A FLEXIBLE PORT NETWORK BY ADAPTIVE PORT PLANNING
A CASE STUDY OF THE PORTS OF ISAFJORDUR NETWORK

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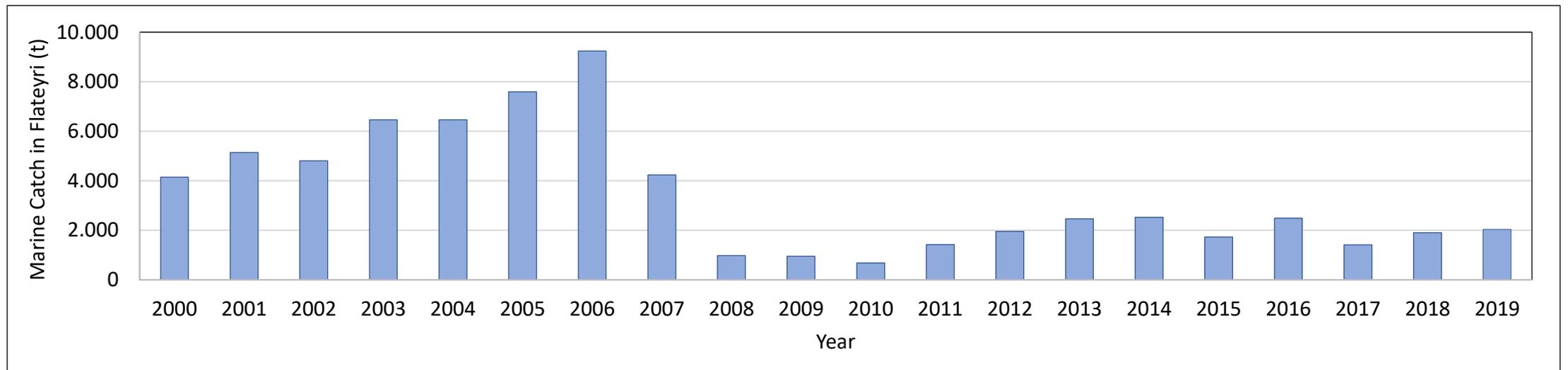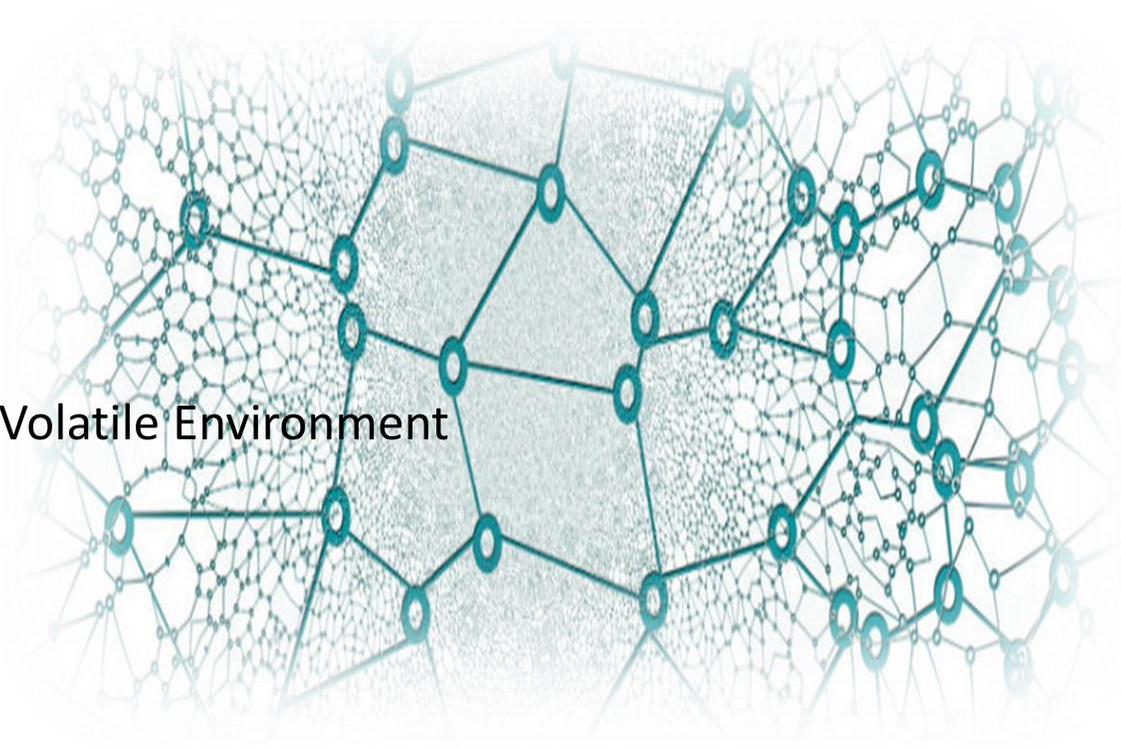
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Introduction

