Creating a world
fit for the future

An innovative and cost effective approach for analysing shipping movements density

Case study in Peru - *Ioannis Tsagatakis, Pizzolato Marco*

www.ricardo.com

Ricardo Team Members

Ioannis Tsagatakis – Principal GIS Consultant

15 years of experience in analysing spatial environmental data using desktop and server GIS applications, providing technical support and advice to Governmental departments for the development of regional Air Quality and GHG policies

Pizzolato Marco – Senior GIS Consultant

Geospatial Data Scientist with advanced capacity in handling big spatial/non spatial datasets using Python, R and SQL languages

Outline

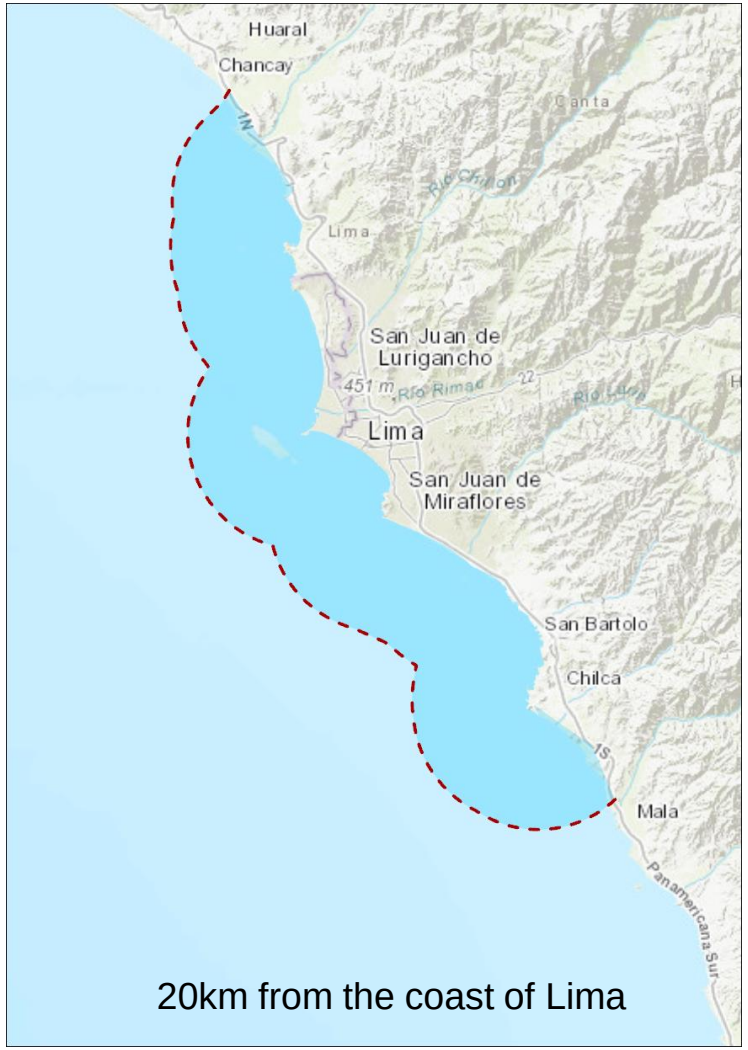
- **Why did we do this?**
  - Background to emissions data from shipping and the need to distribute them
  - What were the aims and objectives?
- **Methodology**
  - Density data: Using products offered by the website MarineTraffic
- **What are the benefits and alternative solutions**

- **Disclaimers**
  - This is an example of utilising publicly available data in order to distribute inventory emissions in a cost-effective way
  - A top down approach which is using a route-specific ship movement data
  - Not as accurate as using an AIS-based methodology

