2nd SSN LRIT Group Meeting

Traffic Density Maps

Agenda item 2.6.1

Edmunds Belinskis / Project officer
Department C: Operations/Unit C.2.1

Lisbon /18 October 2017

EMSA
European Maritime Safety Agency

Background

- HLSG 2 (Brussels 20 June 2017) agreed on “mandating EMSA to start preparing for providing traffic density maps (TDM), based on AIS data, to interested parties upon request, as a new service and then report back to the next HLSG”.

- EMSA produced in the past TDM on the basis of ad hoc requests.

- EMSA contacted several Member State Authorities, EU Institutions and research bodies with prior experience in developing TDM.

- Before developing a TDM service, it is necessary to define and agree the methodology, which needs to be fully understood by the users.

EMSA research

- **The most of methodologies are based on grid-based approaches.**

  - **ship voyage calculation method:** how many times the trips (voyages) cross each cell of the grid during the time period;
  - **ship position calculation method:** how many positions are reported from ships in each cell of the grid during the time period;
  - **ship route calculation method:** rebuilds the ship track from the recorded positions (i.e. how many routes are recorded from the distinct ship in each cell of the grid during the time period).

  - **AIS data only (T-AIS and S-AIS).**

  - **There is no internationally agreed standard definition or method to create TDM.**

  - **System capabilities.**

Selected method

- The method proposed by EMSA is the **ship route calculation** based method:
  - can be implemented in all regions (coastal and open sea) utilizing all the available SPD;
  - allows to connect the dedicated ship's positions and restore the ship's route within areas with a low coverage;
- T-AIS as the main source within coastal areas, while outside only S-AIS will be used.

Methodology: processes

1. Aggregate the positions

- The SPD are aggregated per period of time (configurable) and area, and prepared to recreate the vessel routes as lines (i.e. a list of points).

2. Filter the positions

- The SPD are cleaned and the improbable positions are removed.

- An additional methods might be applied to select the number of positions, e.g.:
  - only one position by dedicated MMSI within the grid cell; or
  - only one position per hour.

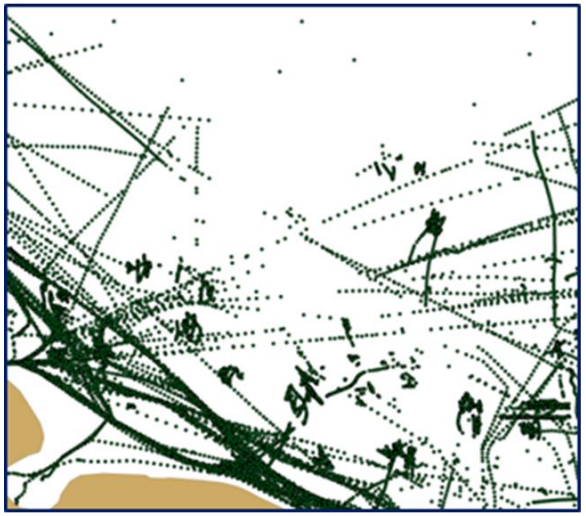
- The above methods may decrease the accuracy of the TDM presentation.

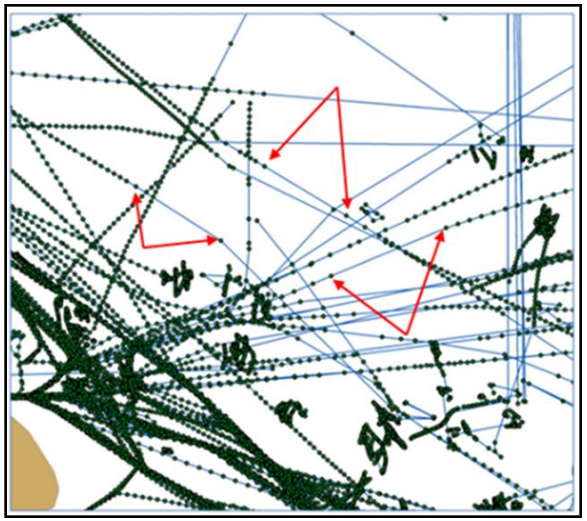
Methodology: processes

3. Create lines connecting the dedicated positions

- SPD with the same MMSI are converted into lines using the time stamp to order the positions (points).
- The output of this process is a file containing the route lines (per MMSI).