- Ports have significant impact on the economic growth and development of countries.
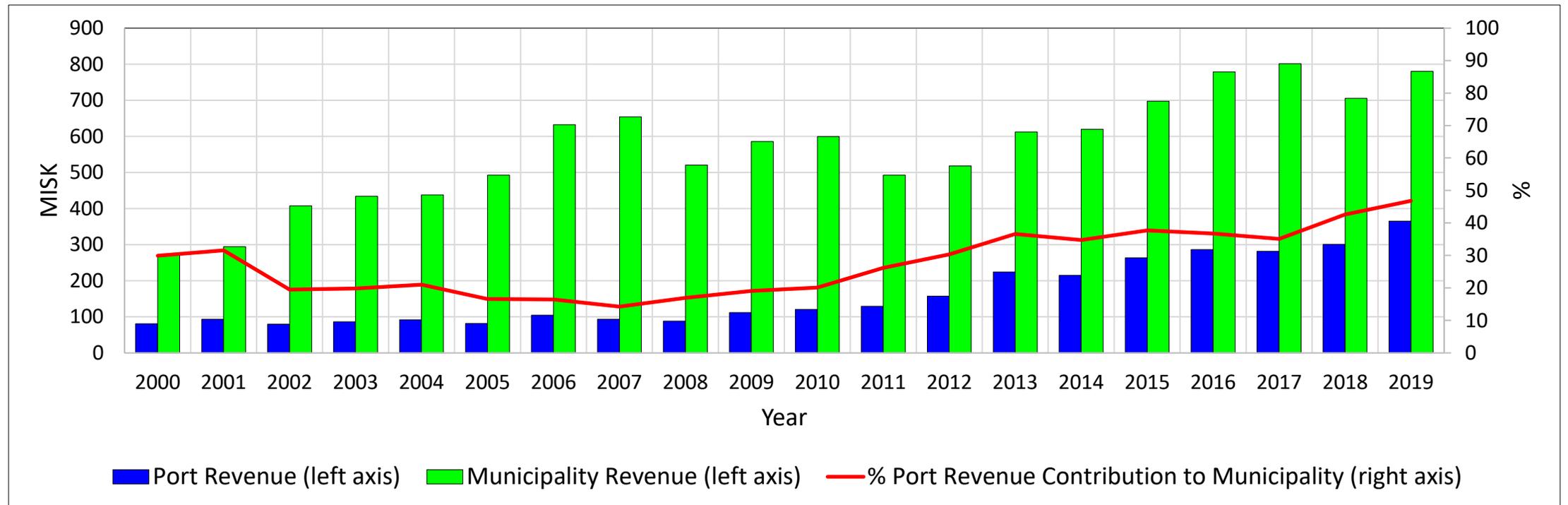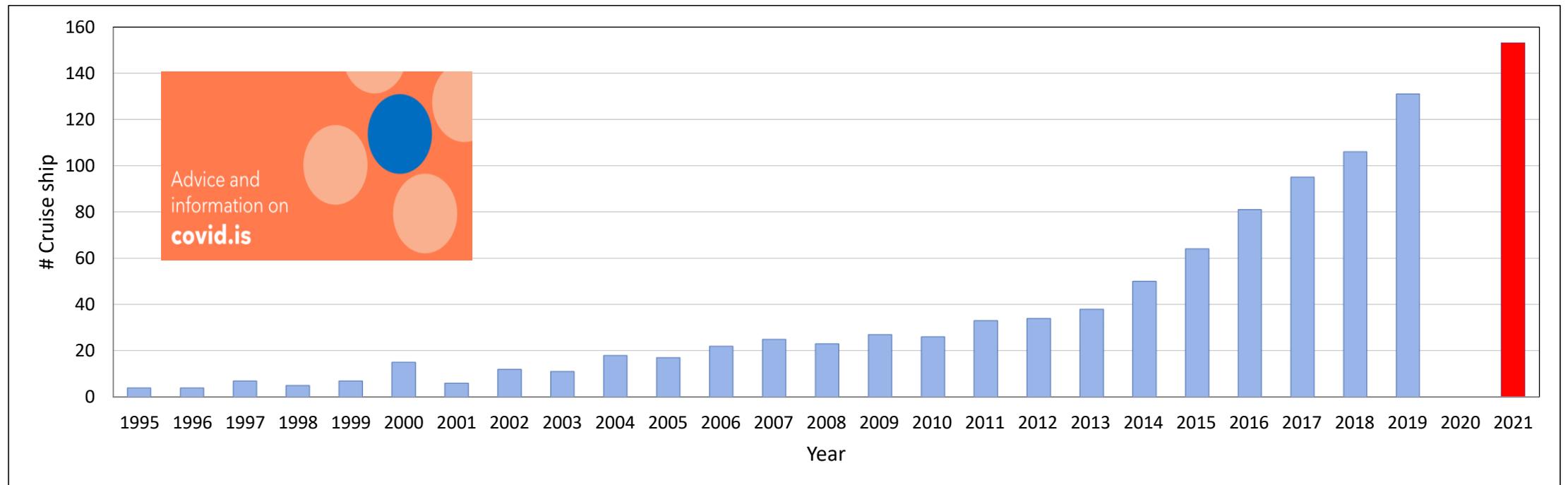
Introduction

