An Ocean of Data:
The potential of data on vessel traffic

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1. Motivation: what is AIS data and why it can be useful
2. Our approach
3. Insights from the results

Motivation

WHAT is AIS?

Automatic Identification System (AIS) is a tracking system for vessels used for safety

- provides position, identification and other information about the vessel
- **Required** in all vessels above 300 gross tonnage used for international voyages, **highly recommended** in others.

AIS signals ('pings') **transmitted** every 2 secs to 6 mins

- each observation represents a ping **received**

Data accessed through the UN Global Platform

- global coverage, from January 2019 onwards
- Available to all NSOs and IOs

WHY use AIS?

Most international merchandise trade is carried by sea

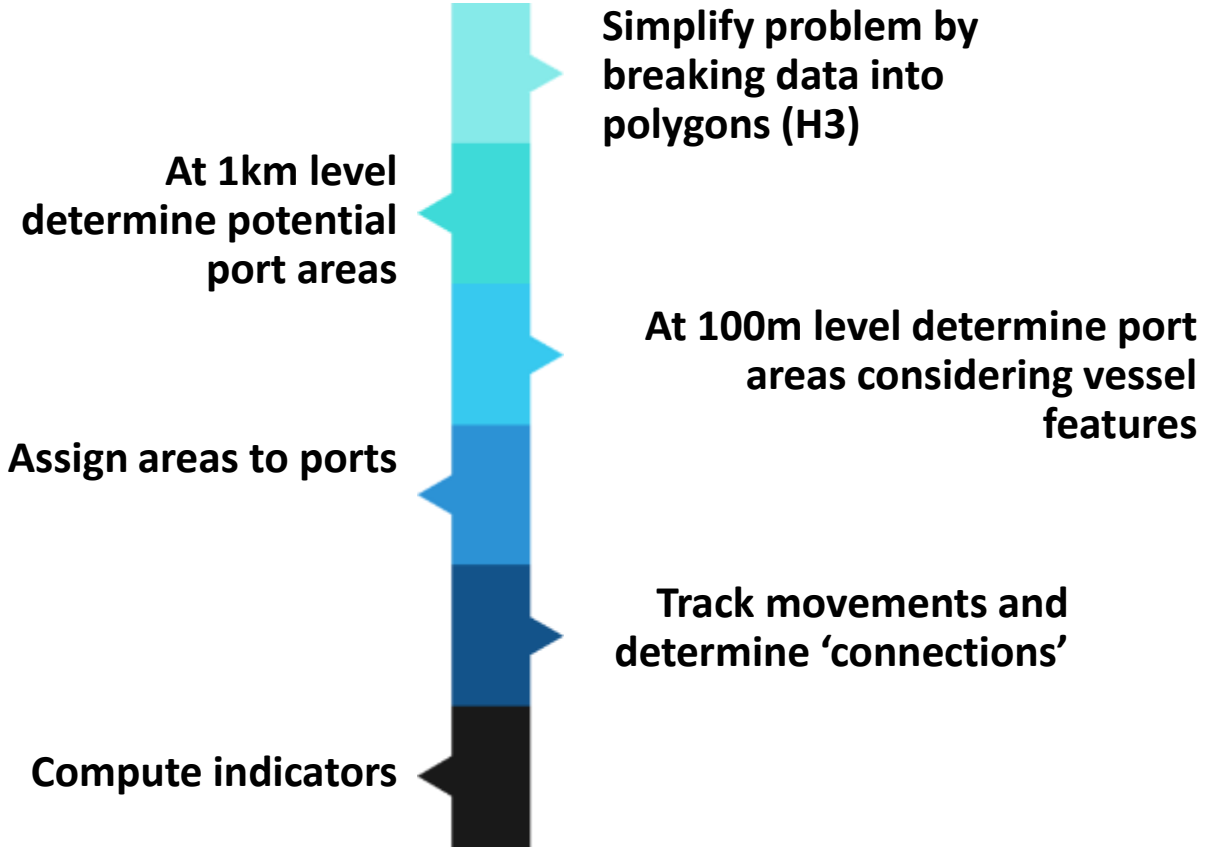
- 80% of volume and 70% of value (UNCTAD, 2017)

Vessel traffic can be monitored in real time to provide policy-relevant insights

- timely: near to real time (database updated every 4 hours)
- granular: port level, berth level, by vessel type, vessel's origin, etc.

