Sundahöfn Container Terminal

Development Options Assessment - Final report

12th January, 2022

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Drewry background and scope discussion

Scope of Drewry engagement

- Faxaport is operating in the capital Reykjavik and three other municipalities in the west coast of Iceland. The Port Authority operates a landlord model and manages five harbours in Iceland.
- Sundahöfn, is a multi purpose port that serves as the main gateway of import and export of goods for the country. The port handles around 290K TEUs p.a. at the two container terminals in the port - Sundabakki and Vogabakki, which are leased to the shipping lines Emskip and Samskip as their dedicated terminal facilities.
- Faxaports as part of its development has identified expansion options at Sundahöfn including landfill to expand the container terminal footprint.
- Potential highway connection across the port area limits the development and expansion options.
- Sundahöfn is situated close to center of the city with demand for land increasing and making land use optimisation a key priority for the port authority.
- Faxaports engaged Drewry to assist in the evaluation of the various development options and to support Faxaports in identifying the optimum development option at Sundahöfn.

Drewry Background

- Founded in 1970
- Drewry is an independent research and advisory organisation for the maritime sector
- Our research and advisory business units provide an industry leading, unrivalled knowledge base. We use our continuing research, specialist knowledge and global offices, to constantly analyse and decipher the shipping and ports sector globally
- We combine and focus our resources for each project and each client, building trusted relationships where our advice is at the centre of commercial decision making

Most recent relevant projects include

- Scandinavian Port Market Study
- Gothenburg port reorganisation advisory
- Institutional structures for a container terminal
- Khalifa port container terminal; assessing growth and operating options

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Contents

CONTENTS

Prepared for:

Faxaflóahafnir sf
Associated Icelandic Ports

Drewry

Executive summary

Executive Summary

	Key takeaways
Project overview	Faxaports is operating in the capital Reykjavik and three other municipalities in the west coast of Iceland. The Port Authority operates a landlord model and manages five harbours in Iceland. Sundahöfn, is a multi purpose port that serves as the main gateway of import and export of goods for the country. The port handles around 290K TEUs p.a. at the two container terminals in the port - Sundabakki and Vogabakki, which are leased to the shipping lines Emskip and Samskip as their dedicated terminal facilities. Key challenges for Faxaports: ➢ Situated close to center of Reykjavík city with demand for land increasing and making **land use optimisation** a key priority for Faxaports. ➢ Eimskip and Samskip currently operate the container terminals in the port, have **long term lease of lots of land** / yard area in the port and **request additional space for the long term.** ➢ **Potential highway crossing**: City of Reykjavik and Icelandic Road Authorities are investigating the possibility of new highway connection across port. Current suggestions involve a bridge that will limit size of ships to the south end of Vogabakki. ➢ Potential highway **will limit the use of existing quays and land**. ➢ **Call** from community and competition authorities **to welcome newcomers.** As part of the assessment of Sundahöfns' development options, Faxaports engaged Drewry to assist in the evaluation of the various development options and to support Faxaports in identifying the optimum development option at Sundahöfn. The underlying objectives of the assessment would be to ensure optimum competitiveness / efficiency of container terminal operations at Sundahöfn and responsible use of public funds / land and value for money for the local communities / shareholders of Faxaports
Approach	Drewry has carried out a stakeholder engagement as part of understand the market needs of various stakeholders. This formed the basis of evaluating the future needs of the development options.

Executive Summary

	Key takeaways
Market overview and outlook	Iceland is a member state of the European Economic Area with a small population of 364,134, almost entirely urban, with 65% of the population located in Greater Reykjavík / Capital region, in and around the capital of Reykjavik. Fish, hydropower and geothermal power are key natural resources, Since 2010, tourism has become a key driver of economic growth. Iceland's economy is highly export-driven, trading mainly with Europe, United Kingdom, United States and Canada. Marine products account for the majority of goods exports along with metals. Imports comprise of raw material used for manufacturing and consumer goods. Reykjavik is the key gateway port to Iceland and handles the vast majority of imports and exports. The Port of Reykjavík comprises of two harbours; Gamla höfn (Old harbour) and Sundahöfn. Gamla höfn (Old Harbour) mainly handles fishing vessels and small cruise vessels. The harbour also comprises of an oil terminal to the north. Sundahöfn is the main gateway port for import and export of goods for the country and handles containers, cruise, general cargo, bulk and trawlers. Containers are handled at two terminals Eimskip terminal and the Samskip terminal. Container throughput handled at Sundahöfn grew from 167,000 TEU in 2010 to 310,000 TEU in 2017, a CAGR (2010-2017) 9.2% p.a., significantly faster that global volume. Throughput declined slightly 2018-2020 due to COVID. Year-on-year change in throughput has been volatile mainly related to changes in fish catch and increases in aluminium production capacity. Historical economic growth has been rapid driven by growth in services (financial sector pre 2008 and tourism from 2010 onwards) and investments in aluminium production. The OECD identifies sectors such as pharmaceuticals, data processing and storage service exports to continue growing fast and Innovative carbon capture technologies to provide export income growth. Oxford economics forecast GDP to grow at CAGR (2020-2030) of 2.6% p.a. and at CAGR of 1.5% p.a. thereafter. Statistics Iceland's own projections are for net immigration to result in a higher growth of total population in the near term to 2027 and to grow by less than 0.5% thereafter. Although there are a number of factors that can drive year on year changes in container traffic, economic growth is generally accepted as a reasonable proxy to determine future container traffic growth. Based on long term economic projections by Oxford economics, container throughput at Sundahöfn is projected to grow just under a million TEU by 2050.

Summary

	Key takeaways
Review of current container operations	Eimskip occupies the Vatnagarðabakki, Kleppsbakki and Sundabakki quays with four services that call at Sundahöfn, serving North Europe, North America and the Faroe Islands. Sundabakki has the deepest depth available at the port and can accommodate the largest vessels deployed. A rock at mid point along Kleppsbakki restricts depth available. Samskip Terminal occupies the Vogabakki quay with two services calling at Sundahöfn , connecting to North Europe and the Faroe islands. Vogabakki has a depth of up to 9.0 meters to the north of the quay with depth reducing to 8.0 meters to the south. Based on current vessels advertised by EIMSKIP and SAMSKIP that are deployed on trades calling at Sundahöfn, the largest container ships measure up to 180 meters LOA with a maximum draft of 10.9 meters. These vessels can only be berthed at Sundabakki. Other vessels currently do not have a constraint on the quays they are deployed at. All services call in Sundahöfn on Monday or Tuesday; Eimskip services all make two calls. There is no activity on Saturday and Sunday, according to the pro forma schedules. 2021 YTD data from Faxaports show significant month by month variations in throughput handled at Sundahöfn. Volume in January and February is well below the average of 150,000 TEU, peak volume was in May, approximately 20% above the average (in line with global planning benchmarks) Berth occupancy and utilisation varies by quay, typically vessels spend around 40 hours alongside with good productivity levels on vessel handling. The occupancy of the quay is not directly related to operations need and can vary and influenced by the need to minimize additional costs for vessel moves and vessels wait alongside the berth. Faxaports as the port authority operates a landlord model and leases the quays to private operators typically for 12 months for vessel handling, and leases the land in the port behind the quay for storage and operations comprises of leases for various parcels of land the lease for which varies between 25-50 years.
Key issues	1. Vatnagarðabakki has low depth and is not used by container vessels 2. A rock at mid point along Kleppsbakki restricts depth available. 3. Container ships measure up to 180 meters LOA with a maximum draft of 10.9 meters currently call at Sundahöfn. Vessels are fully utilised and will need to be upsized to accommodate trade growth. Available depth at Sundahöfn will be a constraint. 4. Weekly vessel calls peak on Monday or Tuesday; there is no activity on Saturday and Sunday. This impacts berth utilisation.

Summary

	Key takeaways
Assessment of future needs	Sundahöfn needs to be able to handle future volume, vessel sizes, the call pattern required by the market and to provide space for competition and new competition Overall economic growth is the driver of future container traffic growth. Based on long term economic projections by Oxford Economics, container throughput at Sundahöfn is projected to grow to just under a million TEU by 2050. 2021 YTD data from Faxaports show significant month by month variations in throughput handled at Sundahöfn. Volume in January and February is well below the average of 150,000 TEU, peak volume was in May, approximately 20% above the average. A 20% peaking allowance is in line with global planning benchmarks. We expect that the capacity of vessels calling at Sundahöfn will rise in line with market demand. Vessel length and draft were forecast according to the volume growth rate and the relationship between vessel capacity and dimensions. Maximum LOA rises to approximately 280m and draft to 13.4m for the biggest ships; these may be too large for the port. Market requirements mean a concentration of import calls early in the week and export calls at the end of the week. This results in call bunching and peaks in demand for quay capacity, particularly on Tuesday-Wednesday. Assuming that existing call patterns continue, Sundabakki will require 491m of berth length in 2025 and nearly 600m by 2040. The use of Kleppsbakki is restricted to vessels with lower draft. We project that quay length required will reach 211m in 2040. Samskip's North and South services call at Vogabakki. 360-370m will be needed in 2025 and 410-420m in 2040 Peak berth length requirements in the High Case reach 1200 m in 2040, on Tuesdays. If 1200m of berths were available, substantial berth capacity would be available on off-peak days, Thursday-Monday.

Summary

	Key takeaways
Assessment of alternatives	We have reviewed six Alternatives for future development: Faxaports plan; Eimskip plan (Sundabakki/Kleppsbakki only); Drewry Alternatives 1, 2, 3a, 3b. We have assumed that the container terminal boundary remains unchanged, that the Sundabraut Bridge is built, and that existing vessel call patterns persist. We have assumed steady increases in berth productivity and reductions in CFS dwell times. Faxaports considered filling in Kleppsbakki basin and extending Sundabakki (by 215m) and Vogabakki (by 440m). The reclaimed area was planned to be used for warehousing and to meet other land use needs, however, this would reduce the berthing capacity for services calling at Sundahöfn. The material for the reclamation would be generated by dredging the approach channel. Eimskip has prepared a proposed plan for its present facility at Sundabakki. The berth would be extended to 615m and the yard reorganised, with RTGs as the main equipment type. Vogabakki is not addressed in this plan. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal. Drewry Alternative 1 proposes a continuation of the split between Eimskip and Samskip's terminals, the extension of Sundabakki (by 215m) and Vogabakki (by 235m) and the extension of stacking areas for both terminals. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal. Alternative 2 proposes a common user quay covering Kleppsbakki, Sundabakki and Vogabakki, with separate stacking areas for the lines. Sundabakki is fully extended by 215m, and only 50m are added to Vogabakki. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal. Alternative 3a proposes that Sundahöfn becomes a common user integrated terminal. All yard area is developed and almost all quay length (some minor sections of the quay have not been developed, but could be, for accommodating bigger ships). This is the only alternative able to receive the biggest vessels included in the forecast for 2050. New entrants would be served by the common user terminal operator. Drewry Alternative 3b proposes a dedicated terminal for Eimskip at Sundabakki, with an extension of quay and yard area, and a common user terminal at an extended Vogabakki that would accommodate both Samskip and future new entrants. The capacity (0.9-1 million teu p.a.) and cost of the various Alternatives are similar; all Alternatives provide sufficient capacity to meet the High Case forecast container traffic. All Alternatives provide the same land area for CFS and coldstores. Throughput capacity is sufficient to meet demand. The main variations are in the availability of slots for new entrants; Alternative 3a generates the largest number of slots for potential newcomers; 3b smallest;1 and 2 are equivalent in terms of slots for newcomers, but subject to agreements with current operators A comparison of civil works and new equipment cost (based on international benchmarks) shows total costs in the period to 2050 range from ISK20.4 billion to ISK23.7 billion. Alternative 3a and 3b have the highest cost, while Alternative 2 shows the lowest cost, due to a lower length of quay added In the High Case, total costs in the period to 2050 range from ISK28.6 billion to ISK32.0 billion. Alternative 3b has the lowest costs Alternative 3a provides the greatest operational flexibility (as a full common user terminal) and the largest number of slots for new entrants. The additional cost compared with Alternative 1 (status quo) is modest. In our view, this is the most attractive option.

Summary

	Key takeaways
Assessment of institutional structure option	Faxaports also asked Drewry to assess the structural options that would best meet their key objectives: 1. Ensure optimum competitiveness / efficiency of container terminal operations at Sundahöfn; 2. Responsible use of public funds / land and value for money for the local communities / shareholders of Faxaports 3. Call from community and competition authorities to welcome newcomers The aims and objectives of Port Authority, independent stevedores and carriers are institutionally separate; but they are not mutually exclusive – they can and do co-exist to the benefit of all port stakeholders. There are three main options: 1. Integrated port authority and operator 2. Landlord port authority in JV with stevedore as terminal operator 3. Third party terminal operator with concession or lease In all three options Land use planning and development and Marine services are performed directly by the port authority. Operations of container berths, yard, CFS, Cold store and container terminal gate allow a range of potential options / participants. The operation of CFS and cold stores can be viewed as a separate option and can be separate to the berth and yard operations structure. Land use for CFS and Cold Stores can be controlled through leases.
	Drewry has assessed attractiveness of each development option on the following criteria: ✓ Clear division of roles and responsibilities - "Duty" or "Profit" ✓ Strategic focus and long term planning ✓ Efficient land use ✓ Terminal efficiency, productivity and reliability ✓ Port and terminal costs to shipping lines and end users ✓ Introduction of global best practice ✓ Access to new entrants / additional lines ✓ Ability to influence wider supply chain ✓ Financial returns to Faxaport stakeholders In addition feasibility of a proposed development option has been assessed on: ✓ Organisational expertise - ability to manage terminal operations ✓ Contractual limitations and feasibility to change On an unweighted assessment of the criteria above to the different structural options a common user terminal with either the port authority in a jv with stevedore as terminal operator or a Third party terminal operator with concession is the most attractive option

Summary

	Key takeaways
Overall Assessment	We base our overall assessment on availability of capacity, operational flexibility, capital expenditure and the attractiveness and feasibility of the associated institutional structures. • Operationally, a common user terminal (Alternative 3a) is the best alternative • The existing operation of two dedicated terminals (Alternative 1) and a combination of a dedicated terminal for Eimskip alongside a common user terminal at Vogabakki (Alternative 3b) are operationally the next best • Based on the capex projection for the High Case, the option of a common berth with dedicated yard areas (Alternative 2), and a combination of a dedicated terminal for Eimskip alongside a common user terminal at Vogabakki (Alternative 3b) are the most attractive alternatives in terms of cost • The common user options (Alternative 3a and 3b) provide the most attractive institutional structures • The existing operation (Alternative 1) and combination of a dedicated terminal for Eimskip alongside a common user terminal at Vogabakki (Alternative 3b) provide the most feasible structures Overall, we conclude that a common user terminal, with a third party terminal operator, is the best option, providing the best operational flexibility for a modest additional cost. Should this prove not be feasible, due to land leases, the combination of a dedicated terminal for Eimskip alongside a common user terminal at Vogabakki 3b would be a fall back option that would provide operational flexibility and an attractive structure.

Drewry

Project overview

Sundahöfn – Challenges for Faxaports

- Situated close to center of Reykjavík city with demand for land increasing and making **land use optimisation** a key priority for Faxaports.
- Eimskip and Samskip currently operate the container terminals in the port, have **long term lease of lots of land** / yard area in the port and **request additional space for the long term.**

- **Potential highway crossing**: City of Reykjavik and Icelandic Road Authorities are investigating the possibility of new highway connection across port. Current suggestions involve a bridge that will limit size of ships to the south end of Vogabakki.
- Potential highway **will limit the use of existing quays and land**.

- **Call** from community and competition authorities **to welcome newcomers.**

Project scope

The core objective of our engagement is to assist in the evaluation of the various development options and to support Faxaports in identifying the optimum development option

Project scope

Faxaports has developed its own future development plan for Sundahöfn. As part of the assessment of Sundahöfns' development options, Faxaports has raised the following key questions that it aims to be addressed as part of this engagement:

1. Land use optimisation and planning:
   - What is the optimal arrangement of container quays and stevedoring equipment in future perspective?
   - Can current container areas been better utilized and how?
   - What strategy should Faxaport apply when allocating new lots?
2. Institutional structure:
   - Should Faxaport consider to offer stevedoring service or support foundation of a third party?
3. Other - Are there any near or long term technical developments in the maritime and port sector that should affect our strategy now?

The underlying objectives of the assessment would be to ensure:

Optimum competitiveness / efficiency of container terminal operations at Sundahöfn;

Responsible use of public funds / land and value for money for the local communities / shareholders of Faxaports

Project approach

A thorough internal and external analysis would lay the foundation for developing the strategy and roadmap for the development of future container operations at Sundahöfn

1. Internal analysis
2. External analysis
3. Strategy development and roadmap
4. Business plan

Drewry

Market overview and outlook

Iceland - Overview

Iceland is a member state of the European Economic Area with a small population of 364,134, almost entirely urban, with 65% of the population located in Greater Reykjavík / Capital region, in and around the capital of Reykjavik.

Fish, hydropower, geothermal power and diatomite are key natural resources, Since 2010, tourism has become a key driver of economic growth.

- Iceland, a member state of the European Economic Area is the westernmost European country between Greenland to the north west, Canada and the USA to the South West and the United Kingdom and Europe to the South East.
- Iceland has a population of 364,134, almost entirely urban with half of the population located in and around the capital of Reykjavik; smaller clusters are primarily found along the coast in the north and west.
- Fish, hydropower, geothermal power and diatomite are key natural resources. Glaciers, rivers and lakes cover a large proportion of land area resulting in abundant freshwater supplies.
- Since 2010, tourism has become a key driver of economic growth, with the number of tourists reaching 8 times the Icelandic population in 2018. From 2010 to 2018, the number of tourists visiting Iceland increased by nearly 400%.

Source: CIA World factbook

Iceland trade composition

Iceland's economy is highly export-driven, trading mainly with EU, United Kingdom, United States and Canada. Marine products account for the majority of goods exports along with aluminium. Imports comprise of raw material used for manufacturing and consumer goods.

Drivers of trade

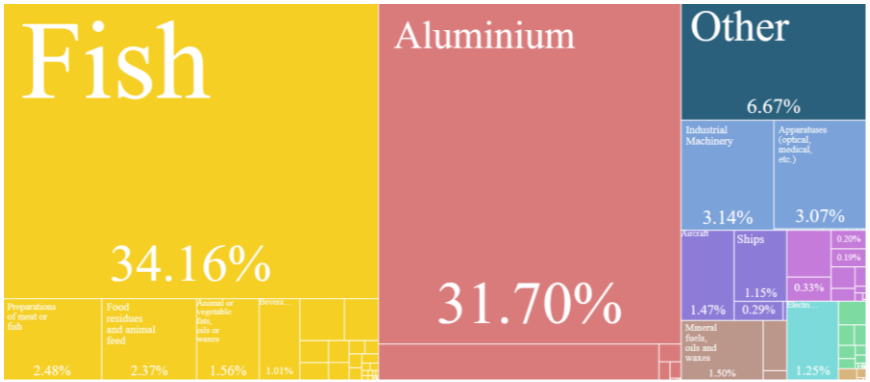
- Historically, the Icelandic economy depended heavily on fisheries. For the period 2010-2020, total catch has varied between 1.0 to 1.4 million tonnes with an average of 1.1 million tonnes. Fiskistofa, the Directorate of Fisheries alots annual catch quotas to limit the total catch. Total catch for Capelin has been increased from 127k tonnes to 900k tonnes in 2022. Marine products account for the majority of goods exports.
- The manufacturing sector comprises of aluminium production, Ferro Silicon production and food processing is based primarily on competitive energy costs and is highly export-driven.
    - There are currently three Aluminium production plants in operation with a total capacity of over 850,000 tonnes per year.
    - There is one Ferro Silicon production plant in Grundartangi with annual production capacity of 120,000 tonnes per year.
    - Food processing, especially salting, drying, curing - smoking and reduction (fish meal and fish oil) of fish is a key contributor to the manufacturing sector in Iceland.

Main exports are to Netherlands, United Kingdom, Germany, Spain, United States, France, Canada. Note that there is a distinction between export countries and entry countries. This is due to the fact that Denmark and Netherlands are often entry points due to port location, but are not necessarily export countries as such in all cases.

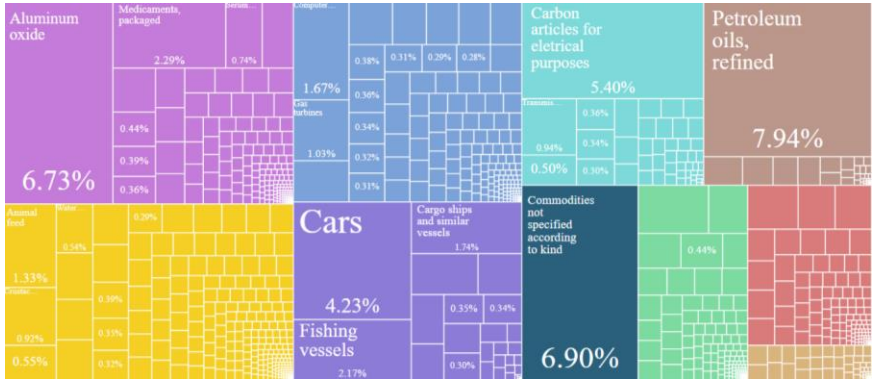
The main imports are refined petroleum, aluminum oxide, carbon/graphite electronics, cement, cars, packaged medicines, machinery and equipment, foodstuffs and textiles.

Imports are mainly from Norway, Netherlands, Germany, Denmark, United States, United Kingdom, China and Sweden. Note that there is a distinction between import countries and entry countries. This is due to the fact that Denmark and Netherlands are often entry points due to port location, but are not necessarily export countries as such in all cases.

Exports



Imports



Source: The Growth Lab at Harvard University. The Atlas of Economic Complexity

Key seaports of Iceland

Reykjavik is the key gateway port to Iceland and handles the vast majority of imports and exports.

- Statistics Iceland lists more than 20 ports in Iceland handling cargo.
- Reykjavik is the key gateway port to Iceland and handles the vast majority of imports and exports.
- The three Aluminium production plants result in imports of raw material and exports of finished products to be handled at Straumsvík, near the town of Hafnarfjörður, Grundartangi in Western Iceland near the town of Akranes and Reyðarfjörður.
- There is one Ferro Silicon production plant in Grundartangi which also routes its products via Grundartangi.
- Container line operators Eimskip and Samskip, advertise calling at seven ports in Iceland – Reykjavik, Grundartangi, Ísafjörður, Sauðárkrókurr, Akureyri, Húsavík, Reyðarfjörður and Vestmannaeyjar.

Key seaports of Iceland

Reykjavik Port overview

The Port of Reykjavík comprises of two harbours; Gamla höfn (Old harbour) and Sundahöfn.
Gamla höfn (Old Harbour) mainly handles fishing vessels and small cruise vessels. The harbour also comprises of an oil terminal to the north.

Source: Faxaports

Sundahöfn overview

Sundahöfn is the main gateway port for import and export of goods for the country and handles containers, cruise, general cargo, bulk and trawlers. Containers are handled at two terminals Eimskip terminal and the Samskip terminal.

Sundahöfn overview

Sundahöfn is the main gateway port for import and export of goods for the country and handles containers, cruise, general cargo, bulk and trawlers.

Container Facilities comprise of two terminals:

1. Eimskip Terminal: occupies the Vatnagarðabakki, Kleppsbakki and Sundabakki quays, where there is a 300,000 sq.m. container terminal with storage capacity of 7.000 TEU and 500 reefer points.
2. Samskip Terminal: occupies the Vogabakki quay, where there is a 220,00 sq.m. container terminal with storage capacity of 7.530 TEU and 352 reefer points.

Large cruise vessels are handled at Skarfabakki.

General cargo, bulk and trawlers are handled at Skarfabakki and Vogabakki.

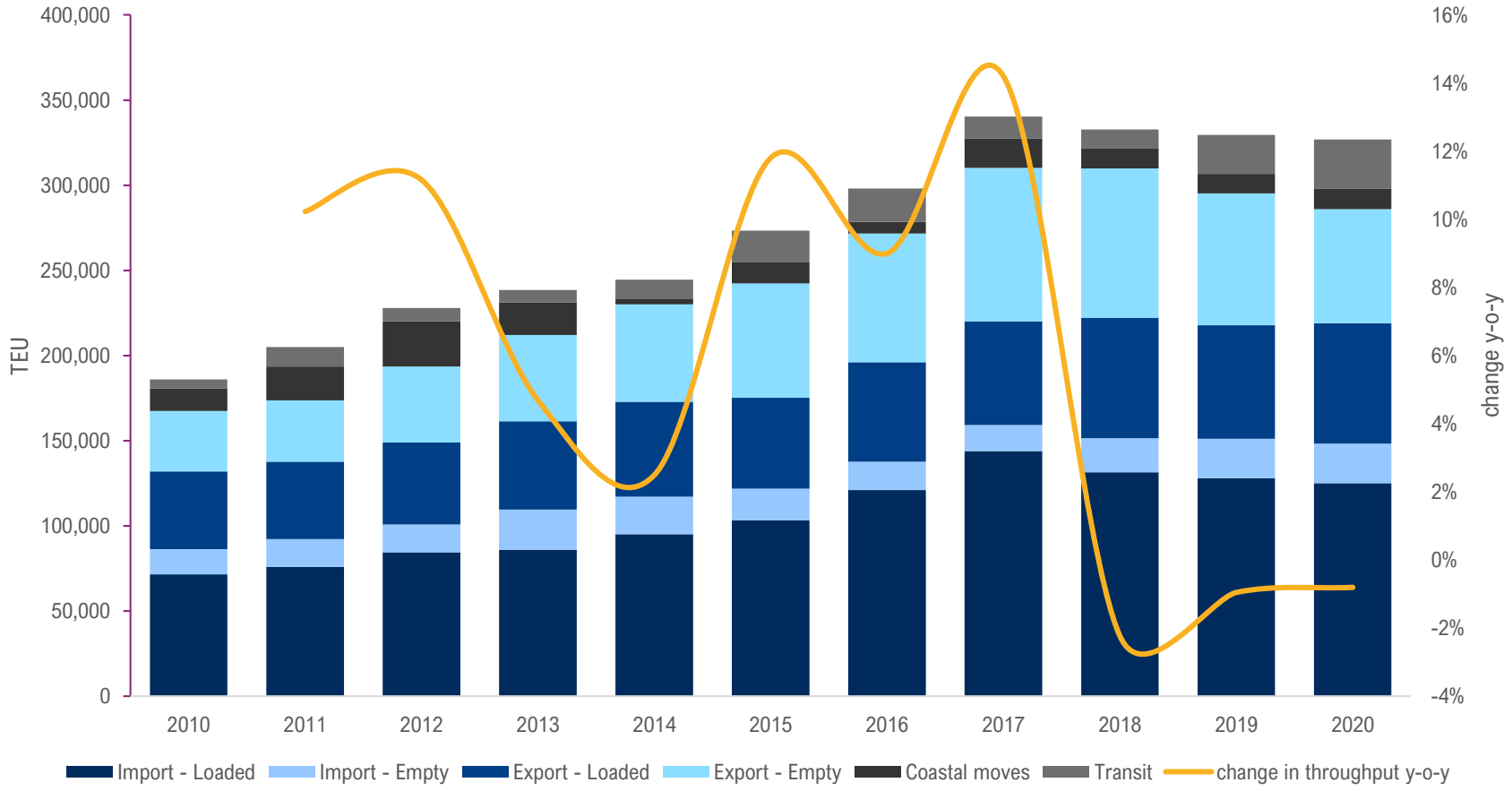
(Source: Port information guide available here https://www.faxafloahafnir.is/wp-content/uploads/2020/06/Port-information-quide-May-2020.pdf)

Sundahöfn Layout

Source: Faxaports

Sundahöfn historic container throughput

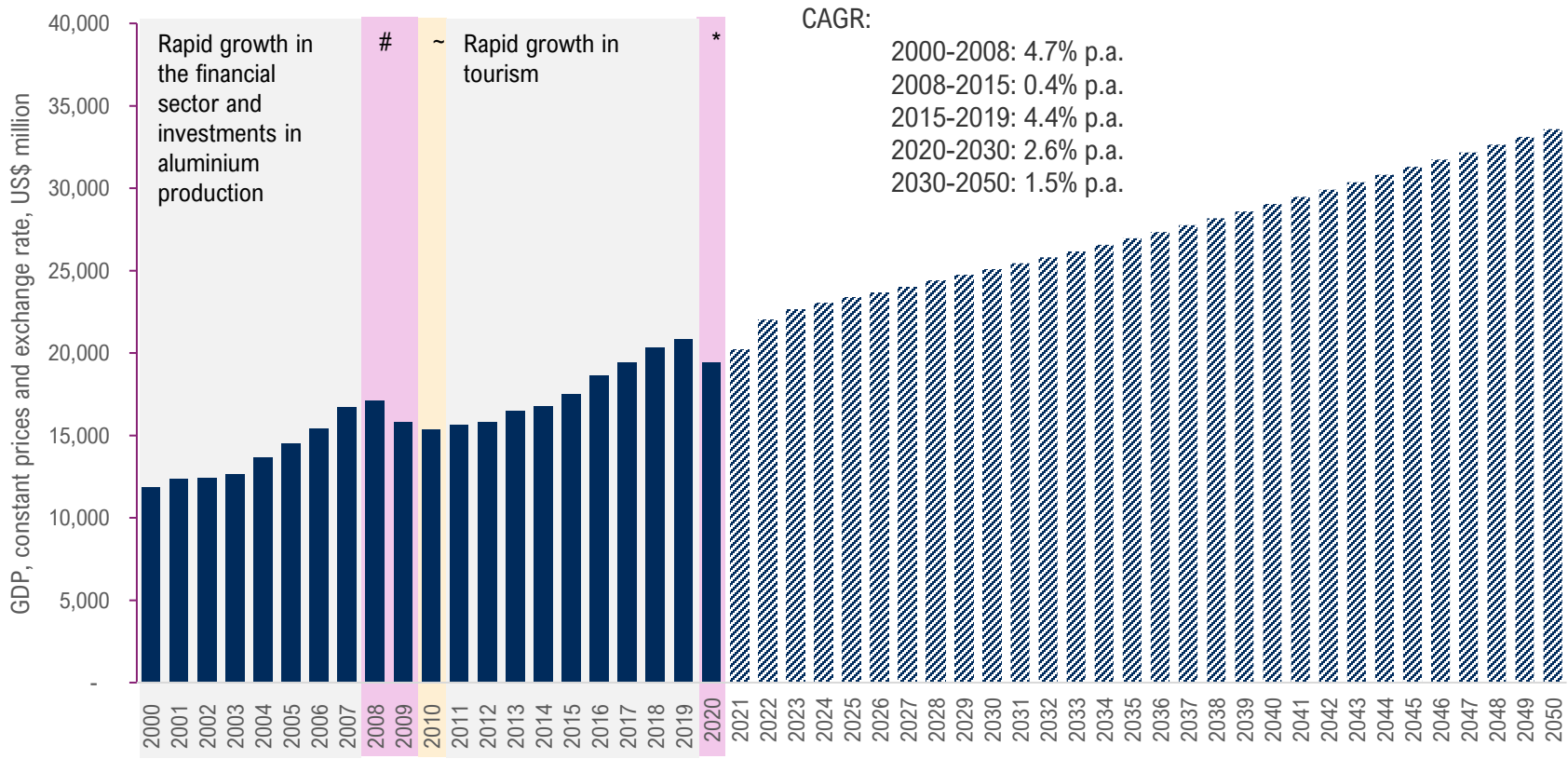
Container throughput handled at Sundahöfn grew from 167,000 TEU in 2010 to 310,000 TEU in 2017, a CAGR (2010-2017) 9.2% p.a., significantly faster that global volume. Throughput declined slightly 2018-2020 due to COVID. Year-on-year change in throughput has been volatile mainly related to changes in fish catch and increases in aluminium production capacity.