- The applied “gaps filling” is based on the ship route assumption:
- Is sufficient for the purposes of the TDM, but cannot be used for other e.g. monitoring purposes outside the fully covered areas



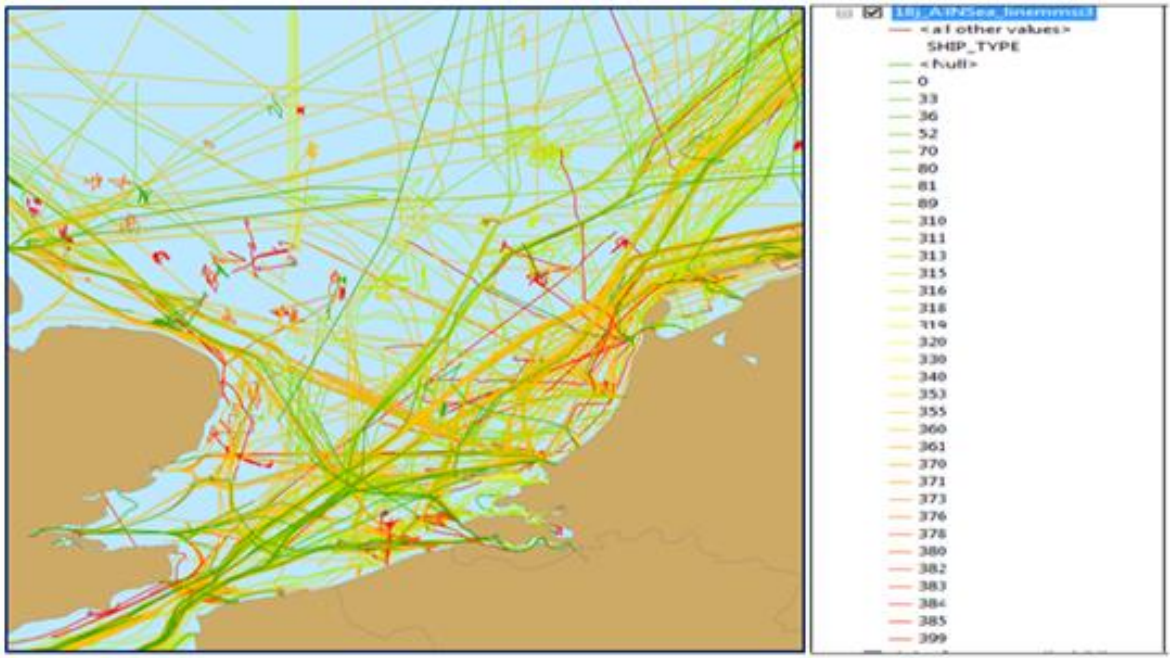


EMSA

Methodology: processes

4. Divide the route lines per ship types

- The result is a set of files by ship type, and for a period of time.



5. Construct TDM

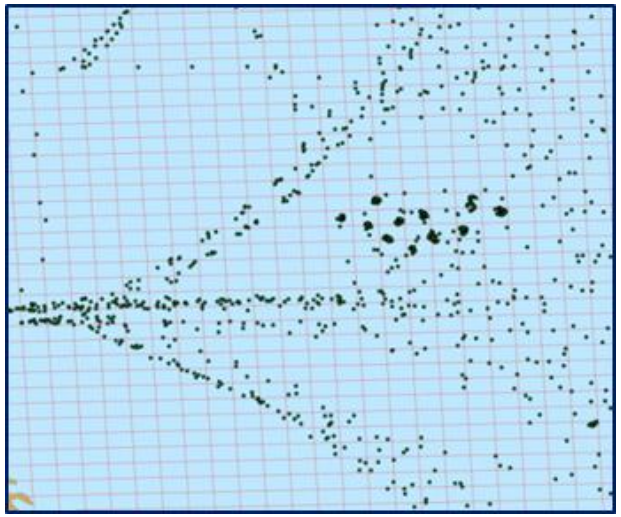
TDM construction: steps

1. Select cells

- The area is divided into a number of cells (1*1 km large squares).

