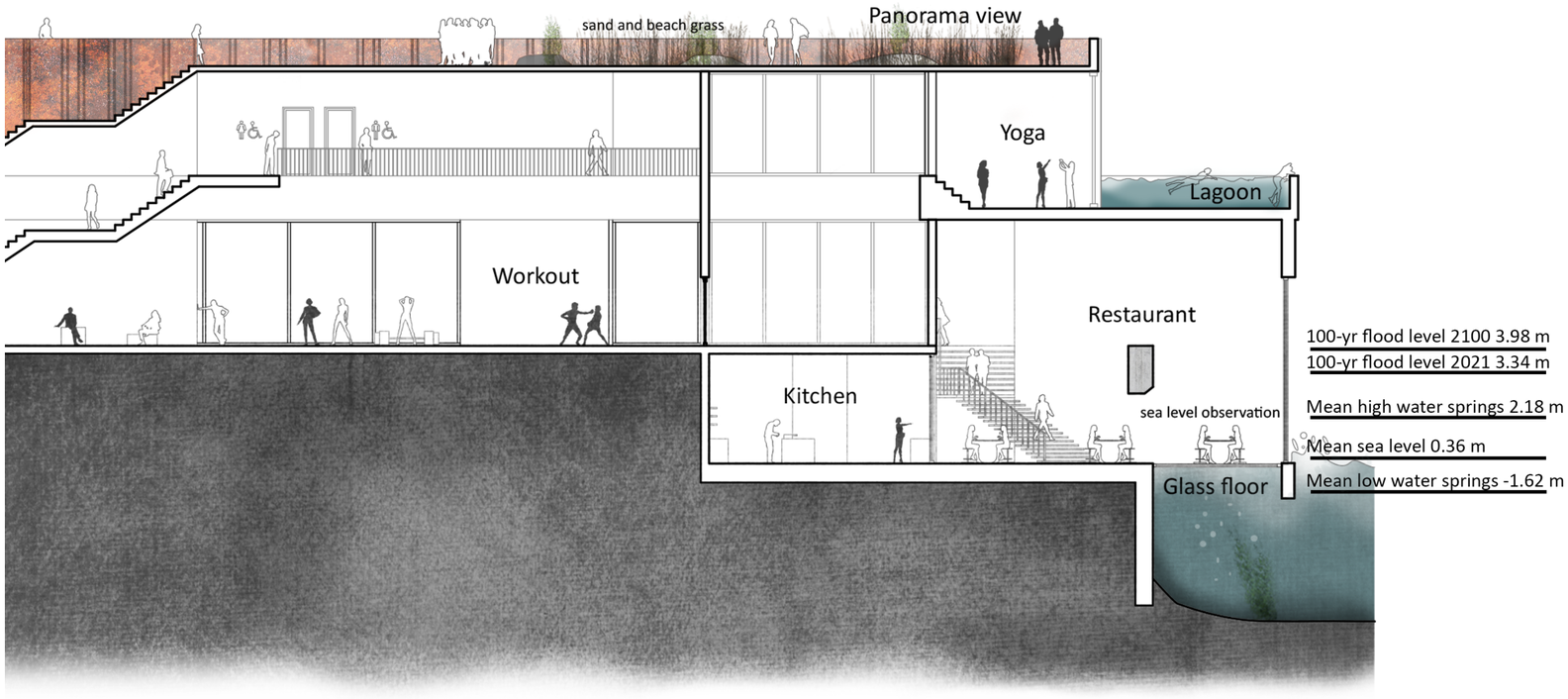
of the structures and the safety of those who use them, including events related to extreme weather events (heavy rain, storms, floods, etc.), their synergistic effect, etc. This includes, e.g., an analysis of which activities or groups of people will be affected by a particular event. The main parts of the risk assessment will be:

- Event definition
- Potential damage caused by the event
- Probability of the event (in the near future and in the more distant future)
- Risk (= damage x probability) (numerical value)

On the basis of the risk assessment, solutions and implementations will be selected to minimise the likelihood of events of the type in question and to minimise the damage of the events that occur nonetheless (see also discussion of the adaptation plan below).

4. Adaptation Plan

In connection with the design of the project and on the basis of the risk assessment, a special adaptation plan for climate change will be prepared, which will specify measures that are intended to be taken in order to minimize the negative effects of climate change during construction, but mostly during operation of the area. The plan may, as appropriate, cover actions such as the education and training of staff in construction and operations, communication with stakeholders, environmental monitoring and the integration of procurement policies.



A section through the Pier house.
Resilience to rising sea levels: The design allows for awareness of the tidal range and rising sea levels in the near future.



The Harbour and the Pier houses.
The beach in the foreground.

5. ECOLOGICAL SERVICES FOR THE NEIGHBOURHOOD AND GREEN JOBS

The project aims at becoming a "showcase" where the public and operators outside the area can learn about sustainable solutions in the operation of population centres and local services.

1. Services
A kindergarten will be located on the ground floor of the Harbour House. All furnishings and equipment there will comply with the Swan's criteria for kindergartens[13] and the kindergarten will be a Green Flag school.[14]

Great emphasis will be placed on environmentally friendly services for residents and operators in the area. All parking spaces by the Harbour House will be equipped with charging stations for electric cars, with a minimum 7 kW capacity. At the house, there will also be charging stations for electric bikes and electric shuttles, (see also section 1 and section 3).

The building is expected to have a small shop with necessities, where only eco-labelled (Nordic Swan, EU Ecolabel or Blue Angel) or organically certified products (Tún Organic Certification or other labels that meet EU Regulation on Organic Production and Labelling of Organic Products (Regulation (EU) 2018/848) will be offered. Emphasis will also be placed on unpackaged products and, to the extent possible, products produced by the residents of the house (local production). The shop will apply for Nordic Swan certification based on the Nordic Swan criteria for grocery stores.[15]

In connection with the store, a simple lending system will be set up in the spirit of a library (Library of things) where people can rent sewing machines, tools, walking equipment or the like. Connections will also be built with larger lending systems (especially for tools and outdoor equipment) to make it easier for residents to use their services. In connection with this, simple repair services will also be offered, such as for repairs of clothing and other textile products, as well as advice on repairs of small electrical and household appliances.

An effort will be made to establish a digital marketplace that makes it easier for residents and operators to exchange tools and equipment, incl. baby clothes and baby products, for a fee or free of charge.

A restaurant area will be designed for the 2nd floor of the Harbour House. This area will serve multiple purposes, such as being a community loft for young individuals, a café/canteen for residents and daily workers during the day, and a place to meet in the evening. This restaurant will apply for Nordic Swan certification based on the Nordic Swan criteria for food services.[16] The same applies to the larger restaurant in the Pier House.

2. Green Jobs
The services described above will result in the creation of a handful of green jobs. The definition of green jobs is most commonly derived from The US Bureau of Labor Statistics (BLS), who originally presented a comprehensive definition of the concept in 2010.[17] According to this, green jobs are:

A. Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources.
B. Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources.

The former (A) includes jobs linked to goods or services related to:

1. Energy from renewable sources.
2. Energy efficiency.
3. Pollution reduction and removal, greenhouse gas reduction, recycling, and reuse.
4. Natural resources conservation. Products and services that conserve natural resources, such as in relation to organic agriculture and sustainable forestry; land management; soil, water, or wildlife conservation; and stormwater management.
5. Environmental compliance, education and training, and public awareness, including products and services that enforce environmental regulations; provide education and training related to green technologies and practices; or increase public awareness of environmental issues.

The latter (B) includes jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources. This includes jobs related to:

1. Energy from renewable sources. Generating electricity, heat, or fuel from renewable sources, primarily for use within the establishment.
2. Energy efficiency. Using technologies and practices to improve energy efficiency within the establishment.
3. Pollution reduction and removal, greenhouse gas reduction, recycling, and reuse, with focus on the establishment.
4. Natural resources conservation. Using technologies and practices within the establishment to conserve natural resources.

The estimated number of green jobs within the Gufunes project is as follows (with references to the definitions above):

1. Preschool teachers: 8 jobs (A5).
2. Eco-labelled restaurants: 8 jobs (A4, A5).
3. Green retail shop: 4 jobs (A3, A4, A5).
4. Library of things: 1 job (A3, A5).
5. Co-ordinator of education: 1 job (A5)
6. Management of charging stations and other green infrastructure: 1 job (A1, A3, A5).
7. Waste collection and sorting: 1 job (A3, A5).

In total, the establishment is projected to create 24 new (permanent) green jobs on site. Additionally, the establishment will indirectly support the creation of green jobs in category B (and even A) within the operations of sub-contractors, such as in waste management, gardening, cleaning, and maintenance.

The estimated number of green jobs, directly linked to the establishment, will be documented in the establishment's annual report, explained in the form of performance indicators, showing the current status and last years' trends in number of green jobs and the division of these between the above categories.



The view from the Harbour house patio to the Pier.

13. Nordic Ecolabelling, 2021: *Nordic Ecolabelling for Small houses, apartment buildings and buildings for schools and pre-schools.* https://www.svanen.se/contentassets/7abc01dd391b4dc4b6d7d5627574cd20/criteria-document_089_small-houses-apartment-buildings-and-buildings-for-schools-and-pre-schools-089_english.pdf.
14. https://landvernd.is/graenfaninn.
15. Nordic Ecolabelling, 2021: *Nordic Ecolabelling for Grocery Stores*. https://www.svanen.se/contentassets/85ca4e52dcd74b1bb41459ea7863061d/criteria-document_079_grocery-stores-079_english2.pdf.
16. Nordic Ecolabelling, 2021: *Nordic Ecolabelling for Food services and conference facilities (without accommodation).* https://www.svanen.se/contentassets/d1ca095de91d459492fa9410ba0123f4/criteria-document_110_food-services-and-conference-facilities-110_english.pdf.
17. The US Bureau of Labor Statistics (BLS), 2013: The BLS Green Jobs Definition. https://www.bls.gov/green/green_definition.htm.