Source: Faxaports

Iceland economic growth

Historical economic growth has been rapid driven by growth in services (financial sector pre 2008 and tourism from 2010 onwards) and investments in aluminium production. The OECD identifies sectors such as pharmaceuticals, data processing and storage service exports to continue growing fast and Innovative carbon capture technologies to provide export income growth. Oxford economics forecast GDP to grow at CAGR (2020-2030) of 2.6% p.a. and at CAGR of 1.5% p.a. thereafter.



Global financial crisis / Global economic crisis

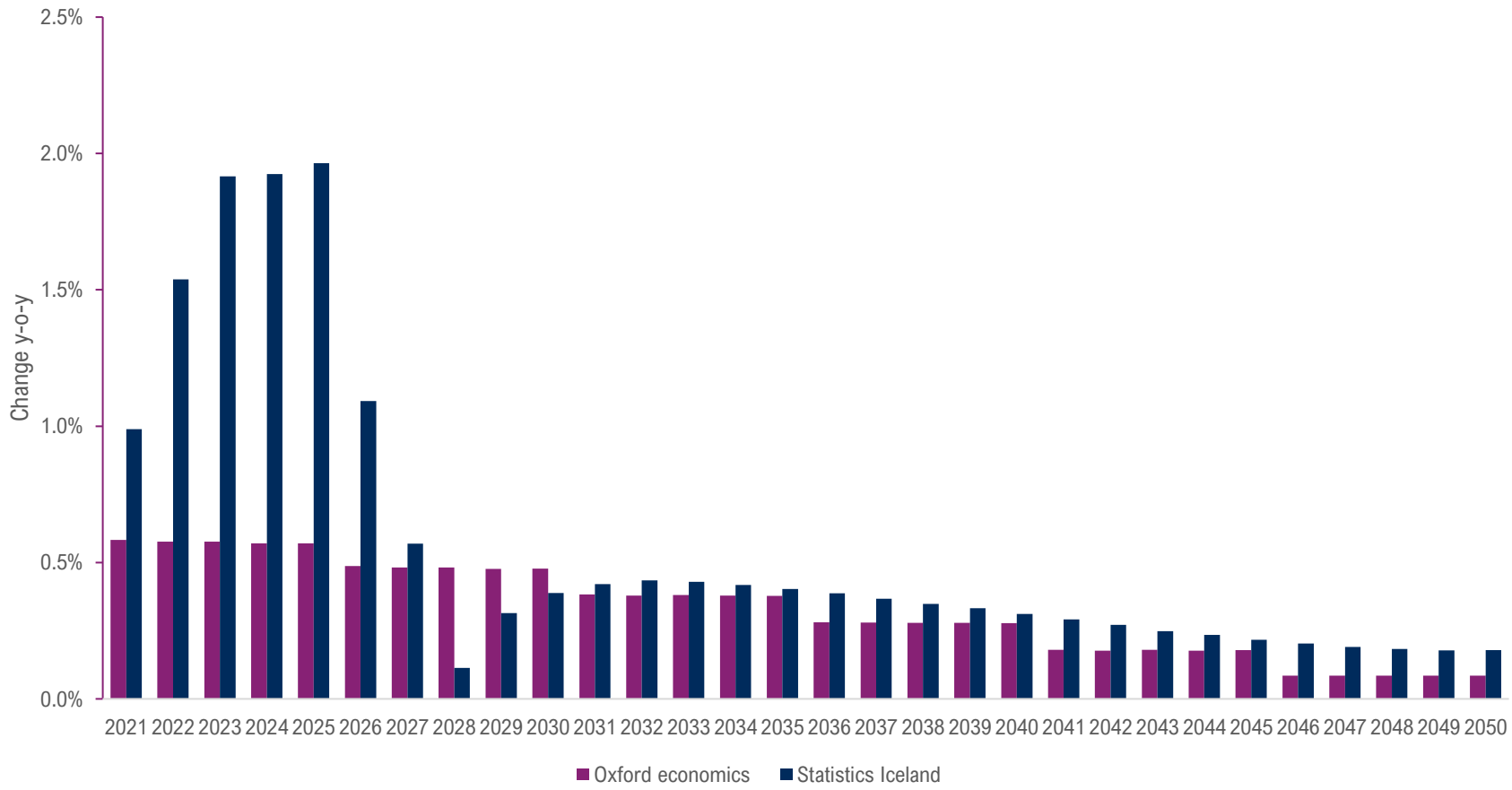
~eruptions of Eyjafjallajökull, 20 Mar 2010 – 27 Oct 2010

* COVID

Source: Oxford Economics

Iceland population growth

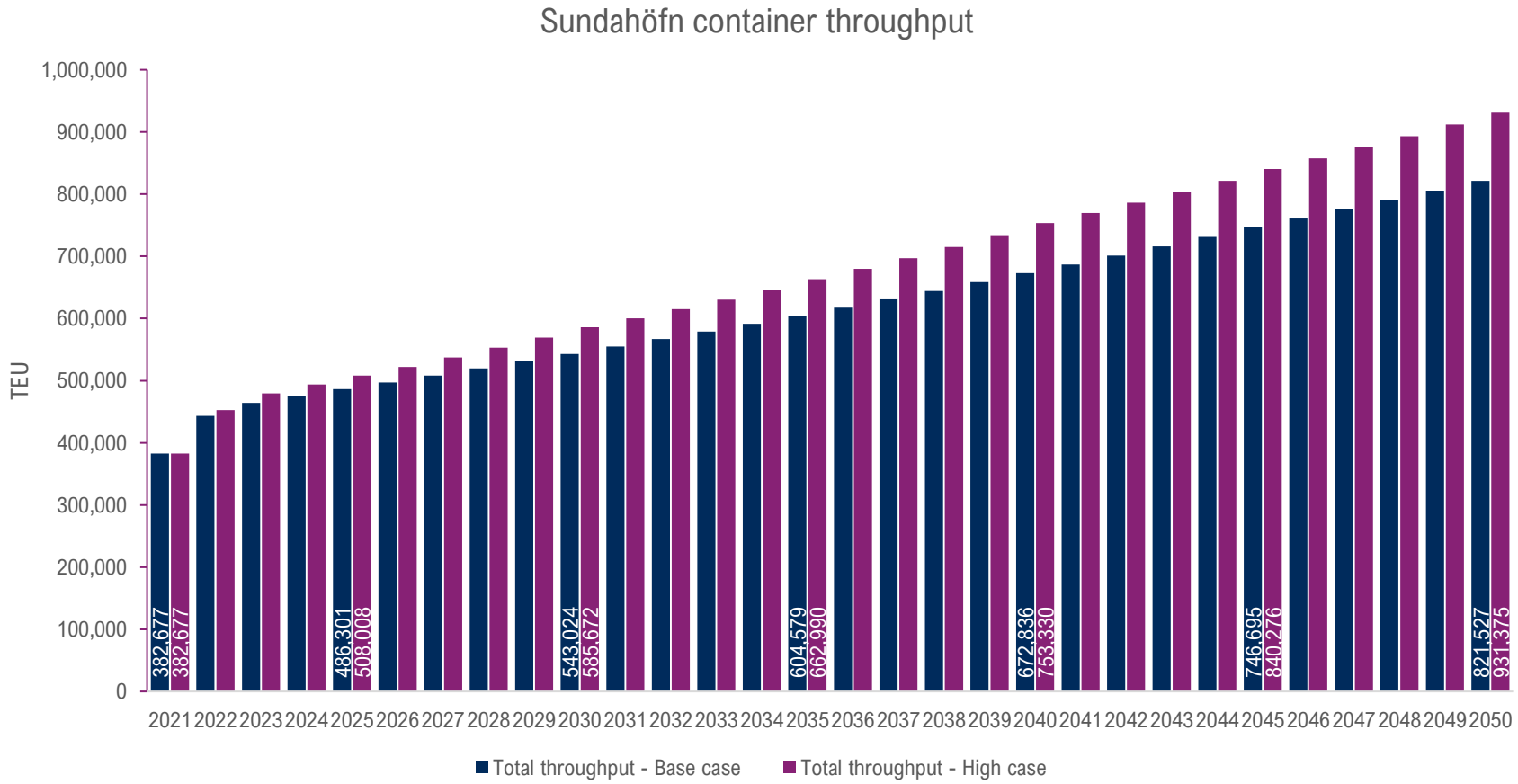
Statistics Iceland's own projections are for net immigration to result in a higher growth of total population in the near term to 2027 and to grow by less than 0.5% thereafter.



Source: Oxford Economics, Statistics Iceland

Sundahöfn forecast container throughput

Although there are a number of factors that can drive year on year changes in container traffic, economic growth is generally accepted as a reasonable proxy to determine future container traffic growth. Based on long term economic projections by Oxford economics, container throughput at Sundahöfn is projected to grow just under a million TEU by 2050.



Source: Oxford Economics, Statistics Iceland

Summary

	Key takeaways
Market overview and outlook	Iceland is a member state of the European Economic Area with a small population of 364,134, almost entirely urban, with 65% of the population located in Greater Reykjavík / Capital region, in and around the capital of Reykjavik. Fish, hydropower, geothermal power and diatomite are key natural resources, Agricultural land is scarce. Since 2010, tourism has become a key driver of economic growth. Iceland's economy is highly export-driven, trading mainly with Europe, United Kingdom, United States and Canada. Marine products account for the majority of goods exports along with aluminium. Imports comprise of raw material used for manufacturing and consumer goods. Reykjavik is the key gateway port to Iceland and handles the vast majority of imports and exports. The Port of Reykjavík comprises of two harbours; Gamla höfn (Old harbour) and Sundahöfn. Gamla höfn (Old Harbour) mainly handles fishing vessels and small cruise vessels. The harbour also comprises of an oil terminal to the north. Sundahöfn is the main gateway port for import and export of goods for the country and handles containers, cruise, general cargo, bulk and trawlers. Containers are handled at two terminals Eimskip terminal and the Samskip terminal. Container throughput handled at Sundahöfn grew from 167,000 TEU in 2010 to 310,000 TEU in 2017, a CAGR (2010-2017) 9.2% p.a., significantly faster that global volume. Throughput declined slightly 2018-2020 due to COVID. Year-on-year change in throughput has been volatile mainly related to changes in fish catch and increases in aluminium production capacity. Historical economic growth has been rapid driven by growth in services (financial sector pre 2008 and tourism from 2010 onwards) and investments in aluminium production. The OECD identifies sectors such as pharmaceuticals, data processing and storage service exports to continue growing fast and Innovative carbon capture technologies to provide export income growth. Oxford economics forecast GDP to grow at CAGR (2020-2030) of 2.6% p.a. and at CAGR of 1.5% p.a. thereafter. Statistics Iceland's own projections are for net immigration to result in a higher growth of total population in the near term to 2027 and to grow by less than 0.5% thereafter. Although there are a number of factors that can drive year on year changes in container traffic, economic growth is generally accepted as a reasonable proxy to determine future container traffic growth. Based on long term economic projections by Oxford economics, container throughput at Sundahöfn is projected to grow just under a million TEU by 2050.

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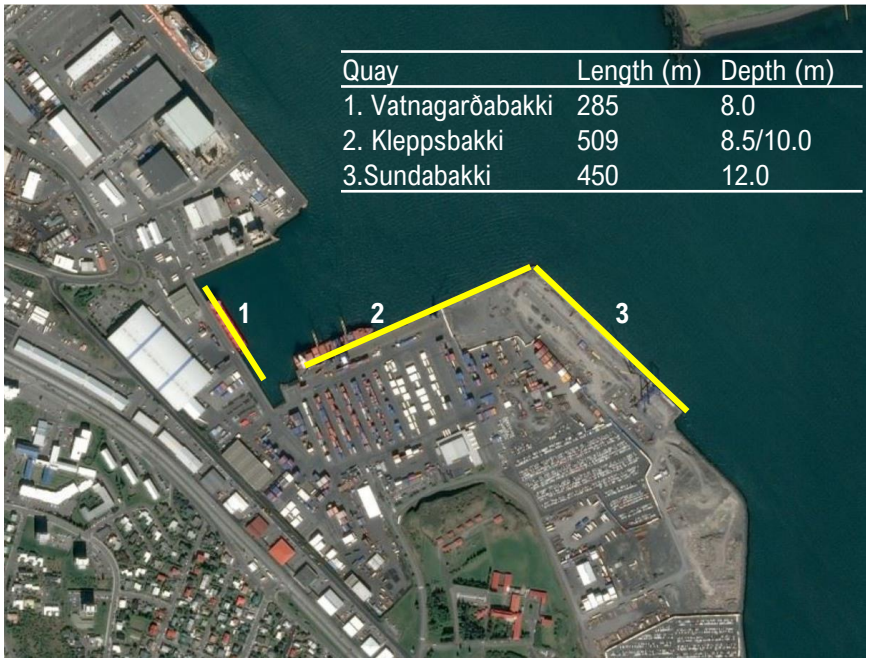
Review of current container operations

Eimskip Terminal

Eimskip occupies the Vatnagarðabakki, Kleppsbakki and Sundabakki quays with four services that call at Sundahöfn, serving North Europe, North America and the Faroe Islands. Sundabakki has the deepest depth available at the port and can accommodate the largest vessels deployed. A rock at mid point along Kleppsbakki restricts depth available.

Terminal characteristics

Occupies the Vatnagarðabakki, Kleppsbakki and Sundabakki quays, where there is a 300,000 sq.m. container terminal with storage capacity of 7.000 TEU and 500 reefer points.



Quay	Length (m)	Depth (m)
1. Vatnagarðabakki	285	8.0
2. Kleppsbakki	509	8.5/10.0
3.Sundabakki	450	12.0

(Source: Port information guide available here https://www.faxafloahafnir.is/wp-content/uploads/2020/06/Port-information-quide-May-2020.pdf)

Eimskip liner services

Eimskip has four services that call at Sundahöfn, serving North Europe, North America and the Faroe Islands.

All four services run weekly, with a total nominal capacity of approximately 5,500 per week

Eimskip liner services calling Reykjavik (as on December 2021)

Service	Port rotation
Blue Line	Reykjavik, Rotterdam, Bremerhaven, Rotterdam, Reykjavik, Grundartangi
Red Line	Nuuk, Reykjavik, Reydarfjordur, Thorshavn, Aarhus, Aalborg, Helsingborg, Aarhus, Thorshavn, Reykjavik, Nuuk
Green Line	Reykjavik, Portland, Halifax, Argentia, Reykjavik, Saudarkrokur, Husavik, Akureyri, Isafjordur, Reykjavik
Yellow Line	Reykjavik, Vestmannaeyjar, Thorshavn, Immingham, Rotterdam, Fredrikstad, Immingham, Reykjavik, Grundartangi

Source: as advertised by EIMSKIP on https://www.eimskip.com/services/liner-sailing-schedule/

Samskip Terminal

Samskip Terminal occupies the Vogabakki quay with two services calling at Sundahöfn , connecting to North Europe and the Faroe islands. Vogabakki has a depth of up to 9.0 meters to the north of the quay with depth reducing to 8.0 meters to the south.

Terminal characteristics

Samskip Terminal occupies the Vogabakki quay, where there is a 220,00 sq.m. container terminal with storage capacity of 7.530 TEU and 352 reefer points.

Samskip liner services

Samskip has two services calling at Sundahöfn , connecting to North Europe and the Faroes, with weekly capacity of approximately 1,400 TEU. The North Route calls at several Iceland ports, whilst the South Route calls only at Reykjavik.

All three quays at Sundahöfn can accept the vessels used by Samskip.

Samskip liner services calling Reykjavik (as on December 2021)

Service	Port rotation
North route	Rotterdam, Reykjavik, Reykjavik, Rotterdam, Grundartangi, Reykjavik, Vestmannaeyjar, Runavik, Rotterdam, Cuxhaven, Varberg, Aarhus, Runavik, Reykjavik
South route	Reykjavik, Isafjordur, Saudarkrokur, Akureyri, Reydarfjordur, Vopnafjordur, Hull, Rotterdam, Reykjavik

Source: as advertised by SAMSKIP on https://en.samskip.is/schedules/sailing-schedule/

Container vessel dimensions calling Sundahöfn

Based on current vessels advertised by EIMSKIP and SAMSKIP that are deployed on trades calling at Sundahöfn, the largest container ships measure up to 180 meters LOA with a maximum draft of 10.9 meters. These vessels can only be berthed at Sundabakki. Other vessels currently do not have a constraint on the quays they are deployed at.

Container vessel dimensions (as on December 2021)

Vessel	Operator	Service	Capacity (TEU)	LOA (m)	Beam (m)	Maximum draft (meter)
Dettifoss	Eimskip	Red Line	2,148	179.40	31.0	10.30
Tukuma Artica	Eimskip	Red Line	2,148	179.40	31.0	10.30
Bruarfoss	Eimskip	Red Line	2,148	179.40	31.0	10.30
Vera D	Eimskip	Blue Line	1,678	178.57	27.6	10.86
Jonni Ritscher	Eimskip	Blue Line	1,875	178.57	27.6	10.87
Skogafoss	Eimskip	Yellow Line	698	129.60	20.6	7.40
Ef Ava	Eimskip	Yellow Line	698	129.60	20.6	7.40
Lagarfoss	Eimskip	Green Line	875	140.68	23.2	8.70
Selfoss	Eimskip	Green Line	698	129.58	20.6	7.40
Vivienne Sheri D	Eimskip	Green Line	925	139.30	22.8	8.70
Helgafell	Samskip	North Route	908	137.53	21.3	8.50
Arnarfell	Samskip	North Route	908	137.52	21.3	8.50
Skaftafell	Samskip	South Route	527	100.58	18.8	6.68
Hoffell	Samskip	South Route	518	100.80	18.8	6.53

Source: as advertised by EIMSKIP on https://www.eimskip.com/services/liner-sailing-schedule/ and by SAMSKIP on https://en.samskip.is/schedules/sailing-schedule/

Calls by Service

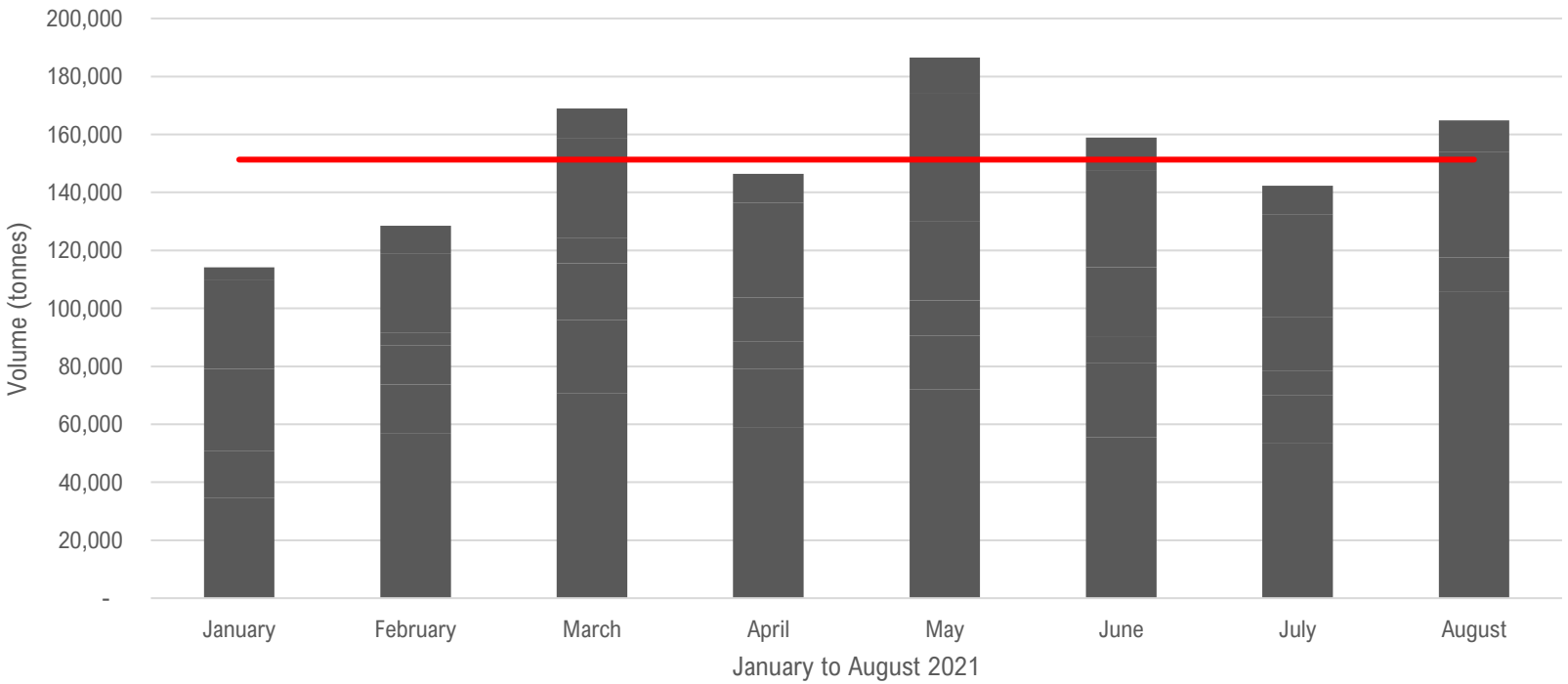
All services call in Sundahöfn on Monday or Tuesday; Eimskip services all make two calls. There is no activity on Saturday and Sunday, according to the pro forma schedules.

- According to the lines' pro forma schedules, all services arrive in Sundahöfn on Monday or Tuesday
- This concentration of calls creates a requirement for three berths from Mondays to Wednesdays
- Eimskip services all make two calls at Reykjavik: Red calls en route to and from Greenland; Green calls en route to and from North America; Green and Yellow discharge at Reykjavik, sail to Grundatangi and return to Reykjavik to load

Service	Call 1 arrival	Call 1 departure	Call 2 arrival	Call 2 departure
Eimskip Blue	Monday	Monday	Thursday	Thursday
Eimskip Yellow	Monday	Monday	Wednesday	Wednesday
Eimskip Red	Tuesday	Wednesday	Tuesday	Wednesday
Eimskip Green	Monday	Tuesday	Friday	Friday
Samskip North route	Tuesday	Wednesday	-	-
Samskip South route	Monday	Monday	-	-

Sundahöfn Port – Volume Seasonality

2021 YTD data from Faxaports show significant month by month variations in throughput handled at Sundahöfn. Volume in January and February is well below the average of 150,000 TEU, peak volume was in May, approximately 20% above the average (in line with global planning benchmarks)



Source: Based on data available from Faxaports

- The peaks of exchanges occur in March, May, June and August. Fewer exchanges occur in winter, in January and February.
- The largest volumes are exchanged on Eimskip's Blue Line. The second most important is Samskip's North Line.

Sundahöfn - review of container Operations

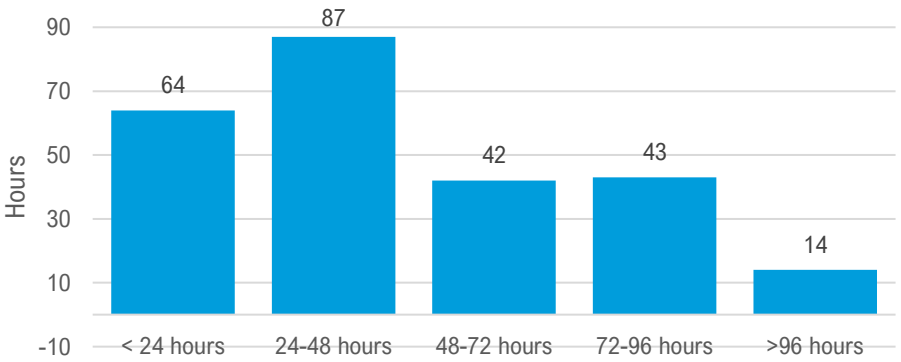
Berth occupancy and utilisation varies by quay, typically vessels spend around 40 hours alongside with good productivity levels on vessel handling. The occupancy of the quay is not directly related to operations need and can vary and influenced by the need to minimize additional costs for vessel moves and vessels wait alongside the berth.

Summary of terminal operations

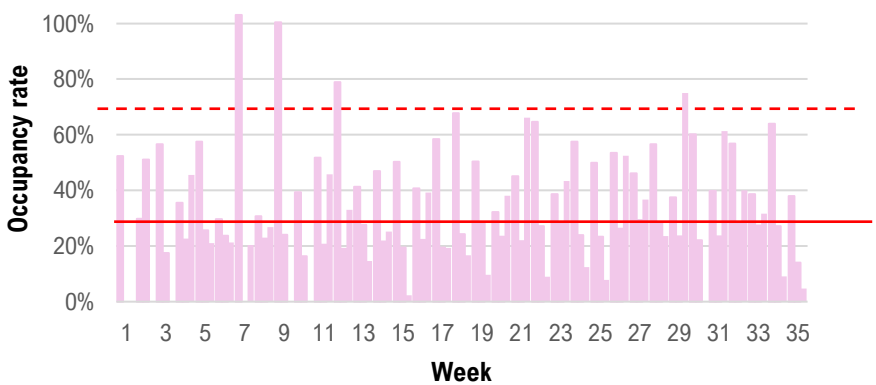
Time at berth		Berth occupancy		Box handled per hour	
Minimum	0.5	Minimum	0%	Minimum	0.0
Average	41	Average	30%	Average	16.1
Maximum	96	Maximum	65%	Maximum	23.8

Waiting time at berth is influenced by ships waiting to berth at Grundartangi to load export metals (aluminium and silicon) in containers, which are heavy and loaded at the bottom (for ship stability) before loading export fish at Sundahofn.