Potential to complement and enhance official statistics, for example recent OECD work on global vessel emissions.

Our approach: from pings to indicators



- Novel algorithm to derive economically meaningful indicators from billions of data points
- Approach solely based on aggregation and filtering
  - purely mechanical/deterministic approach
- Identification of ports key feature of the approach
  - Allows for granular information on ports, even to berth level
- Aim to contribute to the current debate/literature by providing complementary insights
  - exchanges via the UN AIS Task Team

Working at the 1km level

For each 1km polygon determine whether a vessel is ‘static’. We consider static such that:

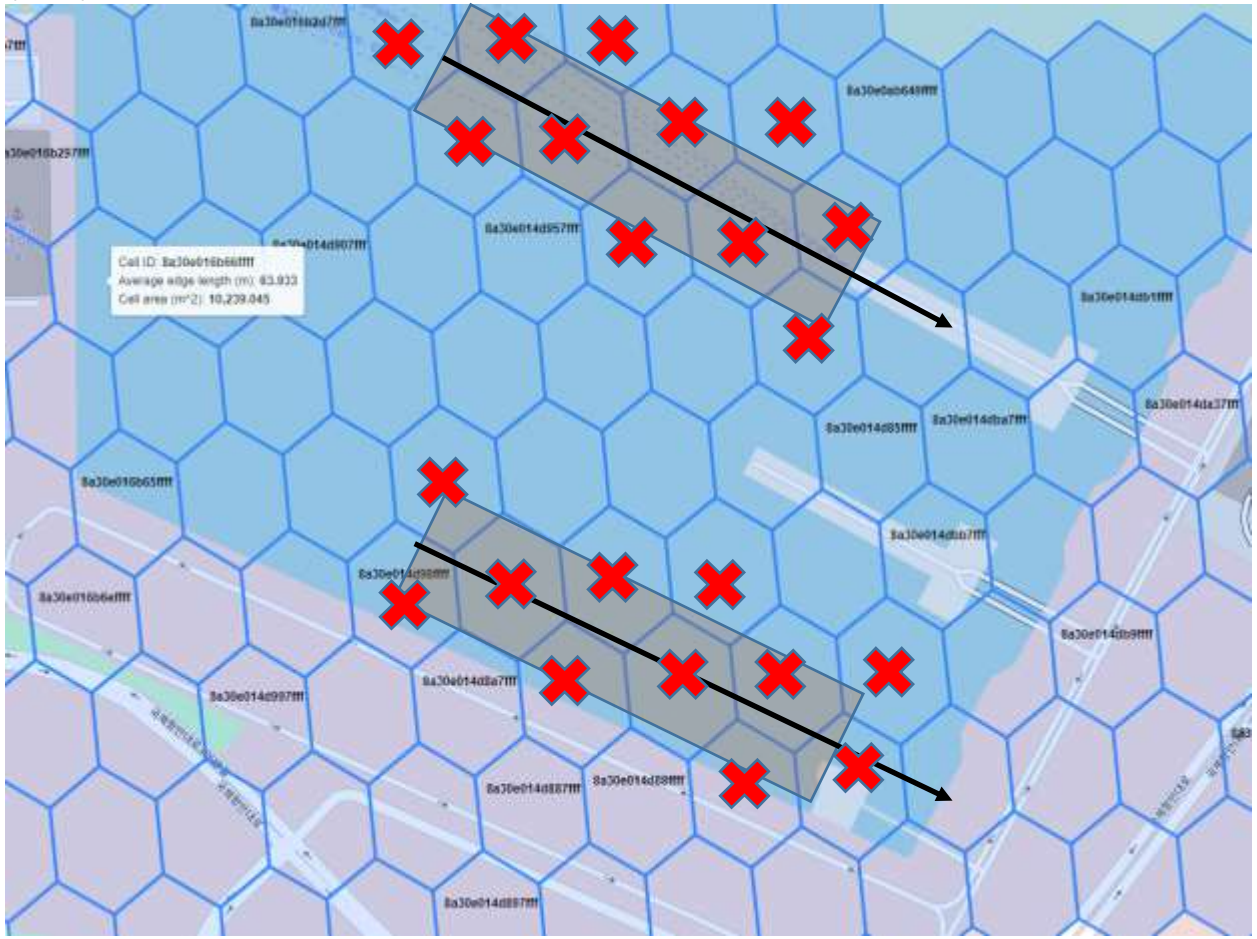
- Minimal vessel movement for 3 ‘pings’
- Minimal heading change for 3 ‘pings’
- Speed of vessel is 0 for 3 ‘pings’