2. Select positions

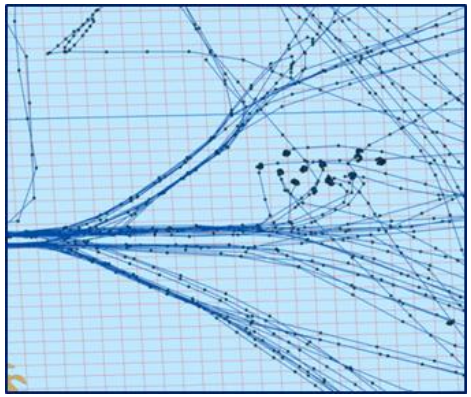
- The aggregated SPD (position reports of the distinct ship) are selected within the grid cells.



TDM construction: steps

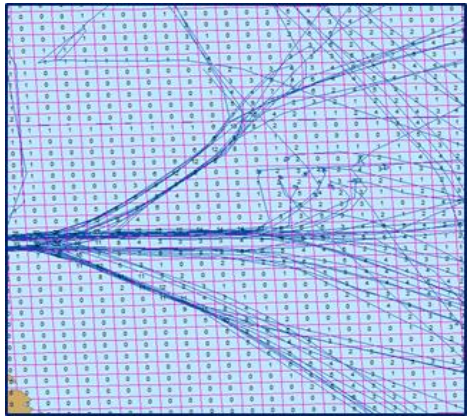
3. Select lines

- The selected positions are connected by lines.



4. Count and sum

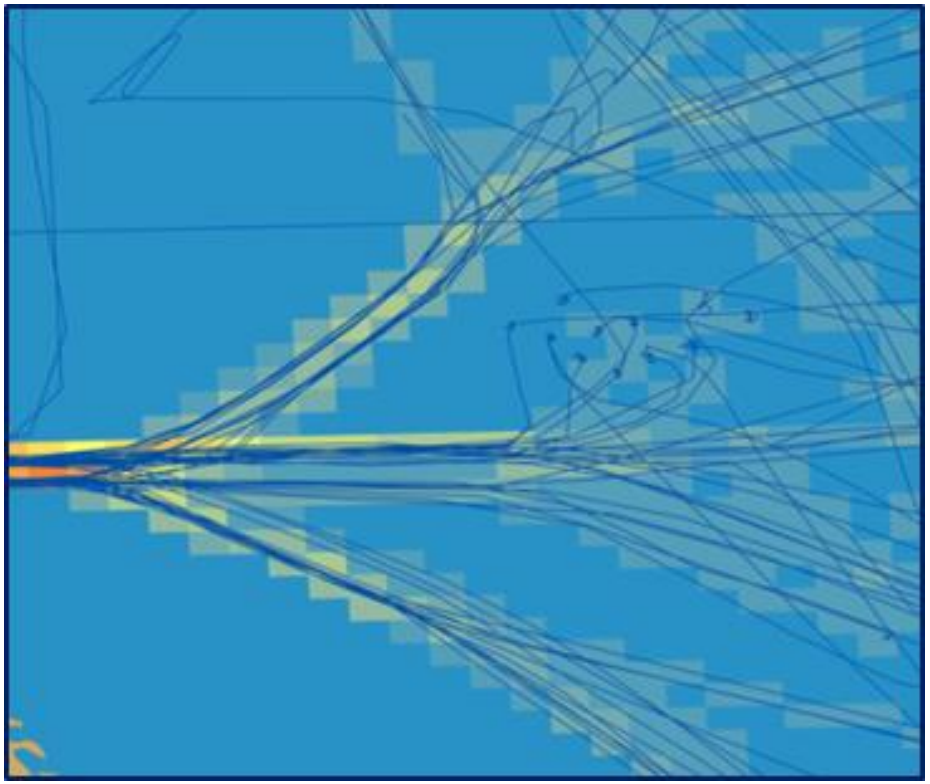
- The number of lines (crossings) inside each of the cells are counted, using a spatial join.



TDM construction: steps

5. Construct a map

- All the crossings in each cell are summed.
- The cells with the higher number of crossings are visualized by a color code.