Background and objectives

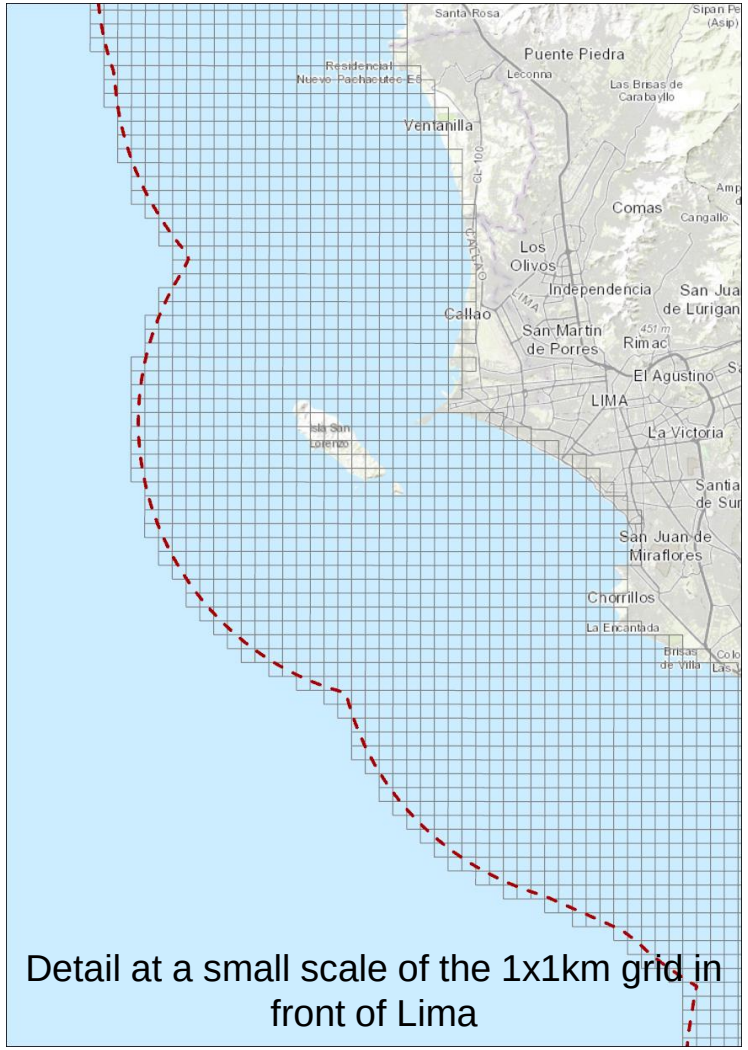
- Port level emission estimates available based on Guidebook 1.A.3.d, p.21
- Activity data based on detailed vessel movement data (i.e. number of arrivals and departures by vessel type)
- Liquid bulk ships, Dry bulk carriers, Container, General Cargo, Ro-Ro Cargo, Passenger, Fishing, Other, Tug, Recreational vessels
- No location data available
- Spatial emissions required to do Air Quality modelling around the area of Lima in Peru
- To spatially distribute the emissions in the shipping sector, historical aggregated vessels positions was needed