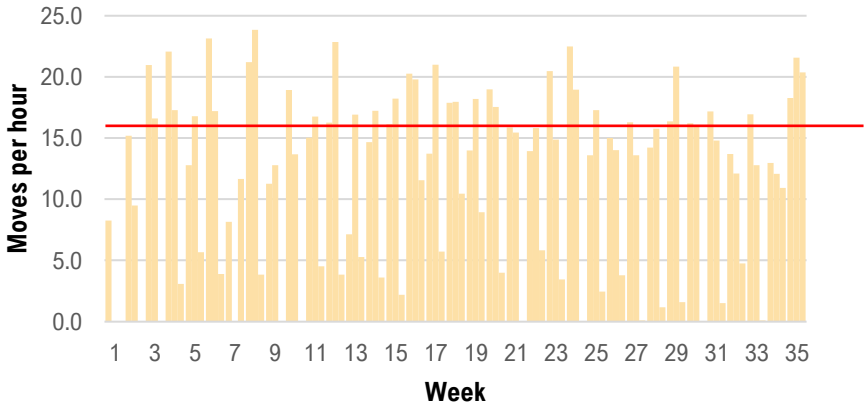
Number of vessels by time spent at berth (Week 1-35, 2021)



Berth occupancy, 2021



Container handling (boxes per hour), 2021



Legend key: Average ———— Industry benchmark - - - - - -

Source: Based on actual vessel call data from Faxaports

Sundahöfn – Institutional structure and land use

Faxaports as the port authority operates a landlord model and leases the quays to private operators typically for 12 months for vessel handling, and leases the land in the port behind the quay for storage and operations comprises of leases for various parcels of land the lease for which varies between 25-50 years.

Faxaports as the port authority operates a landlord model and leases the land for storage and the quay for vessel handling to private operators.

Leases for the use of the quays are typically for 12 months, whereas leases for land in the port behind the quay for storage and operations comprises of leases for various parcels of land the lease for which varies between 25-50 years, although typically are of 25 years duration.

Substantial area in Sundahöfn is devoted to Container Freight Stations (CFS) and cold stores for handling fish facilitating port-centric logistics and distribution.

Stakeholder comments

Stakeholders confirmed the logic of port-centric logistics based on Sundahöfn and expected continued growth in demands for port land, despite the growing challenges arising from the city centre location. Stakeholders confirmed that shipping and port services were good but noted that prices are high.

City centre port location makes sense; needs protection

Port land requested to allow growth

Uncertainty about rationale and policies for land allocation

Road traffic affects transport productivity

Service is good, but prices are high. New competition would be welcome

Current port call pattern is important for cargo owners

Drewry interviewed a variety of port stakeholders, covering shipping lines, importers, fishing industry, animal feed suppliers, trade associations, and the City of Reykjavik. A number of key points emerged in these discussions:

- The concentration of population, commercial activity and consumption in SW Iceland means that a port-centric logistics model based in Sundahöfn makes sense from a logistics point of view;
- This means that there will be continued demand from a variety of players for the use of port land;
- Stakeholders are happy with the level of service provided by lines and the port but note that prices are high;
- Importers and exporters require the existing vessel call pattern: import calls early in the week; export calls (for fish, in particular) towards the end of the week;
- There are challenges for the port arising from its city centre location, including progressive gradual loss of land for port activities, constraints on operations due to concern from neighbouring residents about noise and air quality, and city centre road traffic;
- Stakeholders requested greater clarity and predictability in the logic and processes related to the allocation of port land

Summary

	Key takeaways
Review of current container operations	Eimskip occupies the Vatnagarðabakki, Kleppsbakki and Sundabakki quays with four services that call at Sundahöfn, serving North Europe, North America and the Faroe Islands. Sundabakki has the deepest depth available at the port and can accommodate the largest vessels deployed. A rock at mid point along Kleppsbakki restricts depth available. Samskip Terminal occupies the Vogabakki quay with two services calling at Sundahöfn , connecting to North Europe and the Faroe islands. Vogabakki has a depth of up to 9.0 meters to the north of the quay with depth reducing to 8.0 meters to the south. Based on current vessels advertised by EIMSKIP and SAMSKIP that are deployed on trades calling at Sundahöfn, the largest container ships measure up to 180 meters LOA with a maximum draft of 10.9 meters. These vessels can only be berthed at Sundabakki. Other vessels currently do not have a constraint on the quays they are deployed at. All services call in Sundahöfn on Monday or Tuesday; Eimskip services all make two calls. There is no activity on Saturday and Sunday, according to the pro forma schedules. 2021 YTD data from Faxaports show significant month by month variations in throughput handled at Sundahöfn. Volume in January and February is well below the average of 150,000 TEU, peak volume was in May, approximately 20% above the average (in line with global planning benchmarks) Berth occupancy and utilisation varies by quay, typically vessels spend around 40 hours alongside with good productivity levels on vessel handling. The occupancy of the quay is not directly related to operations need and can vary and influenced by the need to minimize additional costs for vessel moves and vessels wait alongside the berth. Faxaports as the port authority operates a landlord model and leases the quays to private operators typically for 12 months for vessel handling, and leases the land in the port behind the quay for storage and operations comprises of leases for various parcels of land the lease for which varies between 25-50 years.
Key issues	1. Vatnagarðabakki has low depth and is not used by container vessels 2. A rock at mid point along Kleppsbakki restricts depth available. 3. Container ships measure up to 180 meters LOA with a maximum draft of 10.9 meters currently call at Sundahöfn. Vessels are fully utilised and will need to be upsized to accommodate trade growth. Available depth at Sundahöfn will be a constraint. 4. Weekly vessel calls peak on Monday or Tuesday; there is no activity on Saturday and Sunday. This impacts berth utilisation.

Drewry

Assessment of future needs

volume, vessels, call pattern, competition, CFS and coldstores

Drewry

Assessment of future needs

Future needs

Sundahöfn needs to be able to handle future volume, vessel sizes, the call pattern required by the market and to provide berthing and storage facilities for competition

Volume: forecast container traffic (High Case)

Vessel size: project future vessel LOA, draft and beam

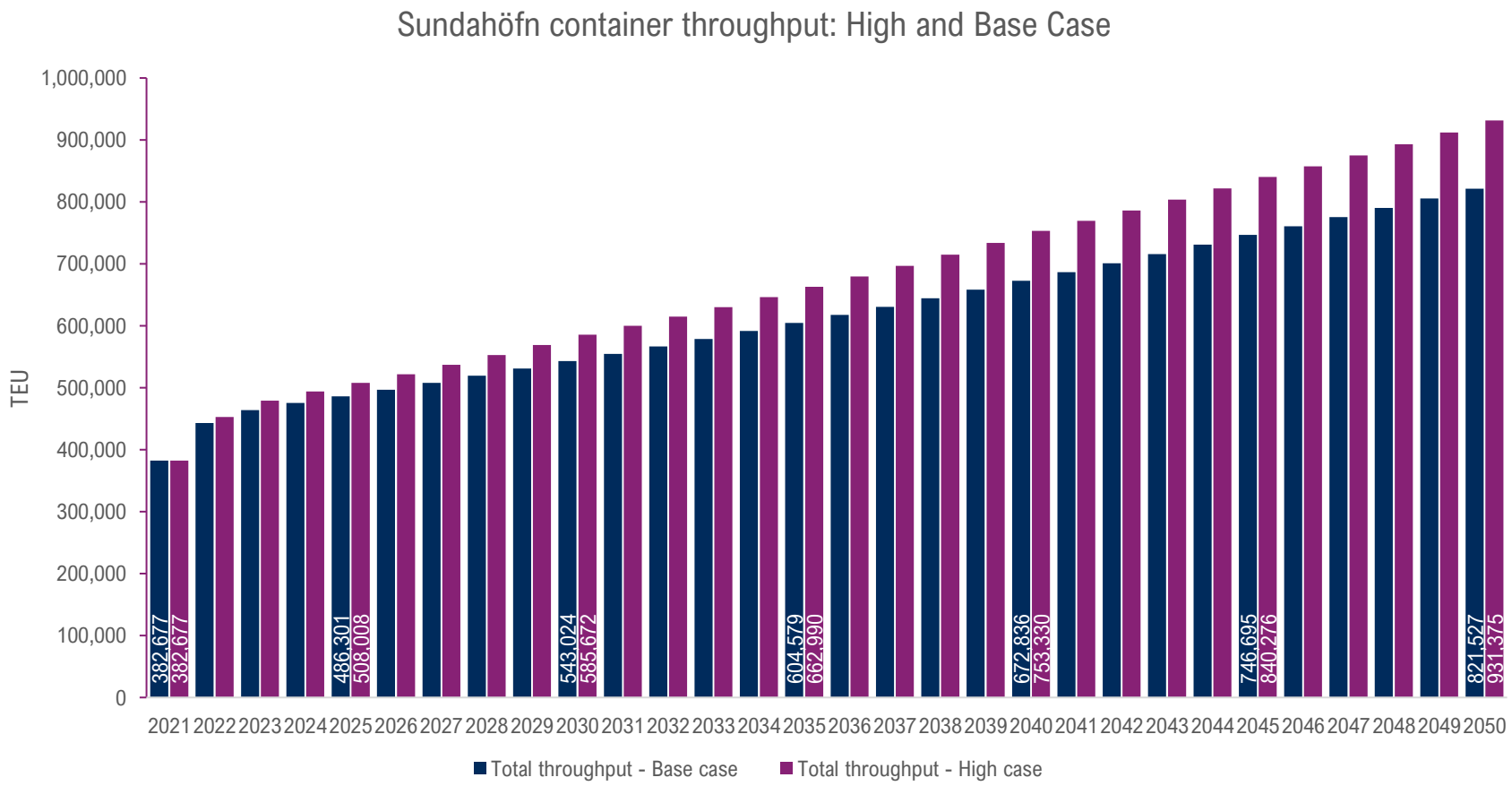
Call pattern: allow timing of ship calls to meet market demand

Competition: allow the possibility of new container services

CFS and coldstore: accommodate expected volume

Sundahöfn forecast container throughput

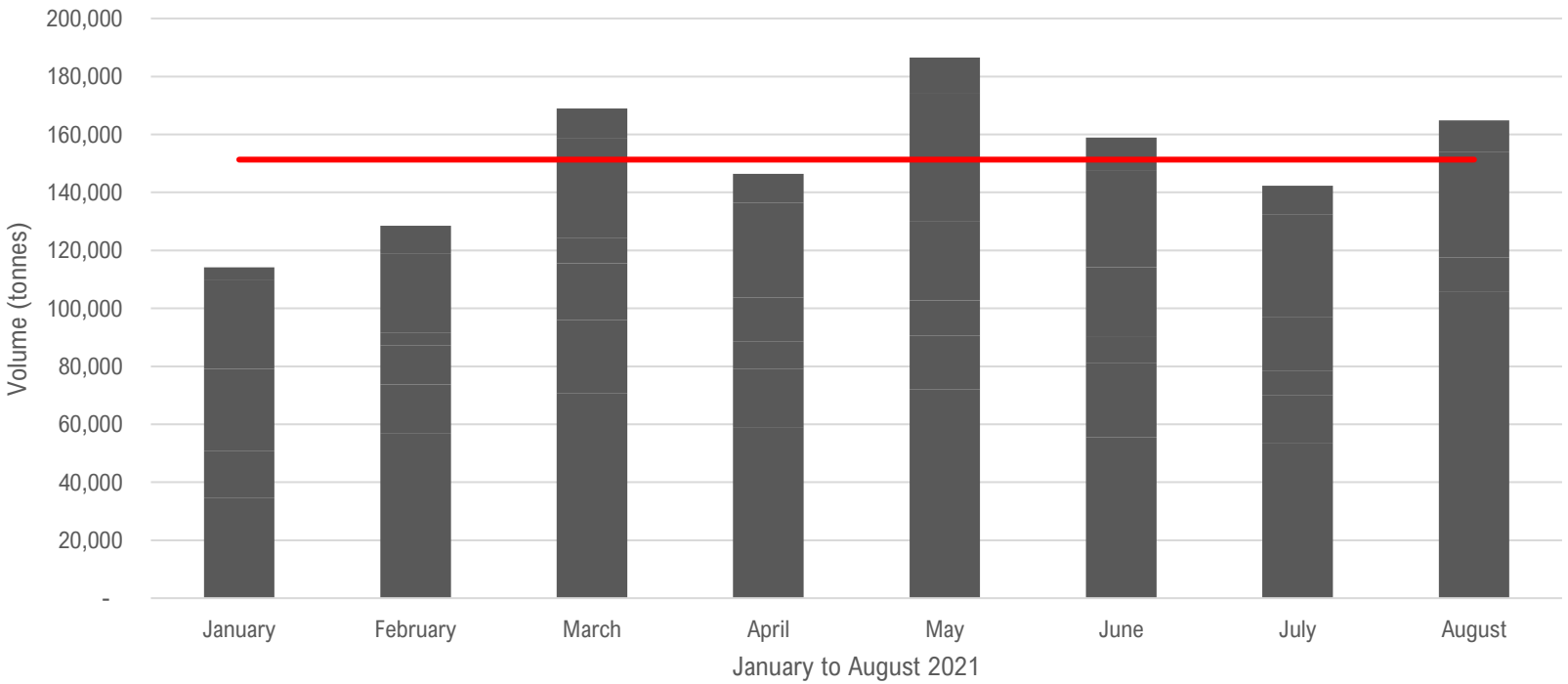
Overall economic growth is the driver of future container traffic growth. Based on long term economic projections by Oxford Economics, container throughput at Sundahöfn is projected to grow to just under a million TEU by 2050.



Source: Oxford Economics, Statistics Iceland

Seasonality

2021 YTD data from Faxaports show significant month by month variations in throughput handled at Sundahöfn. Volume in January and February is well below the average of 150,000 TEU, peak volume was in May, approximately 20% above the average. A 20% peaking allowance is in line with global planning benchmarks.

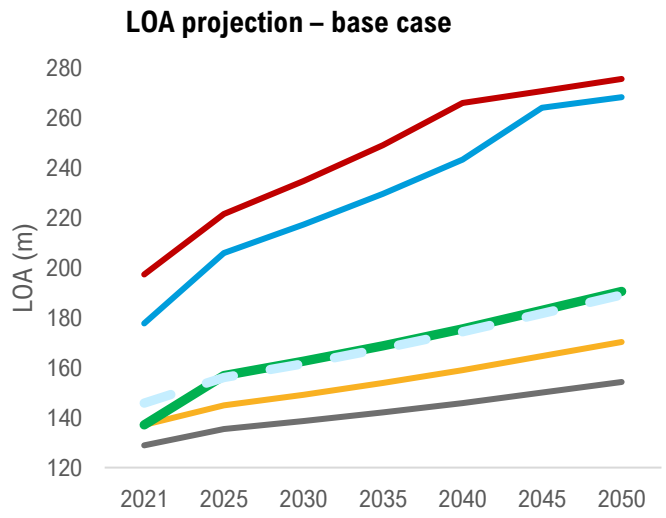


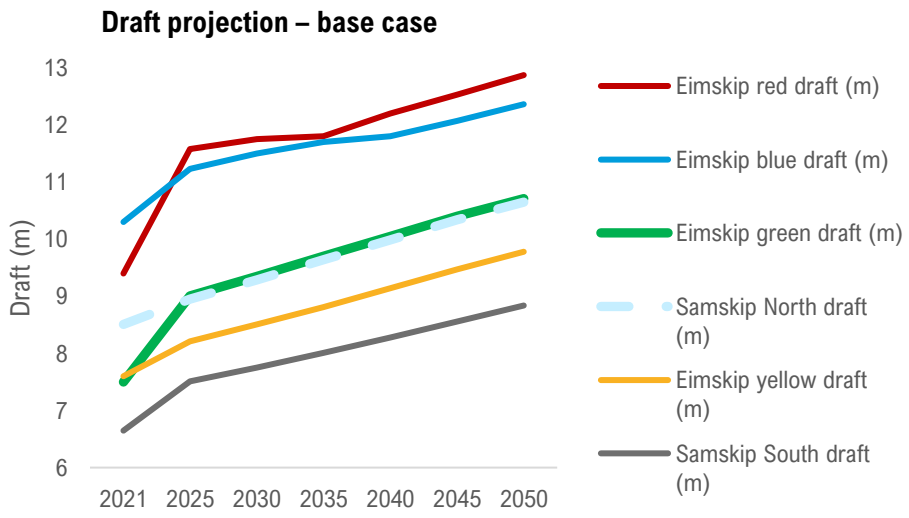
Source: Based on data available from Faxaports

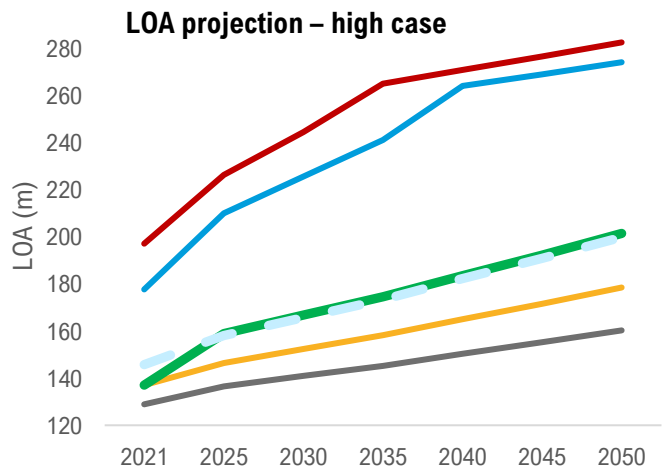
- The peaks of exchanges occur in March, May, June and August. Fewer exchanges occur in winter, in January and February.
- The largest volumes are exchanged on Eimskip's Blue Line. The second most important is Samskip's North Line.

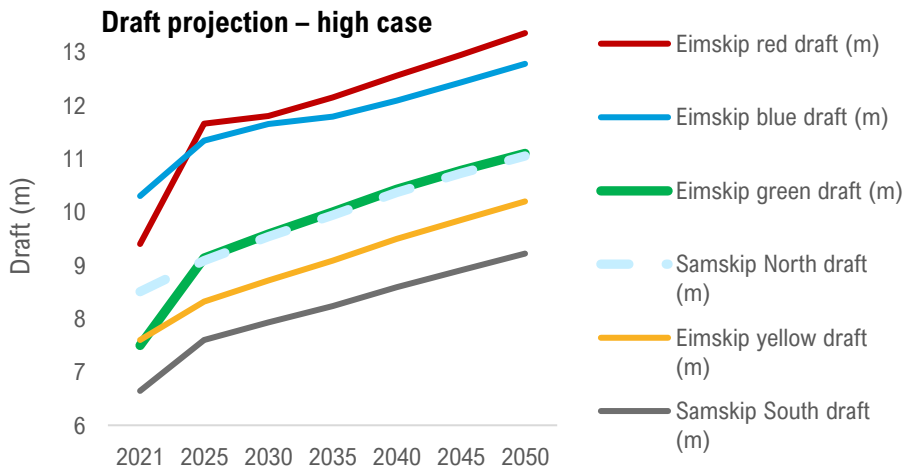
Vessel dimensions forecast

We expect that the capacity of vessels calling at Sundahöfn will rise in line with market demand. Vessel length and draft were forecast according to the volume growth rate and the relationship between vessel capacity and dimensions. Maximum LOA rises to approximately 280m and draft to 13.4m for the biggest ships; these may be too large for the port.



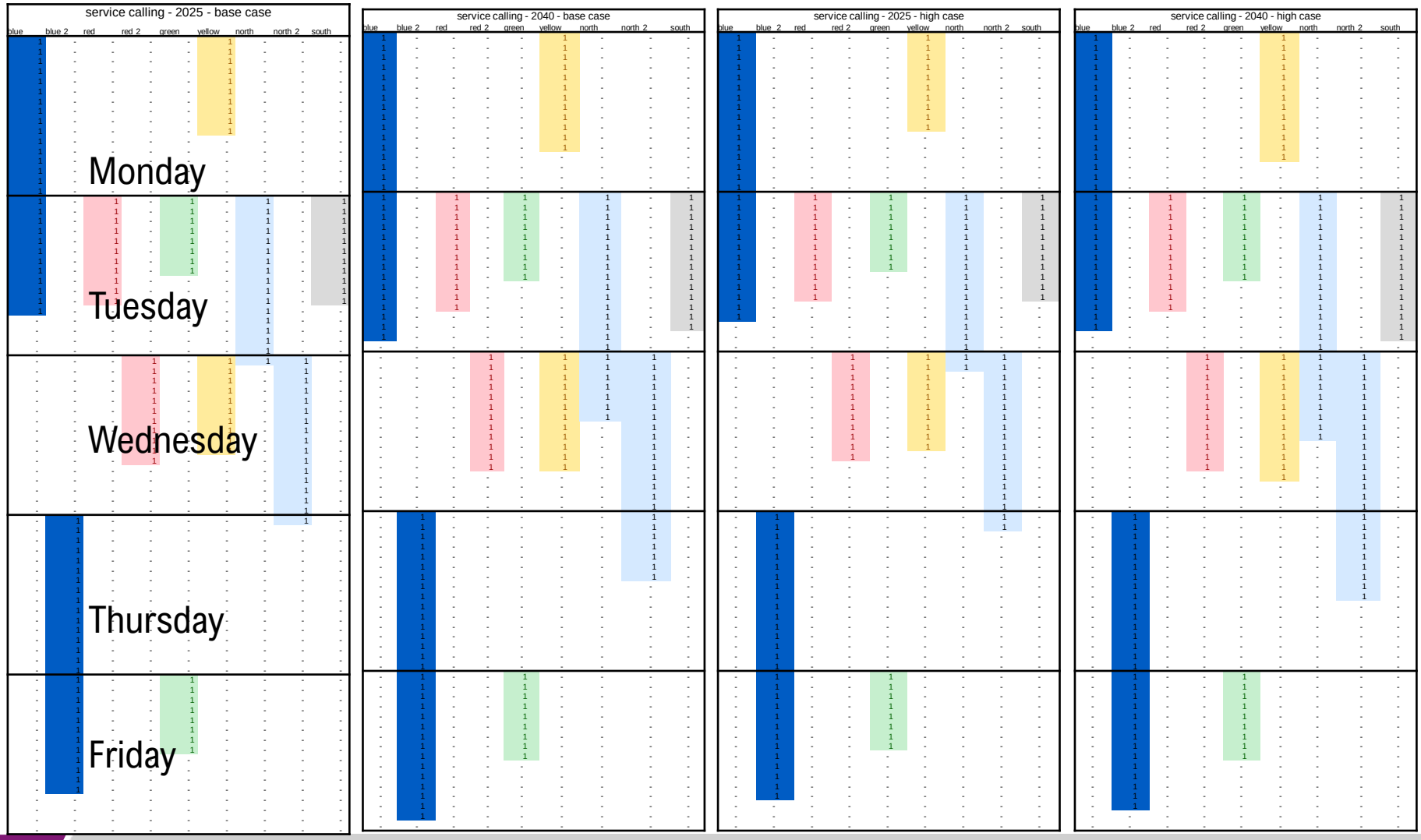






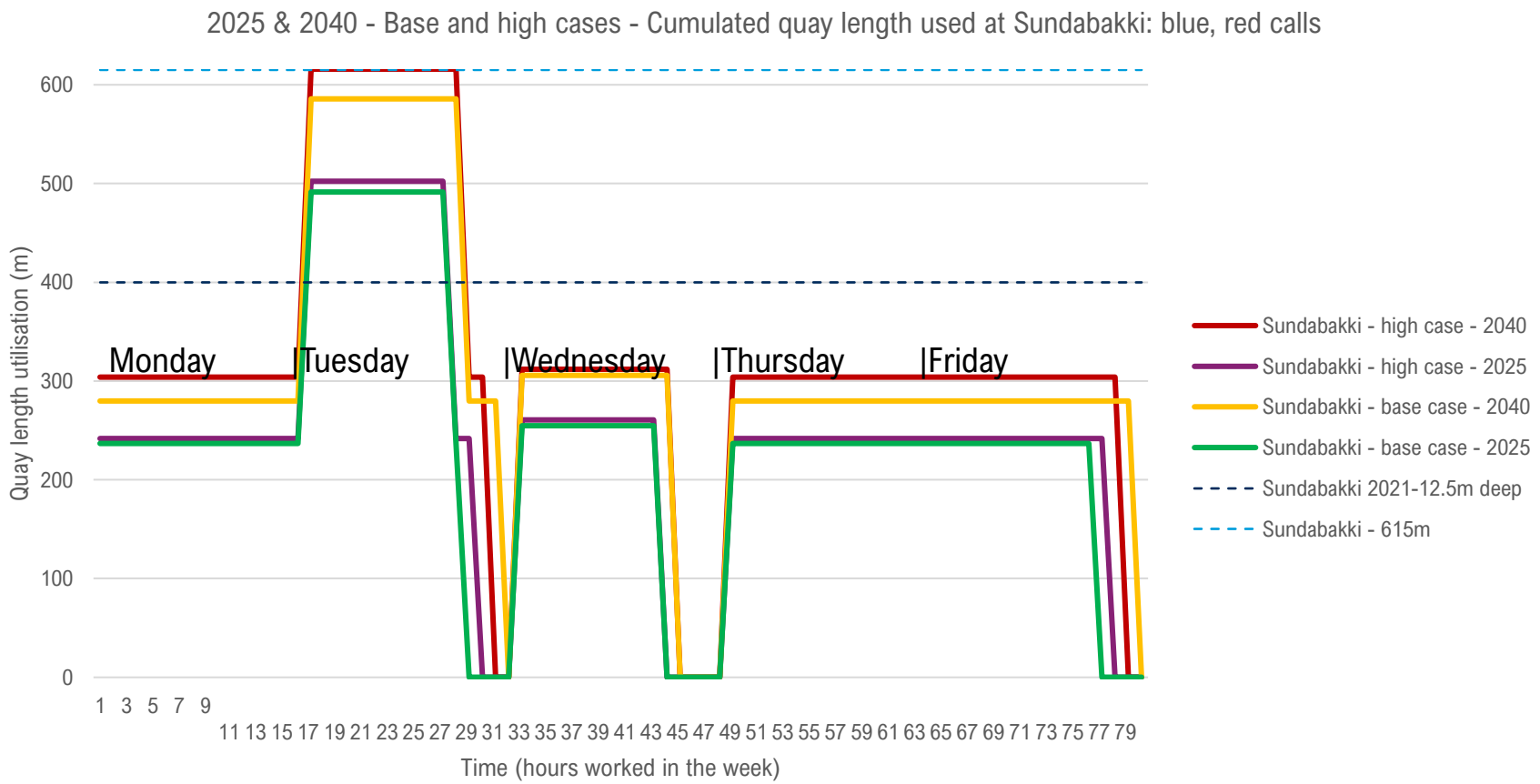
Call pattern

Market requirements mean a concentration of import calls early in the week and export calls at the end of the week. This results in call bunching and peaks in demand for quay capacity, particularly on Tue-Wed.



Berth requirements: Sundabakki

Assuming that existing call patterns continue, Sundabakki will require 491m of berth length in 2025 and nearly 600m by 2040.

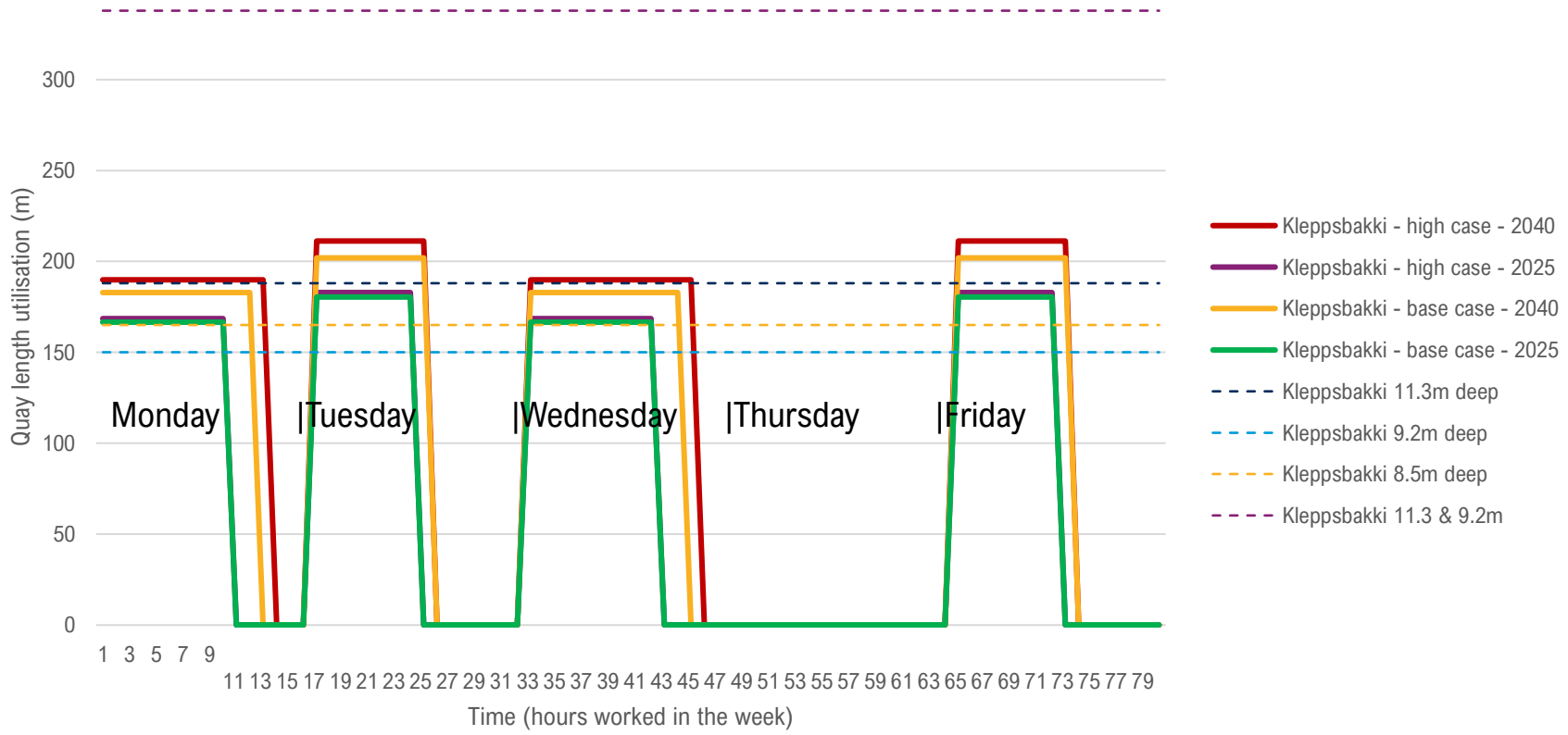


The 615m value corresponds to the maximum quay length possible to build regarding the geographical parameters. Were Sundabakki be extended to 615m, new companies could use part of the quay on all days but Tuesdays.