6. SUSTAINABLE WATER MANAGEMENT

1. Water Collection and Protection in the Capital Area
The project aims to build on the historic resilience in the Capital area's water resources development and utilization, and set a precedence for sustainable use of this valuable resource in the urban environment. In particular, by lowering water demand and limiting the distribution of water prone to protection measures to the outskirts of the city.

The Capital area and its vicinity experiences annual precipitation ranging from about 1000 mm by the coastline to about 4000 mm at higher elevation. Most of the precipitation infiltrates the land surface to the underlying groundwater table where it is transported via lava dominated aquifers to the ocean. Conversely, a relatively small part of the precipitation is accumulated in surface streams. The great abundance of groundwater in productive and accessible aquifers leads to harnessing of high-quality drinking water by the local utilities in the upper outskirts of the city region. To date, this water is supplied to consumers without any mechanical, chemical or optical treatment, in large thanks to extensive delineation of groundwater protection zones and associated land use regulation in the Greater Reykjavík area that have been regulated since 1969. These restrictions have been revisited several times since then, in response to various factors, including urban development, changes in water utilization strategies, and advancements in hydrogeological knowledge. The protection regulations are currently governed and managed through the Association of Municipalities in the Capital Area who strive to defend the resource in the foreseeable future parallel in the face of great expansions of the urban development.

Despite the abundance of pristine water at present in the primary collection area, measures must be taken to maintain the future availability and quality of the water for the rapidly growing city. The resource must be treated with utmost respect and care. It is therefore imperative that these measures will be implemented into the city development through planning and design strategies, as well as increased inhabitants' awareness. The Gufunes project will provide important precedence in these matters for the Capital area by careful selection of water-consuming and utilization components to reduce water consumption at all stages within the area. This includes direct water use in inhabitants' living quarters for toilets, showers, faucets, washing machines etc. Furthermore, water for irrigation and other environmental uses will not be taken from the district system, to avoid unnecessary transport of water from the water protection areas. Rather, sustainable urban drainage (SUDs), or in other terms blue-green infrastructure, will be implemented. Together with the utilization of greywater, this will secure necessary water for irrigation purposes. This strategy further helps to secure future supply of water to the city inhabitants during periods of drought and generally when water scarcity may be affecting the district water system and delivery.

2. Direct Use of Geothermally Heated Water and Full Utilisation of Energy and Resource Streams
The implementation of cascading energy use, where energy in the form of hot water for example, is passed between a cascading series of users until its heat is no longer useable, guarantees that the energy stream is utilized to its full potential with minimal waste. Taking the extra step and utilizing the heat depleted water for some assigned purposes furthermore helps to fully utilize the resource stream.

Reykjavík Energy provides district heating to the city and many of the neighbouring communities. The hot water stems from two primary sources, low-temperature geothermal fields within the city, and high-temperature geothermal fields outside the city margins. At the low-temperature fields, geothermal water is harnessed and directly supplied to consumers within certain parts of the city. At the high-temperature fields, however, electric power is produced utilizing the geothermal brine and steam. The effluent fluid is then used to heat up freshwater pumped from the groundwater resource andthe heated water supplied to the city via district heating systems.

Until recently, this water was only supplied to limited areas within the Capital area, separate from areas that are supplied with the low-temperature geothermal water. Experiments carried out by Veitur Utilities have demonstrated that these different sources can be used interchangeably in different areas. This helps Veitur taking important steps to meet two major goals, resting the low-temperature fields to support their future sustainable utilization, and utilizing excess heated water from the high-temperature geothermal fields, particularly during summer. Rather than discharging vast amounts of excess heated water back into the groundwater, which they are only temporarily allowed to do, Veitur hopes to use the excess water in parts of the city to where low-temperature geothermal water has historically been supplied. Furthermore, additional measures for proper utilization of the heated water will add flexibility to future development of the combined heat and power plants as well as for Veitur's operational schemes.

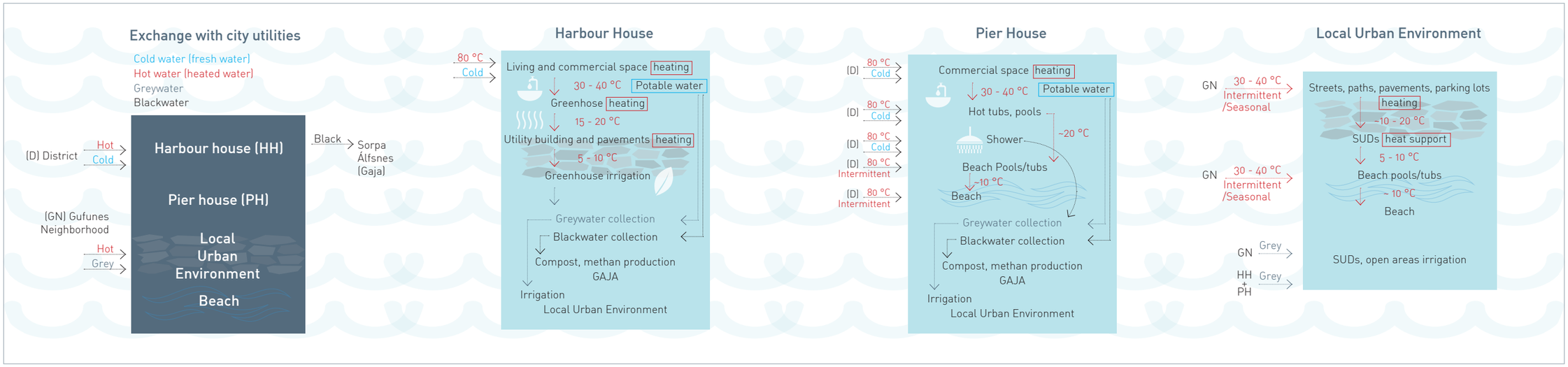
The project aims to cooperate with Veitur on providing such additional measures by supplying the heated water not only to the building networks at the site, but also as the bases for the full utilization of energy and resource streams in the area. As such, the heated water is expected to be delivered to the site at near 80 °C where it is supplied to three main locations, the Harbour House, the Pier House and a beach distribution valve. In each of these locations, the heated water is utilized in a cascading series to various degrees. At the Harbour House, the cascade series extends from heating the living and commercial space to irrigation of the greenhouse. At the Pier House, the initial cascade is divided between heating of the commercial space and heating of hot tubs and showers, each of which has subsequent cascade series.



These cascade series may cross in order to maximize the efficiency of heat utilization. The final cascading steps are associated with the beach pots and the beach itself.

Another primary source of heat energy to the project area is the return water (backwater) of the neighbouring district system and of individual neighbouring buildings. The return water can be expected to be delivered at and above 30°C, still carrying significant amount of heat to be utilized in a cascading series within the project area. The implementation can be done in various ways and at this stage it is quite flexible. The most prominent utilization at this stage is heating of streets, paths, pavements and parking lots, where it can be cascaded for instance to support heating of the SUDs components within the area, particularly in winter to sustain winter flood drainage. Further cascading may include irrigation of local vegetation and water supply to the beach pots, where it then can be cascaded to the beach itself.

18. https://www.veitur.is/uppruni-heita-vatnsins. Origin of hot water in the capital area planned to be fully utilized in cascading series within the project site.





The Pier house roof infinity lagoon.

3. Flood Resilience

The project site is a relatively sheltered harbour site with direct connection to the ocean and beach which floods at high tides. The approximately 4 m tidal range causes the tidal elevation to be significantly noticeable for the inhabitants and visitors in the area. Additionally, great emphasis is put on public pools and other facilities for water-based activities (sea swimming, steam baths, hot pots etc.). This connects the inhabitants and visitors of the area to water and the ocean every day. As part of the full design of the project, risk assessment will be performed to assess potential flood risks from rising sea levels and urban flooding due to increasing precipitation intensity due to climate changes. Educational efforts will be made to raise inhabitants' awareness on potential future flood risks and sea level rise.

Nature-based solutions will be used for excess water where green roofs and green spaces will be utilized to reduce or avoid the need for manmade stormwater systems to minimize stormwater to the city sewers and to mitigate flood risks where possible. This way, water will be returned to the ground through permeable surfaces and vegetation, while overflowing water can run to the ocean through land. Nature-based solution in this project will utilize what nature has to offer to benefit the built environment for the wellbeing of the inhabitants and the environment with energy and resource efficiency and resilience in mind.

4. Wastewater Management and Circular Strategies

A municipal sewage-pumping station is located within 500 m from the project site. In order to reduce the load from the project site on the city sewage system, separate collection of grey- and blackwater will be utilized with the intent of using the inherent resources better than the current sewage system does. This can include biogas production from the blackwater, or usage of the blackwater as nutrients for revegetation, and reusage of greywater for toilets and for irrigation of vegetation. The greywater may include soap particles that can be harmful to vegetation. Educational efforts will be made to implement the collection of used cooking oils and the use of environmentally friendly, biodegradable soaps and detergents to mitigate the risk of harming vegetation. This will be one of many precedence factors the project site is meant to give to the future development of the neighbourhood and the city in general, with the potential for even greater usage of this resource for more sustainable usage of grey- and blackwater.