Define the area



20km from the coast of Lima

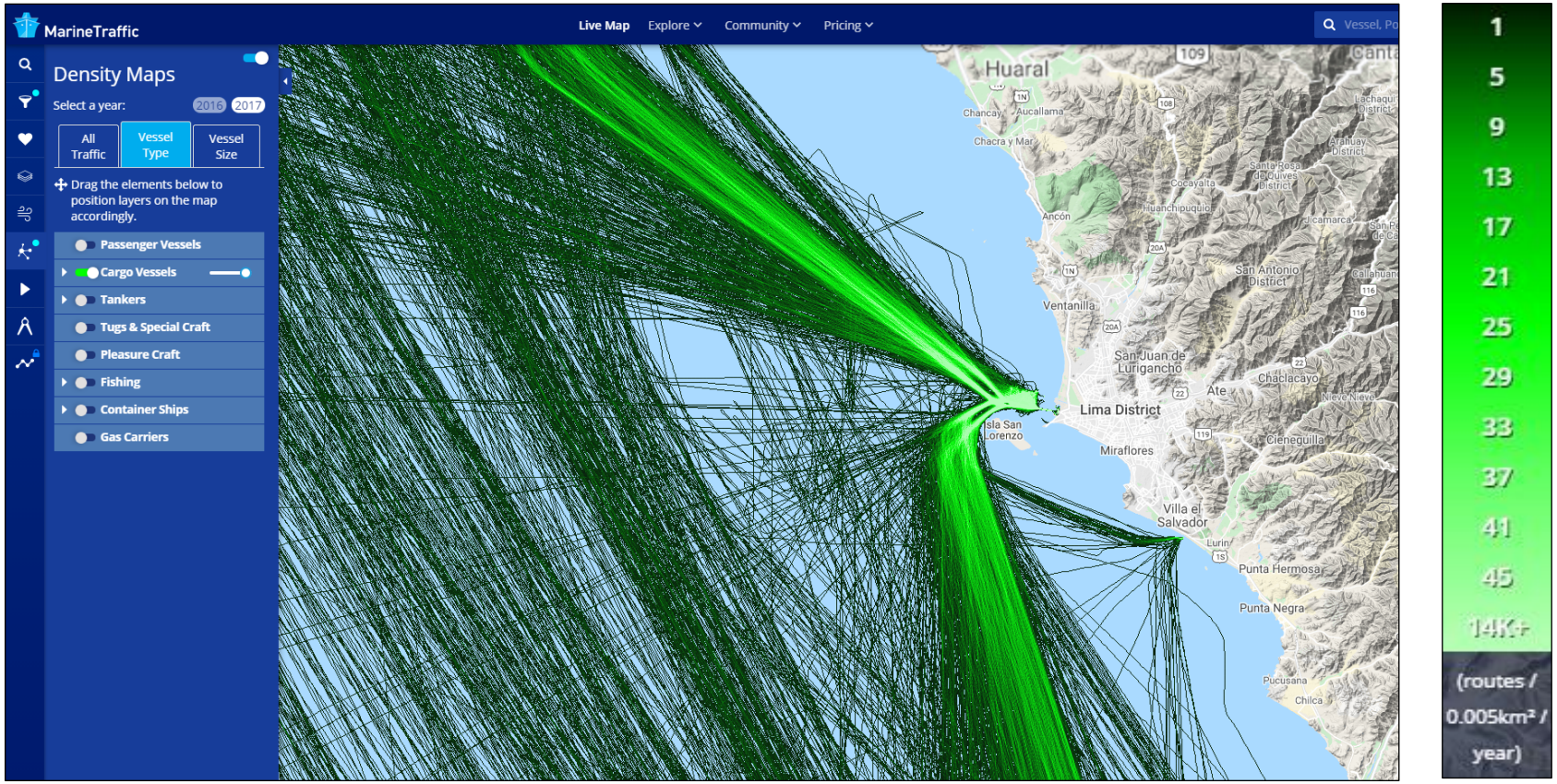
Define the resolution



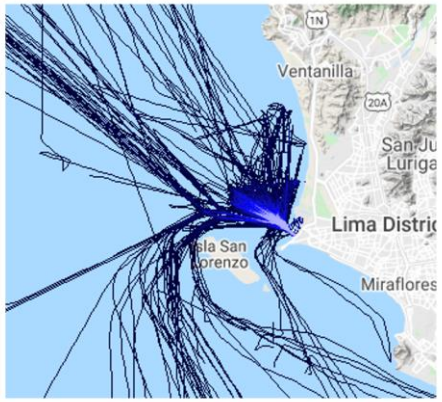
Detail at a small scale of the 1x1km grid in front of Lima

Methodology

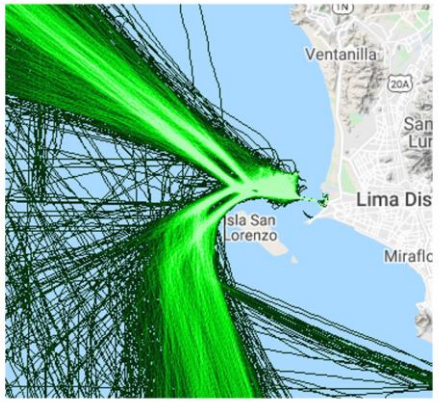
- The Advance Density Map from MarineTraffic allows to access maps showing the **cumulative vessels density** of a solar year for **eight different type of vessels.**
- Density is reported at a maximum resolution of 0.005 km^2 at the maximum available zoom level.