Berth requirements: Kleppsbakki

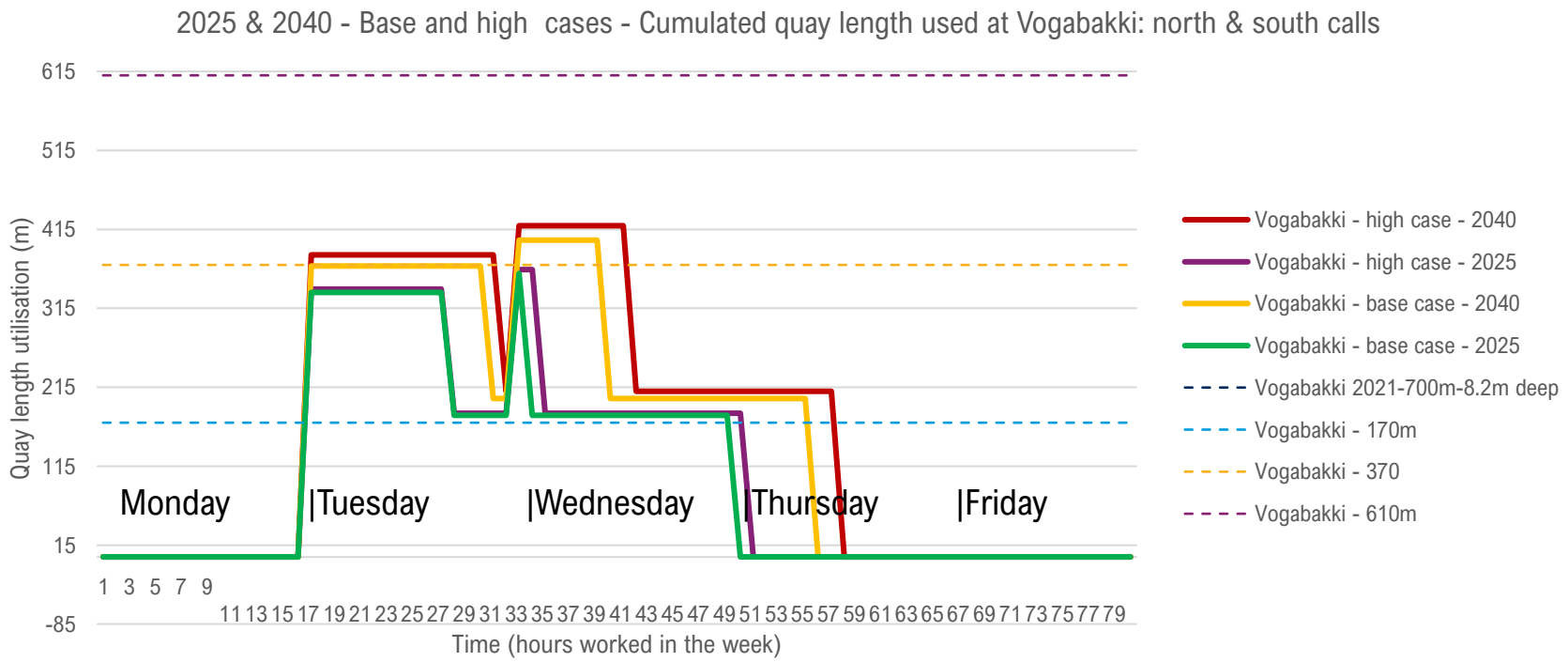
The use of Kleppsbakki is restricted to vessels with lower draft. We project that quay length required will reach 211m in 2040

2025 & 2040 - Base and high cases - Cumulated quay length used at Kleppsbakki: yellow & green calls



Berth requirements: Vogabakki

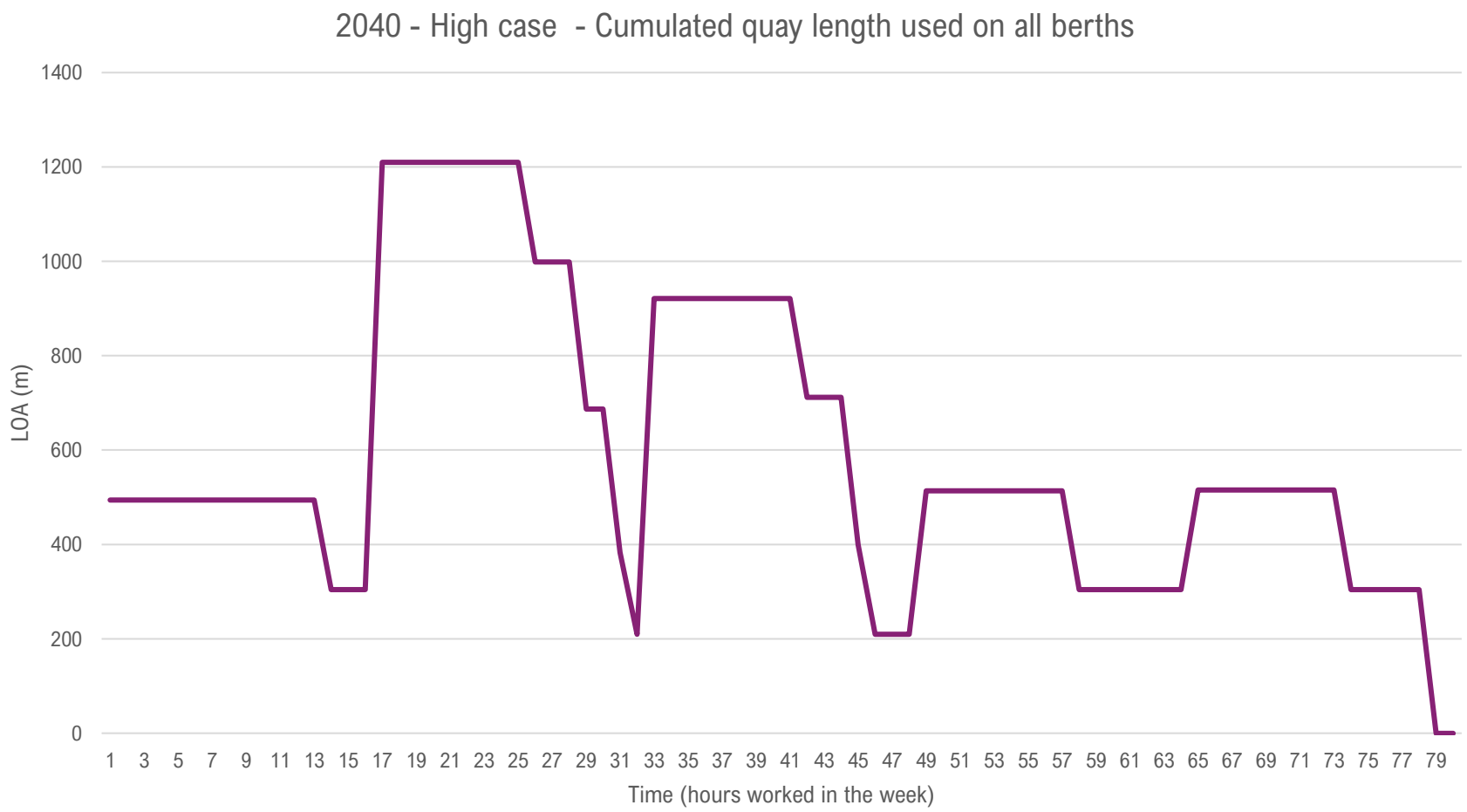
Samskip's North and South services call at Vogabakki. 360-370m will be needed in 2025 and 410-420m in 2040



- The current quay length is 700m. The bridge will be built and make 530m of quay inaccessible to containerships as the bridge's height will undoubtedly be too small. This would result in a 170m long quay usable when the bridge is built, considering that a safety distance regarding the bridge structure should be kept.
- However, fishing vessels might use 470m to pass under the bridge.
- A new company could fully use Vogabakki on Mondays, Fridays, and partly on Thursdays.

Berth requirements: overall

Peak berth length requirements in the High Case reach 1200 m in 2040, on Tuesdays. If 1200m of berths were available, substantial berth capacity would be available on off-peak days,Thursday-Monday.



Summary

	Key takeaways
Assessment of future needs	Sundahöfn needs to be able to handle future volume, vessel sizes, the call pattern required by the market and to provide space for competition and new competition Overall economic growth is the driver of future container traffic growth. Based on long term economic projections by Oxford Economics, container throughput at Sundahöfn is projected to grow to just under a million TEU by 2050. 2021 YTD data from Faxaports show significant month by month variations in throughput handled at Sundahöfn. Volume in January and February is well below the average of 150,000 TEU, peak volume was in May, approximately 20% above the average. A 20% peaking allowance is in line with global planning benchmarks. We expect that the capacity of vessels calling at Sundahöfn will rise in line with market demand. Vessel length and draft were forecast according to the volume growth rate and the relationship between vessel capacity and dimensions. Maximum LOA rises to approximately 280m and draft to 13.4m for the biggest ships; these may be too large for the port. Market requirements mean a concentration of import calls early in the week and export calls at the end of the week. This results in call bunching and peaks in demand for quay capacity, particularly on Tuesday-Wednesday. Assuming that existing call patterns continue, Sundabakki will require 491m of berth length in 2025 and nearly 600m by 2040. The use of Kleppsbakki is restricted to vessels with lower draft. We project that quay length required will reach 211m in 2040. Samskip's North and South services call at Vogabakki. 360-370m will be needed in 2025 and 410-420m in 2040 Peak berth length requirements in the High Case reach 1200 m in 2040, on Tuesdays. If 1200m of berths were available, substantial berth capacity would be available on off-peak days, Thursday-Monday.

Drewry

Assessment of Alternatives

Alternatives considered

We have reviewed six Alternatives for future development: Faxaports plan; Eimskip plan (Sundabakki/Kleppsbakki only); Drewry Alternatives 1, 2, 3a, 3b.

Previous schemes
Faxaports' future development
Eimskip Master Planning, stage C for year 2038

Alternatives developed by Drewry
Alternative 1: separate terminals (Eimskip and Samskip)
Alternative 2: integrated terminal for berthing, separate stacking (Eimskip and Samskip)
Alternative 3a: common user terminal (Eimskip, Samskip and newcomers)
Alternative 3b: Vogabakki common user + Sundabakki and Kleppsbakki (Eimskip)
The sketches of the alternatives show the final layouts for the High Case final configuration in year 2050

Assumptions made

We have assumed that the container terminal boundary remains unchanged, that the Sundabraut Bridge is built, and that existing vessel call patterns persist. We have assumed steady increases in berth productivity and reductions in CFS dwell times.

General data

- The boundaries of the terminal and configuration of berths alignment should be kept
- New bridge construction decided and starting soon
- Only container traffic at this terminal, other like dry bulk, general cargo, and fishing to operate elsewhere.
- Pattern for weekly services *
- Split of traffic between Eimskip and Samskip *
- Split of the service capacity per service *
- Peak factor for container traffic *

Berth & yard subsystem

- The TEU factor increases every 5 years by 0.01 units.
- The rate of overall Gross Moves per hour for STS gantry crane increases every 5 years.
- Average dwell time for containers at the yard. *
- No more than 1 crane per 100 m of quay.

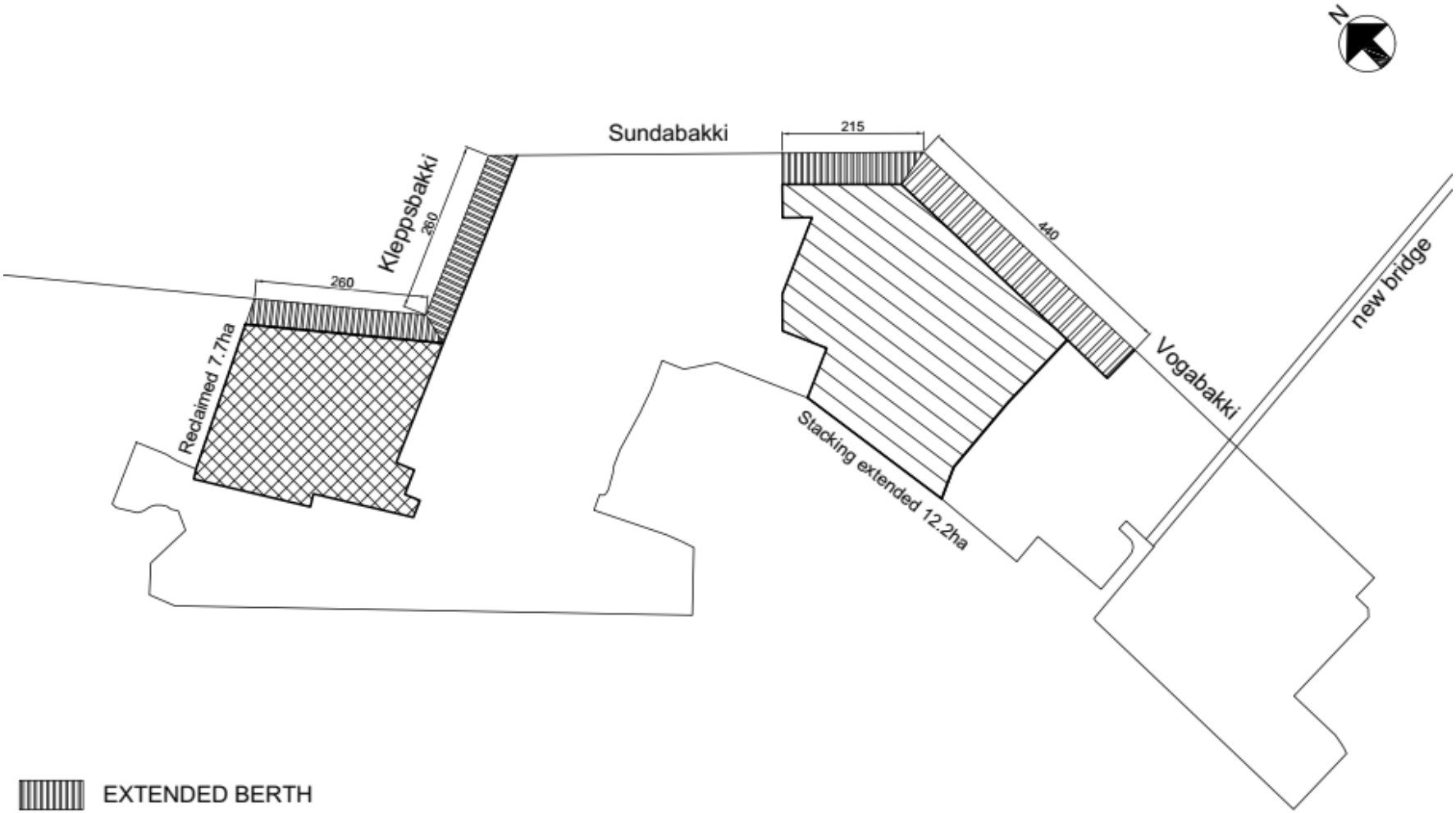
Container Freight Station (CFS) and cold storage

- Main characteristics of existing buildings used as CFS and Cold storage at Sundahöfn are not known in detail
- Ratios for CFS and Cold storage on TEUs imported and exported *
- Average duration of the stay of cargoes at CFS and Cold storage
- Peak factors for CFS and Cold storage *

* Same values throughout the period considered (2021 to 2050)

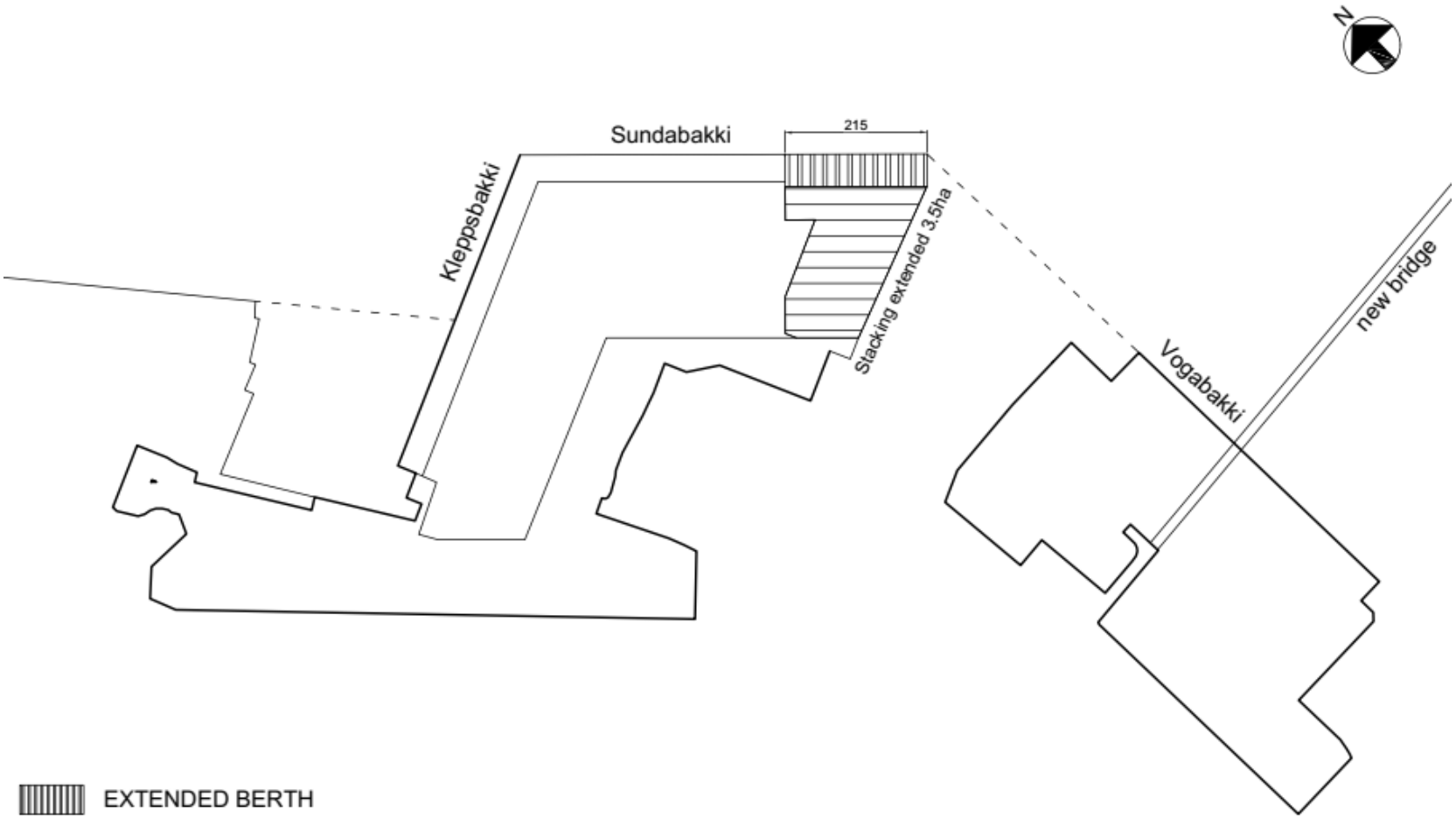
Faxaports' future development plan

Faxaports considered filling in Kleppsbakki basin and extending Sundabakki (by 215m) and Vogabakki (by 440m). The reclaimed area was planned to be used for warehousing and to meet other land use needs, however, this would reduce the berthing capacity for services calling at Sundahöfn. The material for the reclamation would be generated by dredging the approach channel.



Eimskip Master Planning year 2038

Eimskip has prepared a proposed plan for its present facility at Sundabakki. The berth would be extended to 615m and the yard reorganised, with RTGs as the main equipment type. Vogabakki is not addressed in this plan. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal.

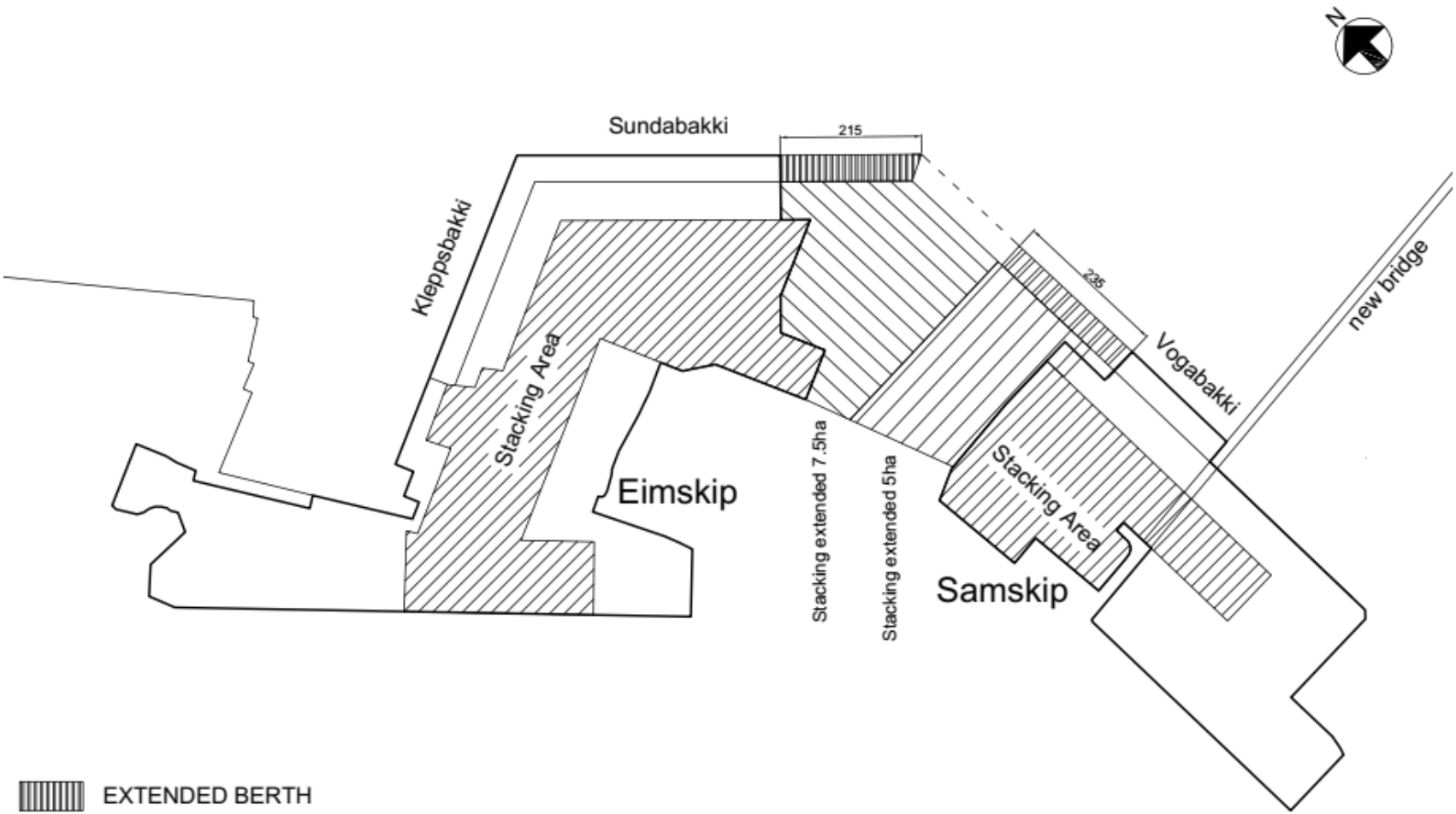


EXTENDED BERTH

ALL LENGTHS AND AREAS TO BE CONFIRMED

Alternative 1: separate terminals 2050 (Eimskip and Samskip)

Drewry Alternative 1 proposes a continuation of the split between Eimskip and Samskip's terminals, the extension of Sundabakki (by 215m) and Vogabakki (by 235m) and the extension of stacking areas for both terminals. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal, subject to agreement with existing operators

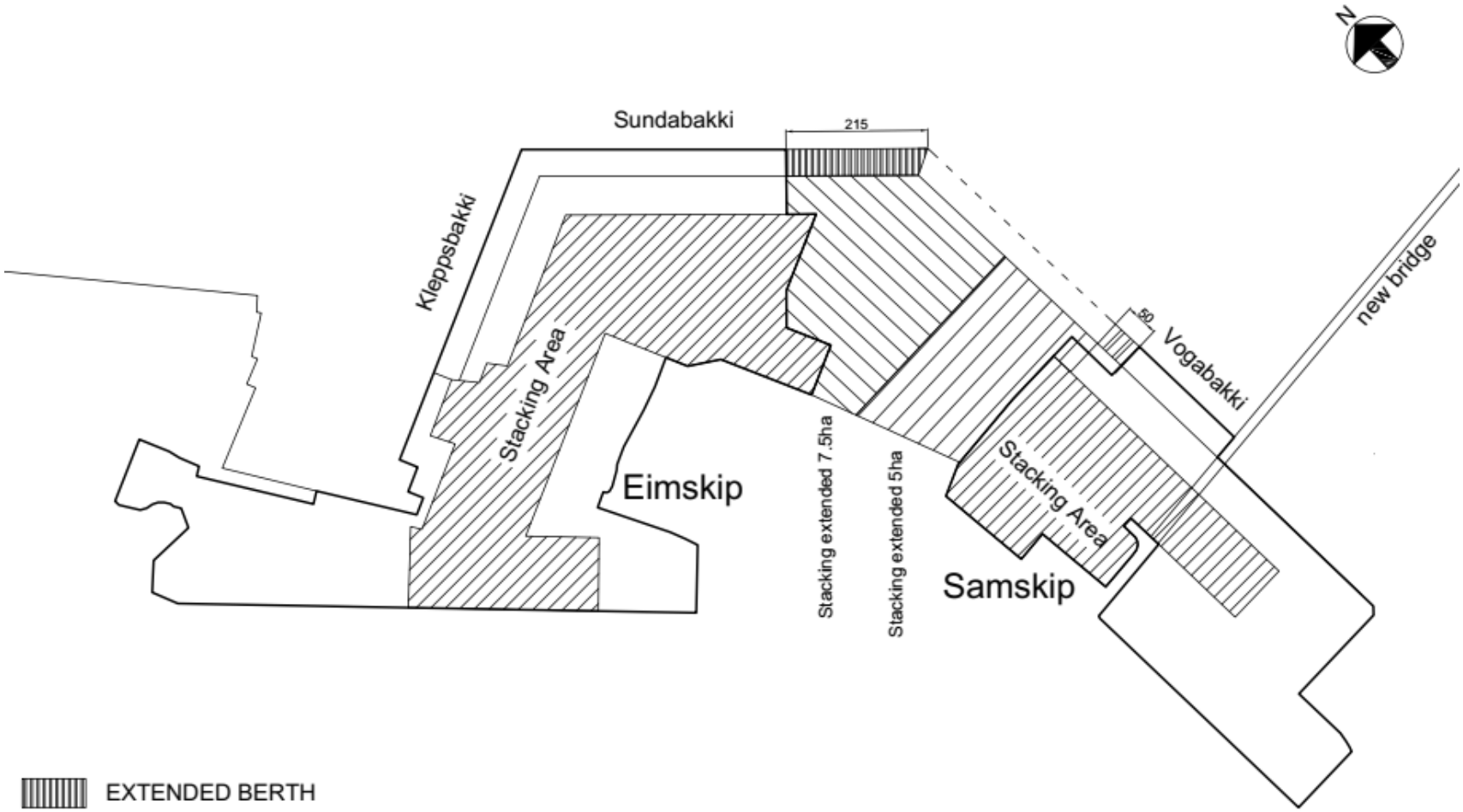


EXTENDED BERTH

ALL LENGTHS AND AREAS TO BE CONFIRMED

Alternative 2: integrated berthing, separate yards (Eimskip & Samskip) 2050

Drewry Alternative 2 proposes a common user quay covering Kleppsbakki, Sundabakki and Vogabakki, with separate stacking areas for the lines. Sundabakki is fully extended by 215m, and only 50m are added to Vogabakki. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal.