5. Promoting Sustainable Living, Increasing Inhabitants' Awareness

Inhabitants' awareness about sustainable resource management and utilization will be raised via the area's emphasis on full utilization of energy and resource streams. This includes the incorporation of a circular economy approach and waste management strategy for the area, involving residents and commercial operators, and tying in with significant, related efforts in the Capital region. Moreover, the project will integrate the concept of urban metabolism with these measures. According to the concept, cities are considered living organisms, requiring resources and products such as food, water and energy to live. It provides a holistic framework for analysing all inflows and outflows with the surrounding biophysical environment. The overall health of a city can be estimated by analysing key parameters, such as waste and net carbon emissions. The approach will stress the importance of deviating from a non-sustainable linear economy based on a "extract-produce-use-dispose" sequence. Instead, the focus will be on implementing concepts and characteristics of a circular economy, where reuse and recycling play essential roles. This includes encouraging recycling, reducing pollution, fortifying carbon offset strategies and reducing waste throughout the community. Moreover, awareness of water savings and sustainable utilisation is fortified through these strategies.

7. SUSTAINABLE WASTE MANAGEMENT

The long-term goal of the project is that no waste will be created (zero waste), i.e., that all material will be re-used or at least recycled. The waste management of the area will follow the line of the circular economy to the fullest.

1. During Construction
During the construction phase, contractors will be required to draw up a waste management plan, which will include information on the planning, registration, sorting, recycling and disposal of waste. At the end of the construction period, they shall make a list of construction waste generated during the project, cf. guidelines of The Icelandic Green Building Council (Grænni byggð), The Housing and Construction Authority (Húsnæðis- og mannvirkjastofnun) and VSÓ Consulting on the treatment of construction waste (published 2019),[19] see also Chapter 15 of the Building Regulation no. 112/2012 with subsequent amendments.

Contractors will be required to classify construction waste in the following categories:

1. Glass and minerals.
2. Gypsum.
3. Plastic foam.
4. Paper and cardboard.
5. Hard plastic (packaging).
6. Soft plastic (plastic film).
7. Metals.
8. Timber (clean).
9. Timber (mixed/colored).
10. Electronics and electronic equipment (WEEE).
11. Batteries and bulbs.
12. Other hazardous waste.
13. Biowaste.
14. Textiles.
15. Mixed waste.

The waste separation on site during the construction period will also have to fulfil the strictest requirements of the standard BREEAM International New Construction, 2016.[20]

2. During Operation
The design of the area includes a sorting centre where all residents and operators return waste material that is generated in their households or activities. All contracts on rental of facilities on the premises (with residents, kindergarten, offices, fitness centre, spa, restaurant, etc.) will stipulate that all waste must be returned correctly sorted into this centre and that the operator of the area negotiates with a waste contractor on the emptying and further processing of what arrives there. This way, it will be ensured as much as possible that all waste treatment is coordinated and takes the zero-waste goal of the project into account. Fees for collection and processing of waste will be included in rental fees, cf. further elaborations in rental agreements.

The operator will seek agreements with the City of Reykjavík on an exemption from the payment of waste fees, in exchange for the operator taking responsibility for results in the area's waste matters and presenting agreements with waste contractors, cf. above.

The sorting centre will contain containers for the following waste categories:

- Corrugated cardboard
- Cardboard and paper cartridges
- Newspapers and similar
- Office paper
- Soft plastic (plastic film) – clear
- Soft plastic (plastic film) – coloured
- Hard plastic (packaging)
- Metals
- Glass – clear
- Glass – coloured
- Biowaste (food scraps, etc.)
- Hazardous waste
  - o Batteries
  - o Small electrical appliances
  - o Lightbulbs
  - o Computer equipment and print cartridges
  - o Chemical residues (paints, etc.)
  - o Other
- Textiles
- Candlesticks (wax)
- Mixed waste

The sorting centre will be under daily supervision and care will be taken to immediately fix everything that goes wrong. The intention is to maintain good repetition of the facility with "the broken windows theory" in mind.[21] The area will be monitored with surveillance cameras to ensure the best possible orderliness and to timely detect deviations.

No other waste containers will be placed in the outdoor area.

Residents and operators will be provided with funnels for the collection of used cooking oil. The purpose of the collection is threefold:

1. Minimize the amount of oil and grease to be poured into waste containers or drains.
2. Improve the utilization of the resource by using the fat for biodiesel production.
3. Educate residents and operators and set a precedence for other districts and localities.

The oil collection will be carried out in collaboration with the public company Vistorka in Akureyri, where this type of collection of waste oil for biodiesel production has been practiced for several years.[22] No concerted collection of this kind is available in the capital area at present.

Promotional material on waste treatment will be prepared for all residents and operators in the area. In addition to information on the importance of sorting and the value of resources in waste, special attention will be paid to the methods and purpose of collecting used cooking oil, as well as on the importance of keeping the sewage system free from any type of solid waste, (except from human excretions). This promotional material will be a be part of the residents' handbook with instructions regarding all the main environmental aspects of the project.

A special chapter on the success of the waste management will be published in the project's annual environmental report, with statistical information in the form of performance indicators, such as the amount of waste in individual categories, the proportion of waste treatment measures (reuse, recycling, other recovery (including incineration for energy production), and disposal), as well as the annual carbon footprint. The main emphasis will be on the priorities of the circular economy (the waste hierarchy), as well as on ensuring and explaining carbon neutrality of the waste management, e.g., by sending all mixed waste to a waste-to-energy plant for energy recovery. The ultimate goal, though, will be to become a zero-waste area. That applies to the site as a whole, as well as to individual units within the site, including apartments, kindergarten, offices, fitness centre, spa, restaurant, etc.). The multiple use of the restaurant area, being a community loft for young individuals, a café/ canteen for residents and daily workers during the day, and a place to meet in the evening, gives opportunities to optimize the use of raw materials for food, thereby preventing the creation of waste.

The operator of the area has set himself the goal of being a role model for others in terms of waste separation and management. To work towards that goal, experiences and





inventions in waste management will be shared with the local government of Reykjavík and local officials, as well as in articles and lectures for external actors.

19. Grænni byggð, Húsnæðis- og mannvirkjastofnun og VSÓ ráðgjöf, 2019: *Leiðbeiningar um meðhöndlun byggingarúrgangs. 12/2019*. https://hms.is/media/7061/vso-medhondlun-byggingarurgangs.pdf.
20. BREEAM, 2019: BREEAM International *New Construction, 2016. Technical Manual. SD 233 2.0*. https://www.breeam.com/discover/technical-standards/newconstruction.
21. Stating that visible signs of crime, anti-social behaviour, and civil disorder create an urban environment that encourages further crime and disorder.
22. https://www.vistorka.is/is/graena-trektin.

8. BIODIVERSITY, URBAN RE-VEGETATION AND AGRICULTURE

The design of the area will focus on its proximity to nature and its natural appearance, as research indicates that these factors have a positive effect on people's physical and mental health. To a certain extent, this comes naturally, as the structures stand on the shores of the sea, where the forces of nature are reflected in a clear and tangible way in the tides and surf. Efforts will be made to further strengthen this image by emphasising diversity, e.g., by creating diverse vegetation in outdoor areas, instead of relying almost exclusively on lawns and shrubs. The diversity does not only have a positive effect on people's experience and wellbeing, but it also increases the area's resilience to various pests that often attack hedges and other plants in open areas with low species diversity.

Biological diversity will be supported by e.g., the following actions:

1. Beds and pots with flowering plants, which is intended to attract a variety of insects, incl. insects feeding on butterfly larvae.
2. Rough heights designed to attract larger soil organisms and a variety of insect species.
3. Small ponds, which are intended to attract birds, e.g., birds feeding on insects and larvae.
4. Restrictions on the use of pesticides, in order to promote the maintenance of diversity, including insects.
5. Restrictions on the use of artificial fertilizers, in order to promote a diverse ecosystem in the topsoil layers.
6. Utilization of compost and livestock manure in open areas for the purpose of promoting the development of nutrient-rich and carbon-rich soil.
7. Utilization of greywater for irrigation in open areas for the purpose of promoting the development of nutrient-rich and carbon-rich soil.

In the design process, special goals will be set, e.g., on the size of green areas as a proportion of the total area, on the maximum distances of green areas from apartment areas, on the production capacity of green areas and on their visibility.

Roofs will be used for cultivation to the extent possible, subject to conditions and water for irrigation. It should be noted, however, that the roof surfaces of buildings in the area will not be particularly large. Guidelines from the newly published handbook by the Swedish knowledge centre Svensk Byggtjänst, Grönatakhandboken,[23] will be used as guidelines in the installation and maintenance of the green roofs. However, most of the cultivation on the roofs will be under glass, including two greenhouse clusters, one linked to the kindergarten, specially designed for kids, and another one on the top of the Harbour House.

Residents of the Harbour House will be encouraged to grow their own vegetables. Guidelines for this kind of urban agriculture will be a part of the residents' handbook, covering all the main environmental aspects of the Gufunes project. As the surface area of the area in question is limited, residents will be assisted regarding access to community gardens elsewhere in Gufunes or in the Grafarvogur neighbourhood. Homemade products will be for sale in the store in the Harbour House as the occasion arises.

The success of the urban agriculture project will be assessed in the number of residents who engage in home cultivation of some kind and in the amount of products. Statistical information on these aspects will be published in the area's annual environmental report.





Green houses of the Harbour house.

23. Svensk Byggtjänst, 2021: *Grönatakhandboken. 2. utg. Växtbädd och Vegetation.* https://byggtjanst.se/bokhandel/projektering/e-bok-gronatakhandboken.-utg-2.

9. INCLUSIVE ACTIONS, SOCIAL BENEFITS AND COMMUNITY ENGAGEMENT

The goal is that this area will become a centre of services and community in the neighbourhood. This ambition by itself is a base for social inclusion, as the residents in the Harbour House will be placed in the centre, instead of finding themselves in the outskirts of town. The lifestyle-related design of the apartments is also a design for inclusion, with residents sharing solutions for living.