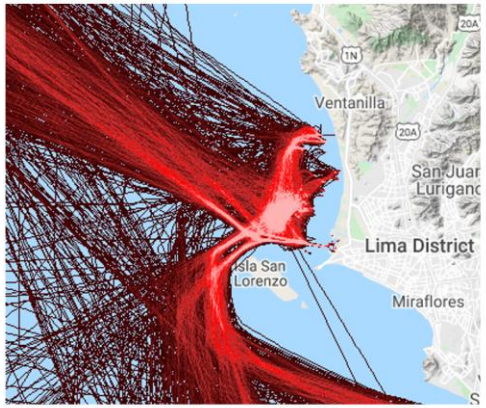
Methodology – vessel type breakdown



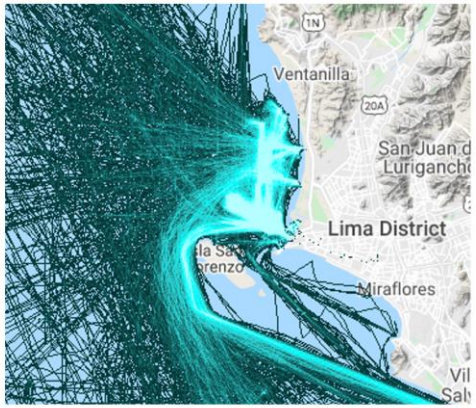
Passengers Vessels



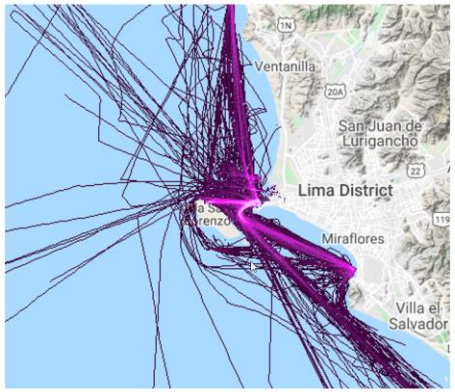
Cargo Vessels



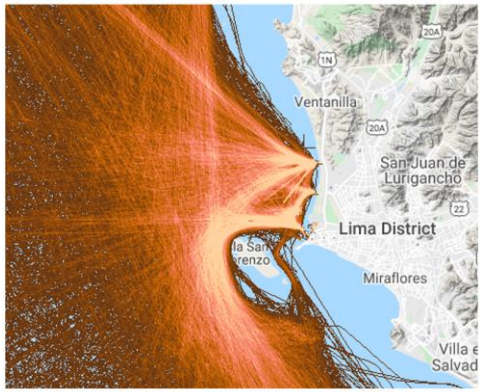
Tankers



Tugs & Special Crafts



Pleasure Crafts



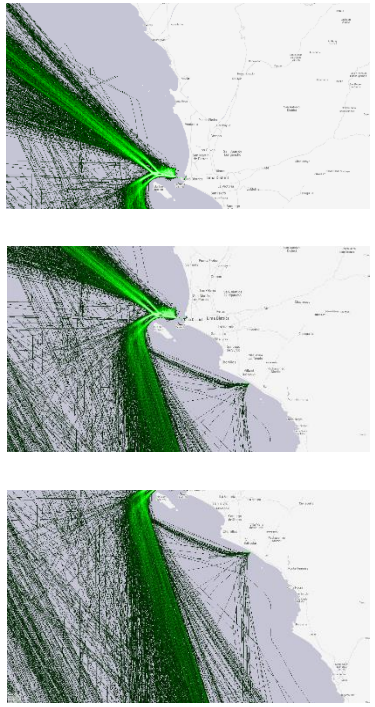
Fishing

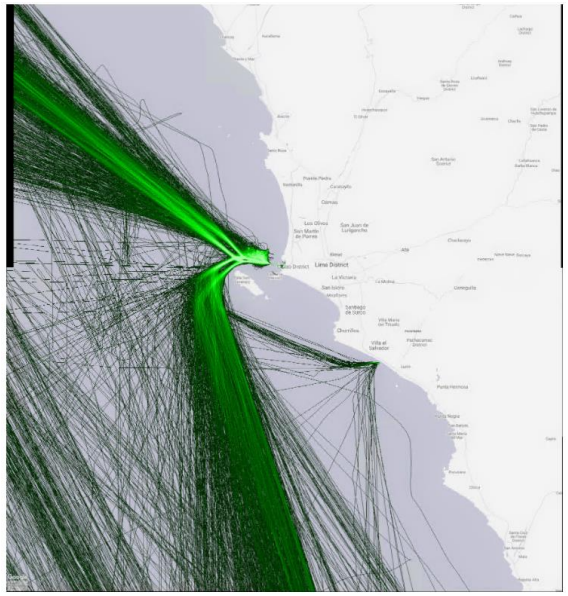