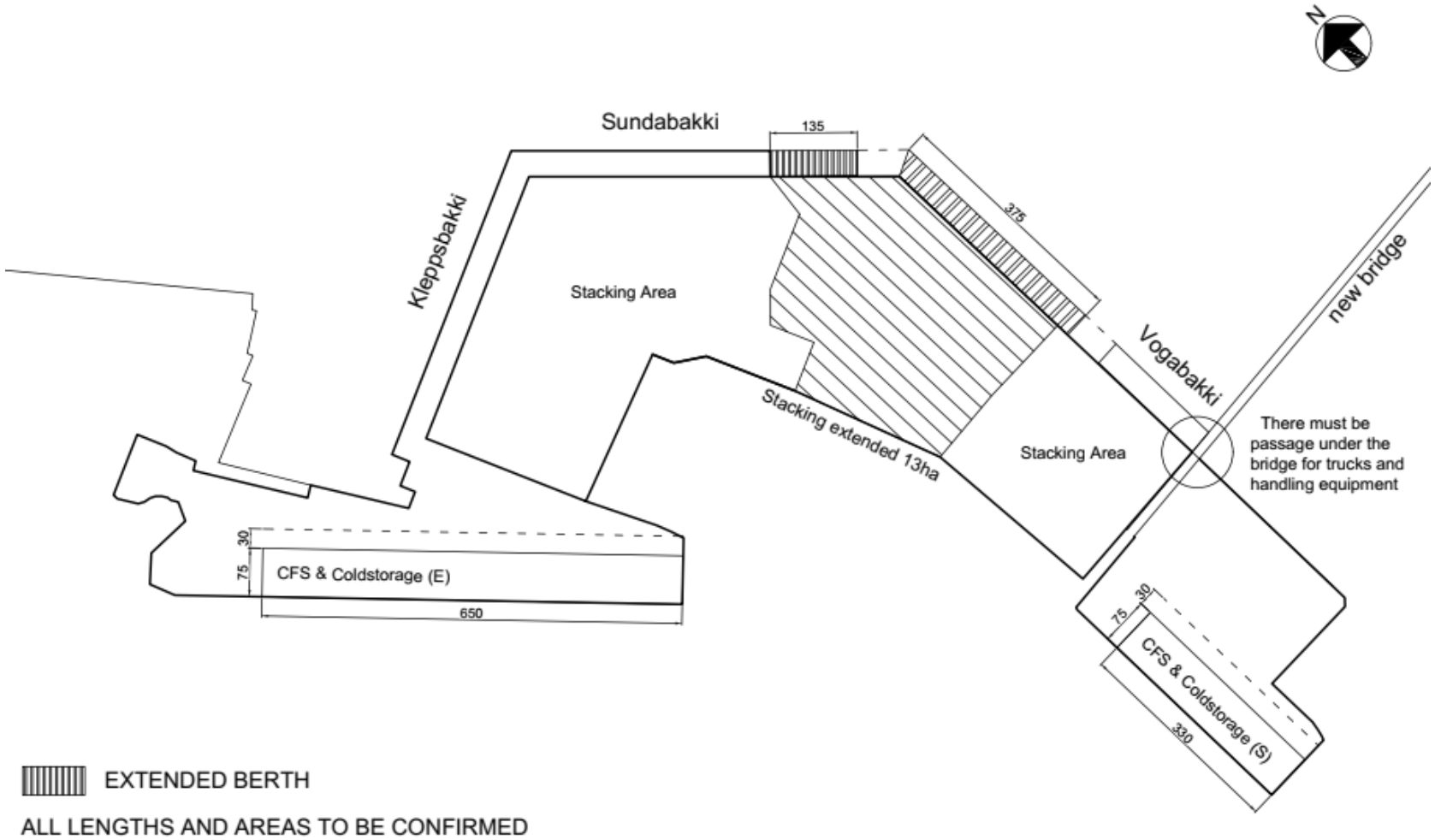


EXTENDED BERTH

ALL LENGTHS AND AREAS TO BE CONFIRMED

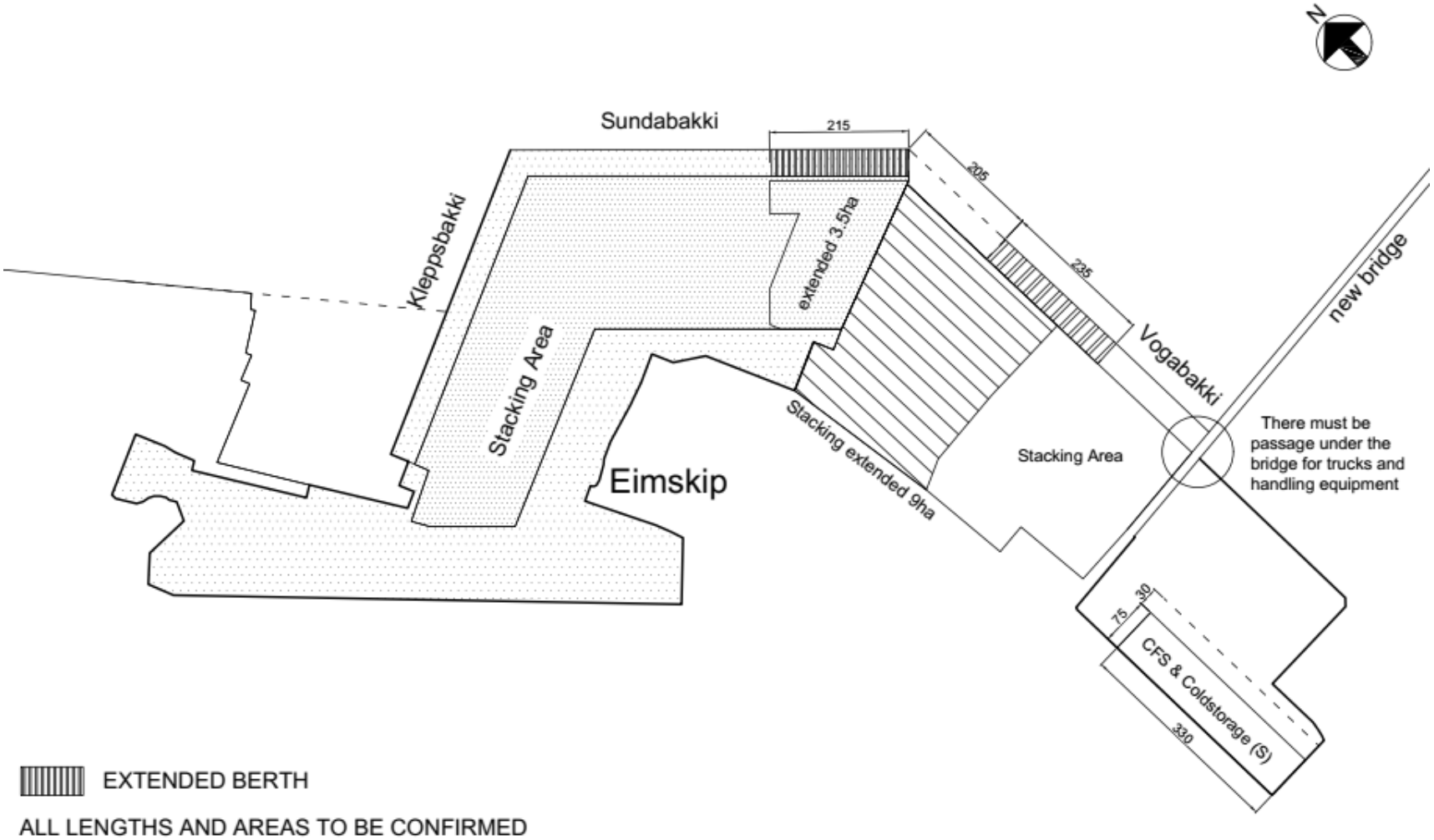
Alternative 3a: common user terminal 2050

Drewry Alternative 3a proposes that Sundahöfn becomes a common user integrated terminal. All yard area is developed and almost all quay length (some minor sections of the quay have not been developed, but could be, for accommodating bigger ships). This is the only alternative able to receive the biggest vessels included in the forecast for 2050. New entrants would be served by the common user terminal operator.



Alternative 3b: Vogabakki common user + Sundabakki and Kleppsbakki (Eimskip) 2050

Drewry Alternative 3b proposes a dedicated terminal for Eimskip at Sundabakki, with an extension of quay and yard area, and a common user terminal at an extended Vogabakki that would accommodate both Samskip and future new entrants.



Main characteristics

The capacity (0.9-1 million teu p.a.) and cost of the various Alternatives are similar. The main variations are in the availability of berthing slots for new entrants.

Alternative	Case	Yard capacity ('000 TEUs p.a.)	Max continuous berth length (m)	Total quay length (m)	Weekly slots for newcomers (no.)	Investment: NPV (billion ISK)
1	Base	1,007	615	1,368	27	15.5
2	Base	1,007	615	1,193	27	14.0
3a	Base	1,036	515	1,407	34	16.8
3b	Base	921	615	1,368	18	16.8
1	High	1,008	615	1,388	27	19.7
2	High	1,007	615	1,203	27	18.5
3a	High	1,047	535	1,448	34	20.9
3b	High	974	615	1,388	18	18.4

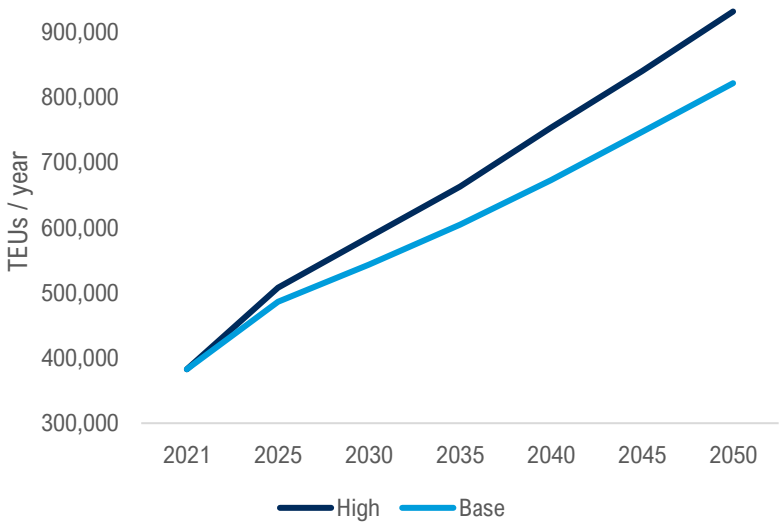
- 2050 throughput capacity is approximately 1 million TEU p.a. in all cases. Capacity in Alternative 3b is slightly lower; Alternative 3a creates the highest capacity. Capacity could be increased above forecasted throughput in both alternatives by adding additional RTGs at the stacking yard (more in the case of 3b).
- Alternative 3a offers slightly lower maximum continuous berth length, but this could be increased if required by constructing the complete quay length of Sundabakki and Vogabakki
- Alternative 2 has the shortest total berth length (Note that the quay length of Kleppsbakki is considered to be the quay length from the quay of 11.3m depth and the quay of 9.2m depth, providing 338m).
- There is a wide range in the number of berthing slots available for new entrants: Alternative 3a provides the most, while Alternative 3b (in which new entrants are accommodated only at Vogabakki) offers the least; additional slots could be offered by Eimskip at its terminal
- In Alternative 1 and 2, newcomers would require agreement with Eimskip or Samskip in order to be able to use their terminals. Alternatives 3a and 3b allow open access to newcomers
- The development cost for all Alternatives is similar. Alternative 2 is the lowest cost in the Base Case, due to shorter quay length and Alternative 3b is the lowest cost in the High Case due to lower equipment costs

Traffic and capacity

All Alternatives provide sufficient capacity to meet the High Case forecast container traffic.

- In 2050, Base Case volume is projected to be 822,000 TEUs
- In 2050, the High case forecast is 931,000 TEUs
- Projected volume can be handled by all Alternatives
- This study focuses on the high case as a public authority should help the country's economic growth and not limit it by underestimating the needs.
- For all alternatives, the yard capacity is set to meet throughput forecasts by choosing the adequate number of RTGs and reach stackers.
- The yard capacity is the limiting factor compared to the quay capacity, which depends on the number of cranes.
- The quay capacity and the yard capacity are sufficient to handle all the forecast throughput.
- In the event of higher demand the numbers of quay cranes and yard equipment can be increased
- The yard capacity can be increased by increasing the ratio RTGs/reach stackers to handle all the forecast throughput.
- In the high case, in 2050, depending on the alternative chosen, it is possible to improve the yard capacity by increasing the proportion of RTGs. Capacity can be increased by 8% to 18%, if demand requires

Total throughput forecast for Base and High cases



Maximum quay length required

Quay length demand peaks define the required quay length. At Sundabakki, vessel size (defined as expected LOA of Red Service) will be limited by the maximum possible quay length of 615 meters. This may lead to constraints in vessel LOA from 2045. Expected vessel sizes of services at other berths can be accommodated.

Base case	Year	2021	2025	2030	2035	2040	2045	2050
Maximum quay length required (m)	Sundabakki	658	491	520	550	586	615	625
	Kleppsbakki	158	180	187	194	202	210	219
	Vogabakki	335	359	372	386	401	418	435

Based on standard vessel sizes, the maximum required continuous berth length would exceed that available at Sundabakki in 2050 in the Base Case and from 2045 in the High Case.

High case	year	2021	2025	2030	2035	2040	2045	2050
Maximum quay length required (m)	Sundabakki	658	502	541	583	616	628	641
	Kleppsbakki	158	183	192	201	211	221	232
	Vogabakki	335	364	381	399	419	439	460

Alternative vessel dimensions

The largest vessel projected to be calling at Sundahöfn in 2050 would have a capacity of 3,505 teu. Standard vessels of this size would be too long for the port, but shorter, beamier vessels would be available that have the required capacity.

Maximum dimensions:

Maximum LOA (m)	Maximum draft (m)
267.00	12.50

Biggest containership existing on the market and meeting these criteria:

LOA (m)	Draft (m)	Beam (m)	Capacity (TEUs)
265.00	12.00	32.20	4,250

Source: Clarkson

The biggest ship in 2050 on the blue service is required to have a capacity of:

Base case (TEUs)	High case (TEUs)
3,091	3,505

Both are less than the biggest ship allowable to berth at Sundabakki.

Slots for newcomers

Alternatives 3a generates the largest number of slots for potential newcomers; 3b smallest;1 and 2 are equivalent in terms of slots for newcomers, but subject to agreements with current operators.

Alternative 1					
	Total week day	Used weekday	Available weekday	Total weekend	Total available
Sundabakki	10	8	2	4	6
Kleppsbakki	5	4	1	2	3
Vogabakki	10	3	7	4	11
Total	25	15	10	10	20
If all quays were built			15	12	27

Alternative 2					
	Total week day	Used weekday	Available weekday	Total weekend	Total available
Sundabakki	10	8	2	4	6
Kleppsbakki	10	5	5	4	9
Vogabakki	5	2	3	2	5
Total	25	15	10	10	20
If all quays were built			15	12	27

- We have calculated berth slots available and used. A berth slot is a 16 hour window at a specific berth
- Alternative 1 and 2 each generate 25 weekday slots and 10 weekend slots. New entrants would require acceptance by either Eimskip or Samskip. There is a precedent this in the case of the arrangement between Eimskip and Royal Arctic Line.
- Alternative 3a generates 35 weekday slots and 14 weekend slots, the largest number of slots for potential new entrants
- The common user terminal in Alternative 3b generates 10 weekday slots and 4 weekend slots, the lowest number of slots for new entrants. Although 3b provides the fewest additional slots, 7 slots would accommodate several new services

Alternative 3a					
	Total week day	Used weekday	Available weekday	Total weekend	Total available
Sundabakki	10	6	4	4	8
Kleppsbakki	10	3	7	4	11
Vogabakki	15	6	9	6	15
Total	35	15	20	14	34
If all quays were built			20	14	34

Alternative 3b					
	Total week day	Used weekday	Available weekday	Total weekend	Total available
Sundabakki	0	0	0	0	0
Kleppsbakki	0	0	0	0	0
Vogabakki	10	3	7	4	11
Total	10	3	7	4	11
If all quays were built			12	6	18

ALTERNATIVE 1: SEPARATE TERMINALS

ALTERNATIVE 2: SHARED BERTHS

ALTERNATIVE 3a: FULLY DEVELOPED UNDER COMMON USER SCHEME

ALTERNATIVE 3b: SEPARATE TEMINALS FOR EIMSKIP AND COMMON USER

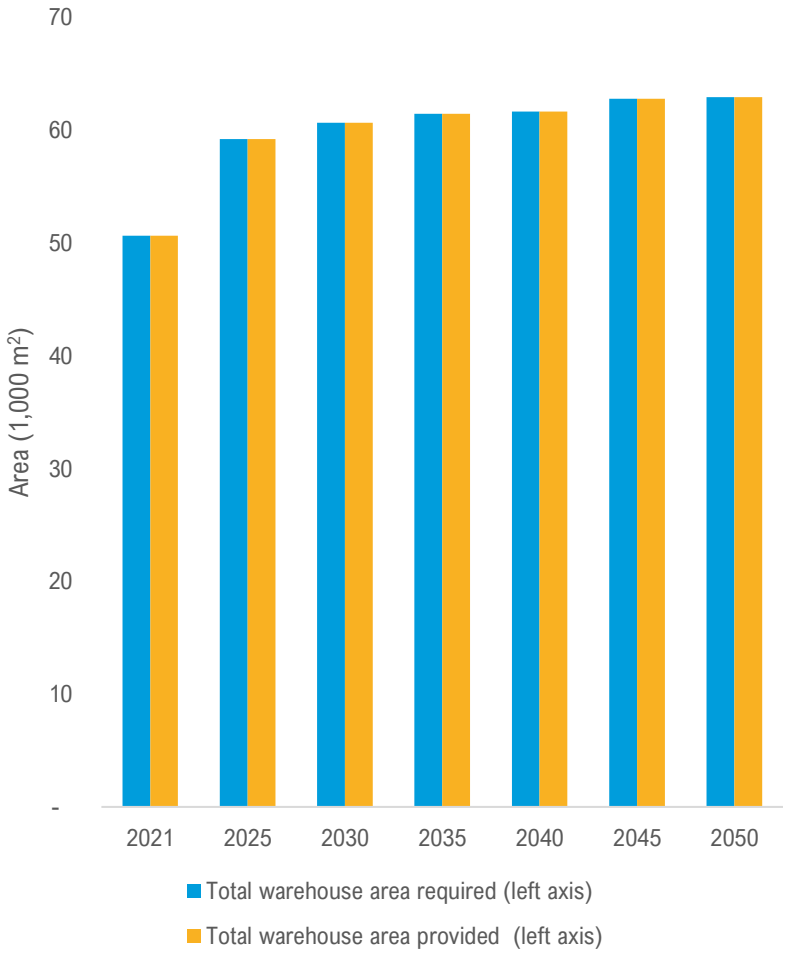
Eimskip exclusive user of Sundabakki and Kleppsbakki

Vogabakki is a common user facility

Container Freight Station (CFS) and coldstores

All Alternatives provide the same land area for CFS and coldstores. Throughput capacity is sufficient to meet demand.

- Substantial area in Sundahöfn is devoted to Container Freight Stations (CFS) and cold stores.
- The land area for CFS and cold stores is determined by port throughput and is the same for all alternatives.
- We assume that the dwell time of cargo in the CFS reduces continuously from 2030 to 2050 as the efficiency of supply chains improves. As a result, the area used by CFSs remains the same from 2030 to 2050
- If dwell times in the CFS do not fall, there may be a shortage of capacity by 2050
- The area occupied by cold stores will keep increasing until 2050.
- The total warehouse areas increases in all Alternatives to 2050.
- The CFS and cold stores capacities are able to handle the projected volume in all Alternatives



Capital expenditure – Base Case

A comparison of civil works and new equipment cost (based on international benchmarks) shows total costs in the period to 2050 range from SK20.4 billion to ISK23.7 billion. Alternative 3a and 3b have the highest cost, while Alternative 2 shows the lowest cost, due to a lower length of quay added

Base case capex (ISK million)

Alternative	2022	2025	2030	2035	2040	2045	2050	Total	NPV
1	4,231	7,234	1,516	4,301	1,635	2,059	1,569	22,544	15,537
2	5,403	4,760	1,867	1,958	2,220	2,644	1,569	20,421	14,000
3a	7,063	5,924	1,516	2,595	1,926	2,908	1,774	23,705	16,782
3b	5,637	7,820	1,750	1,936	2,996	2,139	1,115	23,393	16,829

- We have estimated the cost of civil works and new equipment for each Alternative using international benchmark costs to allow a comparison of Alternatives
- The actual costs that may be incurred in each case will depend on a wide variety of local factors and costs and the market price of equipment at the time of purchase
- Total costs in the period to 2050 range from SK20.4 billion to ISK23.7 billion
- For ease of comparison, we have also calculated the Net Present Value (NPV) of the cost of each Alternative, using a discount rate of 5%
- The NPV of construction and equipment costs in the Base Case ranges from ISK14.0 billion to 16.8 billion
- In the Base Case, Alternative 3a and 3b have the highest cost, while Alternative 2 shows the lowest cost, due to a lower length of quay added

Capital expenditure – High Case

In the High Case, total costs in the period to 2050 range from SK28.6 billion to ISK32.5 billion. Alternative 3a has the highest cost, while Alternative 3b shows the lowest cost, due to lower equipment costs.

High case capex (ISK million)

Alternative	2022	2025	2030	2035	2040	2045	2050	Total	NPV
1	4,466	8,644	2,683	4,026	2,965	3,335	5,879	31,996	19,700
2	5,403	6,358	3,136	3,484	2,709	2,163	7,050	30,303	18,494
3a	7,868	6,717	2,360	3,008	4,532	2,178	5,835	32,498	20,944
3b	4,466	8,058	2,382	4,348	3,009	2,178	4,158	28,599	18,365

- In the High Case, total costs in the period to 2050 range from SK28.6 billion to ISK32.0 billion
- The NPV of construction and equipment costs in the High Case ranges from ISK18.4 billion to 20.9 billion
- In the High Case, Alternative 3a has the highest cost, while Alternative 3b shows the lowest cost, due to lower equipment costs. Based on the projected volume at the common user terminal, the yard could continue to be served by reachstackers, which are significantly cheaper than Rubber Tyred Gantries (RTG)

Infrastructure investment required for Alternative 1

Case	Alt.	Type	Description	Unit cost (EUR)	unit	2021	2025	2030	2035	2040	2045	2050
Base	1	Berth	Sundabakki	60,000	m	-	215	-	-	-	-	-
Base	1	Berth	Vogabakki	60,000	m	215	-	-	-	-	-	-
Base	1	Quay eq.	MHC	4,000,000	no.	2	1	-	-	-	-	-
Base	1	Quay eq.	STS gantry crane	8,000,000	no.	1	1	-	2	-	-	-
Base	1	Yard	Added area	1,500,000	ha	-	2.7	2.0	1.5	1.8	2.5	2.0
Base	1	Yard eq.	RTG (6+1x5+1)	2,000,000	no.	-	2	2	4	3	4	3
Base	1	Yard eq.	Tractor + trailer	100,000	no.	-	5	5	9	8	10	7
Base	1	Yard eq.	RS	400,000	no.	-	10	-	-	-	-	-
Base	1	Other	CFS bldg.	1,200	m²	-	6,660	1,193	700	228	-	-
Base	1	Other	Coldstorage bldg.	2,000	m²	-	1,983	712	692	696	655	508

Case	Alt.	Type	Description	Unit cost (EUR)	unit	2021	2025	2030	2035	2040	2045	2050
High	1	Berth	Sundabakki	60,000	m	-	215	-	-	-	-	-
High	1	Berth	Vogabakki	60,000	m	175	-	-	60	-	-	-
High	1	Quay eq.	MHC	4,000,000	no.	1	1	-	-	-	-	-
High	1	Quay eq.	STS gantry crane	8,000,000	no.	2	1	-	1	-	1	3
High	1	Yard	Added area	1,500,000	ha	-	3	2	2	2	3	2
High	1	Yard eq.	RTG (6+1x5+1)	2,000,000	no.	-	4	4	4	6	4	5
High	1	Yard eq.	Tractor + trailer	100,000	no.	-	10	9	11	15	9	13
High	1	Yard eq.	RS	400,000	no.	-	10	-	-	-	-	-
High	1	Other	CFS bldg.	1,200	m²	-	8,715	2,893	1,687	1,448	-	-
High	1	Other	Coldstorage bldg.	2,000	m²	-	3,060	1,476	1,261	1,382	1,063	926

Infrastructure investment required for Alternative 2

Case	Alt.	Type	Description	Unit cost (EUR)	unit	2021	2025	2030	2035	2040	2045	2050
Base	2	Berth	Sundabakki	60,000	m	215	-	-	-	-	-	-
Base	2	Berth	Vogabakki	60,000	m	-	-	40	-	-	-	-
Base	2	Quay eq.	MHC	4,000,000	no.	-	-	-	-	1	1	-
Base	2	Quay eq.	STS gantry crane	8,000,000	no.	3	1	-	-	-	-	-
Base	2	Yard	Added area	1,500,000	ha	-	2.7	2.0	1.5	1.8	2.5	2.0
Base	2	Yard eq.	RTG (6+1x5+1)	2,000,000	no.	-	2	2	4	3	4	3
Base	2	Yard eq.	Tractor + trailer	100,000	no.	-	5	5	9	8	10	7
Base	2	Yard eq.	RS	400,000	no.	-	10	-	-	-	-	-
Base	2	Other	CFS bldg.	1,200	m²	-	6,660	1,193	700	228	-	-
Base	2	Other	Coldstorage bldg.	2,000	m²	-	1,983	712	692	696	655	508

Case	Alt.	Type	Description	Unit cost (EUR)	unit	2021	2025	2030	2035	2040	2045	2050
High	2	Berth	Sundabakki	60,000	m	215	-	-	-	-	-	-
High	2	Berth	Vogabakki	60,000	m	-	-	50	-	-	-	-
High	2	Quay eq.	MHC	4,000,000	no.	-	-	-	2	-	-	-
High	2	Quay eq.	STS gantry crane	8,000,000	no.	3	1	-	-	-	-	4
High	2	Yard	Added area	1,500,000	ha	-	3	2	2	2	3	2
High	2	Yard eq.	RTG (6+1x5+1)	2,000,000	no.	-	5	4	4	5	4	5
High	2	Yard eq.	Tractor + trailer	100,000	no.	-	12	10	10	13	9	13
High	2	Yard eq.	RS	400,000	no.	-	9	-	-	-	-	-
High	2	Other	CFS bldg.	1,200	m²	-	8,715	2,893	1,687	1,448	-	-
High	2	Other	Coldstorage bldg.	2,000	m²	-	3,060	1,476	1,261	1,382	1,063	926

Infrastructure investment required for Alternative 3a

Case	Alt.	Type	Description	Unit cost (EUR)	unit	2021	2025	2030	2035	2040	2045	2050
Base	3a	Berth	Sundabakki	60,000	m	-	115	-	-	-	-	-
Base	3a	Berth	Vogabakki	60,000	m	300	-	-	-	54	-	-
Base	3a	Quay eq.	MHC	4,000,000	no.	2	-	-	-	-	-	-
Base	3a	Quay eq.	STS gantry crane	8,000,000	no.	2	1	-	1	-	1	-
Base	3a	Yard	Added area	1,500,000	ha	-	2.2	2.0	2.0	2.5	2.5	1.4
Base	3a	Yard eq.	RTG (6+1x5+1)	2,000,000	no.	-	3	2	2	2	3	4
Base	3a	Yard eq.	Tractor + trailer	100,000	no.	-	7	5	5	5	8	10
Base	3a	Yard eq.	RS	400,000	no.	-	9	-	-	-	-	-
Base	3a	Other	Demolition bldg.	80	m²	3,000	-	-	-	-	-	-
Base	3a	Other	CFS bldg.	1,200	m²	-	6,660	1,193	700	228	-	-

Case	Alt.	Type	Description	Unit cost (EUR)	unit	2021	2025	2030	2035	2040	2045	2050
High	3a	Berth	Sundabakki	60,000	m	-	90	-	-	45	-	-
High	3a	Berth	Vogabakki	60,000	m	325	-	-	-	50	-	-
High	3a	Quay eq.	MHC	4,000,000	no.	1	-	-	1	-	-	-
High	3a	Quay eq.	STS gantry crane	8,000,000	no.	3	1	-	-	1	-	3
High	3a	Yard	Added area	1,500,000	ha	-	2	2	2	3	3	2
High	3a	Yard eq.	RTG (6+1x5+1)	2,000,000	no.	-	4	3	4	4	4	5
High	3a	Yard eq.	Tractor + trailer	100,000	no.	-	10	7	10	10	10	13
High	3a	Yard eq.	RS	400,000	no.	-	9	-	-	-	-	-
High	3a	Other	Demolition bldg.	80	m²	3,000	-	-	-	-	-	-
High	3a	Other	CFS bldg.	1,200	m²	-	8,715	2,893	1,687	1,448	-	-