Likely waiting area: could a future extension consider these areas?

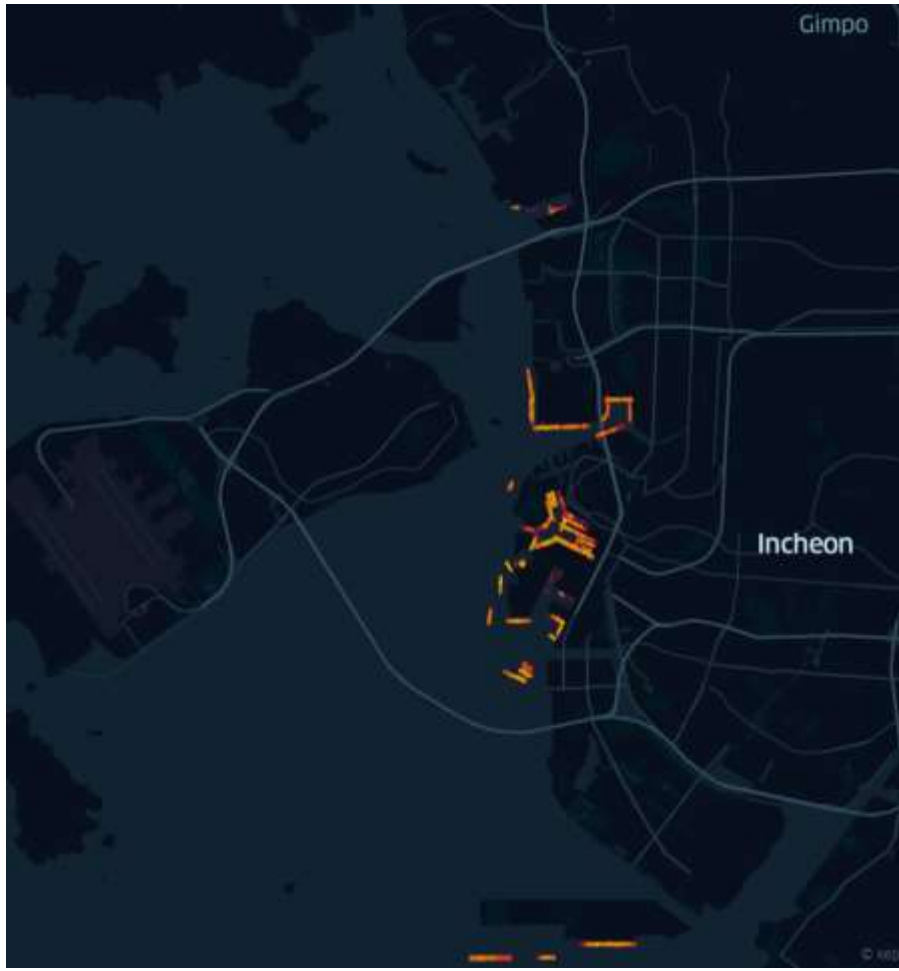
Filter:

- >20% of vessels static
- More vessels are ‘moored’ than ‘anchored’

Extending to the 100m level



For each ‘static’ boat take the length, width and heading and determine a potential polygon (grey), identify intersecting polygons at 100m hexagon level (Red Cross). Aggregate to the global level



Assign to port

- Take UNLOCodes for ports
- When co-ordinate data doesn’t exist attempt match with World Port Index
- If unsuccessful use ‘fuzzy matching’ with Geonames to determine the most appropriate location.