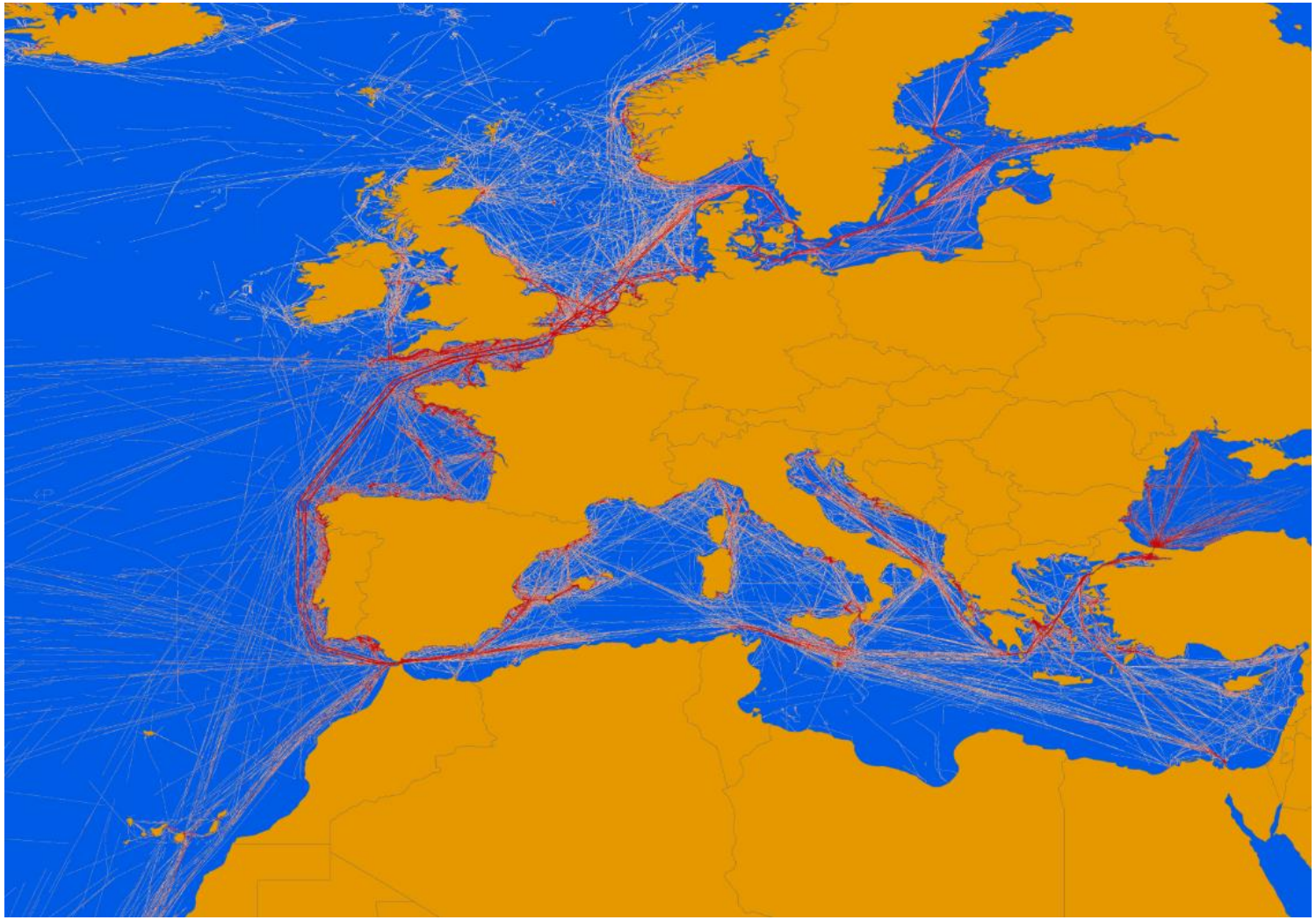
TDM construction: steps

6. Presentation

- A color classification can be applied to visualize the most clear pathways.
- A density level filtering can be applied to present the areas with the highest density traffic.