- A Port Represents a Complex Engineering System in a Volatile Environment

Introduction

- Cruise Ship call to the Ports of Isafjordur Network

Study area

The Ports of Isafjordur Network (Hafnir Ísafjarðarbæjar)

A: Port of Isafjordur

B: Port of Sudureyri

C: Port of Flateyri

D: Port of Thingeyri

Main functions of the port network:

- Transfer and storage of (non-) containerized cargo
- Industrial value-added activities, including marine
   productions and fish processing
- Recreational activities, including servicing cruise
   and expedition ships, private and sailing boats
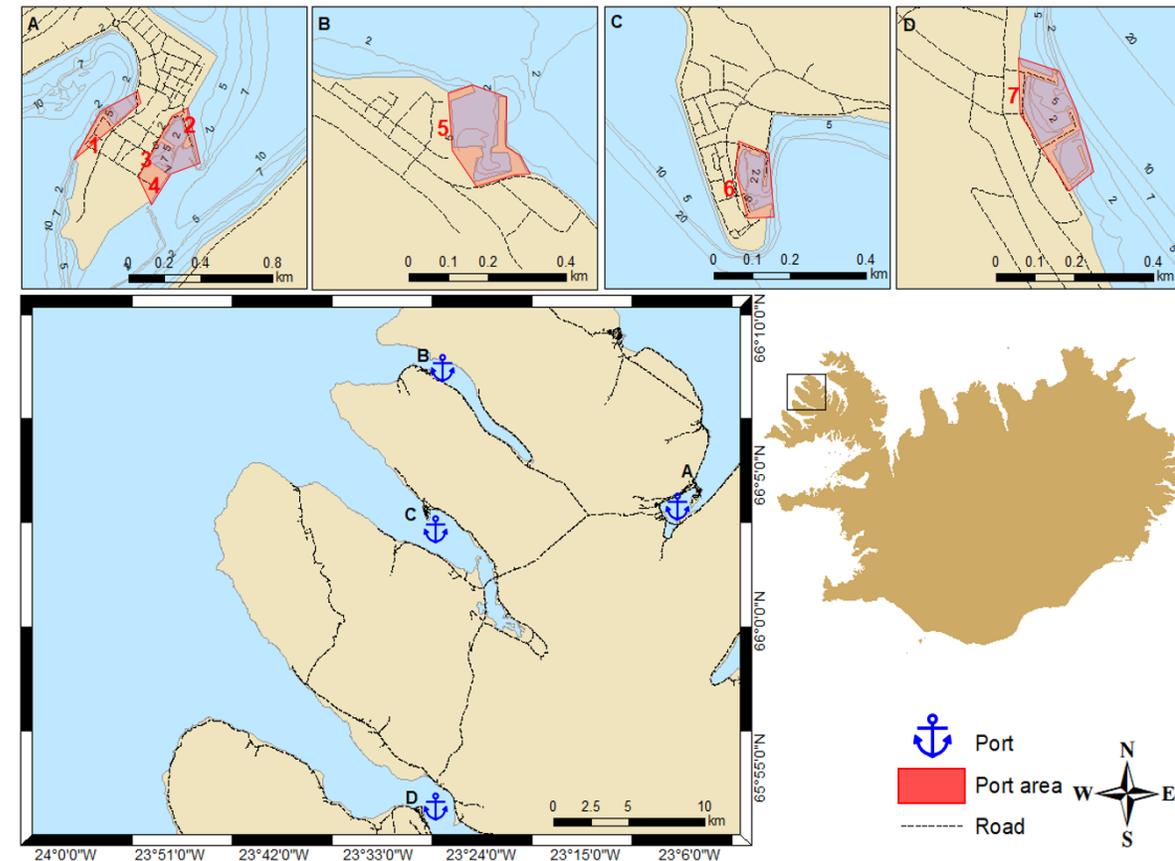
Port Throughput Analysis and Forecast