All decisions regarding issues affecting residents will be based on consultation processes where the residents are encouraged to participate, through polls or other means. Efforts will be made to organize common events with emphasis to embrace different cultures of people with different ethnical background.

Residents and staff will have access to electric sharing cars at affordable rental prices, which partly has the aim to eliminate a common difference between low-income and higher-income people. Among other efforts to support inclusion are community lofts for young individuals in the area, as well as a café/canteen/meeting place for residents and daily workers. Furthermore, the presence of the kindergarten and other services is conducive to make the residents to truly feel “at home”. Frequent customer terms for the residents will be embedded in contracts between the developer and the facility-operators at the pier.

Successful community engagement will be monitored through an annual poll among the residents. The results from this poll will be published in the annual report, showing trends over time.



The Harbour house in the morning sun.

A Sustainable, Environmentally Friendly, Certified Kindergarten

Sustainability revolves around the interaction of three elements in sociological development that are interwoven and depend on each other. These elements are environment, economy and social factors.

In order to teach children to take care of their environment, they must have an opportunity to enjoy nature. That way, they learn to love it and instinctively want to take better care of it and protect it.

Focus	Methods
The children get to experience nature first-hand.	Field trips. Outdoor activities.
The children experience the seasons and are alert to the changes in the environment they bring.	The beach and the sea.
The children learn cultivation and how best to utilise nature without spoiling it.	Vegetable gardens and cultivation. The beach, shells.
The children learn how to sort garbage and how to recycle it.	Sort garbage in the departments Recycle garbage by making paper etc.
The children get to know living beings in their environment and their ways of life. Birds, insects, beach fauna etc.	Field trips to the beach.
The children become aware of global warming and rising sea levels.	Beach and restaurant.

Social factors play an important role regarding sustainability. If we are to meet the present's needs and be mindful of the opportunities of future generations, we must be aware of how society develops and have a good insight into how it works. The kindergarten children need to experience this, so they should get a connection to other institutions and companies around them. It is also important to ensure the kindergarten's relations to other institutions in society, and therefore the children go on field trips and attend cultural events. Acceptance is a prominent virtue in the work. There is discussion about different origins and family types, meeting everyone's needs and desires. This way, the children become more broadminded and develop a more positive attitude towards their community.

The economic factor is no less important than the other two. The kindergarten should aim to economise and be mindful of products it purchases. All material is utilised to the fullest extent and the aim is to reduce all waste from the kindergarten. Purchases are limited where possible and wrapping reused. Energy is conserved in various ways, the children turn off lights in unuses spaces and take care not to let the water run unnecessarily. There is less dishwashing and unused electric appliances are turned off. The children make sure this is implanted, getting an opportunity to take responsibility for their environment.

The kindergarten receives a Green Flag certification, see https://landvernd.is/graenfaninn/.

Sea Bathing, Pools and Spa

On the roof of the Pier House lies a swimming pool that utilizes excess energy from the city's geothermal heating system. The pool is connected to a yellow, sandy beach that was created when the cement factory stood here, through an area with hot pots. Hot-sea baths are open to the public and the neighbourhood's residents, and the sea along the coast is heated with run-off water from the pool. The swimming pool and spa have paid admittance.

Special focus is on diversity and gender self-determination. To meet this, there is a choice of three changing rooms, one for females, one for males and one for non-specific genders, a "rainbow room" for young parents who want to bathe with their children and for people who fall outside male/female definitions.

10 INNOVATIVE ARCHITECTURE AND URBAN DESIGN

„We shape our buildings and afterwards our buildings shape us.“

Winston Churchill.



UPGRADING THE SITE IN THE URBAN ENVIRONMENT...

The development plan from 2019 of the former industrial area of Gufunes and surroundings laid the foundation for a new city district with mixed use.

Since then, the first residential units with an emphasis on ecological and social aspects have risen in the district. The present project will consolidate this contemporary approach to urban design.

Together with the partial reuse of buildings from the former State Fertilizer Plant (1954-2001) for the movie industry, and the development of further residential and commercial units in the adjacent green areas, the future of Gufunes is that of a lively and unique urban district.

...AS THE CENTER OF A NEW NEIGHBOURHOOD

The reuse of this project's site for the Pier and the Harbour Houses has all the potential to upgrade the site to the status of the new centre of Gufunes.

The upgrading of the site has another important aspect, that is to build the Pier and Harbour Houses on the reuse of a landfill, which is environmentally sound as it minimises the impact on any existing site ecology.

These new buildings will create a new centre of attention for the neighbourhood as they provide shelter for social interactions and personal recreation for both residents and visitors.

The project will revive the harbour, that formerly was used to move goods in and out of the factory, to move people in and out of the district, placing the Pier and the Harbour Houses at the centre of flow of people (formerly goods).

LEARNING FROM THE PIER AND THE HARBOUR HOUSES

This project will contribute to the future of Gufunes as a neighbourhood with distinctive ecological and social characteristics.

The question is how the ecological and social values on which this project is based can serve as a model for similar developments along the shores of the greater Reykjavík area in the future.

The ecological and social values serving as guidelines:

Any similar future development's footprint should mostly be on an area of land which has previously been developed for use by industrial and/or commercial purposes in the last 50 years.

There are quite a few such areas on landfills along the coastline of the greater Reykjavík area that have been used for buildings with no social function, such as warehouses. Now is the opportunity to use the foundations of these structures or reuse the structures themselves as a basis for the development of ecological and social urban developments such as a sound urban mix of residential, commercial and leisure functions.

The first residential units in similar projects could have the same experimental aspects as the residential units in the Harbour House, i.e., co-living, sharing and consensual social contact, and serve as a potential model for other new residential units, as it hopefully will in Gufunes.

PASSIVE DESIGN

The aim of this project is to follow the principles of passive design, that is to use layout, fabric and form to reduce or remove mechanical cooling, heating, ventilation and lighting demand.

These goals can be achieved by optimizing spatial planning and orientation to control solar gains and maximise daylighting, manipulating the building form and fabric to facilitate natural ventilation strategies and making effective use of thermal mass to help reduce peak internal temperature.

These design measures will contribute to the health and wellbeing of its occupants.

Glare Control

The aim is to avoid increasing lighting energy consumption by glare control. On clear days in winter, the sun shines horizontally during daytime and in summer it does so in the evening. Blocking direct sunlight with curtains will increase the use of artificial lighting. This is avoided by installing „brise-soleil" claddings made of driftwood in front of the windows. This system does not stop daylight from entering the working and living zones under cloudy conditions, nor when sunlight is not on the facade.

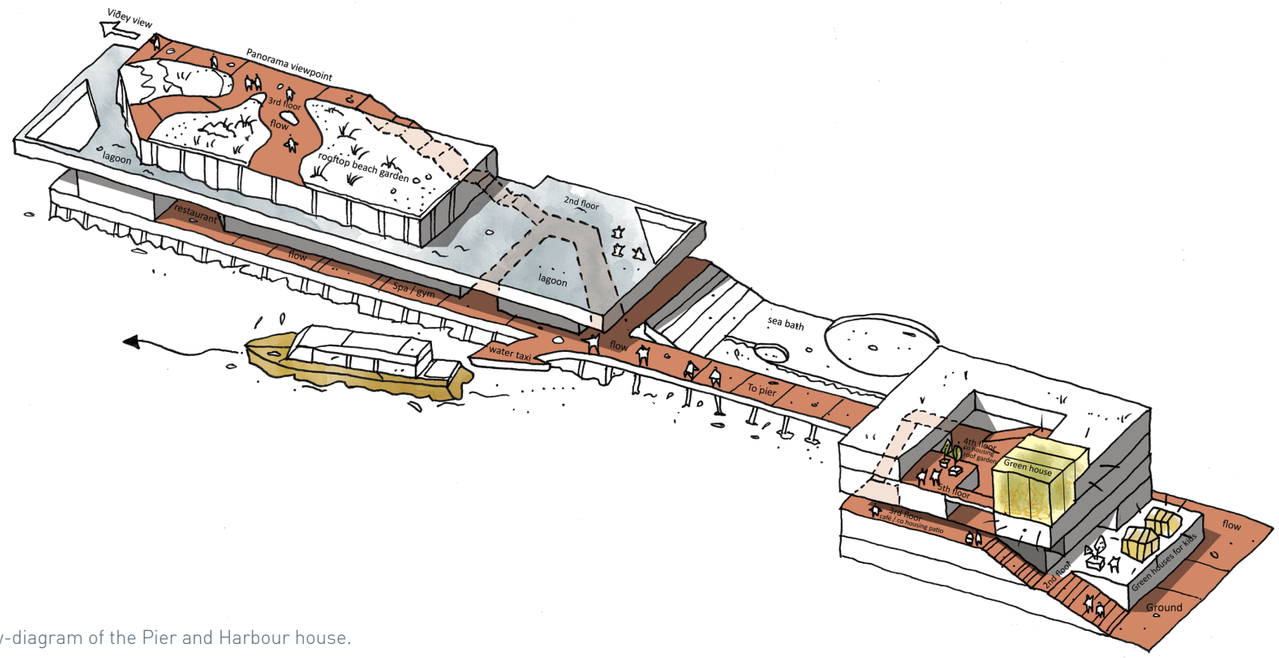
Furthermore, the south facade of the office floor is recessed, thus blocking direct sunlight.

Daylighting

An optimal daylighting provision is achieved by passive design, i.e., an optimal window-to-floor ratio adapted to the buildings' latitude. An average daylight factor of 2.2% should be achieved for 80% of all relevant occupied spaces.

Indoor Air Quality

An adequate indoor quality is achieved by natural ventilation through air intakes in the facade and openable windows, using the natural resource of usually windy, cool conditions by the Icelandic coast.