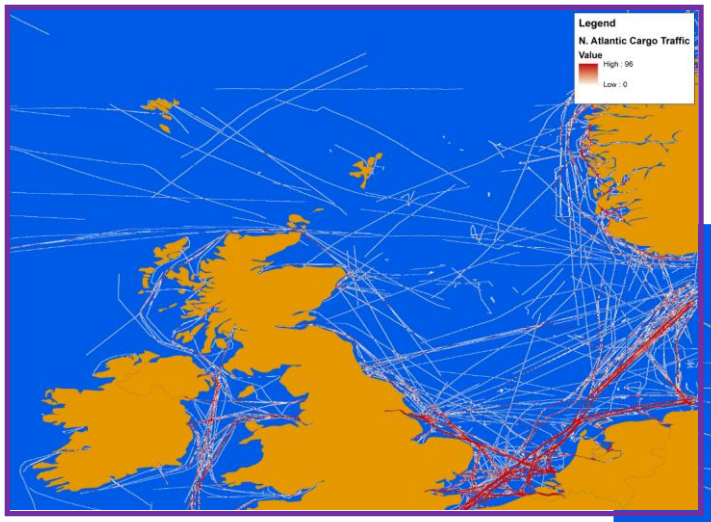
Examples

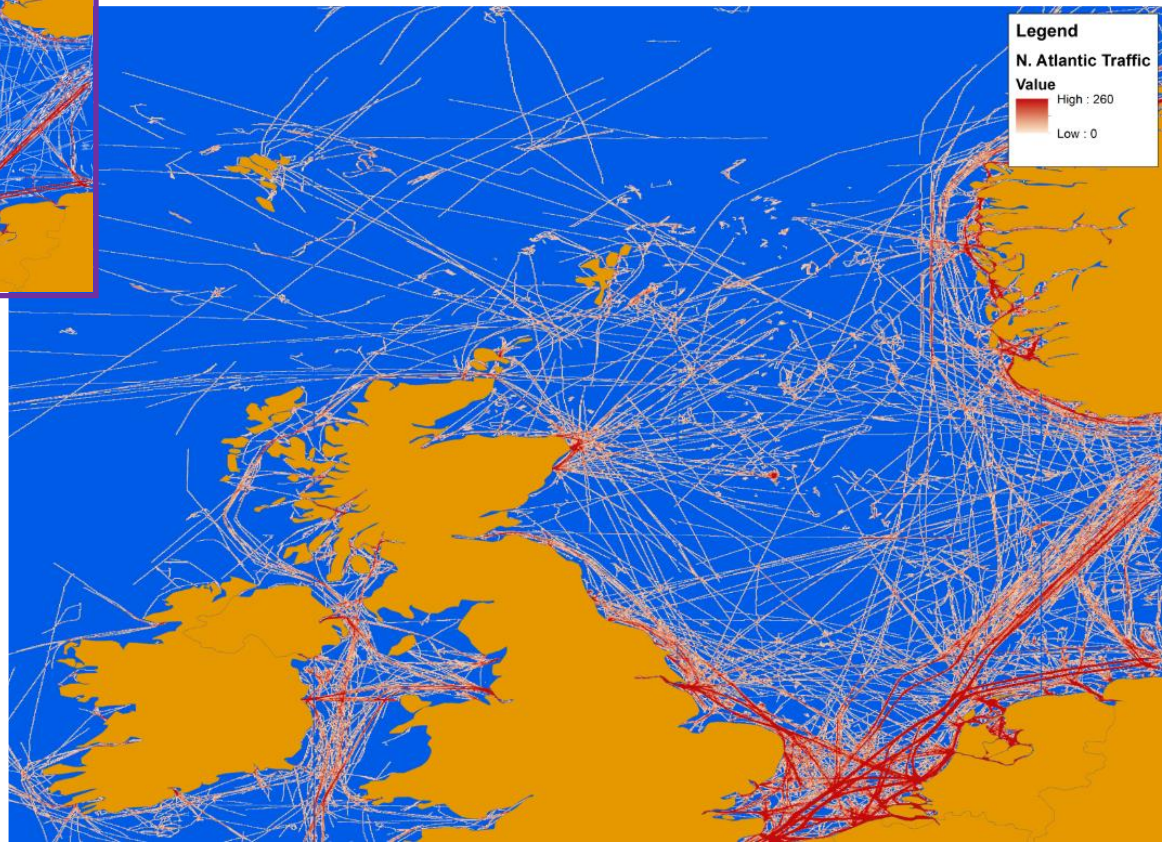
- **Europe (1 day data, 11th August 2017))**