Epistemic uncertainties in forecasting models:
- Model uncertainties (due to the choice of variables, assumptions, and the processes)
- Parameter uncertainties (related to the quantity and quality of the data used)

Accounting for:

Parameter uncertainty
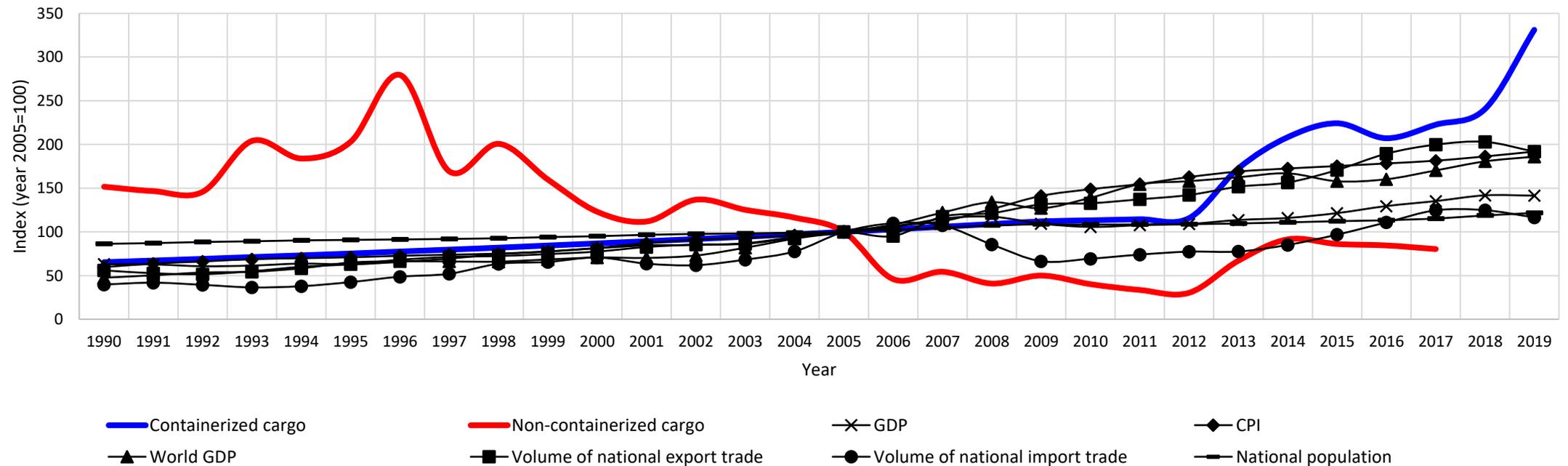- Mutual information method

Model uncertainty
- Bayesian statistical method

Port Throughput Analysis and Forecast

**Mutual Information**

- Measures non-linear relations between variables
- Measures non-stationary relations between variables

Port Throughput Analysis and Forecast

Identification of the main flow of non-containerized cargo

- Fuel oil (FOL)
- Road construction materials (RCM)
- Fertilizer and fish feed (FFF)
- Marine products (MAP)
- Industrial materials (INM)
- Small general cargo (SGC)
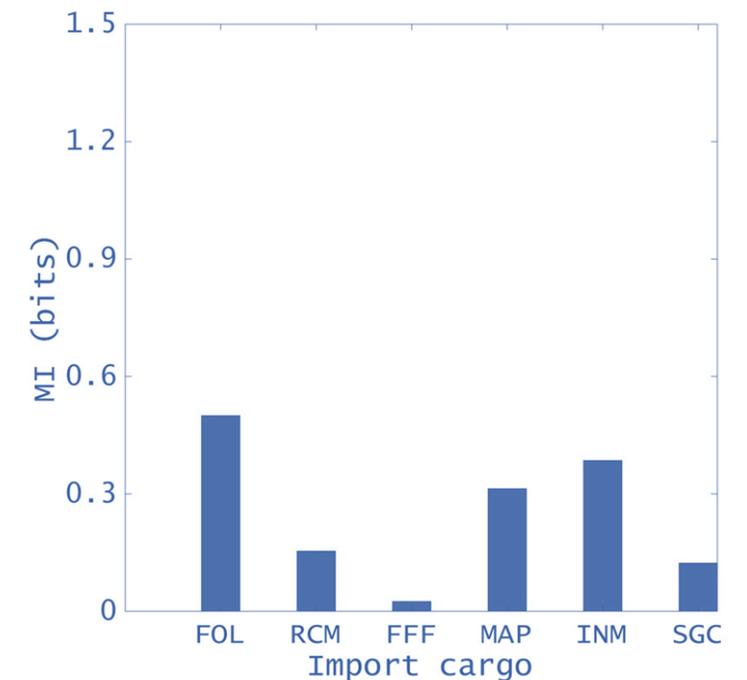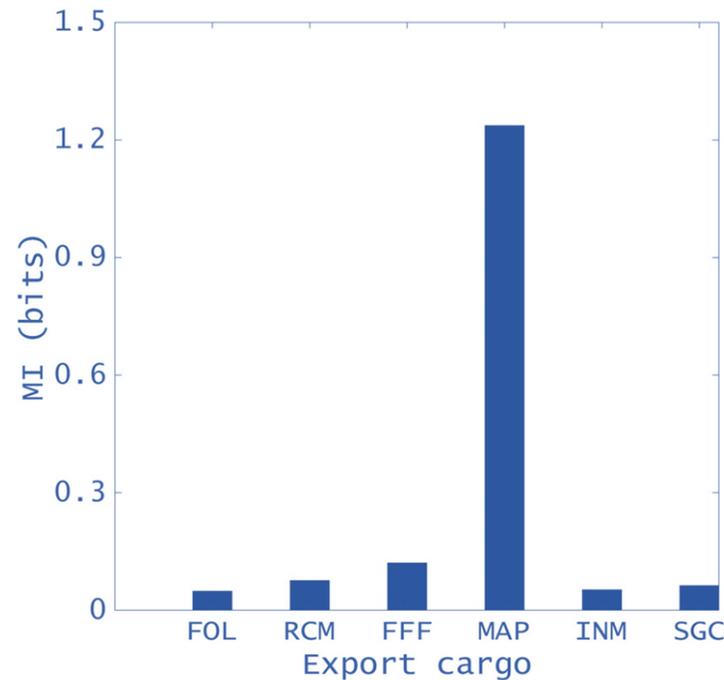
Port Throughput Analysis and Forecast