Infrastructure investment required for Alternative 3b

Case	Alt.	Type	Description	Unit cost (EUR)	unit	2022	2025	2030	2035	2040	2045	2050
Base	3b	Berth	Sundabakki	60,000	m	-	215	-	-	-	-	-
Base	3b	Berth	Vogabakki	60,000	m	175	-	-	40	-	-	-
Base	3b	Quay eq.	MHC	4,000,000	no.	1	-	-	-	2	-	-
Base	3b	Quay eq.	STS gantry crane	8,000,000	no.	3	2	-	-	-	-	-
Base	3b	Yard	Added area	1,500,000	ha	-	2.7	1.6	1.2	1.2	1.4	1.4
Base	3b	Yard eq.	RTG (6+1x5+1)	2,000,000	no.	-	2	3	3	4	5	2
Base	3b	Yard eq.	Tractor + trailer	100,000	no.	-	5	7	8	10	12	5
Base	3b	Yard eq.	RS	400,000	no.	-	10	-	-	-	-	-
Base	3b	Other	CFS bldg.	1,200	m²	-	6,660	1,193	700	228	-	-
Base	3b	Other	Coldstorage bldg.	2,000	m²	-	1,983	712	692	696	655	508

Case	Alt.	Type	Description	Unit cost (EUR)	unit	2022	2025	2030	2035	2040	2045	2050
High	3b	Berth	Sundabakki	60,000	m	-	215	-	-	-	-	-
High	3b	Berth	Vogabakki	60,000	m	175	-	-	60	-	-	-
High	3b	Quay eq.	MHC	4,000,000	no.	1	-	-	2	-	-	-
High	3b	Quay eq.	STS gantry crane	8,000,000	no.	2	1	-	-	-	1	3
High	3b	Yard	Added area	1,500,000	ha	-	3	2	2	2	2	2
High	3b	Yard eq.	RTG (6+1x5+1)	2,000,000	no.	-	4	3	5	6	1	-
High	3b	Yard eq.	Tractor + trailer	100,000	no.	-	10	7	13	15	2	-
High	3b	Yard eq.	RS	400,000	no.	-	10	-	-	-	-	-
High	3b	Other	CFS bldg.	1,200	m²	-	8,715	2,893	1,687	1,448	-	-
High	3b	Other	Coldstorage bldg.	2,000	m²	-	3,060	1,476	1,261	1,382	1,063	926

Container Freight Stations (CFS) & Cold storage

Base case

	Units	2022	2025	2030	2035	2040	2045	2050
Total estimated area CFS + Cold storage	m²	50,635	59,199	60,638	61,449	61,655	62,792	62,920
Width	m	75						
Length	m	675	789	809	819	822	837	839
Additional width for trucks' docking maneuvers	m	30						
Additional area for enclosed storage to be built	m²	0	8,281	1,439	810	206	1,137	128
Accumulated	m²		8,281	9,720	10,531	10,737	11,874	12,002

High case

	Units	2022	2025	2030	2035	2040	2045	2050
Total estimated area CFS + Cold storage	m²	50,635	62,282	66,114	68,400	70,401	72,403	73,465
Width	m	75						
Length	m	675	830	882	912	939	965	980
Additional width for trucks' docking maneuvers	m	30						
Additional area for enclosed storage to be built	m²	0	11,364	3,831	2,286	2,001	2,002	1,063
Accumulated	m²		11,364	15,196	17,482	19,483	21,485	22,547

Conclusions

- All options provide sufficient capacity to meet projected demand, can accommodate call patterns and vessels of the required capacity
- Alternative 3a and 3b provide open access to new entrants. Access is possible for new entrants in Alternatives 1 and 2, but depends on securing agreement with either Eimskip or Samskip
- Alternative 3a provides the greatest operational flexibility (as a full common user terminal) and the largest number of slots for new entrants. The additional cost compared with Alternative 1 (status quo) is modest. In our view, this is the most attractive option
- Eimskip has long leases to the terminal area that it presently uses and may wish to continue with its present dedicated terminal. In this case, Alternative 3b could be adopted in order to allow access to new entrants and increased flexibility and Vogabakki
- Alternative 2 is the lowest cost option in the Base Case, but delivers lower quay length and less operational flexibility. Alternative 3b is the lowest cost option in the High Case

Summary

	Key takeaways
Assessment of alternatives	We have reviewed six Alternatives for future development: Faxaports plan; Eimskip plan (Sundabakki/Kleppsbakki only); Drewry Alternatives 1, 2, 3a, 3b. We have assumed that the container terminal boundary remains unchanged, that the Sundabraut Bridge is built, and that existing vessel call patterns persist. We have assumed steady increases in berth productivity and reductions in CFS dwell times. Faxaports considered filling in Kleppsbakki basin and extending Sundabakki (by 215m) and Vogabakki (by 440m). The reclaimed area was planned to be used for warehousing and to meet other land use needs, however, this would reduce the berthing capacity for services calling at Sundahöfn. The material for the reclamation would be generated by dredging the approach channel. Eimskip has prepared a proposed plan for its present facility at Sundabakki. The berth would be extended to 615m and the yard reorganised, with RTGs as the main equipment type. Vogabakki is not addressed in this plan. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal. Drewry Alternative 1 proposes a continuation of the split between Eimskip and Samskip's terminals, the extension of Sundabakki (by 215m) and Vogabakki (by 235m) and the extension of stacking areas for both terminals. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal. Alternative 2 proposes a common user quay covering Kleppsbakki, Sundabakki and Vogabakki, with separate stacking areas for the lines. Sundabakki is fully extended by 215m, and only 50m are added to Vogabakki. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal. Alternative 3a proposes that Sundahöfn becomes a common user integrated terminal. All yard area is developed and almost all quay length (some minor sections of the quay have not been developed, but could be, for accommodating bigger ships). This is the only alternative able to receive the biggest vessels included in the forecast for 2050. New entrants would be served by the common user terminal operator. Drewry Alternative 3b proposes a dedicated terminal for Eimskip at Sundabakki, with an extension of quay and yard area, and a common user terminal at an extended Vogabakki that would accommodate both Samskip and future new entrants. The capacity (0.9-1 million teu p.a.) and cost of the various Alternatives are similar; all Alternatives provide sufficient capacity to meet the High Case forecast container traffic. All Alternatives provide the same land area for CFS and coldstores. Throughput capacity is sufficient to meet demand. The main variations are in the availability of slots for new entrants; Alternative 3a generates the largest number of slots for potential newcomers; 3b smallest;1 and 2 are equivalent in terms of slots for newcomers, but subject to agreements with current operators A comparison of civil works and new equipment cost (based on international benchmarks) shows total costs in the period to 2050 range from SK20.4 billion to ISK23.7 billion. Alternative 3a and 3b have the highest cost, while Alternative 2 shows the lowest cost, due to a lower length of quay added In the High Case, total costs in the period to 2050 range from SK28.6 billion to ISK32.0 billion. Alternative 3b has the lowest costs Alternative 3a provides the greatest operational flexibility (as a full common user terminal) and the largest number of slots for new entrants. The additional cost compared with Alternative 1 (status quo) is modest. In our view, this is the most attractive option

Drewry

Structural options and evaluation

Institutional structure: Key questions and considerations

Institutional structure: Key questions

1. Should Faxaport consider to offer stevedoring service or support foundation of a third party?
2. What are the various regional institutional structures and set up – pros and cons of each
3. Assess the attractiveness and appropriateness of various institutional structural options and fit to Faxaports
4. Select structural option
   - Institutional structure and operating model options, attractiveness and suitability.

Institutional structure: Key considerations

1. Ensure optimum competitiveness / efficiency of container terminal operations at Sundahöfn;
2. Responsible use of public funds / land and value for money for the local communities / shareholders of Faxaports
3. Call from community and competition authorities to welcome newcomers.

Port Authority, independent stevedores and carriers - Objectives

The aims and objectives of Port Authority, independent stevedores and carriers are institutionally separate; but they are not mutually exclusive – they can and do co-exist to the benefit of all port stakeholders

	Port Authority aims and mission: "DUTY"	Global/international terminal stevedores aims and mission: "PROFIT"	Global carriers aims and mission: "PROFIT
Main activity	**Long term planning and efficient land use** **Ensure port are efficient links that serve the economy**	Terminal operation is prime purpose of business	Container shipping is prime purpose of business
Financial aims	Not for profit in the majority of the case although self sustaining	**Terminals are profit centres – focus on sustained profitability**	**Terminals are usually cost centres**
Efficiency aims	Greater efficiency of supply chain and **benefits to the economy**	Greater efficiency of terminals through implementing common practices – **profitability key driver of efficiency**	Greater efficiency of the shipping network rather than the terminals
Main purpose of terminals network	Local focus - ensure efficiency and benefits to the economy	Global focus driven by a desire to spread investment risk, maximisation of profits	**Terminal network supports shipping activities and strategy**

Institutional structure options - Introduction

Tasks to be fulfilled	Port Authority	Port authority in JV with stevedore	Stevedore
Land use planning and development			
Marine services			
Container berth operations			
Container yard operations			
CFS operation*			
Cold store operation*			
Gate operation			

Cold store: Reefer warehouse for storage of frozen or chilled goods

CFS: container freight station for storage of dry goods

Three main options:

1. Integrated port authority and operator
2. Landlord port authority in JV with stevedore as terminal operator
3. Third party terminal operator with concession or lease

- In all three options Land use planning and development and Marine services are performed directly by the port authority.
- Operations of container berths, yard, CFS, Cold store and container terminal gate allow a range of potential options / participants.
- The operation of CFS and cold stores can be viewed as a separate option and can be separate to the berth and yard operations structure. Land use for CFS and Cold Stores can be controlled through leases.

j/v options:

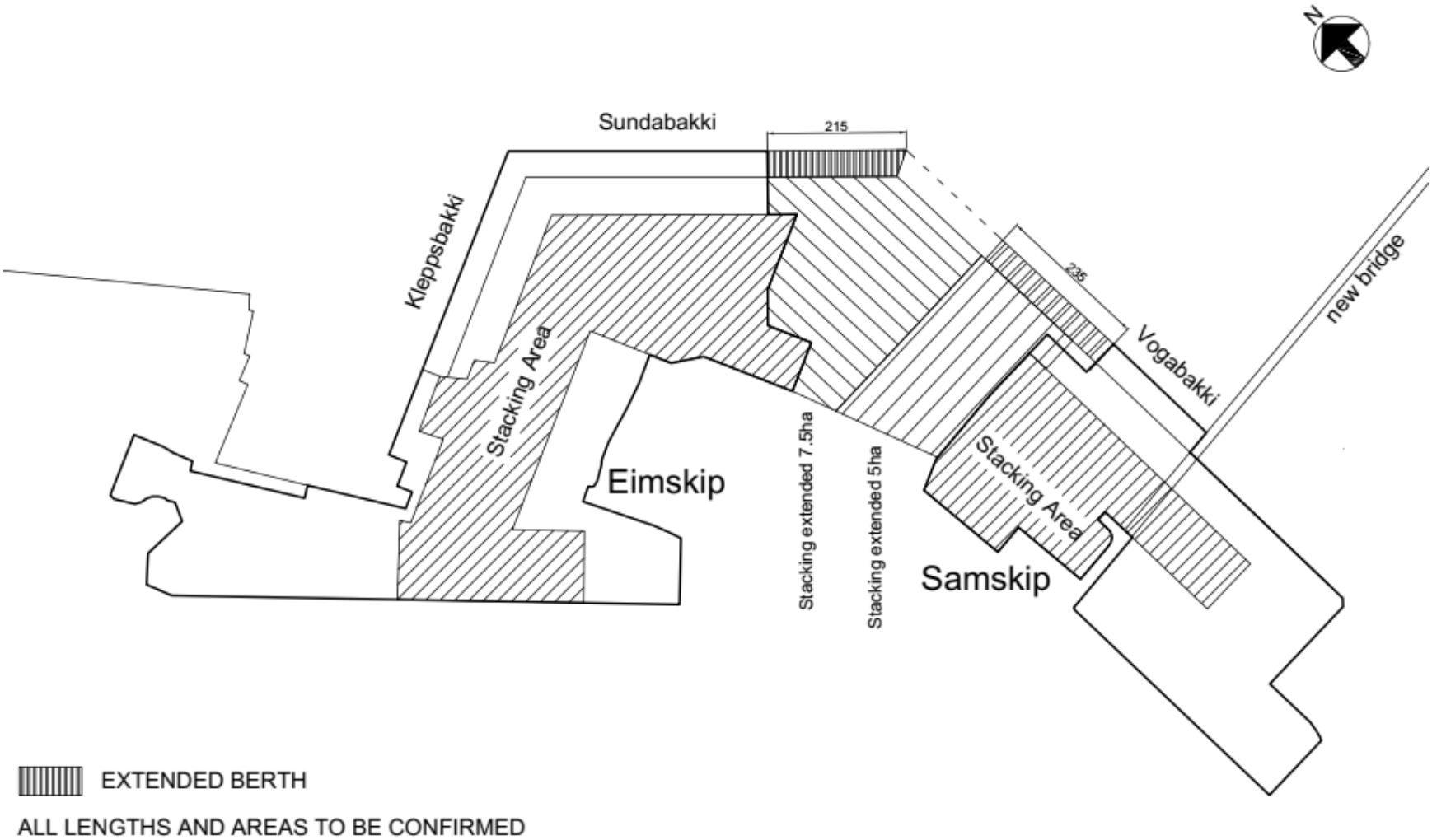
- ✓ Faxaports / Eimskip j/v
- ✓ Faxaports / Samskip j/v
- ✓ Faxaports/Eimskip/Samskip j/v
- ✓ Eimskip/Samskip j/v
- ✓ A new Icelandic terminal operating company that would take over the terminal operating activities and resources of Eimskip and Samskip, but have other shareholders, possibly including Faxaports

Stevedore options:

- ✓ Eimskip
- ✓ Samskip
- ✓ An independent international terminal operator

Alternative 1: separate terminals 2050 (Eimskip and Samskip)

Drewry Alternative 1 proposes a continuation of the split between Eimskip and Samskip's terminals, the extension of Sundabakki (by 215m) and Vogabakki (by 235m) and the extension of stacking areas for both terminals. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal.



Pros and Cons of current model

Operating and institutional structure	Land Area	Terminal Infrastructure	Terminal Equipment	Quay Use	Quayside Operations	Landside Operations	Examples
Pure Landlord port with private tenants	Publicly owned	Owned and constructed by port authority	Privately owned or rented from port authority	**Dedicated**	**Shipping Line**	**Shipping Line**	Sundahöfn Aalborg

- Clear division of roles and responsibilities between port authority and terminal operator
- Faxaports can focus on strategic goal to ensure port is an efficient link that serves the economy
- Faxaports can focus on long-term port planning and ensure port land / infrastructure is allocated efficiently
- Faxaport can control / influence market participation (i.e. it can decide which companies can lease berths / yard area)
- ***Potential*** to drive competitiveness and efficiency - but needs to apply different levers

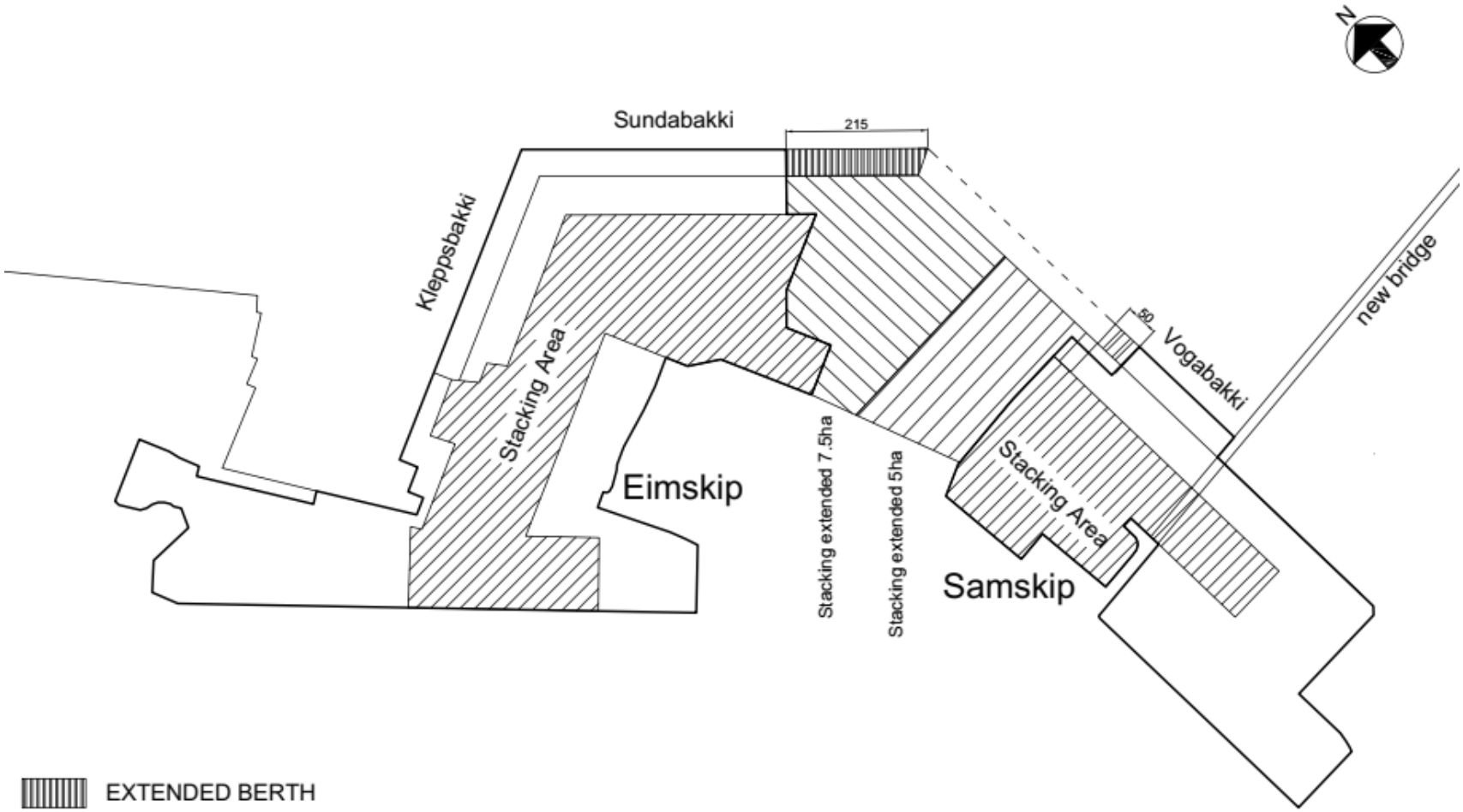
- Terminal operator goals do not align with port authority goals.
  - *For current terminal operators, container shipping is prime purpose of business, with operation of Sundahöfn terminals focussed on optimising shipping activities, terminals are cost-centres rather than profit-centres*
- Land use optimisation not an objective of the terminal operator
- Port authority cannot influence introduction of new lines / additional services
- Port authority cannot directly influence performance of terminal operations

Alternative 1: Institutional structure – attractiveness and fit to Faxaports

	Key objectives	Current model	Comments
Attractiveness	Clear division of roles and responsibilities - "Duty" or "Profit"	3	
	Strategic focus and long term planning	3	
	Efficient land use	1	Current land use can be more efficient
	Terminal efficiency, productivity and reliability	2	For current terminal operators, container shipping is prime purpose of business, terminals focussed on optimising shipping activities, Land use optimisation not core objective
	Port and terminal costs to shipping lines and end users	1	Anecdotal evidence suggests THC charges are high
	Introduction of global best practice	1	Current operators with limited global terminal footprint
	Access to new entrants / additional lines	1	Can be influenced at the discretion of existing operators
	Ability to influence wider supply chain	2	Decide which companies can lease berths / yard area
	Financial returns to Faxaport stakeholders	2	Fixed fee for lease of land
	Unweighted score:	**16**	
Feasibility	Organisational expertise - ability to manage terminal operations	3	Current terminal operators bring operational expertise required
	Contractual limitations and feasibility to change	3	No change in current model
	Unweighted score:	**6**	
Attractiveness and feasibility score		**22**	

Alternative 2: integrated berthing, separate yards (Eimskip & Samskip) 2050

Drewry Alternative 2 proposes a common user quay covering Kleppsbakki, Sundabakki and Vogabakki, with separate stacking areas for the lines. Sundabakki is fully extended by 215m, and only 50m are added to Vogabakki. New entrants would need to be accommodated at either the Eimskip or the Samskip terminal.



EXTENDED BERTH

ALL LENGTHS AND AREAS TO BE CONFIRMED

Global / Regional institutional structures

In Alternative 2, Quay side operations could be operated by Faxaports, or operated by a Joint venture in which Faxaports is a JV partner.

Operating and institutional structure	Land Area	Terminal Infrastructure	Terminal Equipment	Quay Use	Quayside Operations	Landside Operations	Examples
Integrated Landlord port authority and terminal operator (multiuser berths)	a) Publicly owned port authority b) Privately owned port authority*	Owned and constructed by port authority	Owned by port authority	Multiuser	Operated by port authority	Private tenants	
Landlord port authority in JV with private stevedore as terminal operator	a) Publicly owned port authority b) Privately owned port authority*	Owned and constructed by port authority	JV	Multiuser	JV	Private Tenants	

Faxaports as integrated port authority and operator

Operating and institutional structure	Land Area	Terminal Infrastructure	Terminal Equipment	Quay Use	Quayside Operations	Landside Operations	Examples
Integrated Landlord port authority and terminal operator (dedicated berths)	a) Publicly owned port authority b) Privately owned port authority	Owned and constructed by port authority	Owned by port authority	Multiuser	Operated by Port authority	Private tenants	• Port of Tilbury (P&O Ferries)

- ***Potential*** for economies of scale arising from a fully integrated terminal operation, but less so than with multiuser terminal option
- ***Potential*** for improved land utilisation at Sundahöfn (eg. adjusting storage charges to reduce dwell time), but less so than with multiuser terminal option
- ***Potential*** to generate increased financial returns for shareholders of Faxaports
- ***Potential*** to influence wider supply chain
- ***Some potential*** to welcome new lines / additional services but would require additional berths / land area, therefore less potential than under Option 1 (multiuser option)

- The port authority "duty" and terminal operator "profit" roles and motives can become blurred – it is challenging to balance delivery of short-term operational results and longer term strategic goals
- Terminal management requires different skill set to port authority, risk that senior management can become immersed in day-to-day operations at the expense of delivering strategic development goals
- Globally, public-sector operator ports are less efficient (although often due to historic factors / lack of port reform)
- Placing too much weight on wider public benefit could compromise terminal efficiency / productivity

Alternative 2: Institutional structure – attractiveness and fit to Faxaports

	Key objectives	Integrated port authority and operator	Comments
Attractiveness	Clear division of roles and responsibilities - "Duty" or "Profit"	2	Some risk of diluting, being focused on operations
	Strategic focus and long term planning	3	
	Efficient land use	1	Current land use can be more efficient
	Terminal efficiency, productivity and reliability	2	Some economies of scale arising from an integrated berth operation.
	Port and terminal costs to shipping lines and end users	2	Some ability to lower THC
	Introduction of global best practice	1	
	Access to new entrants / additional lines	2	Potential to welcome new lines / additional services; yard area a constraint
	Ability to influence wider supply chain	2	Decide which companies can lease berths / yard area
	Financial returns to Faxaport stakeholders	2	Economies of scale arising from an integrated berth operation. Revenue from quay side handling.
	Unweighted score:	**17**	
Feasibility	Organisational expertise - ability to manage terminal operations	0	No existing capability.
	Contractual limitations and feasibility to change	2	On going long term land lease at the yards.
	Unweighted score:	**2**	
Attractiveness and feasibility score		**19**	

Faxaports has shareholding in terminal operator JV

Operating and institutional structure	Land Area	Terminal Infrastructure	Terminal Equipment	Quay Use	Quayside Operations	Landside Operations	Examples
Landlord port authority in JV with private stevedore as terminal operator	a) Publicly owned port authority b) Privately owned port authority	Owned and constructed by port authority	JV	Multiuser	JV	Private tenants	

- Retains a clear division of roles and responsibilities between port authority and terminal operator, JV enables an arms-length relationship
- Faxaports can continue to focus on long-term port planning and ensure port land / infrastructure is allocated efficiently
- ***Potential*** to drive efficiency via participation in JV as shareholder (i.e. greater influence over terminal operations), thus delivering on strategic goal to ensure port is an efficient link that serves the Icelandic economy
- ***Potential*** to welcome new lines / additional services to a multiuser facility
- ***Potential*** for introduction of global best practices (dependent on JV partner(s))
- ***Potential*** to generate increased financial returns for shareholders of Faxaports

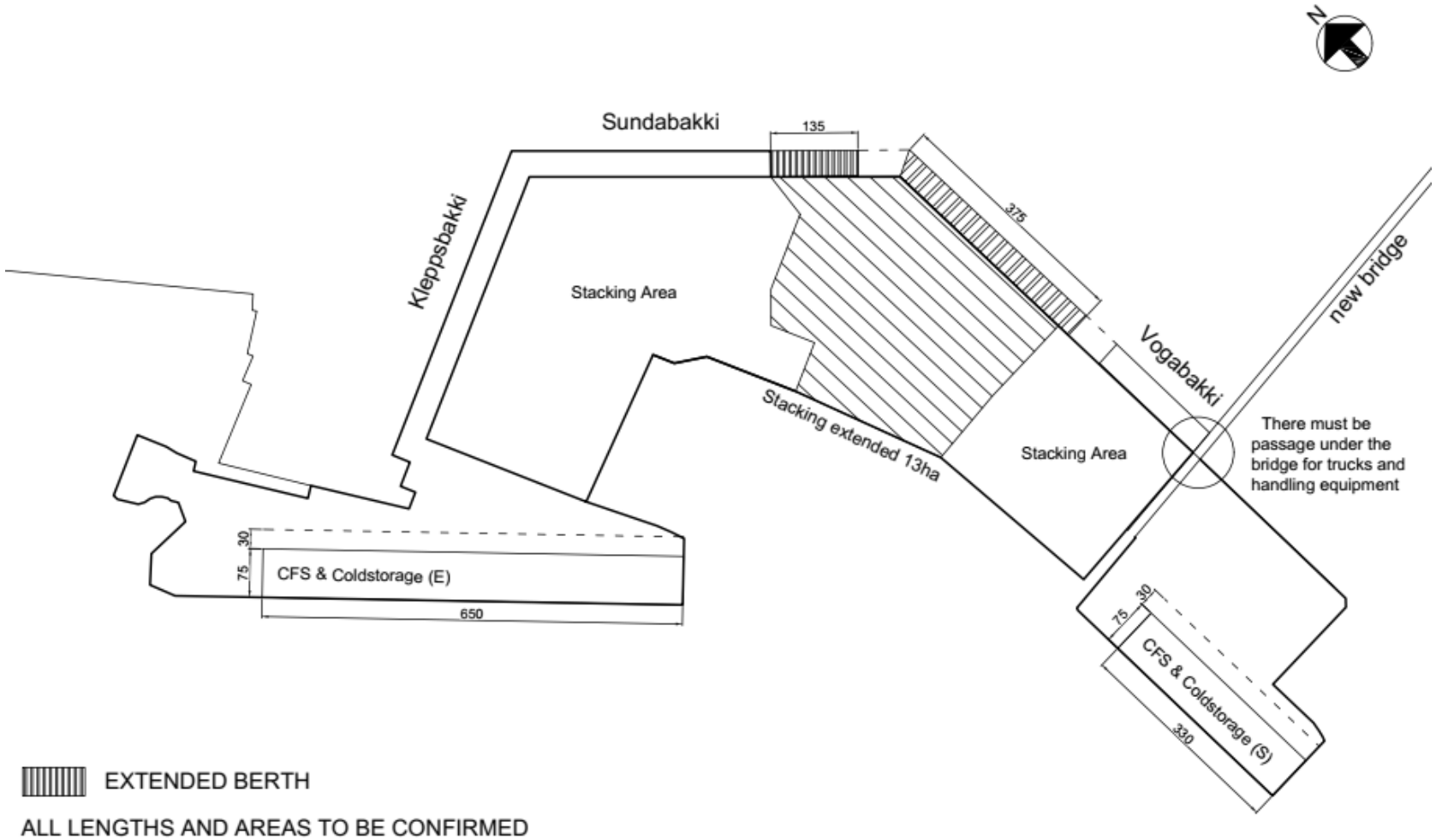
- JV partners may have different goals, need a strong shareholder agreement to manage interface and balanced board voting rights
- Current shipping lines may not wish to join forces and form a JV to operate the terminal, but failure to include both may be seen to be anti-competitive

Alternative 2: Institutional structure – attractiveness and fit to Faxaports

	Key objectives	Landlord port authority in JV with stevedore as terminal operator	Comments
Attractiveness	Clear division of roles and responsibilities - "Duty" or "Profit"	2	Some risk of diluting being focused on operations
	Strategic focus and long term planning	3	Potential for improved land utilisation
	Efficient land use	1	Cannot influence land use directly in this option
	Terminal efficiency, productivity and reliability	2	Economies of scale arising from an integrated berth operation.
	Port and terminal costs to shipping lines and end users	2	Some ability to lower THC
	Introduction of global best practice	1	Limited scope
	Access to new entrants / additional lines	2	some ability to welcome new lines / additional services, access to yard a constraint
	Ability to influence wider supply chain	2	
	Financial returns to Faxaport stakeholders	2	Economies of scale arising from an integrated berth operation. Some revenue from quay side handling.
	Unweighted score:	**17**	
Feasibility	Organisational expertise - ability to manage terminal operations	3	Assumed to be provided by j/v partner
	Contractual limitations and feasibility to change	2	On going long term land lease at the yards. Tenants as JV partners.
	Unweighted score:	**5**	
Attractiveness and feasibility score		**22**	

Alternative 3a: common user terminal 2050

Drewry Alternative 3a proposes that Sundahöfn becomes a common user integrated terminal. All yard area is developed and almost all quay length (some minor sections of the quay have not been developed, but could be, for accommodating bigger ships). This is the only alternative able to receive the biggest vessels included in the forecast for 2050. New entrants would be served by the common user terminal operator.