Container Ships

source: https://www.marinetraffic.com/

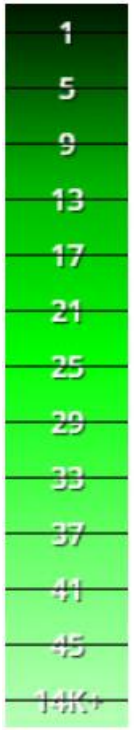
Methodology – K-means clustering

1. Stitching images together

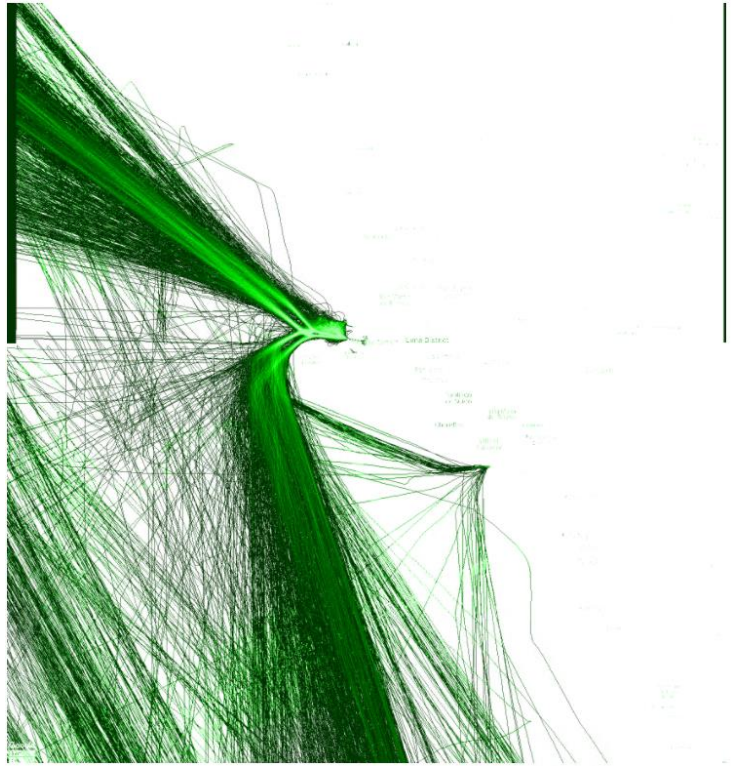




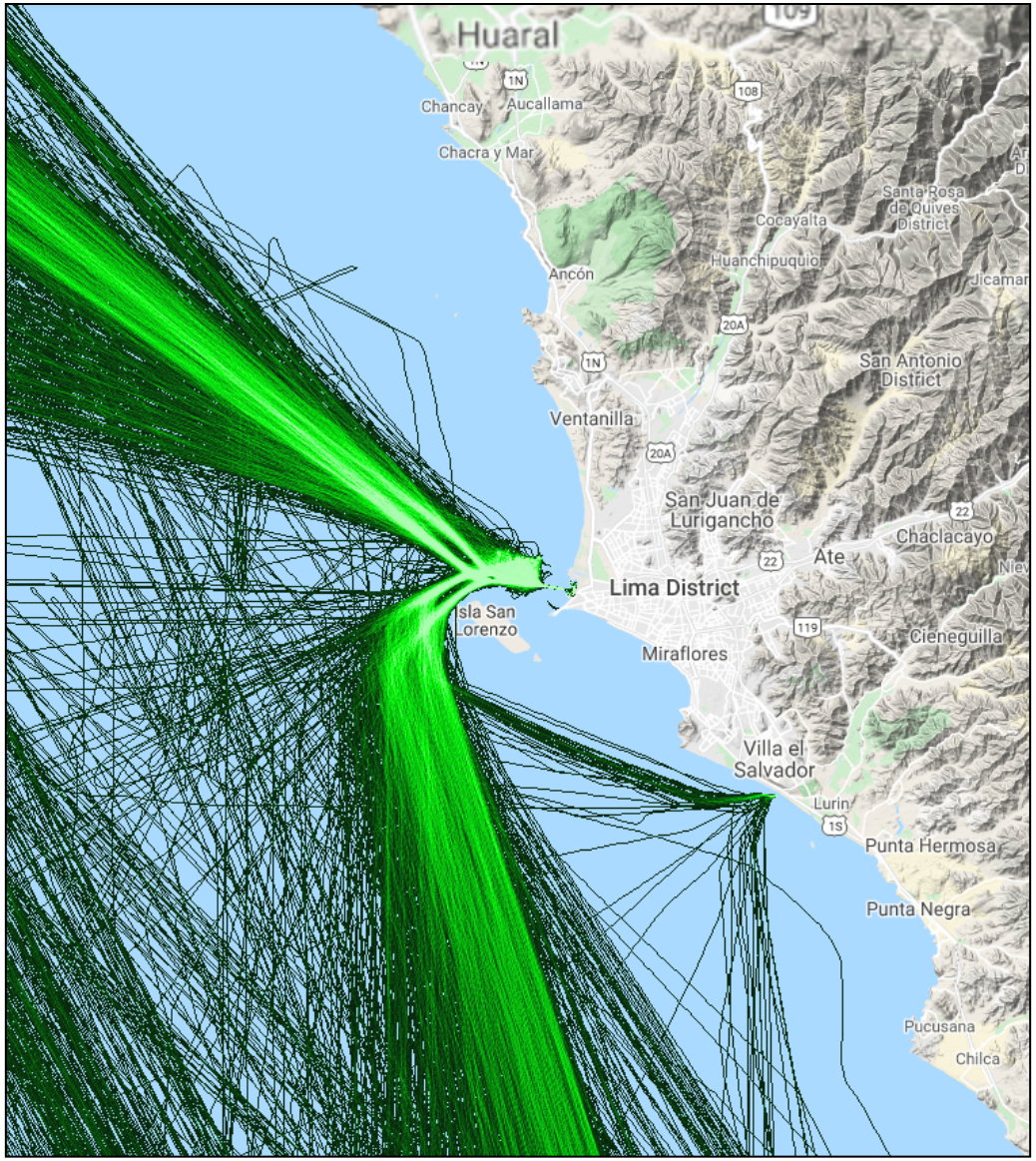
2. Cluster centers from Legend



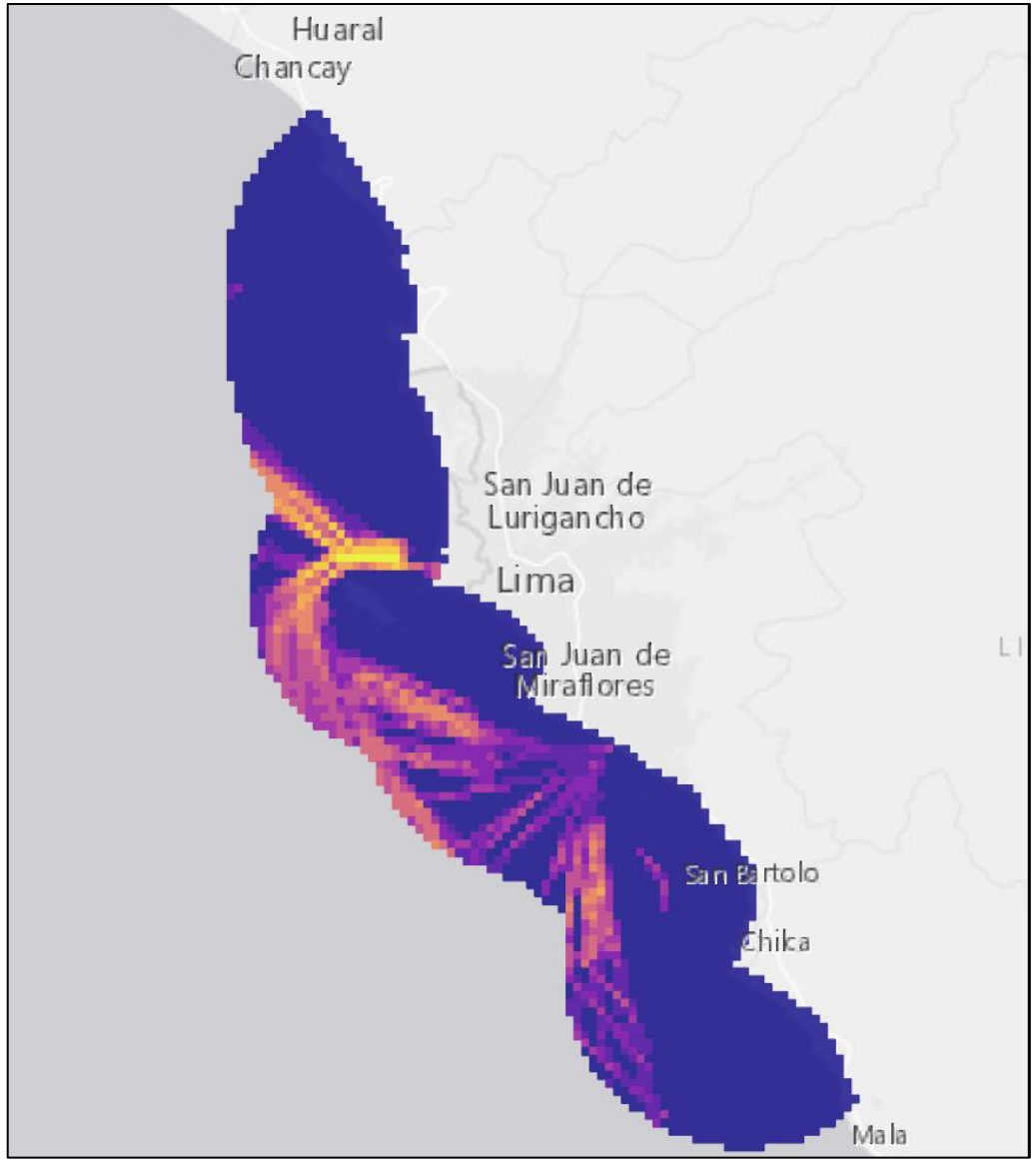
3. Image segmentation
K-means clustering with sklearn