- Assign each hexagon to the closest port

Calculating insights and moving to policy

- Identify vessels passing into our port polygons:
  - Log time of entry
  - Log time of exit
  - Remove false positives (ie. Just passing through, or obvious data errors due to data failures)

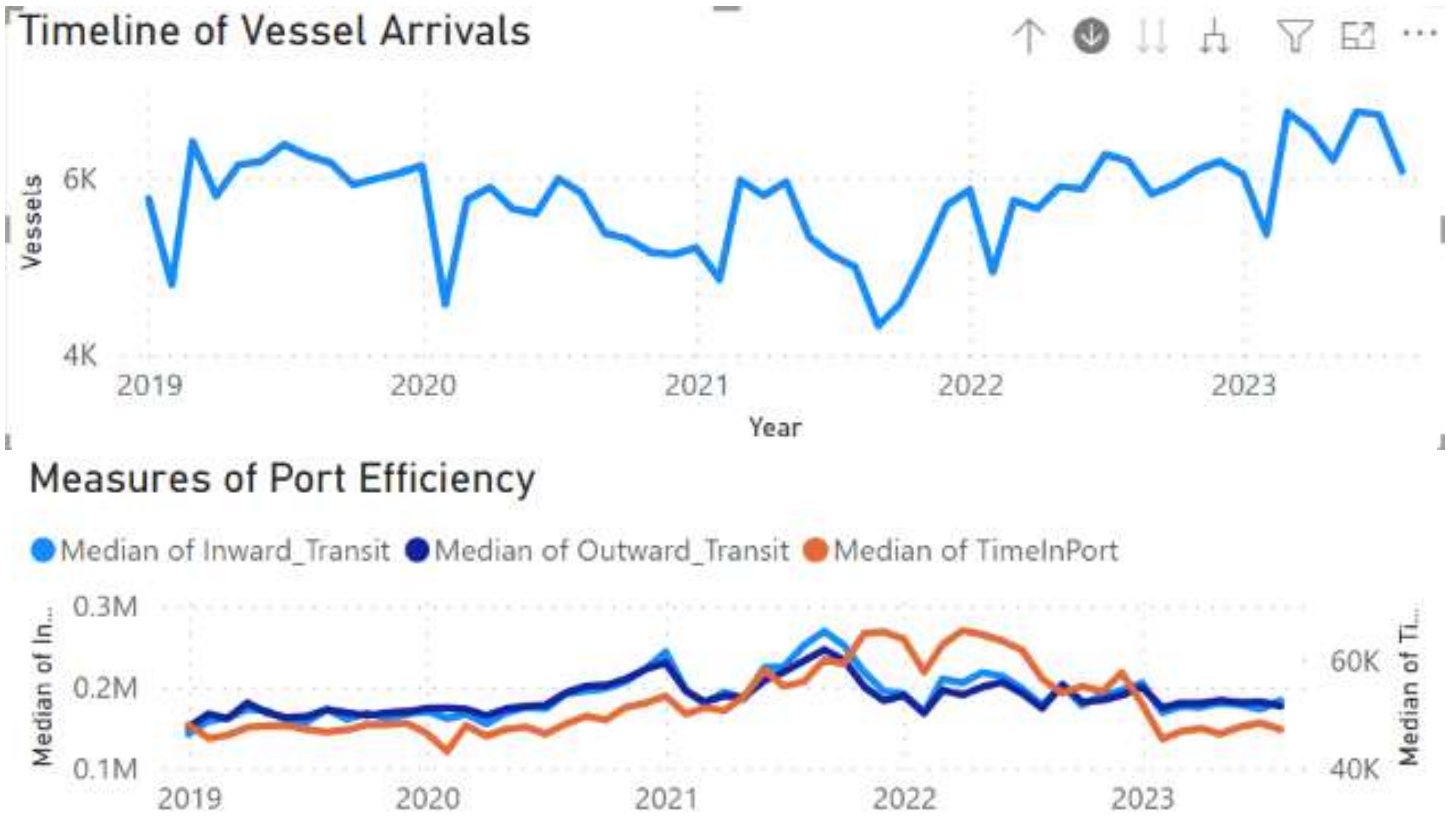
port capacity
port utilization
event studies…