Identification of the main macroeconomic variables

- National GDP (NGDP)
- Average yearly CPI (ACPI)
- World GDP (WGDP)
- Volume of national export trade (VNET)
- Volume of national import trade (VNIT)
- National population (NPOP)
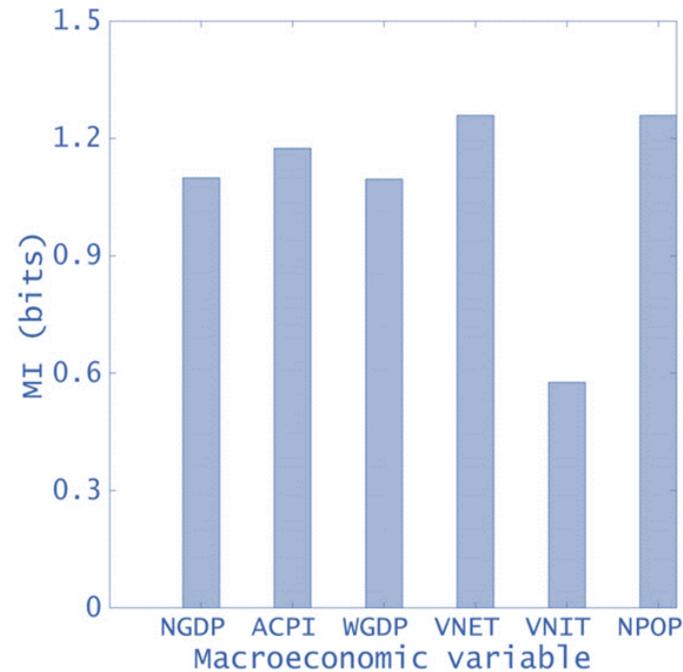
Containerized throughput
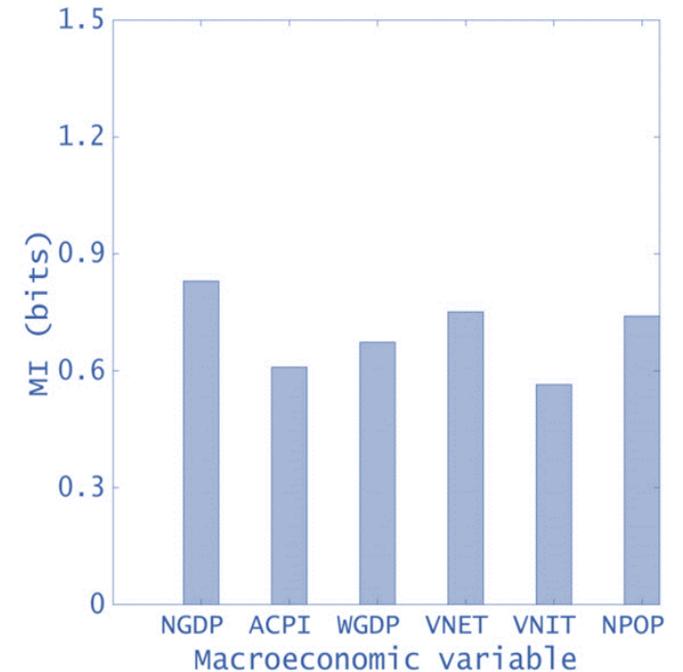
Non-containerized throughput