Methodology – distribution

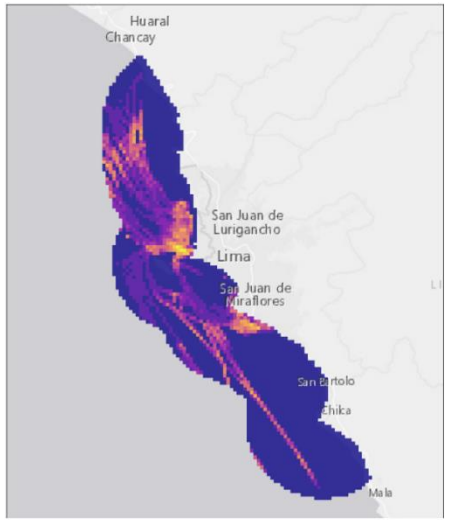


Cargo Vessel - source: https://www.marinetraffic.com/

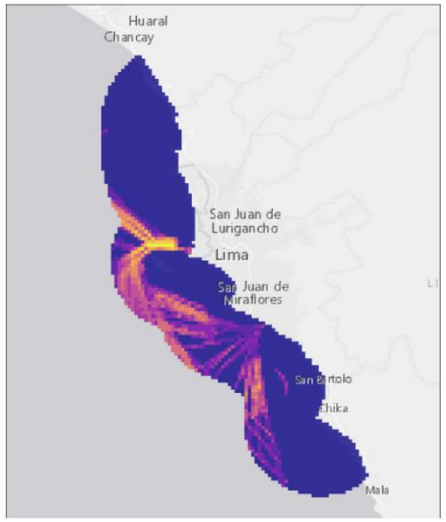


Cargo Vessel - normalised distribution grid

Methodology – vessel type distributions



Passengers Vessels



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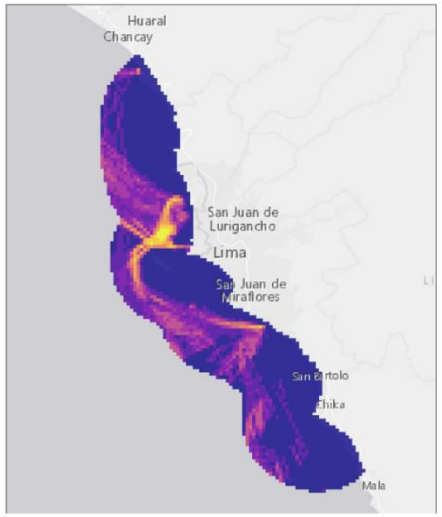

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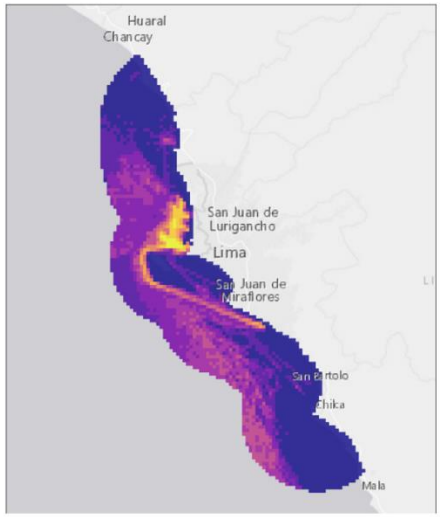
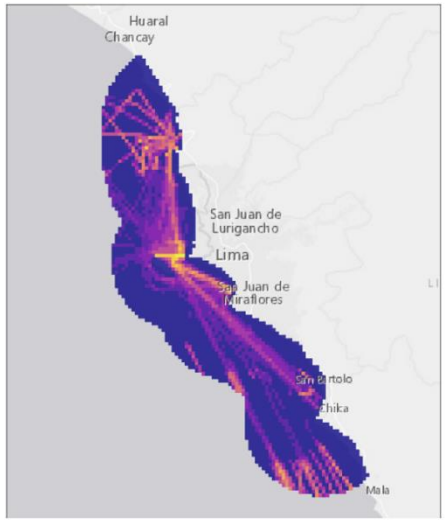