Insights and uses for policy

Efficiency measures at a country level

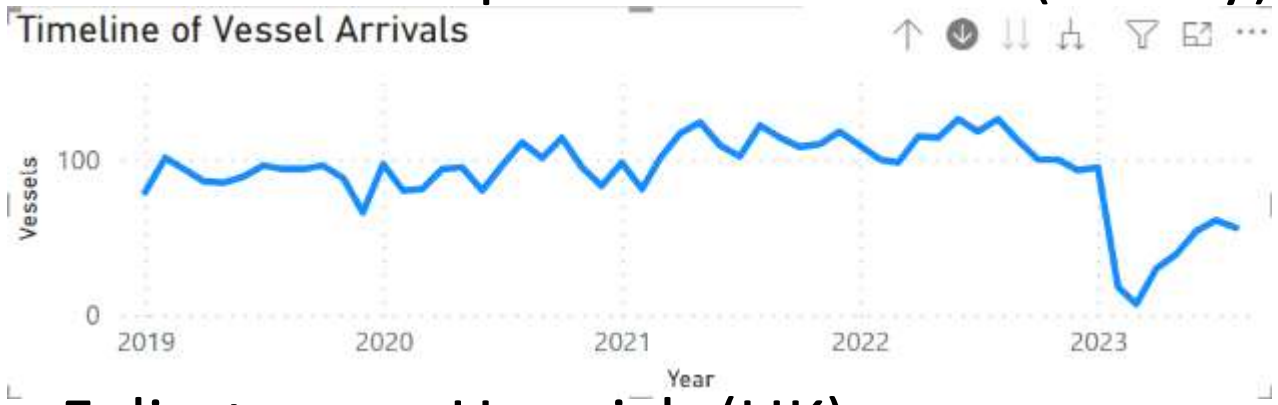
- Can compare timeline of vessel arrivals and efficiency measures such as:
  - Time from previous port (likely includes waiting time)
  - Time in port (likely includes delays in processing)
  - Time to next stop