Global / Regional institutional structures

In Alternative 3a, Quay side operations could be operated by Faxaports, or operated by a Joint venture in which Faxaports is a JV partner or operated by a dedicated Terminal operator.

Operating and institutional structure	Land Area	Terminal Infrastructure	Terminal Equipment	Quay Use	Quayside Operations	Landside Operations	Examples
Integrated Landlord port authority and Terminal operator (multiuser berths)	a) Publicly owned port authority b) Privately owned port authority*	Owned and constructed by port authority	Owned by port authority	Multiuser	Operated by port authority	Operated by port authority	• Copenhagen Malmo Port • Helsingborg
							• Port of Felixstowe • ABP Immingham Container Terminal
Landlord port authority in JV with private stevedore as Terminal operator	a) Publicly owned port authority b) Privately owned port authority*	Owned and constructed by port authority	JV	Multiuser	JV	JV	• Terminal des Flandres, Dunkirk • Colombo, Sri Lanka
							• Liverpool2 (Peel Ports / TIL)
Pure Landlord port with private tenants / concessionaires (multiuser berths)	Publicly owned	Owned and constructed by port authority	Privately owned (or rented from port authority)	Multiuser	Terminal operator	Terminal operator	• Port of Aarhus • Port of Dublin • Port of Rotterdam

** In UK the majority of the major port authorities are privately owned*

Faxaports as integrated port authority and operator

Operating and institutional structure	Land Area	Terminal Infrastructure	Terminal Equipment	Quay Use	Quayside Operations	Landside Operations	Examples
Integrated Landlord port authority and terminal operator (multiuser berths)	a) Publicly owned port authority	Owned and constructed by port authority	Owned by port authority	Multiuser	Operated by port authority	Operated by port authority	• Copenhagen Malmo Port • Helsingborg
	b) Privately owned port authority						• Port of Felixstowe • ABP Immingham Container Terminal

- ***Potential*** for economies of scale arising from a fully integrated terminal operation (i.e. no duplication of assets, better utilisation of fixed / mobile assets and workforce)
- ***Potential*** for improved land utilisation at Sundahöfn (eg. adjusting storage charges to reduce dwell time)
- ***Potential*** to generate increased financial returns for shareholders of Faxaports
- ***Potential*** to welcome new lines / additional services
- ***Potential*** to influence wider supply chain

- The port authority "duty" and terminal operator "profit" roles and motives can become blurred – it is challenging to balance delivery of short-term operational results and longer term strategic goals
- Terminal management requires different skill set to port authority, risk that senior management can become immersed in day-to-day operations at the expense of delivering strategic development goals
- Globally, public-sector operator ports are less efficient (although often due to historic factors / lack of port reform)
- Placing too much weight on wider public benefit could compromise terminal efficiency / productivity

Alternative 3a: Institutional structure – attractiveness and fit to Faxaports

	Key objectives	Integrated port authority and operator	Comments
Attractiveness	Clear division of roles and responsibilities - "Duty" or "Profit"	2	Some risk of diluting being focused on operations
	Strategic focus and long term planning	3	
	Efficient land use	3	
	Terminal efficiency, productivity and reliability	2	Economies of scale arising from a fully integrated terminal operation.
	Port and terminal costs to shipping lines and end users	2	
	Introduction of global best practice	1	Limited scope
	Access to new entrants / additional lines	3	Potential to welcome new lines / additional services.
	Ability to influence wider supply chain	3	
	Financial returns to Faxaport stakeholders	3	Economies of scale arising from a fully integrated terminal operation. Revenue from quay side and yard handling and storage.
	Unweighted score:	**22**	
Feasibility	Organisational expertise - ability to manage terminal operations	0	No existing capability.
	Contractual limitations and feasibility to change	0	On going long term land lease at the yards.
	Unweighted score:	**0**	
Attractiveness and feasibility score		**22**	

Faxaports has shareholding in terminal operator JV

Operating and institutional structure	Land Area	Terminal Infrastructure	Terminal Equipment	Quay Use	Quayside Operations	Landside Operations	Examples
Landlord port authority in JV with private stevedore as terminal operator	a) Publicly owned port authority b) Privately owned port authority	Owned and constructed by port authority	JV	Multiuser	JV	JV	• Terminal des Flandres, Dunkirk • Colombo, Sri Lanka • Liverpool2 (Peel Ports / TIL)

- Retains a clear division of roles and responsibilities between port authority and terminal operator, JV enables an arms-length relationship
- Faxaports can continue to focus on long-term port planning and ensure port land / infrastructure is allocated efficiently
- ***Potential*** to drive efficiency via participation in JV as shareholder (i.e. greater influence over terminal operations), thus delivering on strategic goal to ensure port is an efficient link that serves the Icelandic economy
- ***Potential*** to welcome new lines / additional services to a multiuser facility
- ***Potential*** for introduction of global best practices (dependent on JV partner(s))
- ***Potential*** to generate increased financial returns for shareholders of Faxaports

- JV partners may have different goals, need a strong shareholder agreement to manage interface and balanced board voting rights
- Current shipping lines may not wish to join forces and form a JV to operate the terminal, but failure to include both may be seen to be anti-competitive
- JV could exploit monopoly position to make unreasonable profits, increasing costs for port users

Alternative 3a: Institutional structure – attractiveness and fit to Faxaports

	Key objectives	Landlord port authority in JV with stevedore as terminal operator	Comments
Attractiveness	Clear division of roles and responsibilities - "Duty" or "Profit"	3	
	Strategic focus and long term planning	3	Potential for improved land utilisation
	Efficient land use	3	
	Terminal efficiency, productivity and reliability	3	Economies of scale arising from a fully integrated terminal operation.
	Port and terminal costs to shipping lines and end users	3	Improved efficiency could reduce cost to users; some risk of abuse of monopoly position
	Introduction of global best practice	2	score would be lower if local as opposed to regional / global operators are selected
	Access to new entrants / additional lines	3	Potential to welcome new lines / additional services.
	Ability to influence wider supply chain	3	
	Financial returns to Faxaport stakeholders	3	Economies of scale arising from a fully integrated terminal operation. Revenue from quay side and yard handling and storage.
	Unweighted score:	**26**	
Feasibility	Organisational expertise - ability to manage terminal operations	3	Assumed to be brought in by j/v partner.
	Contractual limitations and feasibility to change	1	On going long term land lease at the yards. Tenants as JV partners.
	Unweighted score:	**4**	
Attractiveness and feasibility score		**30**	

Third party terminal operator with concession

Operating and institutional structure	Land Area	Terminal Infrastructure	Terminal Equipment	Quay Use	Quayside Operations	Landside Operations	Examples
Pure Landlord port with private tenants / concessionaires (multiuser berths)	Publicly owned	Owned and constructed by port authority	Privately owned (or rented from port authority)	Multiuser	Terminal operator	Terminal operator	• Port of Aarhus • Port of Dublin • Port of Rotterdam

- Tried and tested / most common model adopted worldwide
- Retains a clear division of roles and responsibilities between port authority and terminal operator
- Faxaports can continue to focus on long-term port planning and ensure port land / infrastructure is allocated efficiently
- ***Potential*** for the terminal to be operated as a profit centre – key driver of efficiency
- ***Potential*** to welcome new lines / additional services to a multiuser facility
- ***Potential*** for introduction of global best practices (dependent on concessionaire))
- ***Potential*** to generate increased financial returns for shareholders of Faxaports

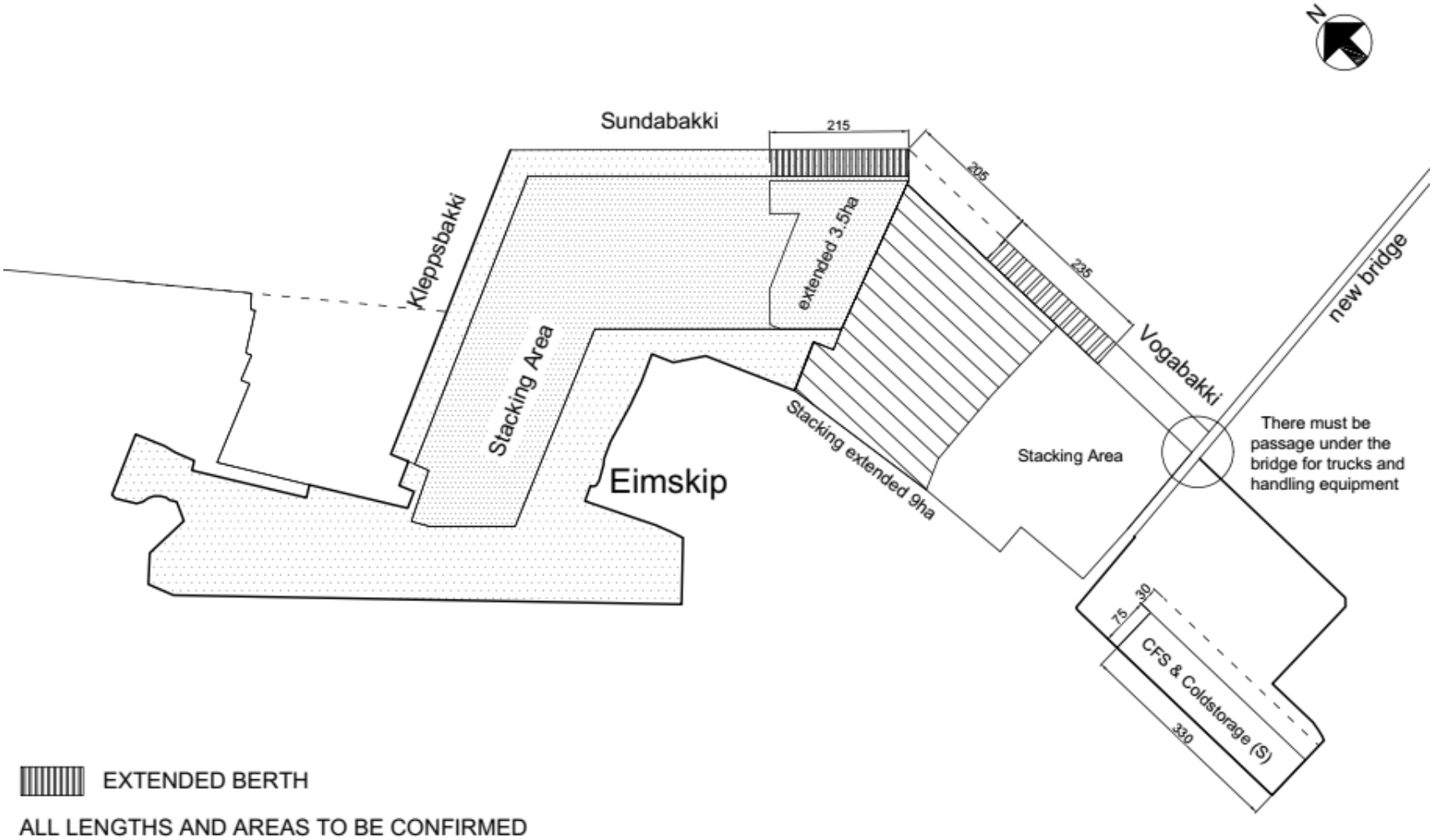
- Success of competitive tender for port concession may not be successful
- Success of the competitive tender for the concession can be influenced by the two key customers
- Risk that the two key lines bid against each other, with potential for adverse impact on competitive positioning of unsuccessful bidder
- Potential that chosen terminal operator could exploit monopoly position to make unreasonable profits, increasing costs for port users

Alternative 3a: Institutional structure – attractiveness and fit to Faxaports

	Key objectives	Third party terminal operator with concession	Comments
Attractiveness	Clear division of roles and responsibilities - "Duty" or "Profit"	3	
	Strategic focus and long term planning	3	Potential for improved land utilisation.
	Efficient land use	3	
	Terminal efficiency, productivity and reliability	3	Economies of scale arising from a fully integrated terminal operation.
	Port and terminal costs to shipping lines and end users	3	
	Introduction of global best practice	3	Score would be lower if local as opposed to regional / global opeators are selected
	Access to new entrants / additional lines	3	Potential to welcome new lines / additional services.
	Ability to influence wider supply chain	3	
	Financial returns to Faxaport stakeholders	3	Revenue from concession fee
	Unweighted score:	**27**	
Feasibility	Organisational expertise - ability to manage terminal operations	3	No capability required by Faxaports in this option.
	Contractual limitations and feasibility to change	1	On going long term land lease at the yards.
	Unweighted score:	**4**	
Attractiveness and feasibility score		**31**	

Alternative 3b: Vogabakki common user + Sundabakki and Kleppsbakki (Eimskip) 2050

Drewry Alternative 3b proposes a dedicated terminal for Eimskip at Sundabakki, with an extension of quay and yard area, and a common user terminal at an extended Vogabakki that would accommodate both Samskip and future new entrants.



Alternative 3b: Institutional structure – attractiveness and fit to Faxaports

	Key objectives	Third party terminal operator with concession	Comments
Attractiveness	Clear division of roles and responsibilities - "Duty" or "Profit"	3	
	Strategic focus and long term planning	3	Potential for improved land utilisation.
	Efficient land use	2	Limited to common user terminal
	Terminal efficiency, productivity and reliability	2	Limited to common user terminal
	Port and terminal costs to shipping lines and end users	3	
	Introduction of global best practice	2	Limited to common user terminal
	Access to new entrants / additional lines	2	Limited to common user terminal
	Ability to influence wider supply chain	3	
	Financial returns to Faxaport stakeholders	2	Limited to common user terminal
	Unweighted score:	**22**	
Feasibility	Organisational expertise - ability to manage terminal operations	3	No capability required by Faxaports in this option.
	Contractual limitations and feasibility to change	3	On going long term land lease at the yards.
	Unweighted score:	**6**	
Attractiveness and feasibility score		**28**	

Institutional structure – attractiveness and fit to Faxaports

	Option	Alt 1	Alt 2 - integrated berths with dedicated yards		Alt 3a. common user terminal			Alt 3b
	Institutional structure	Current model	Integrated port authority and operator	Landlord port authority in JV with stevedore as terminal operator	Integrated port authority and operator	Landlord port authority in JV with stevedore as terminal operator	Third party terminal operator with concession	Third party terminal operator with concession
	Example	Lines' dedicated or affiliated terminals are common, e.g. Singapore, Aalborg	None	None	Copenhagen Malmo Port Helsingborg	Terminal des Flandres, Dunkirk Colombo, Sri Lanka	Most common structure globally	Most common structure globally
Attractiveness	Clear division of roles and responsibilities - "Duty" or "Profit"	3	2	2	2	3	3	3
	Strategic focus and long term planning	3	3	3	3	3	3	3
	Efficient land use	1	1	1	3	3	3	2
	Terminal efficiency, productivity and reliability	2	2	2	2	3	3	2
	Port and terminal costs to shipping lines and end users	1	2	2	2	3	3	3
	Introduction of global best practice	1	1	1	1	2	3	2
	Access to new entrants / additional lines	1	2	2	3	3	3	2
	Ability to influence wider supply chain	2	2	2	3	3	3	3
	Financial returns to Faxaport stakeholders	2	2	2	3	3	3	2
	Unweighted score:	**16**	**17**	**17**	**22**	**26**	**27**	**22**
Feasibility	Organisational expertise - ability to manage terminal operations	3	0	3	0	3	3	3
	Contractual limitations and feasibility to change	3	2	2	0	1	1	3
	Unweighted score:	**6**	**2**	**5**	**0**	**4**	**4**	**6**
Attractiveness and feasibility score		**22**	**19**	**22**	**22**	**30**	**31**	**28**

Summary

	Key takeaways
Assessment of institutional structure option	Faxaports also asked Drewry to assess the structural options that would best meet their key objectives: 1. Ensure optimum competitiveness / efficiency of container terminal operations at Sundahöfn; 2. Responsible use of public funds / land and value for money for the local communities / shareholders of Faxaports 3. Call from community and competition authorities to welcome newcomers The aims and objectives of Port Authority, independent stevedores and carriers are institutionally separate; but they are not mutually exclusive – they can and do co-exist to the benefit of all port stakeholders. There are three main options: 1. Integrated port authority and operator 2. Landlord port authority in JV with stevedore as terminal operator 3. Third party terminal operator with concession or lease In all three options Land use planning and development and Marine services are performed directly by the port authority. Operations of container berths, yard, CFS, Cold store and container terminal gate allow a range of potential options / participants. The operation of CFS and cold stores can be viewed as a separate option and can be separate to the berth and yard operations structure. Land use for CFS and Cold Stores can be controlled through leases.
	Drewry has assessed attractiveness of each development option on the following criteria: ✓ Clear division of roles and responsibilities - "Duty" or "Profit" ✓ Strategic focus and long term planning ✓ Efficient land use ✓ Terminal efficiency, productivity and reliability ✓ Port and terminal costs to shipping lines and end users ✓ Introduction of global best practice ✓ Access to new entrants / additional lines ✓ Ability to influence wider supply chain ✓ Financial returns to Faxaport stakeholders In addition feasibility of a proposed development option has been assessed on: ✓ Organisational expertise - ability to manage terminal operations ✓ Contractual limitations and feasibility to change On an unweighted assessment of the criteria above to the different structural options a common user terminal with either the port authority in a jv with stevedore as terminal operator or a Third party terminal operator with concession is the most attractive option

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Recommendations

Overall assessment

Overall, we conclude that 3a, with a third party terminal operator, is the best option, providing the best operational flexibility for a modest additional cost. Should this prove not be feasible, due to land leases, 3b would be a fall back option that would provide operational flexibility and an attractive structure.

Alternative	Alternative 1	Alternative 2		Alternative 3a			Alternative 3b
Structure	Current model	Integrated port authority and operator	Landlord port authority in JV with stevedore as terminal operator	Integrated port authority and operator	Landlord port authority in JV with stevedore as terminal operator	Third party terminal operator with concession	Third party terminal operator with concession
Capacity	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Operational flexibility	2.0	1.0	1.0	3.0	3.0	3.0	2.0
Capital expenditure	2.0	3.0	3.0	2.0	2.0	2.0	3.0
Structural Attractiveness	1.8	1.9	1.9	2.4	2.9	3.0	2.4
Structural feasibility	3.0	1.0	2.5	0.0	2.0	2.0	3.0
Total score	11.8	9.9	11.4	10.4	12.9	13.0	13.4

We base our overall assessment on availability of capacity, operational flexibility, capital expenditure and the attractiveness and feasibility of the associated institutional structures.

- Operationally, 3a is the best followed by 1 and 3b
- Based on the High Capex capex projection, 2 and 3b are the most attractive
- 3a and 3b provide the most attractive structures
- 1 and 3b provide the most feasible structures

Overall, we conclude that 3a, with a third party terminal operator, is the best option, providing the best operational flexibility for a modest additional cost. Should this prove not be feasible, due to land leases, 3b would be a fall back option that would provide operational flexibility and an attractive structure.

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SmartPorts: best practice

Smart port overview

Smart ports use technologies such as big data, Artificial Intelligence (AI) internet of things (IoT), fifth-generation technology (5G), blockchain solutions, and other smart technology-based methods to drive efficiency, improve performance and reduce waste to the benefit of all stakeholders and the port's broader community.

Smart port pillars	Key enablers	Process	Beneficiaries
Big Data	Sensors and devices	Digital strategy and cultural transformation to drive: ➢ Efficiency ➢ Safety ➢ Security ➢ Sustainability	➢ Port ➢ Port Stakeholders ➢ Hinterland ➢ Society
Connectivity	5G technology Blockchain solutions Virtual Storage		
Artificial Intelligence and robotics	Internet of Things Virtual reality and augmented reality		
Other	3D printing Smart materials - High tensile smart materials for quay/flood wall		

Levels of digital transformation into a smart port

A smart port takes a holistic approach to digital transformation, starting from internal digitalisation of the port to progressively integrate the port community, the hinterland and ultimately the entire end to end supply chain.

0	1	2	3	4
No Automation	Internal Digitalisation	Digitalisation of port community users	Digitalisation and integration of entire hinterland	Digitalisation and integration of end to end supply chain
	Eliminate waste for Port Authority	Eliminate waste for Port authority + Port community	Eliminate waste for Port authority + Port community + Port hinterland users	Eliminate waste for total supply chain i.e. integrate two or more ports at stage 3

Smart port technologies adoption

Port of Rotterdam, Port of Antwerp and Port of Hamburg rank as the top smart ports in the world having adopted technologies such as big data, Artificial Intelligence (AI) internet of things (IoT), fifth-generation technology (5G), blockchain solutions, and other smart technology-based methods to drive efficiency, improve performance and reduce waste to the benefit of all stakeholders and the port's broader community.

Smart port pillars	Key enablers	Port of Rotterdam	HPA Hamburg Port Authority	Port of Antwerp
Big Data	Sensors and devices	✓	✓	✓
Connectivity	5G technology	✓	✓	✓
	Virtual Storage	✓	✓	✓
	Blockchain solutions	✓	✓	✓
Artificial Intelligence and robotics	Internet of Things	✓	✓	✓
	Virtual reality and augmented reality / Digital Twin	✓	✓	✓
Other	3D printing	✓		
	Smart materials - High tensile smart materials for quay/flood wall	✓		

Smart port initiatives - Port of Rotterdam

We have assessed how the Port of Rotterdam Authority has adopted smart technologies to drive efficiency, improve performance and reduce waste to the benefit of all stakeholders and the port's broader community. The Port captures and processes big data and incorporates machine learning to drive efficiency, improve performance and reduce waste.

Big data

Big data is a core pillar of a Smart port that covers large volume of data that exceed conventional systems' processing capabilities, to be received from sensors and devices within a port and processed in real time.

- **Port Master / Port forward:** is a platform developed by the Port of Rotterdam to help port authorities to optimally manage their operations. The system uses numerous digital tools to collect and collate large volumes of data / big data to track the operational KPIs and monitor safety and sustainability performance of the port. The platform also supports the automatic calculation and invoicing of port dues thereby assisting with efficient planning, operations and asset management.
- AIS data is used to monitor and track vessel movements in real time, data from various sensors deployed in and around the port provide real time data on weather, tide, quay utilisation, dredging work performed for the quay and maintenance status
- https://www.portofrotterdam.com/en/news-and-press-releases/increased-efficiency-thanks-digital-port-management

Artificial Intelligence & machine learning (ML)

Machine learning detect patterns in sample data sets to extrapolate these behaviours.

- **PortXchange:** is an application that allows shipping companies, agents, terminals and other service providers to optimise the planning, execution and monitoring of all activities during a port call on the basis of standardised data exchange. That leads to improvements in predictability, shorter waiting times, lower costs and lower carbon emissions
- Utilises big data from AIS and the Port Authority databases on historical calls. The computer recognises (regularly updated) historical patterns enabling it to (continuously) learn (Artificial intelligence / machine learning) to extrapolate / forecast with a higher level of accuracy output parameters such as information on vessel's ETA, notify, and warn companies about possible changes and conflicts in their planning allowing users to proactively reschedule activities before the conflict arises. This results in more efficient port calls, just in time (JIT) arrivals and emissions reduction.
- https://www.portofrotterdam.com/en/news-and-press-releases/self-learning-computer-predicts-vessel-arrival

Smart port initiatives - Port of Rotterdam

Port of Rotterdam has been using both Cloud computing and 5G technology since 2019 that support its Smart port applications. The port has built an IoT platform for monitoring its port activities in real time and has gone further to develop a Digital Twin of the port on its IoT cloud-based platform to allow smarter and more efficient management of logistics chains and asset maintenance.

Connectivity

To handle the large volume of data between sensors and devices, ports must be able to managing, process and store digital information efficiently and in a scalabe way.
Cloud computing enables the provision of computing services like infrastructures (servers and storage), platforms (databases and programs), and applications and other resources over the internet and in a scalable way.

Use of fifth generation mobile wireless technology supports transferring greater volumes of data at faster speeds, operating on higher frequencies with reduced latency. 5G enables the implementation of the Internet of Things, remote control over machinery and the beginnings of autonomous operations.

Port of Rotterdam has been using both Cloud computing and 5G technology since 2019.

Artificial Intelligence and robotics

Internet of Things (IoT) encompasses the set of technologies and applications designed to provide secure communication and connections between devices, objects, and machines using the IP communications protocol leading to increase of “smart” devices.

Virtual reality and augmented reality are technologies that combine images in real time and in an interactive way.

- **Digital Twin:** As part of its Improved and smart management of port infrastructure, Port of Rotterdam has developed a Digital Twin of the port on its IoT cloud-based platform. The Digital twin includes all the infrastructure, ship movements, weather conditions and hydro-information linking data from sensors and radar images.
- By building a digital replica (digital twin) of the Port Industrial Complex, the whole life cycle of the port area, i.e. the development, management and demolition of assets and infrastructure can be simulated and shaped. This will allow smarter and more efficient management of logistics chains and asset maintenance.
- The port intends to further develop the IoT platform to lay the foundation for, among other things, autonomous shipping in the port of the future.

https://www.portofrotterdam.com/sites/default/files/2021-06/annual-report-highlights-port-of-rotterdam-2019_0.pdf

Smart port initiatives - Port of Rotterdam

Portbase, the port community system developed by Port of Rotterdam and used by all Dutch ports integrates the ports to their hinterland resulting in efficiencies and reducing waste. Further, Port of Rotterdam and Teesport UK are exploring to connect and exchange data in real time using their Port Community System (PCS) platform to eliminate waste in the entire supply chain.

Port community system

Portbase, Port community system (PCS): Developed by Port of Rotterdam, the platform is manages the Port Community System (PCS) of the Dutch ports of Rotterdam, Amsterdam, Groningen, The Hague/ Scheveningen, Harlingen, Moerdijk linking the various stakeholders in the Port community. Portbase's Port Community System enables the automated exchange of various reports and declarations between private parties and government agencies.

The Port continues to add further integration of other actors in the hinterland. In conjunction with Portbase, Nextlogic offers integrated planning for the handling of inland container shipping in the port of Rotterdam. That leads to the optimal deployment of the assets of deep sea terminals, empty depots and barge operators, and makes the inland shipping product efficient and reliable for shippers and freight forwarders.

Hinterland Container Notification (HCN) integrated in Portbase provides the full exchange of data for all types of transport (Train, Truck and Inland Barge) in the hinterland chain.

Cargo Tracker is a tool Portbase has been offering that allows the parties involved to stay informed about cargo they are handling or that is sent to them.

https://www.portofrotterdam.com/sites/default/files/2021-06/Annual-report-highlights-Port-of-Rotterdam-2020.pdf

Port community system and connected ports

Portbase, Port community system (PCS): Successfully developed by Port of Rotterdam, the platform is transferable and usable by other ports.

PD Ports, the Statutory Harbour Authority for the River Tees, has successfully rolled out a Port Community System (PCS) developed by and leveraging technology used by the Port of Rotterdam.

The next stage of the project will explore connecting and exchanging data between the two ports creating a connected supply chain which optimises the total supply chain to drive efficiency, improve performance and reduce waste to the benefit of all stakeholders and the port's broader community. The sail time between Rotterdam and Teesport is between 16 and 18 hours. With enhanced data exchange, the Ports will have greater oversight of vessel arrival and departure times which ultimately leads to greater operational efficiency for all PCS users.

https://www.portofrotterdam.com/en/news-and-press-releases/pd-ports-steps-towards-smart-port-status-new-rotterdam-partnership

Smart port initiatives - Port of Rotterdam

Other smart port initiatives include 3D printed bollards, use of smart bollards and smart sensors to support the smart development and maintenance of its port assets.