Tugs & Special Crafts



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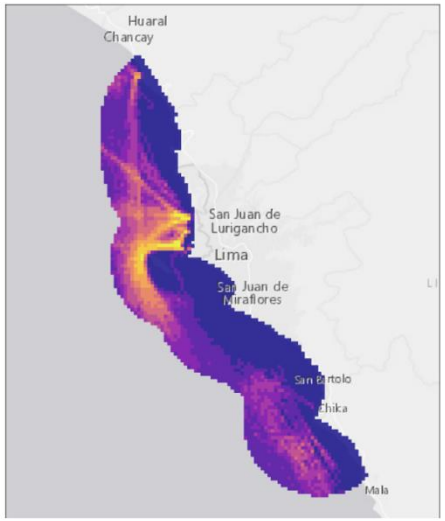
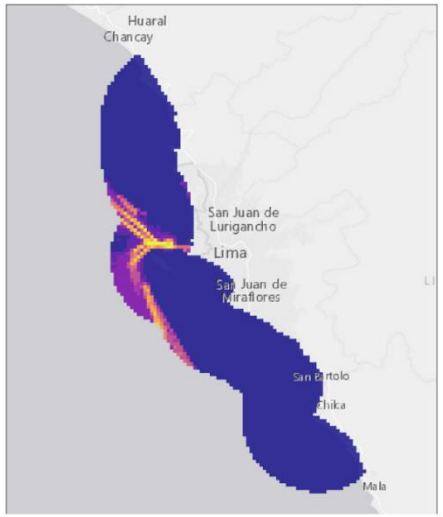