Port Throughput Analysis and Forecast

Historic and forecasted port throughput
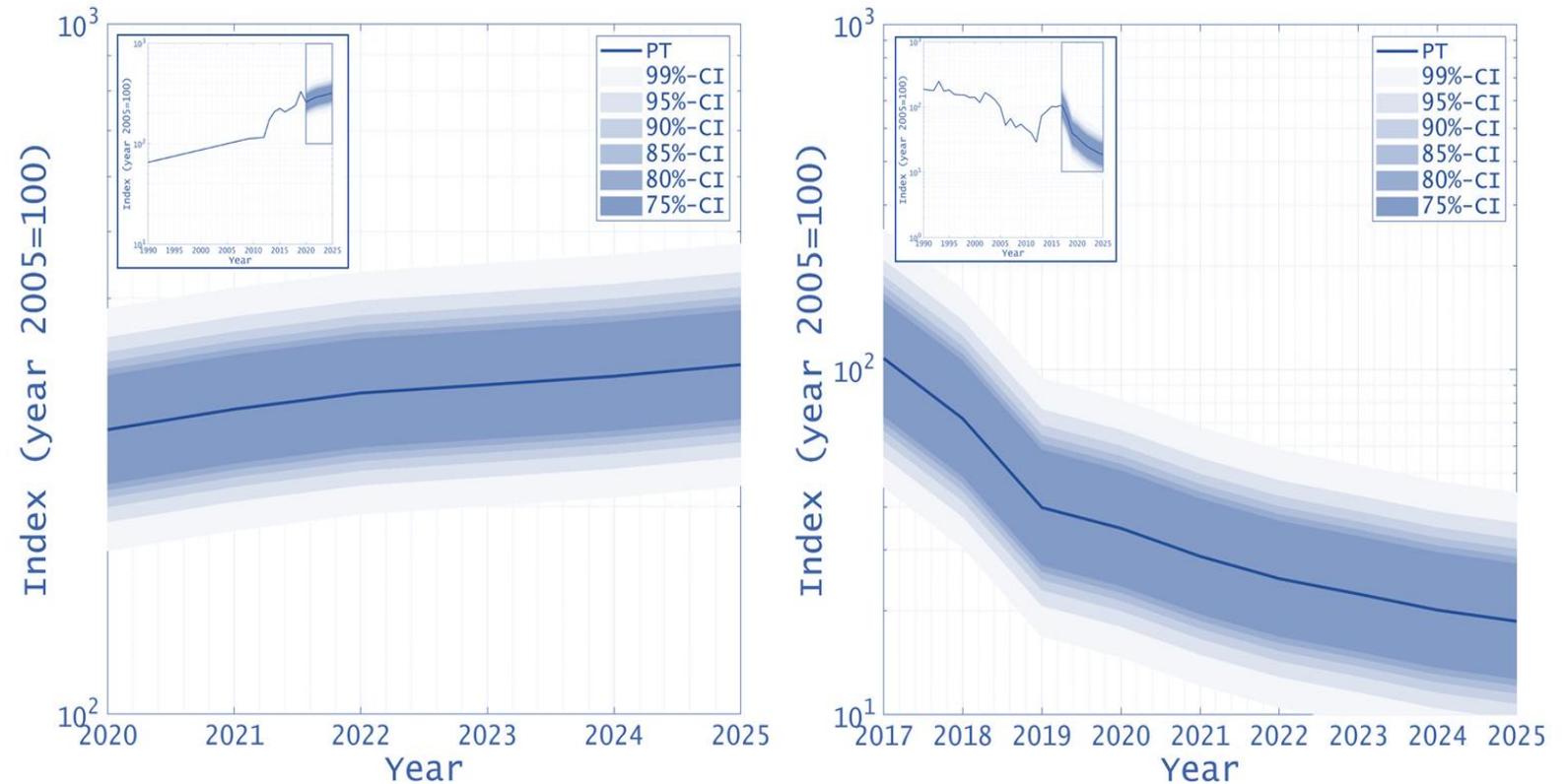
Containerized (left) and non-containerized (right) throughput. data are indexed to the year 2005

Dealing with Uncertainties in Port Planning Process

Main functions of the port network:

- Transfer and storage of cargo
- Industrial value-added activities
- Recreational activities

Meeting with Key stakeholders:

Internal stakeholders

- Port Director

External stakeholders (based on the Port functions)