A flow-diagram of the Pier and Harbour house.

Thermal Comfort

The cool Icelandic climate calls for high heating needs. A high building thermal mass can support passive heating, thus contributing to the thermal comfort of occupants. Therefore, the aim is to achieve a balanced scheme of glazing areas, glazing type, shading and the adequate materials for storing heat, i.e., precast concrete facade sandwich-elements and floor slabs. Due to the cool Icelandic climate, the adequate area of high-solar-transmission glass should be considered.

The health and wellbeing of the buildings' occupants and its energy consumption will benefit from the passive design measures taken.

THE HARBOUR HOUSE

Built on a landfill dating back to the 1980's, the Harbour House is a multi-functional building that stands for the core of the ecological and social values of the Gufunes project.

Living, working, children's day-care and leisure are united under one roof and the aim is to organise the cohabitation of its users according to specific social guidelines, based on consensual social contact.

The kindergarten covers the greater part of the 1st floor, with five units organized around a common area. The administration is on the 2nd floor, facing the kindergarten's roof garden.

A small area of 70m² at the northwestern corner of the 1st floor is reserved for a small food store, selling handicrafts and fresh, local produce.

The upper floors can be accessed by the main entrance on the northern side and by outdoor stairs leading up to the 5th floor.

The 2nd and 3rd floors are reserved for offices. The cafeteria on the 2nd floor is open for residents in the evening. The top floors have seventeen apartments of different sizes, thus supporting the goal of a mixed occupancy regarding age, family structure and social background.

The apartments are organized around the multi-functional roof garden on the two top floors, open for social gatherings. A greenhouse for common use is at the south-eastern corner of the top floor.

The kindergarten's playground is diverse, changing and changeable, offering a variety of equipment, most of it being reused items with a new function. Driftwood logs used for swings, sandpits, exercise-bars and see-saws. Old plastic fish containers, commonly used and made in Iceland, reused as sandpits and tubs for crabs and small fish the children have caught. Old buoys.

The cycle storage and waste recycling are housed in a separate structure north of the playground. The aim is to sort all waste, biological, paper, cardboard, glass, metal and plastics.

The pavement on the northern side of the Harbour House takes visitors to the public beach and, via the old pier and a new pontoon bridge made of reused pier logs, to...

...THE PIER HOUSE

The Pier House stands on the shell of the old pier dating back to the early days of the State Fertilizer Plant, housing a fitness centre with a spa, restaurant and bar.

The seawater tubs on the pontoon bridge, heated with surplus hot water from the communal system, are open to the public, as is the restaurant. The fitness centre is for club members.

The fitness centre offers a variety of leisure activities, a fully equipped exercise hall, sauna, Turkish bath and bathing pools with seawater heated with surplus hot water from the communal system.

Electric water-taxis from Reykjavík city centre dock at the southern side of the Pier, offering a sustainable transport alternative for guests and visitors to the centre, restaurant and public beach.

The main entrance to the restaurant is on the ground floor. The dining room is on the lower floor, approximately at present average sea level. Guests experience the tidal waves beating the dining room's windows. With rising sea levels, the dining room will someday be below sea level, a reminder of the path where we are unfortunately heading.

The entire lower roof is a bathing pool. The upper roof is covered with sand, pebbles and plants from the local beach.

MATERIALS
THE ICELANDIC MATERIAL COLLECTION

First comes a list of different materials used in this project, which have strong Icelandic characteristics.

Driftwood

Around the coast of Iceland, you will find driftwood, sustainably transported by sea currents from Siberia. Driftwood used to be a valuable asset and the Icelandic language has words for thirteen different types of driftwood. It is still used in our times, for example for fence posts, handicrafts and art. After years in the sea on its journey across the Atlantic, the wood is impregnated with sea salt, a natural protection from rot. Driftwood is excellent building timber.

In this project, the driftwood is used as:
- cladding of the facades of the Harbour House
- brise-soleil for glare control
- interior floor tiles
- fixed furniture
- playground equipment

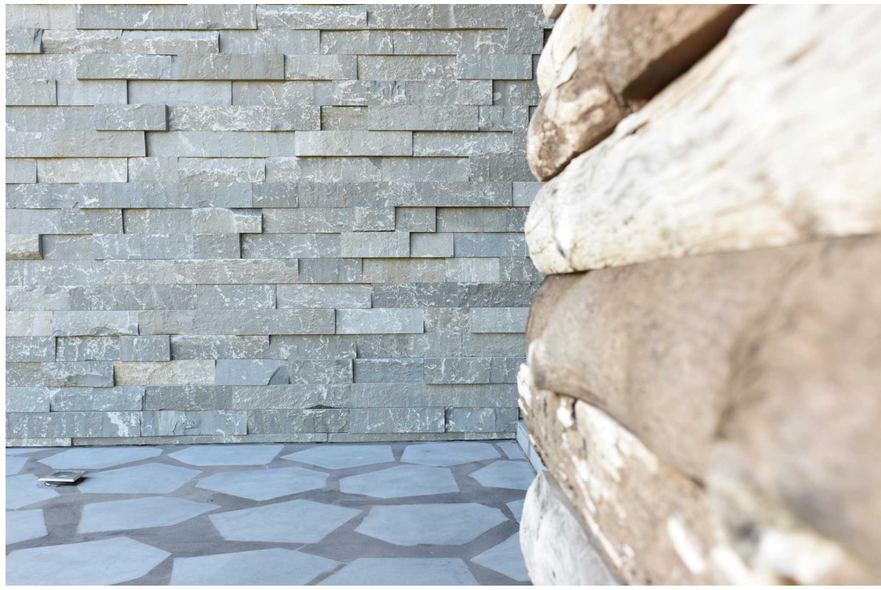
Icelandic Stone

Basalt and bluestone are to be found in abundance in Iceland and are retrieved from licensed mines. Although too porous for bigger slabs, Icelandic basalt and bluestone are perfectly suitable for floor and wall tiles.

Steel Retaining Walls

Icelandic ports, big and small, are frequently being remodeled. Old steel retaining walls on docks and piers end up as scrap metal that can be reused for the purposes of this project:
- facade elements
- handrails











Timber from Retaining Walls and Pier Decks

The same goes for timber from discarded retaining walls and pier decks. It can serve the same purposes as the driftwood. It could for example be used as cladding of the Harbour House.

Fishing Nets, Fish Containers and Buoys

The Icelandic fishing equipment industry produces fishing nets made of nylon, among other things. Old nets can be reused as part of the playground equipment and – with a rather tight mesh – as handrail cladding.

Old fish containers and buoys, made in Iceland, can be reused as part of the playground equipment.

Fish Leather

Fish leather is a unique Icelandic product made from Atlantic salmon and cod skin. It is used worldwide by the fashion and furniture industries.

Fish leather or fish skin is a by-product of the fishing industry. An Icelandic firm has turned this former waste into high-quality raw material. The company produces fish leather according to sustainability standards.

It can be used as cladding on upholstered chairs and benches in the restaurant and – combined with Icelandic stone wool – acoustic elements on walls.



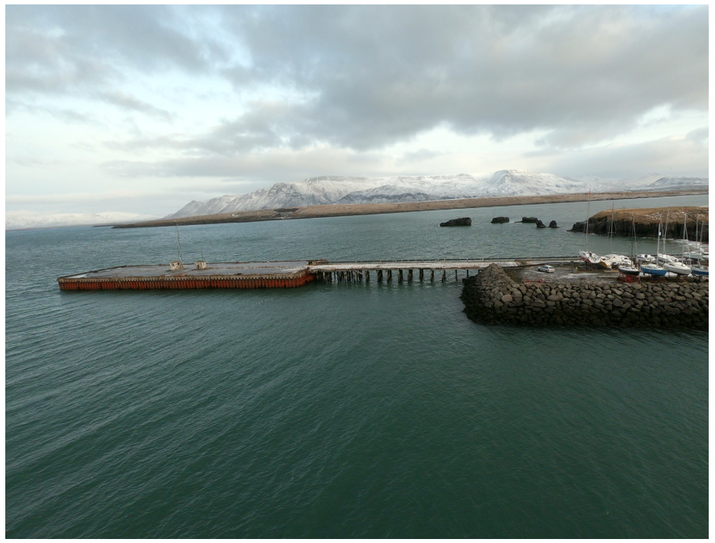




















A SUMMARY OF MATERIALS

The foundations and structure are in-situ concrete. The outer shell is made of fair-faced concrete precast elements. The percentage of use of recovered/recycled aggregates in the concrete is to be assessed.

The upper floors' outer shell, structure and slabs of the Harbour House are made of CLT-units.

Parts of the facades and windows are clad with reused wood, i.e. driftwood and reused timber from retaining walls and pier decks.

Outdoor floors, roof gardens and stairs are clad with Icelandic basalt and bluestone tiles.

Reused steel from retaining walls is used for handrails and wall claddings. Handrails are clad with reused fishing nets.