Measures for Containership arrivals in China

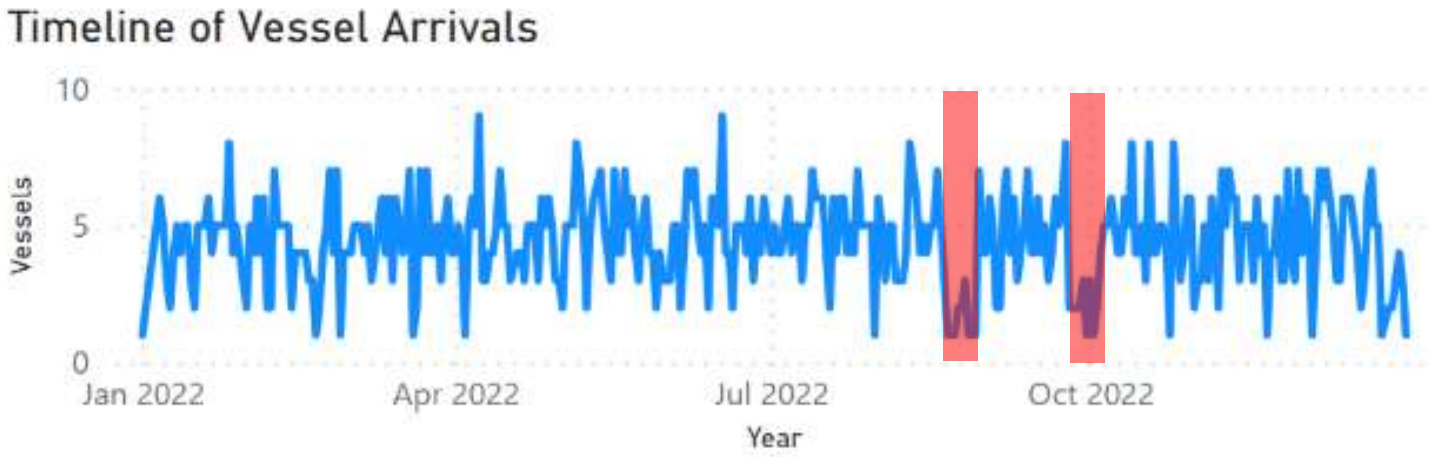


Port level insights

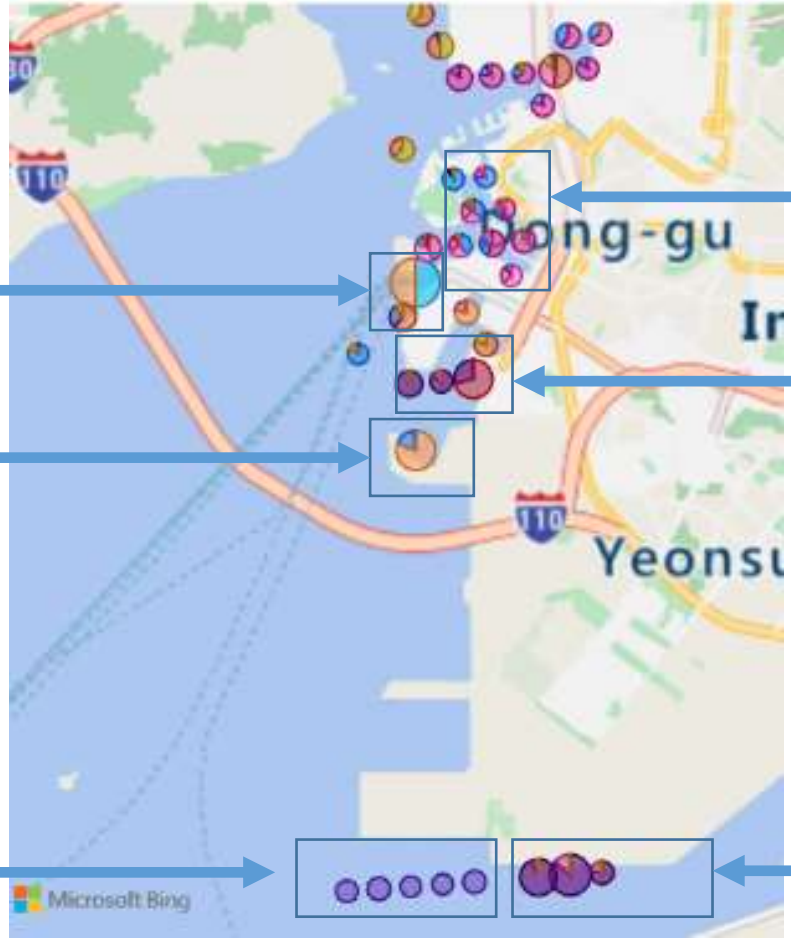
Impact after an earthquake: Iskenderun (Turkey)



Strikes: Felixstowe + Harwich (UK)



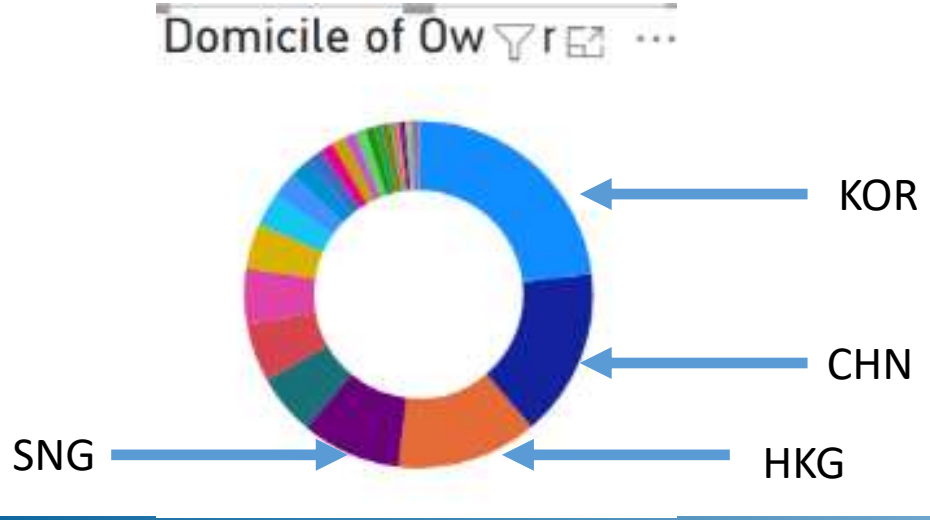
Port level insights: Incheon (Korea)