- The port association of Iceland
- Two fishing and aquaculture companies
- Transport company
- Cruise Agency
- Oil and Energy Company

Legislation and public policy stakeholders

- The Icelandic Road and Coastal Administration

11

Dealing with Uncertainties in Port Planning Process

Time horizon
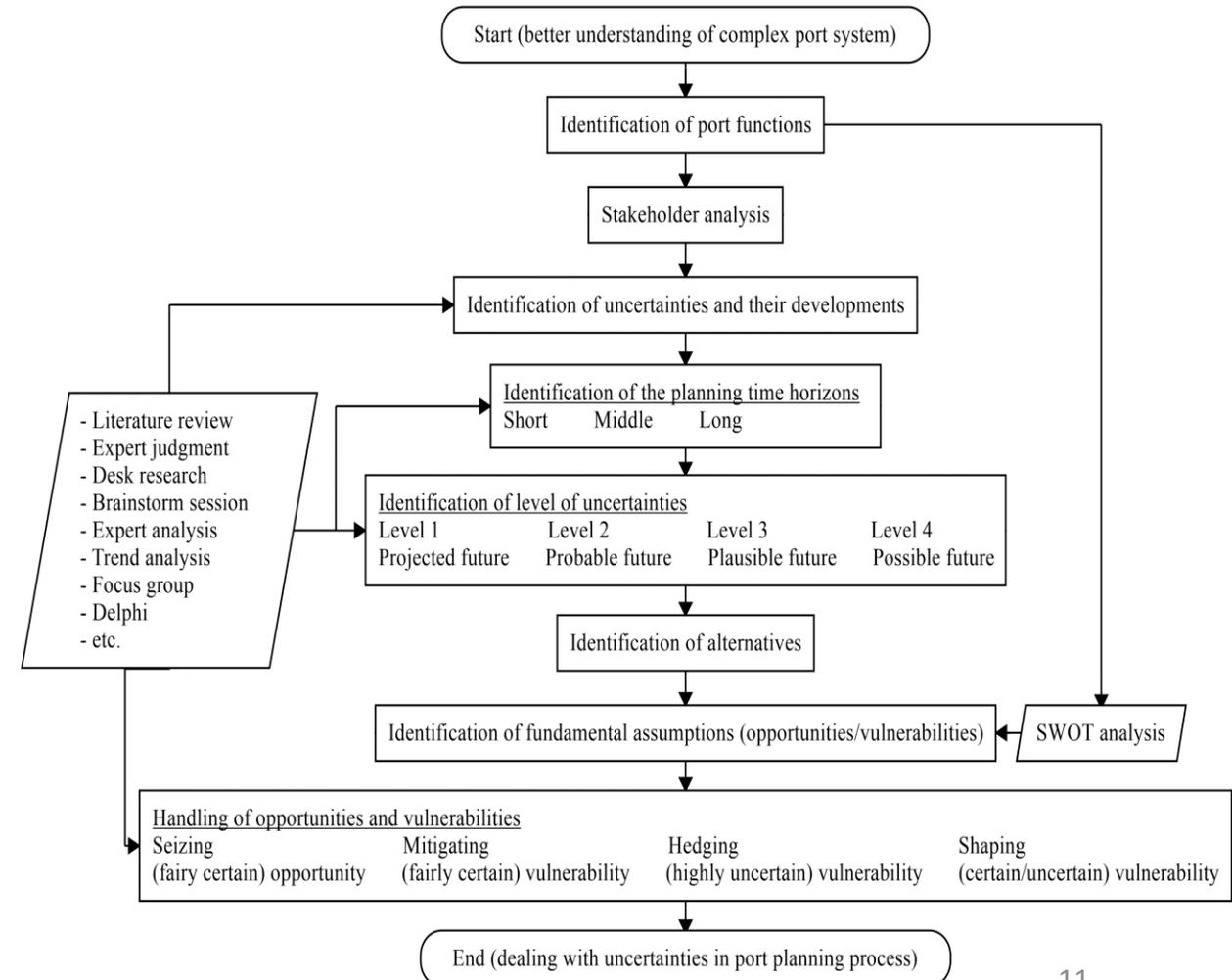- Short-time horizon 5 years (2020-2025)
- Middle-time horizon 25 years (2025-2050)

SWOT (Strength, Weakness, Opportunity, Threat)
Identify capabilities and inabilities of the port network

Uncertain developments mainly offer:
- Opportunities in short-time horizon
- Vulnerabilities in middle-time horizon

Effective actions in response to opportunities and vulnerabilities:
Seizing actions: to take advantage of opportunities as the port network has a competitive position

Shaping, mitigating and hedging actions: to manage vulnerabilities derived from:
- Volume of cargo flow
- Value added activities related to fishing and aquaculture activities
- Servicing cruise ships