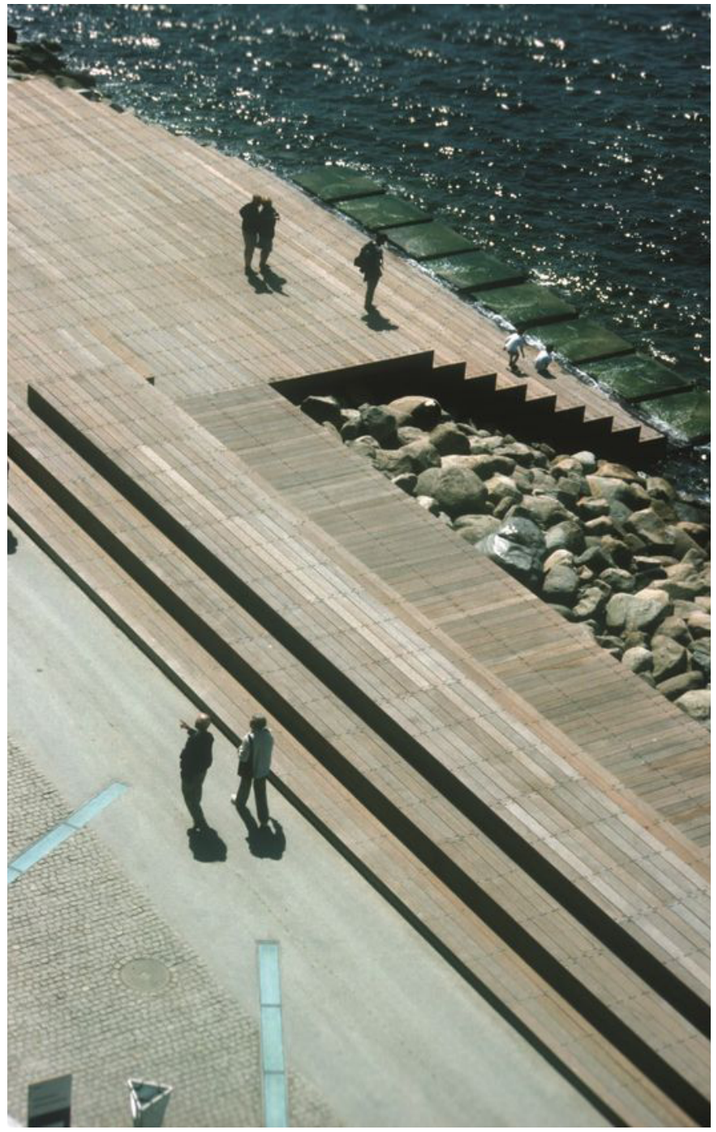
Parts of the indoor finishes are made of driftwood. Floors are covered with Icelandic stone tiles.

Sound absorption in the office spaces and fitness centre, especially for the absorption of low-frequency sound, can be solved with panels made of Icelandic fish leather and stone wool.

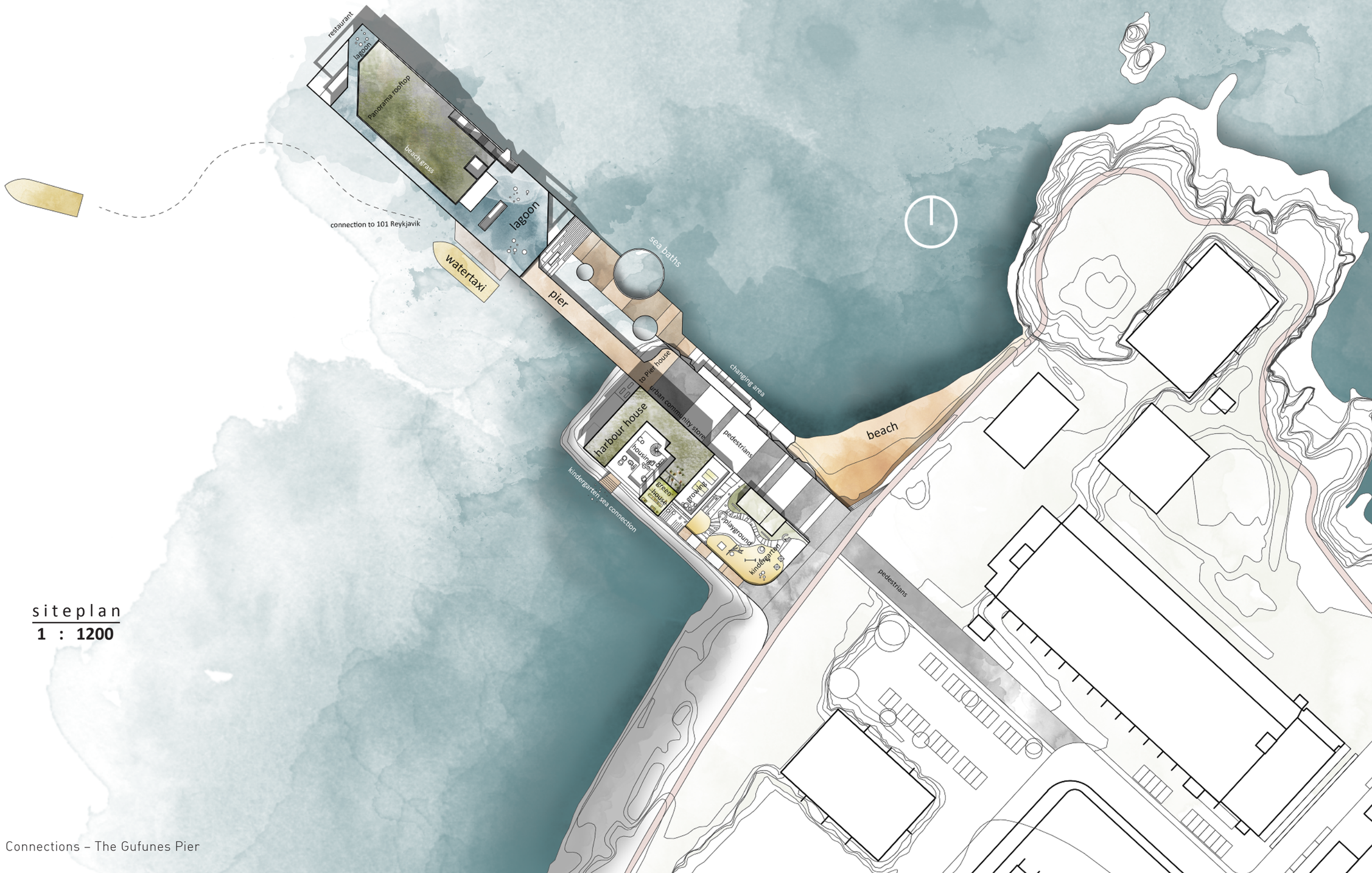
All hard landscaping surfaces, pathways and parking spaces are covered with permeable materials such as grass stone.

Durability, resilience and robustness are among the major guidelines for the choice of materials and design.

The overall goal is that the materials cited here and in other building parts, such as windows, doors and drywalls, are responsibly sourced in such a way that they fulfil the BREEAM International Construction standard for at least a "very good" rating.



SITE : GUFUNES



siteplan
1 : 1200



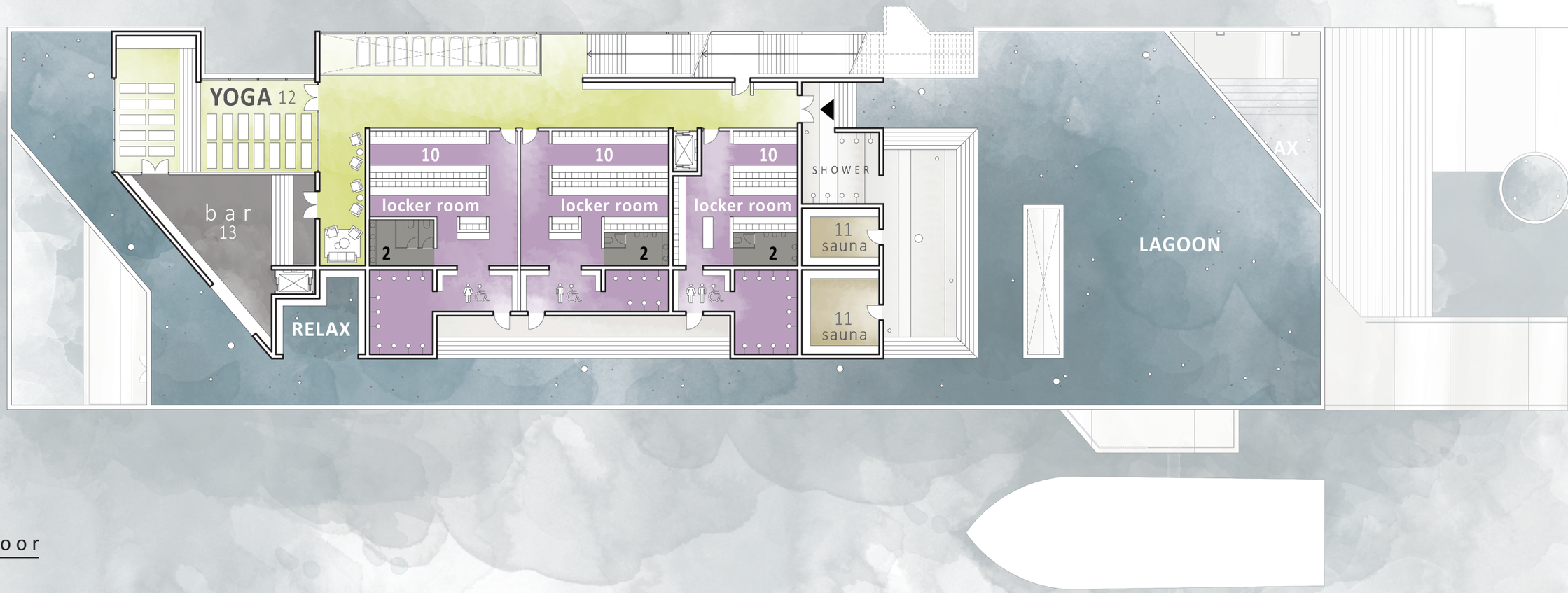
basement
1 : 300

2	wc	**20**m²
5	restaurant	**320**m²



first floor
1 : 300

1	shared facilities	**15**m²	4	spinning room	**110**m²	7	office	**95**m²
2	wc	**20**m²	5	restaurant	**100**m²	8	foyer	**60**m²
3	gym	**515**m²	6	sea taxi terminal	**120**m²	9	entrance	**20**m²