Custom queries…

- Which are the most important ports for container ships leaving Incheon in China?

Outward_PortName	Count of imo
Waigaoqiao Pt	1393
Qianwan	847
Tianjin Pt	655
Daxie Pt	393
Maji Shan	390
Yantai Pt	360
Total	**5913**



- And who ultimately owns these vessels?

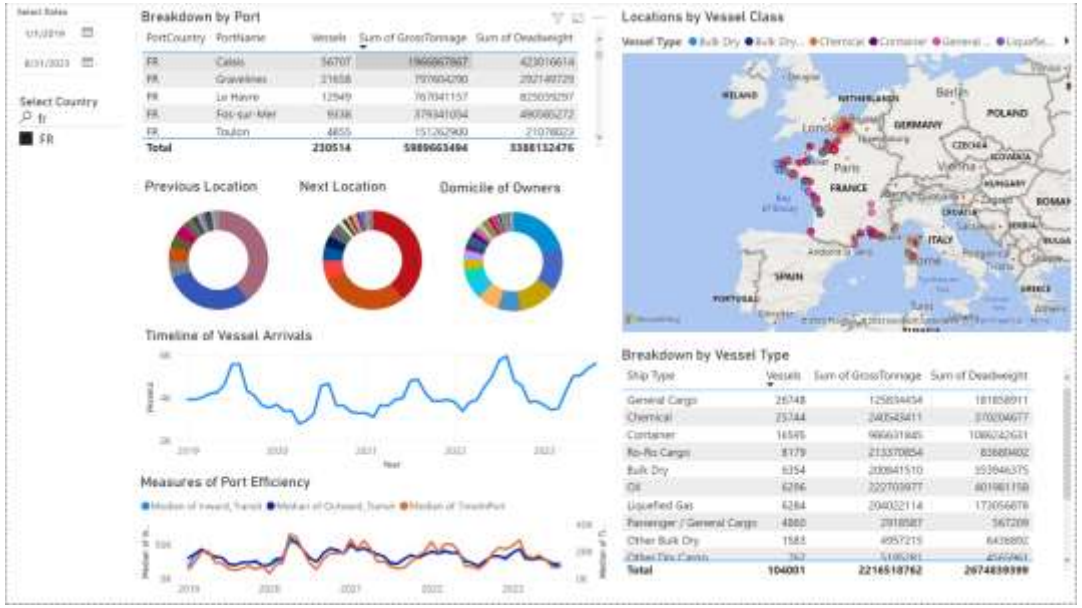
Uses for measuring resilience?

1. Given an event in a given port how is this likely to impact my jurisdiction (ie. How many vessels to/from Korea pass by Iskenderun as some point)?
2. How reliant is your country on one port for a given product or route (e.g. Dover-Calais)
3. What is the ratio of vessel occupation to available space for a given port – is it close to capacity an how does it compare to other ports?
4. If the port developed handling facilities for product X, how many vessels carrying this product pass close to the port already?
5. Who generally owns vessels visiting a given port

Next steps

- Enhance polygon detection to determine position of the AIS receiver on the vessel?
- Can we extend method to consider waiting areas?
- Real-time updates?

- Explore the data and provide feedback:
  - Graham.pilgrim@oecd.org
  - Can provide access to our AIS Dashboard



THANK YOU