Recommendations

1- Port authorities should reduce uncertainty of port throughput forecast to rationalize their investment decisions on port capacity planning and management, by:

- Identification of the major cargo flow in the port
- Estimation of influencing macroeconomic variables on port throughput
- Accounting for uncertainty of model

2- Port authorities should develop flexibility in the port planning process to deal with uncertainties and adapt the port layers to changes in a projected lifetime, by:

- Planning a course of action for timely and strategically implementing the plan in the face of uncertainty

Funding

- Municipality of Isafjordur (Isafjardarbaer)

- University of Iceland Research Fund (Rannsoknarsjodur Haskola Islands)

- Icelandic Road and Coastal Administration Research Fund (Rannsoknarsjodur Vegagerdarinnar)

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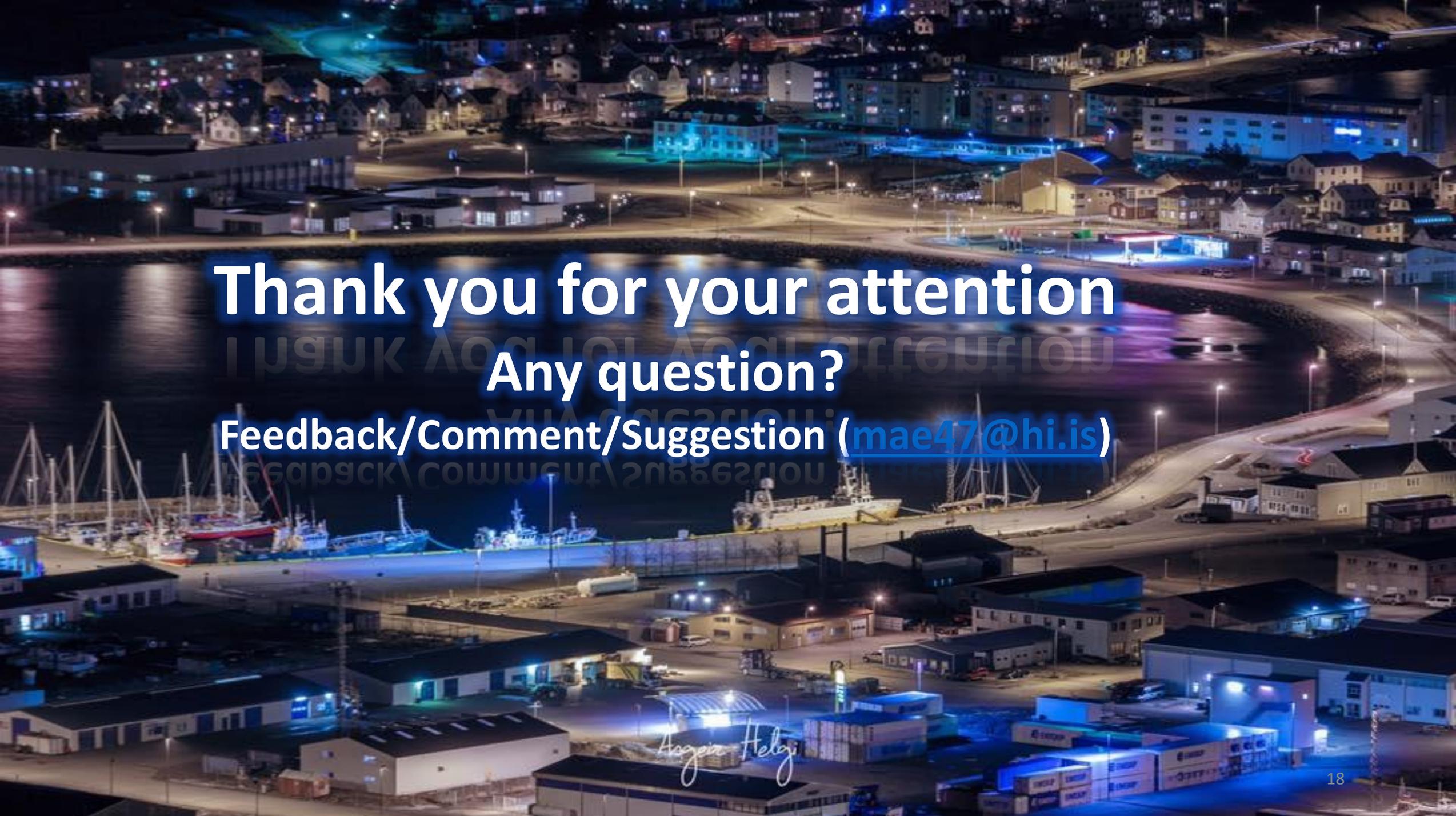
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