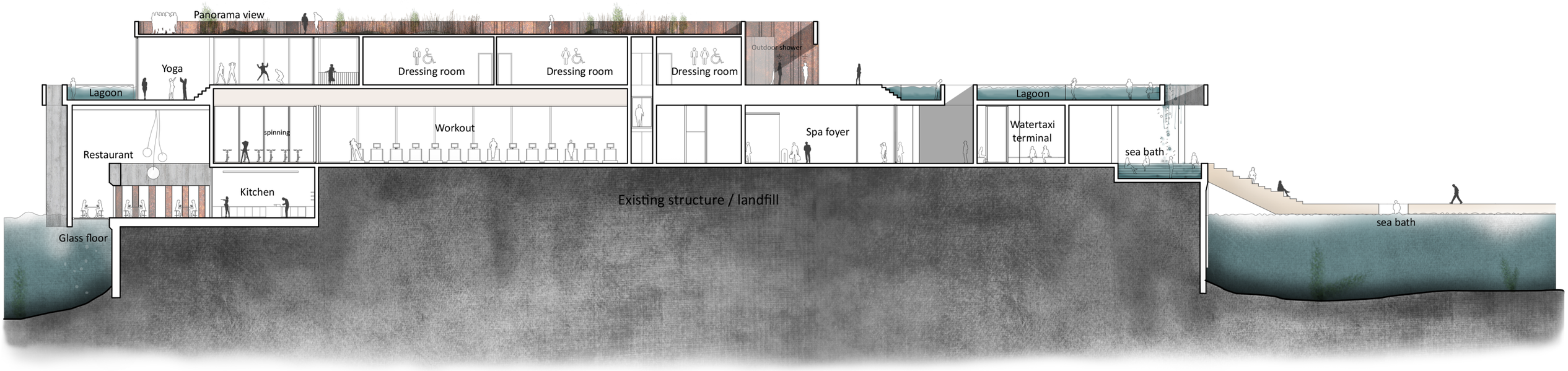


second floor

1 : 300

2	wc	**35**m²	12	yoga room	**110**m²
10	locker rooms	**365**m²	13	bar	**85**m²
11	saunas	**60**m²		LAGOON	**915**m²

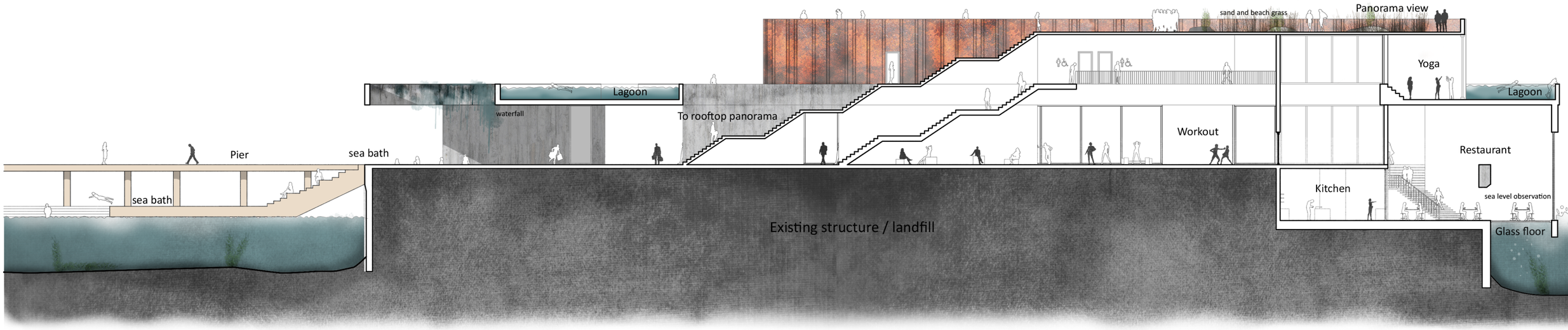
THE **PIER** HOUSE



section : A-A

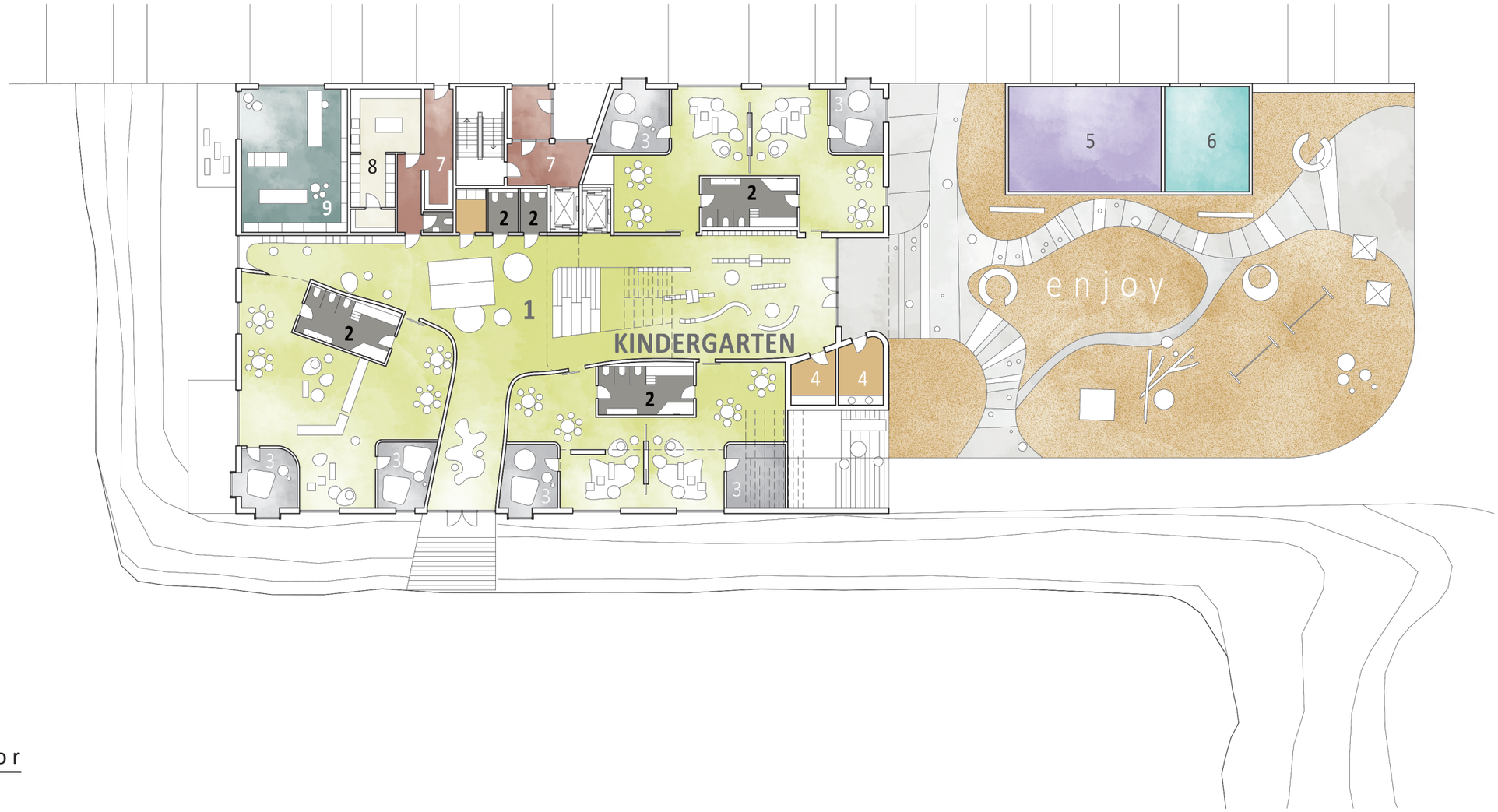
1 : 300

THE **PIER** HOUSE



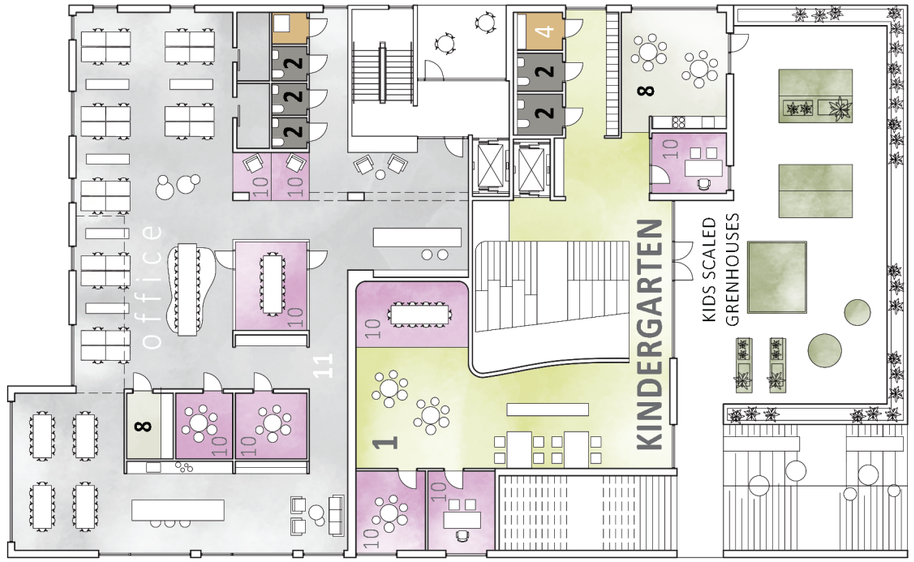
section : B-B

1 : 300



first floor
1 : 300

1	kindergarten	**620**m²	4	shared facilities	**25**m²	7	entrance	**35**m²
2	wc	**70**m²	5	bike storage	**65**m²	8	kitchen	**35**m²
3	relaxing areas	**90**m²	6	sorting centre	**35**m²	9	urban community store	**60**m²



second floor

1 : 300

1	kindergarten	**135**m²	8	kitchen	**35**m²
2	wc	**15**m²	10	meeting rooms	**100**m²
4	shared facilities	**10**m²	11	office	**360**m²