Other

3D printing: In 2019 RAMLAB field lab, part of the Port of Rotterdam Authority, received €10 million in European funding for the extensive further development and application of 3D metal printing using welding technology. In July 2021 the Port of Rotterdam Authority installed the world's first 3D-printed steel bollards on the new quay in the Sleepboothaven at Rotterdam Heijplaat. The six bollards are part of a series of twelve 3D-printed bollards that the Port Authority and RAMLAB have co-developed. The 3D printing of bollards is part of the infrastructure innovation programme launched by the Port Authority to improve and increase sustainability in the manufacture and use of quayside hardware through scientific research, innovation and digitisation.

https://www.portofrotterdam.com/en/news-and-press-releases/world-premiere-first-series-of-3d-printed-bollards-in-rotterdam-harbour

Smart Bollard: In early 2021 the Port of Rotterdam Authority, as part of a trial installed a smart bollard at Hutchison Ports ECT Delta terminal on the Maasvlakte.
The bollard can measure the strain on the mooring lines in real time, which can vary due to differences in local conditions. The smart bollard trial is part of a series of measures aimed at using digital technology to manage highly capital-intensive assets such as quay walls more efficiently.

https://www.portofrotterdam.com/en/news-and-press-releases/port-rotterdam-authority-launches-smart-bollard-trial-ect

Smart Sensors: installed in many quays and the results have shown that quay walls last much longer than had previously been assumed. This research has now resulted in the updating of the European standards for structural design (Eurocodes).

https://www.portofrotterdam.com/en/news-and-press-releases/port-rotterdam-authority-launches-smart-bollard-trial-ect

Smart construction: As part of the expansion at the Prinses Amaliahaven located on Maasvlakte II, the port authority has deployed the quays to be equipped with a wide range of sensors to monitor forces and any deformations and will use ECOncrete blocks installed at two locations. These act as artificial vertical reefs to stimulate underwater biodiversity;

https://www.portofrotterdam.com/en/building-port/ongoing-projects/quay-wall-construction-amaliahaven

SMART Ports Case Study: Finland / Sweden trade corridors (1)

In Europe, EU funding has been utilised to support research and real-world application of SMART port technology. The Central Baltic Efficient Flow project, which resulted in the launch of a new open-access App – "Fintraffic Port Activity App". The project Highly Commended in Seatrade's Port and Terminal Digital Technology Award category in 2021.

Efficient flow of goods between Finland and Sweden

- Under the EU's INTERREG funding programme a research project was conducted to develop ICT tools that would improve the efficiency of maritime transport flows between Finland and Sweden.
- The project focussed on tow major corridors:
  - Gavle – Rauma; and
  - Stockholm – Turku.
- The project objectives were:
  - Reduction in manual information exchange between supply chain actors,
  - Improvement of processes to support productivity and sustainability gains,
  - Practical application of ICT tools.
- Project partners were:
  - Sjöfartsverket (Swedish Maritime Administration),
  - Rauman Satama Oy (Port of Rauma),
  - Gavle Hamn AB (Port of Gavle),
  - Satakunta University of Applied Sciences - Faculty of Logistics and Maritime Technology and Faculty of Technology (SAMT),
  - Liikennevirasto (Finnish Transport Agency),
  - Vessel Traffic Services Finland.

Research effort led by Satakunta University

- Initial research commenced in 2017, focussed on the ports of Rauma (Finland) and Gavle (Sweden).
- According to SAMT, the practical steps of the research were as follows:
  1. Define the current situation
  2. Develop the business model and logic for information and communication solutions
  3. Identify the stakeholders and define roles
  4. Define the communication between stakeholders
  5. Develop a new online tool
- The new applications, which run on mobile telephones, provide all users with real-time information on vessel arrival and departures.
- The app was developed on basis of open-access source code and is freely available.
- Further development of the app resulted in a nationwide launch in Finland – "Fintraffic Port Activity App" which is open and free to all port operators in Finland.
- The project was Highly Commended in Seatrade's Port and Terminal /Digital Technology Award category in 2021.
- Research is on-going to further develop information sharing, with SAMK currently working on the SaLoDi project, which is examining the digital logistics chains in Satakunta.

SMART Ports Case Study: Finland / Sweden trade corridors (1)

A key feature of the project was the delivery of a user-friendly App that has replaced previous manual information exchanges, ensuring latest available information is on-hand (via mobile phone) for service delivery partners (pilots, tug operators, mooring gangs, etc). Better coordination enables a move towards "Just-In-Time" arrivals which reduces emissions in port areas.

Collaboration between Port of Rauma and Gavle

- Implementation of port collaboration solutions enables coordinated port call planning across the port actors.
- Improved information flow is supporting the sychronisation of port calls with hinterland activity (i.e. receipt / delivery of cargo can be planned on basis of up-to-date ETAs).
- The sharing of all the information via a single App improves coordination across all port users – pilots, VTS, towage companies, mooring gangs, dredging / diving contractors, terminal operators / stevedores, hauliers, etc.
- Ship flow optimisation is critical in the transport corridor between Sweden and Finland. There are 2.7 million passenger movements and 90,000 transport units moving each year on scheduled RoPax ferries, and coordination of other vessel movements is needed to ensure that waiting time is minimised / eliminated at the narrow passages where only one vessel may transit. This will result in fuel cost savings, reduced emissions and also improve safety.
- The open-source code means that this application is freely available to other ports / maritime agencies.

See also: https://www.seatrafficmanagement.info/projects/efficientflow/

Summary

	Key takeaways
Smart Ports overview	Smart ports use technologies such as big data, Artificial Intelligence (AI) internet of things (IoT), fifth-generation technology (5G), blockchain solutions, and other smart technology-based methods to drive efficiency, improve performance and reduce waste to the benefit of all stakeholders and the port's broader community. A smart port takes a holistic approach to digital transformation, starting from internal digitalisation of the port to progressively integrate the port community, the hinterland and ultimately the entire end to end supply chain.
Smart port technologies adoption	Port of Rotterdam, Port of Antwerp and Port of Hamburg rank as the top smart ports in the world having adopted technologies such as big data, Artificial Intelligence (AI) internet of things (IoT), fifth-generation technology (5G), blockchain solutions, and other smart technology-based methods to drive efficiency, improve performance and reduce waste to the benefit of all stakeholders and the port's broader community.
Smart port initiatives - Port of Rotterdam	We have assessed how the Port of Rotterdam Authority has adopted smart technologies to drive efficiency, improve performance and reduce waste to the benefit of all stakeholders and the port's broader community. The Port captures and processes big data and incorporates machine learning to drive efficiency, improve performance and reduce waste. Port of Rotterdam has been using both Cloud computing and 5G technology since 2019. **Port Master / Port forward:** is a platform developed by the Port of Rotterdam to help port authorities to optimally manage their operations. **PortXchange:** is an application that allows shipping companies, agents, terminals and other service providers to optimise the planning, execution and monitoring of all activities during a port call on the basis of standardised data exchange. **Digital Twin:** As part of its Improved and smart management of port infrastructure, Port of Rotterdam has developed a Digital Twin of the port on its IoT cloud-based platform. **Portbase:** the port community system developed by Port of Rotterdam and used by all Dutch ports integrates the ports to their hinterland resulting in efficiencies and reducing waste. Further, Port of Rotterdam and Teesport UK are exploring to connect and exchange data in real time using their Port Community System (PCS) platform to eliminate waste in the entire supply chain. **Other:** Other smart port initiatives include 3D printed bollards, use of smart bollards and smart sensors to support the smart development and maintenance of its port assets.

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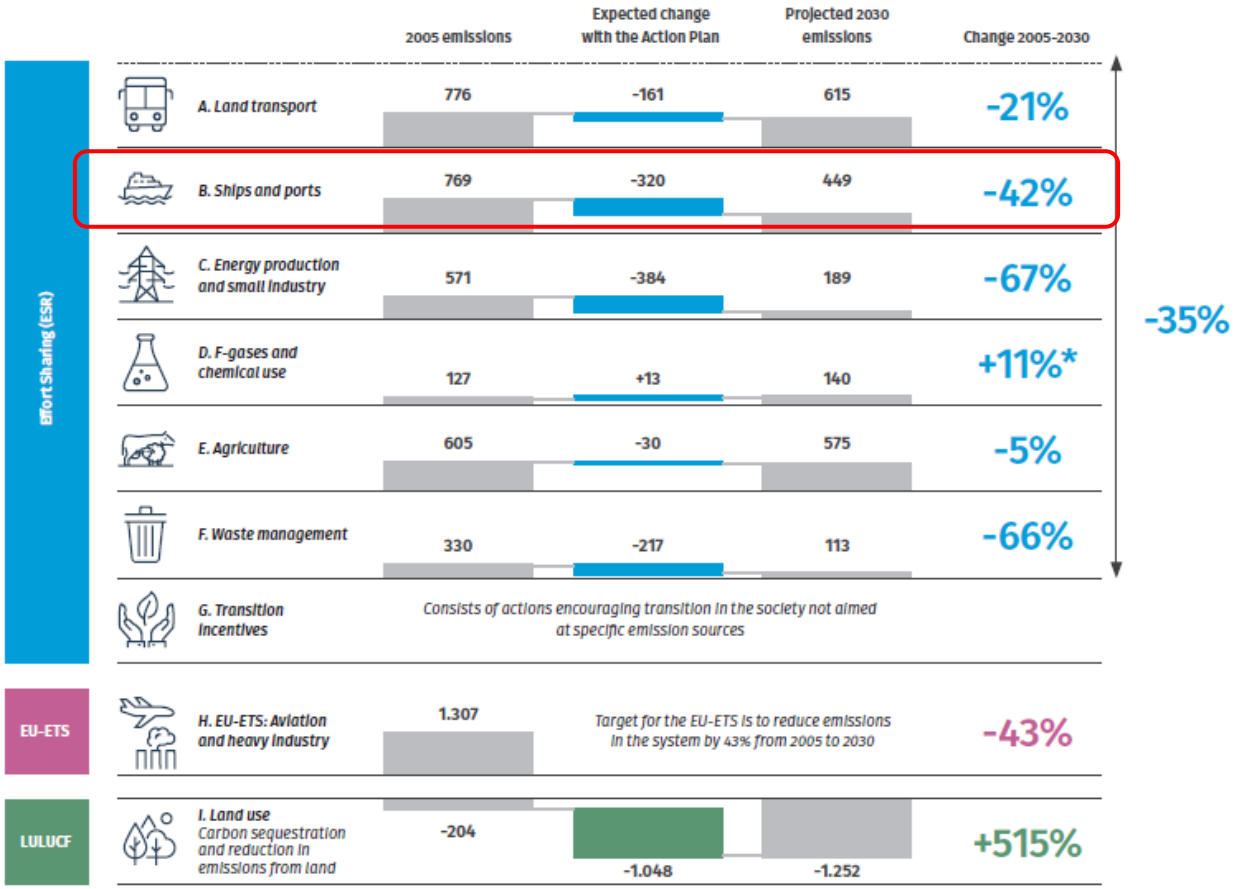
GreenPorts: best practice

Iceland's 2020 Climate Action Plan

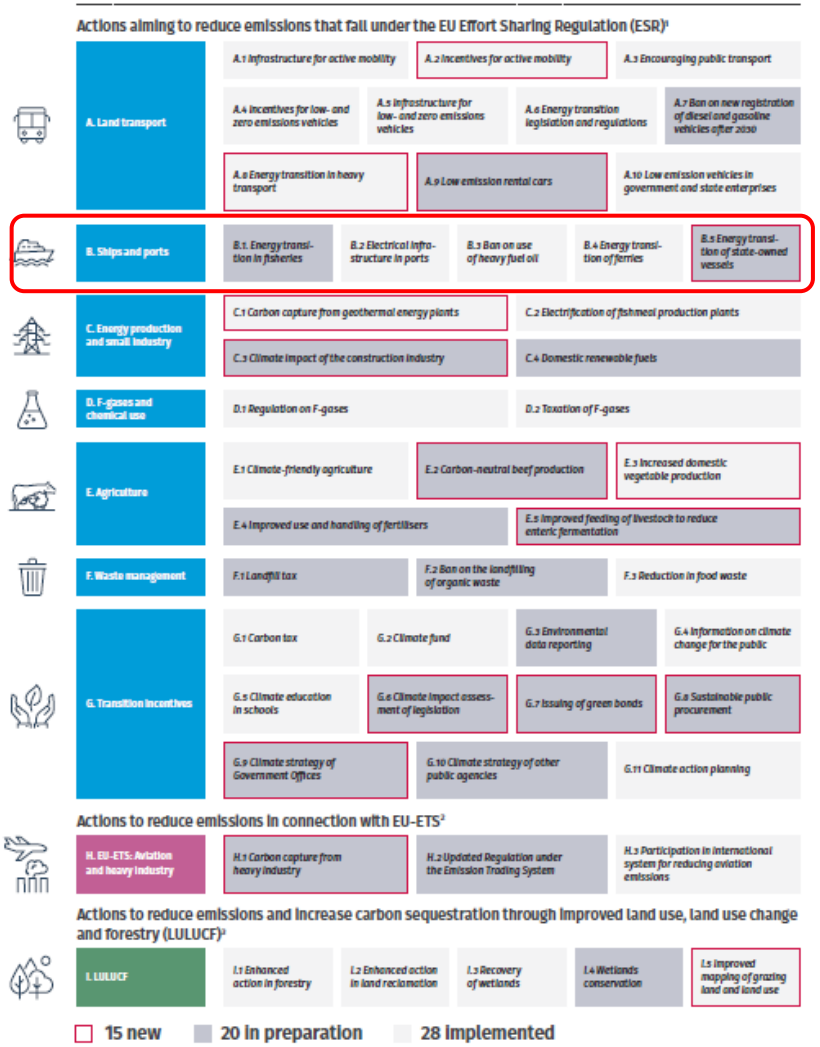
Iceland aims to achieve carbon neutrality before 2040 and to cut greenhouse gas emissions by 40% by 2030 under the Paris Agreement

Estimated reduction 2005-2030 in Iceland's emissions under the Effort Sharing Regulation



Iceland's 2020 Climate Action Plan

Climate Action Plan contains clearly defined actions and is Iceland's main policy instrument to reach its goals of cutting emissions and reach carbon neutrality.



Climate Action Plan aiming to reduce emissions that fall under the EU Effort Sharing Regulation (ESR)

B.1. Energy transition in fisheries
B.2 Electrical infrastructure in ports
B.3 Ban on use of heavy fuel oil
B.4 Energy transition of ferries
B.5 Energy transition of state-owned vessels

Faxaports

Faxaports has adopted a number of Health, environmental and safety policies and is ISO 14001 certified. The aim of our work is therefore not an audit of Faxaport's initiatives but to outline global best practices and various initiatives in ports related to decarbonisation efforts.

bsi

ISO 14001
Environmental Management
CERTIFIED

ISO 45001
Occupational Health and Safety Management
CERTIFIED

ÍST 85:2012
Equal Wage Management System
CERTIFIED

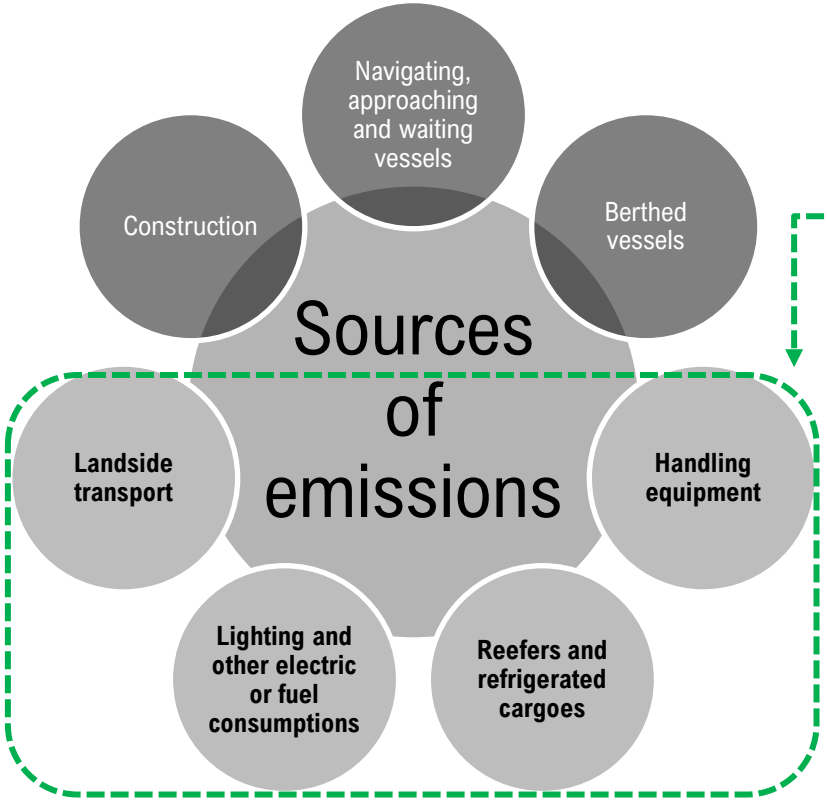
SUSTAINABLE DEVELOPMENT GOALS

This standard contributes to the following Sustainable Development Goals:

1 2 3 4 6 7 8 9 12 13 14 15

Decarbonisation in Ports – Main sources of emissions

Iceland's climate action plan includes measures to drive electrification of Port's infrastructure and ban on use of heavy fuel oil. We therefore focus on measures related to vessel approach, berthing and construction projects.



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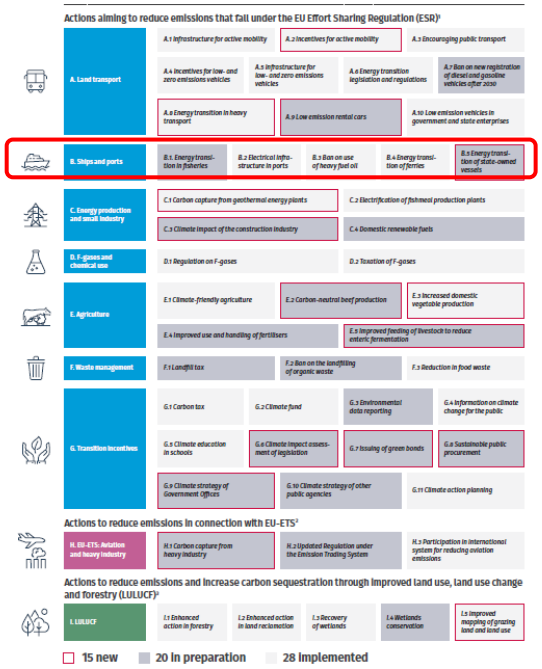
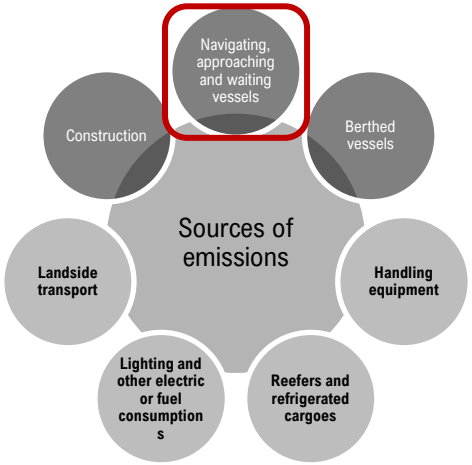


Emission from Navigating, approaching and waiting vessels

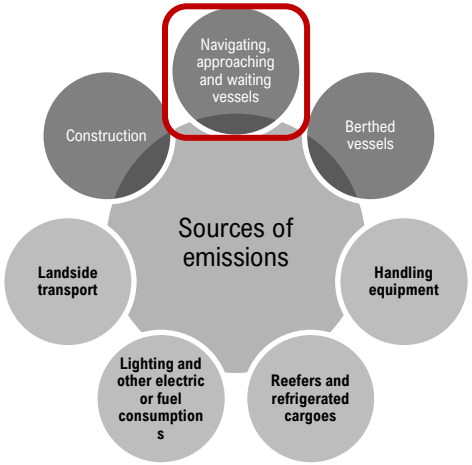
The main measure adopted for vessels approaching a port is to incentivise a reduction in speed that would result in lower emissions. This measure is mainly adopted in North America such as the Port of Long Beach and the Port of New York/New Jersey.



Key Issues	reduction / mitigation initiatives	Best practice examples
Emissions from navigating, approaching and waiting vessels	Vessel speed reduction	Port of Long Beach rewards vessel for slowing down to 12 knots within 40 nautical miles of the port entrance https://polb.com/business/incentives/#green-flag-program Port of NY/NJ provides financial incentives to ocean-going vessel to reduce air emission through speed reduction to 10 knots or less within 20 nautical miles of the Territorial Sea Line https://www.panynj.gov/port/en/our-port/sustainability/clean-vessel-incentive-program.html

Emission from Navigating, approaching and waiting vessels

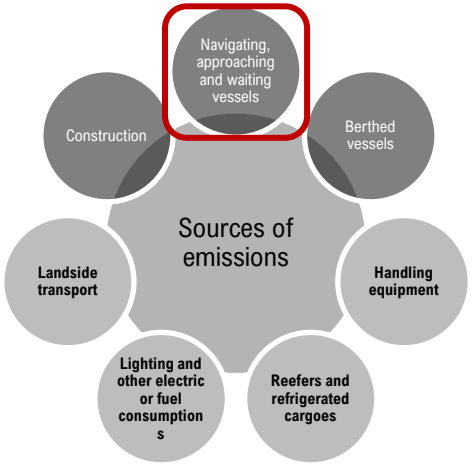
For vessels that perform better in reducing air emissions than required by the IMO, a number of ports offer discounts on port dues. This is a common measure adopted by ports since 2011 and increasingly adopted by ports globally. Examples in Europe include Port of Bergen, Rotterdam, Amsterdam, Antwerp, Hamburg, Le Havre, Port of Aarhus, Port of Helsinki, Port of Gothenburg.



Key Issues	reduction / mitigation initiatives	Best practice examples
Emissions from navigating, approaching and waiting vessels	Green vessel incentive schemes - Environmental Ship Index (ESI)	Implemented at a number of ports globally since 2011 and increasingly being adopted by a number of ports. Main tool is financial incentives for vessels that perform better in reducing air emissions than required by the current emission standards of the International Maritime Organization (IMO). Examples in Europe include Rotterdam, Amsterdam, Antwerp, Hamburg, Le Havre, Port of Aarhus, Port of Helsinki, Port of Gothenburg https://www.environmentalshipindex.org/ports
	Environmental Port Index (EPI)	Self reporting tool requiring vessel crew to record the vessel's key utility data, such as fuel consumption, emission levels, and power usage during the ship's time at port. Main tool is financial incentives for vessels that perform better in reducing air emissions than calculated baseline maximum tolerable environmental impact. Examples include Port of Bergen and several other ports in Norway https://epiport.org/how-the-epi-works/

Emission from Navigating, approaching and waiting vessels

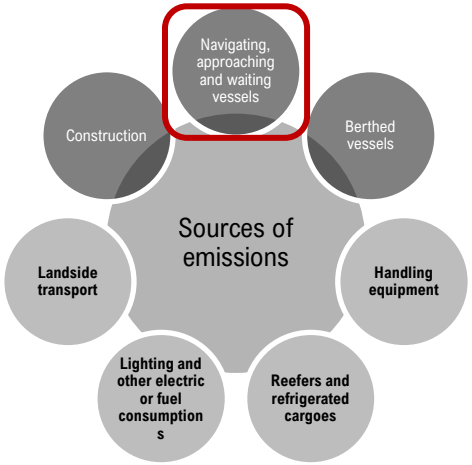
A number of ports are developing IT platforms to optimise vessel calls in order to reduce waiting time. These platforms encourage vessels to reduce speed (thereby reducing emissions) instead of waiting at harbour entrance.



Key Issues	reduction / mitigation initiatives	Best practice examples
Emissions from vessels awaiting berthing	IT platform for optimizing port calls	Port of Hamburg https://www.hvcc-hamburg.de/en/networking/ Port of Los Angeles https://www.portoflosangeles.org/business/supply-chain/port-optimizer%E2%84%A2 Shipping and ports are working together in an International Taskforce promoting Port Call Optimization. IAPH is an endorser of the project. https://portcalloptimization.org/

Emission from Navigating, approaching and waiting vessels

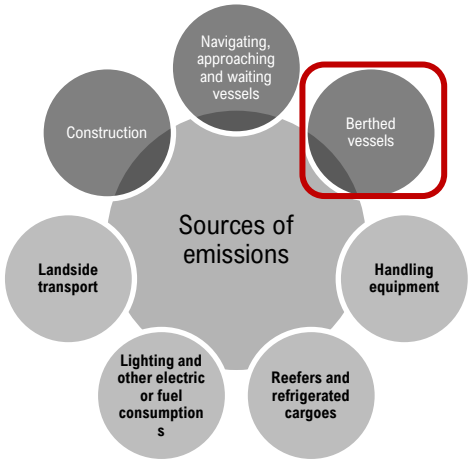
A number of ports are also transitioning to lower emission vessels used by the port such as tug boats and pilot boats. Battery operated tugs and pilot boats are already in operation at select ports and hybrid operations using greener fuels are also being tested.



Key Issues	reduction / mitigation initiatives	Best practice examples
Emissions from service vessels (tugs, Pilot boats)	Electrification of tugs and pilot boats	Battery operated tugs: Ports of Auckland https://www.poal.co.nz/media/ports-of-auckland-buys-world-first-electric-tug Istanbul harbour Tuzla bay shipyard https://corvusenergy.com/projects/gisas-power/ Port of San Diego (Battery operated tugs) https://www.crowley.com/news-and-media/press-releases/ewolf-electric-tug/ Port Canaveral Pilots Association (Battery operated pilot boat) https://canaveralpilots.com/canaveral-pilots-partner-with-glosten-ray-hunt-for-electric-pilot-boat/

Emission from Berthed vessels

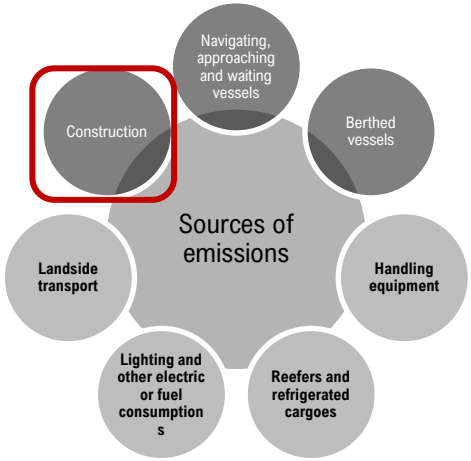
Provision of shore power from low carbon electricity supply, by means of on berth connection points and cable management systems, also known as cold ironing, significantly reduces GHG emissions. Incentives offered by the port include discounts on port tariffs for qualifying vessels as being offered by the Port of Gothenburg.



Key Issues	reduction / mitigation initiatives	Best practice examples
Emissions from vessels alongside	On Shore power supply / cold ironing	Port of Gothenburg – Key initiatives include: 1. no charge for the power provided 2. Vessels connected to an onshore power supply score higher in the indexes on which the environmentally discounted port charge is based https://www.portofgothenburg.com/about-the-port/greener-transport/onshore-power-supply-for-vessels/ Port of Hamburg – Key initiative include: 1. Discount on port tariffs for using on shore power Port of Bergen - https://bergenhavn.no/en/cruise-en/shore-power/

Emission from Construction projects

Port of Gothenburg has incorporated in its procurement system new stipulations for contractors with the aim of reducing carbon emissions in the port.



Key Issues	reduction / mitigation initiatives	Best practice examples
Emissions from Construction projects	Drive reduction through contractor procurement system	Port of Gothenburg – Key initiative includes introducing a procurement system that includes new stipulations: 1. selected contracts with the aim of reducing carbon emissions at the port 2. Promoting the use of greener construction equipment and methods https://www.portofgothenburg.com/news-room/press-releases/port-of-gothenburg-introduces-pilot-scheme-for-emission-free-construction-sites/

Summary

	Key takeaways
Green Ports overview	Iceland aims to achieve carbon neutrality before 2040 and to cut greenhouse gas emissions by 40% by 2030 under the Paris Agreement. Climate Action Plan contains clearly defined actions and is Iceland's main policy instrument to reach its goals of cutting emissions and reach carbon neutrality. Faxaports has adopted a number of Health, environmental and safety policies and is ISO 14001 certified. The aim of our work is therefore not an audit of Faxaport's initiatives but to outline global best practices and various initiatives in ports related to decarbonisation efforts. Iceland's climate action plan includes measures to drive electrification of Port's infrastructure and ban on use of heavy fuel oil. We therefore focus on measures related to vessel approach, berthing and construction projects.
Green port initiatives	Iceland's climate action plan includes measures to drive electrification of Port's infrastructure and ban on use of heavy fuel oil. We therefore focus on measures related to vessel approach, berthing and construction projects.
Emission from Navigating, approaching and waiting vessels	1. The main measure adopted for vessels approaching a port is to incentivise a reduction in speed that would result in lower emissions. This measure is mainly adopted in North America such as the Port of Long Beach and the Port of New York/New Jersey. 2. For vessels that perform better in reducing air emissions than required by the IMO, a number of ports offer discounts on port dues. This is a common measure adopted by ports since 2011 and increasingly adopted by ports globally. Examples in Europe include Port of Bergen, Rotterdam, Amsterdam, Antwerp, Hamburg, Le Havre, Port of Aarhus, Port of Helsinki, Port of Gothenburg. 3. A number of ports are developing IT platforms to optimise vessel calls in order to reduce waiting time. These platforms encourage vessels to reduce speed (thereby reducing emissions) instead of waiting at harbour entrance. 4. A number of ports are also transitioning to lower emission vessels used by the port such as tug boats and pilot boats. Battery operated tugs and pilot boats are already in operation at select ports and hybrid operations using greener fuels are also being tested.
Emission from Berthed vessels	Provision of shore power from low carbon electricity supply, by means of on berth connection points and cable management systems, also known as cold ironing, significantly reduces GHG emissions. Incentives offered by the port include discounts on port tariffs for qualifying vessels as being offered by the Port of Gothenburg.
Emission from Construction projects	Port of Gothenburg has incorporated in its procurement system new stipulations for contractors with the aim of reducing carbon emissions in the port.

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