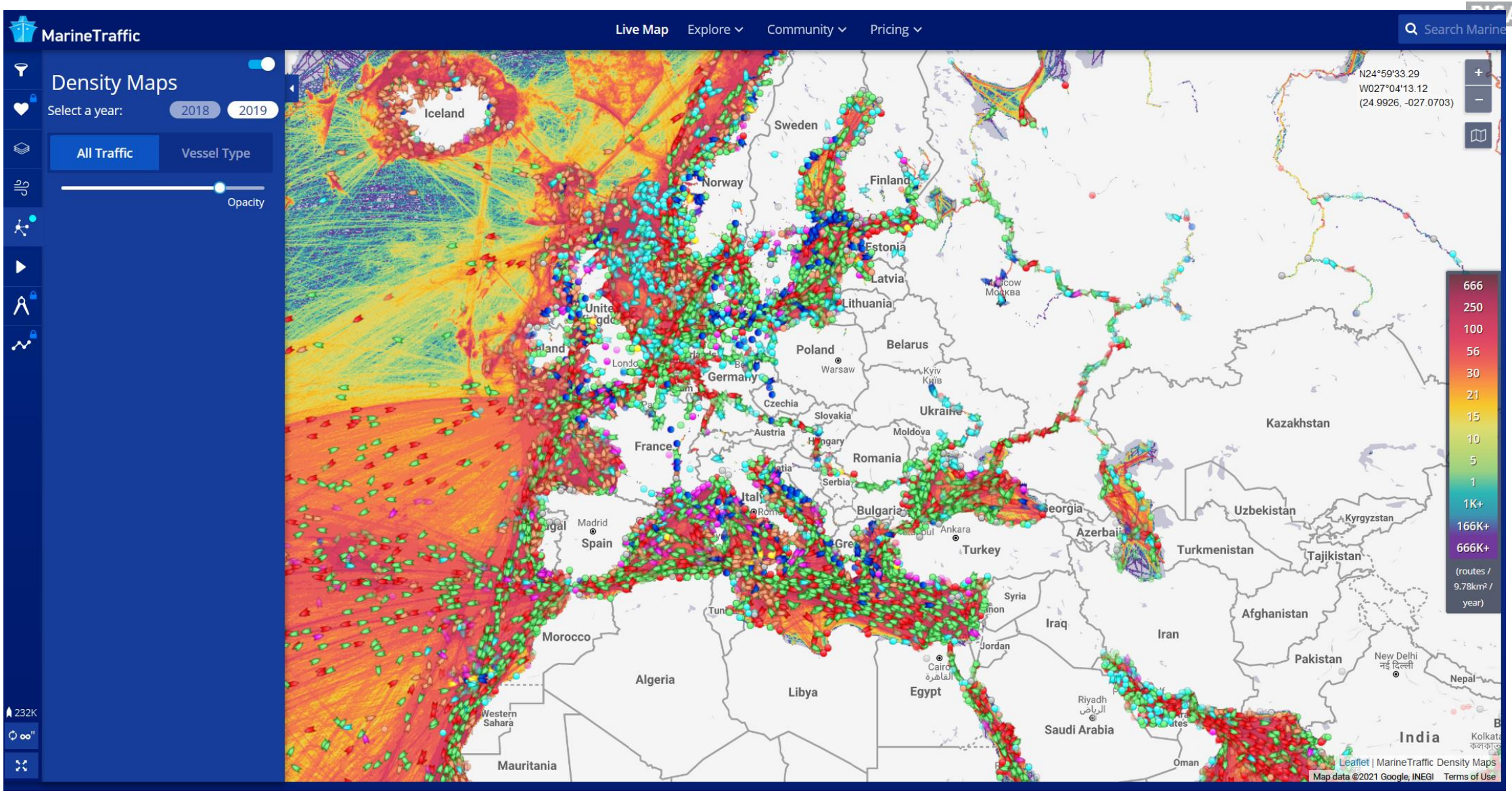
Fishing



Container Ships

Source original data: https://www.marinetraffic.com/

Global scale data



source: https://www.marinetraffic.com/

Cost benefit and accuracy

Advanced Density Maps

Raw gridded data

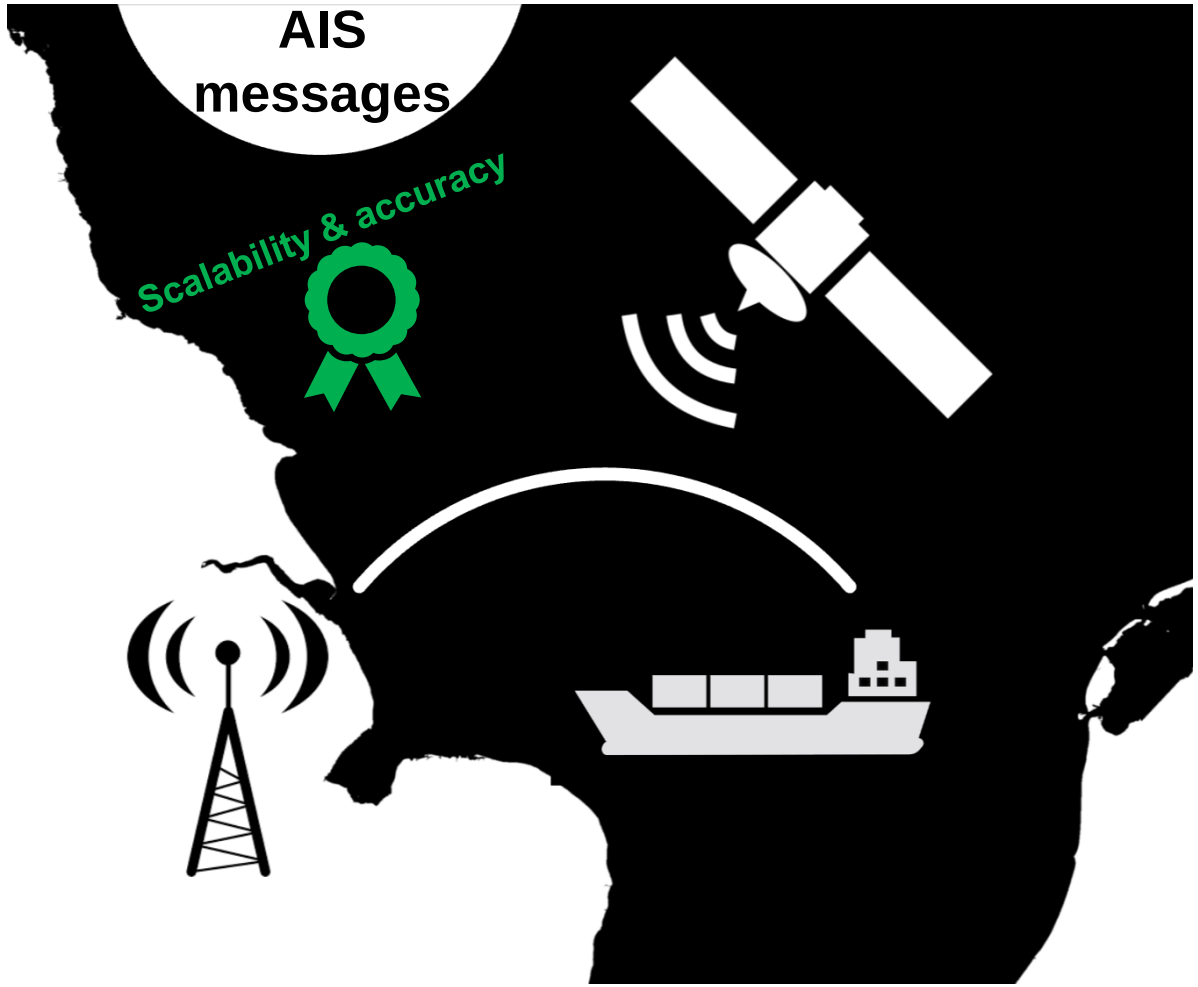
Cost-effective

6 Euros per month

Global data

~12k-15k Euros*

Predefined area (e.g. Lima)



+ Cost of IT systems and advanced processing on top of any data cost

*Cost is subject of the size of area and the year of interest
For more accurate cost, contact the online services of Marine Traffic

Thank you for your time

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