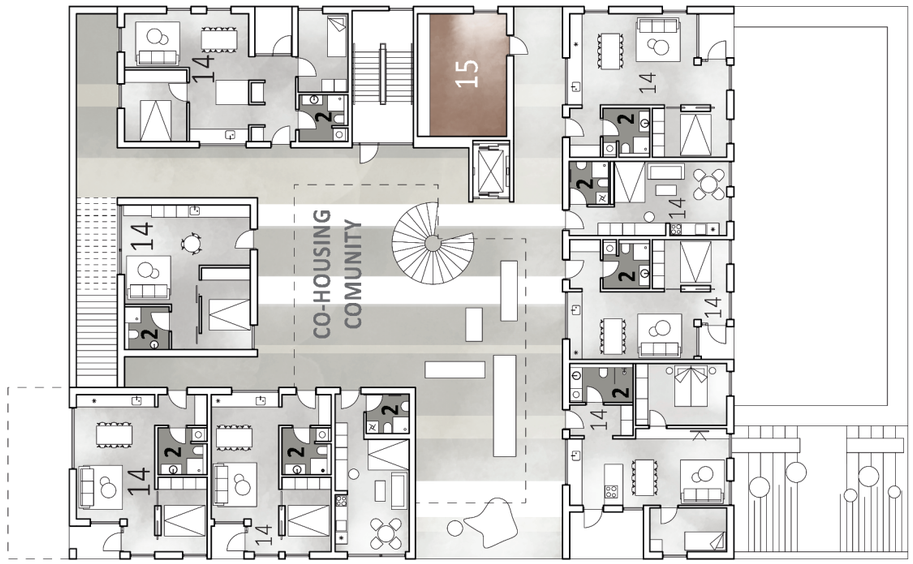


third floor

1 : 300

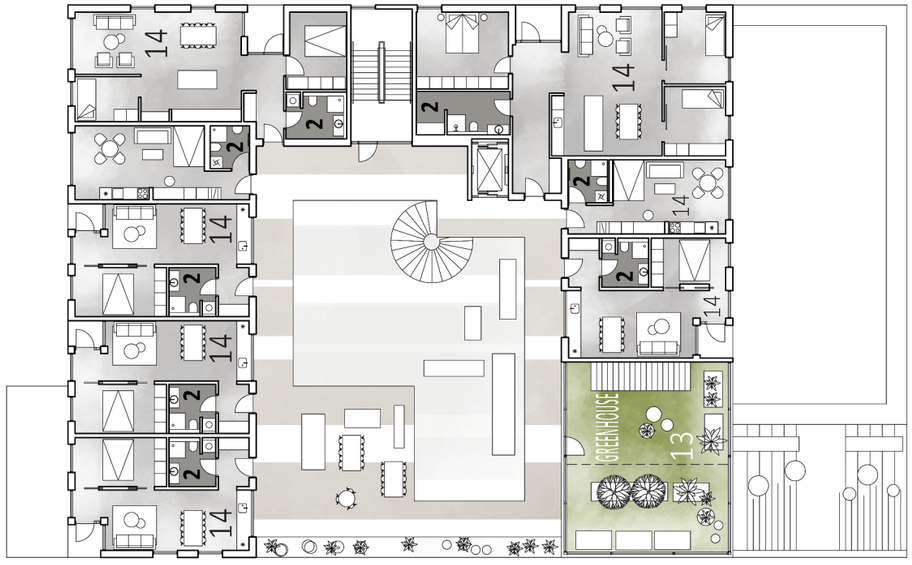
2	wc	**15**m²	10	meeting rooms	**40**m²
4	shared facilities	**10**m²	11	office	**380**m²
8	kitchen	**10**m²	12	co-housing dininghall	**175**m²





fourth floor
1 : 300

2	wc	**35**m²
14	apartments	**420**m²
15	shared laundry room	**25**m²



fifth floor
1 : 300

2	wc	**40**m²
13	greenhouse	**110**m²
14	apartments	**420**m²



section : A-A

1 : 300



section : B-B
1 : 300

PRESENTATION OF THE SCHEDULE AND ACTIVITIES DEVELOPED IN THE PROJECT

SURFACE CHART

THE **PIER** HOUSE

basement

2	wc	**20**m²
5	restaurant	**320**m²

first floor

1	shared facilities	**15**m²
2	wc	**20**m²
3	gym	**515**m²
4	spinning room	**110**m²
5	restaurant	**100**m²
6	sea taxi terminal	**120**m²
7	office	**95**m²
8	foyer	**60**m²
9	entrance	**20**m²

second floor

2	wc	**35**m²
10	locker rooms	**365**m²
11	saunas	**60**m²
12	yoga room	**110**m²
13	bar	**85**m²

brutto + 20% **2.460**m²

THE **HARBOUR** HOUSE

first floor

1	kindergarten	**620**m²
2	wc	**70**m²
3	relaxing areas	**90**m²
4	shared facilities	**25**m²
5	bike storage	**65**m²
6	sorting centre	**35**m²
7	entrance	**35**m²
8	kitchen	**35**m²
9	urban community store	**60**m²

second floor

1	kindergarten	**135**m²
2	wc	**15**m²
4	shared facilities	**10**m²
8	kitchen	**35**m²
10	meeting rooms	**100**m²
11	office	**360**m²

third floor

2	wc	**15**m²
4	shared facilities	**10**m²
8	kitchen	**10**m²
10	meeting rooms	**40**m²
11	office	**380**m²
12	co-housing dininghall	**175**m²

fourth floor

2	wc	**35**m²
14	apartments	**420**m²
15	shared laundry room	**25**m²

fifth floor

2	wc	**40**m²
13	greenhouse	**110**m²
14	apartments	**420**m²

brutto + 20% **4.044**m²

THE **LAGOON**

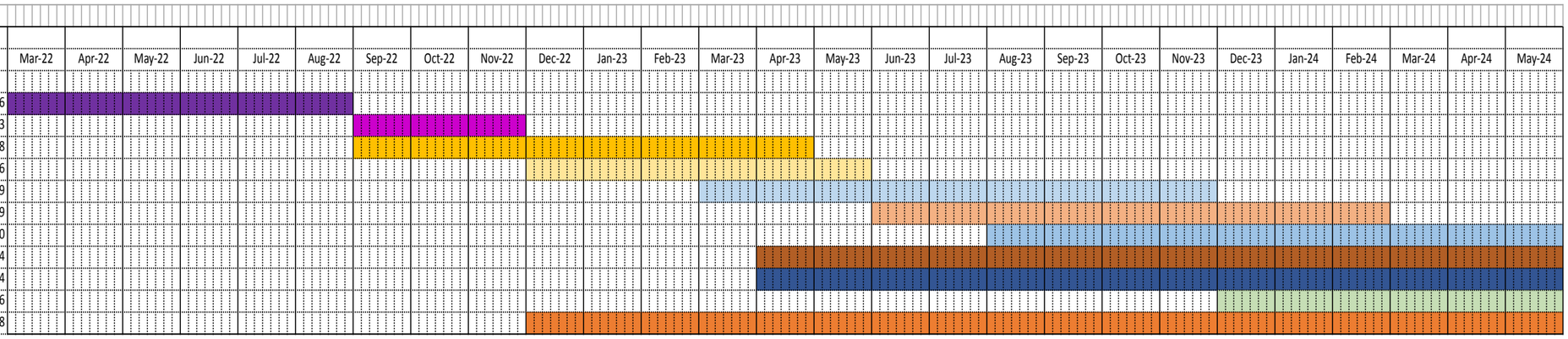
	LAGOON 2nd floor	**915**m²
	SEA BATH 1st floor	**1.400**m²

brutto + 20% **2.778**m²

PLANNING

C 40

		duration
		Months
1	Pre-design and planning	6
2	Planning process to acceptance	3
3	Design	8
4	Earthworks	6
5	Structural frame and concrete	9
6	Outdoor finishing	9
7	Interior finishing	10
8	HVAC	14
9	Electrical work	14
10	Landscaping and site cleanup	6
11	Site cost	18



30-11-2021

APPENDICES

Table 1. Pier House: Carbon footprint of major building materials

Material	Mass (tons)	Volume (m^3)	EF (tons CO_2eq/ton)	Carbon footprint (tons/CO_2eq)	Sources
Concrete	1.680	700	0.13	218	EPD-Norge.no
CLT	90	200	-1.25	-112	EPD-Norge.no
Stone wool	30	300	0.11	3	EPD-Norge.no
Glass	27	10	3.50	94	Various
Reinforcing steel	34		2.00	68	Various
TOTAL				**271**	

Table 2. Harbour House: Carbon footprint of major building materials

Material	Mass (tons)	Volume (m^3)	EF (tons CO_2eq/ton)	Carbon footprint (tons/CO_2eq)	Sources
Concrete	456	190	0.13	59	EPD-Norge.no
CLT	270	600	-1.25	-338	EPD-Norge.no
Stone wool	26	260	0.11	3	EPD-Norge.no
Glass	40	15	3.50	140	Various
Reinforcing steel	9		2.00	18	Various
TOTAL				**-118**	

Note: The carbon footprint calculations above include production, transport and assembly, while excluding emissions during operation and end-of-life. The included emissions are those who require immediate (short-term) climate actions, including sequestration.