Examples

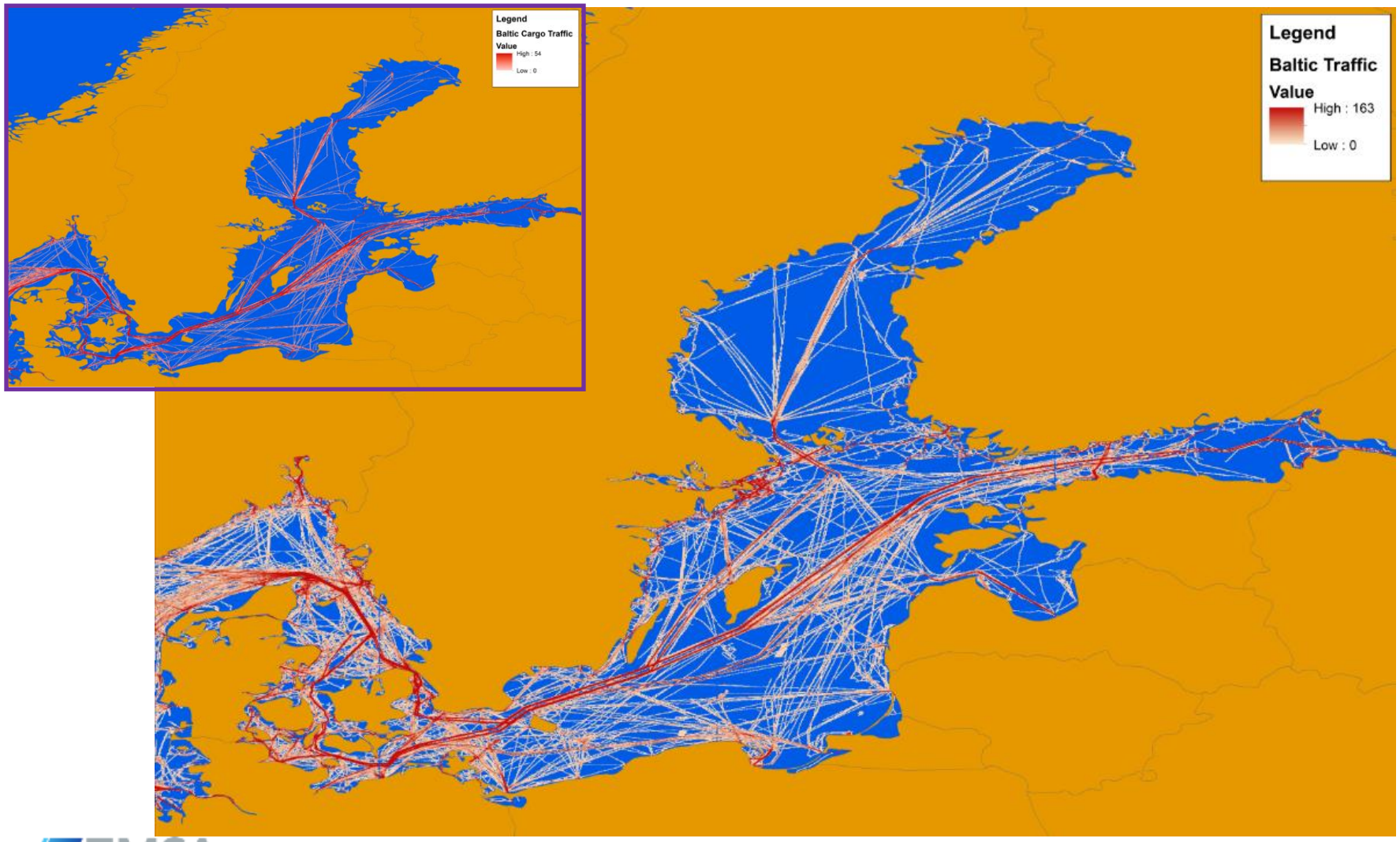
- **North Sea/Atlantic (1 day data, 11th August 2017))**





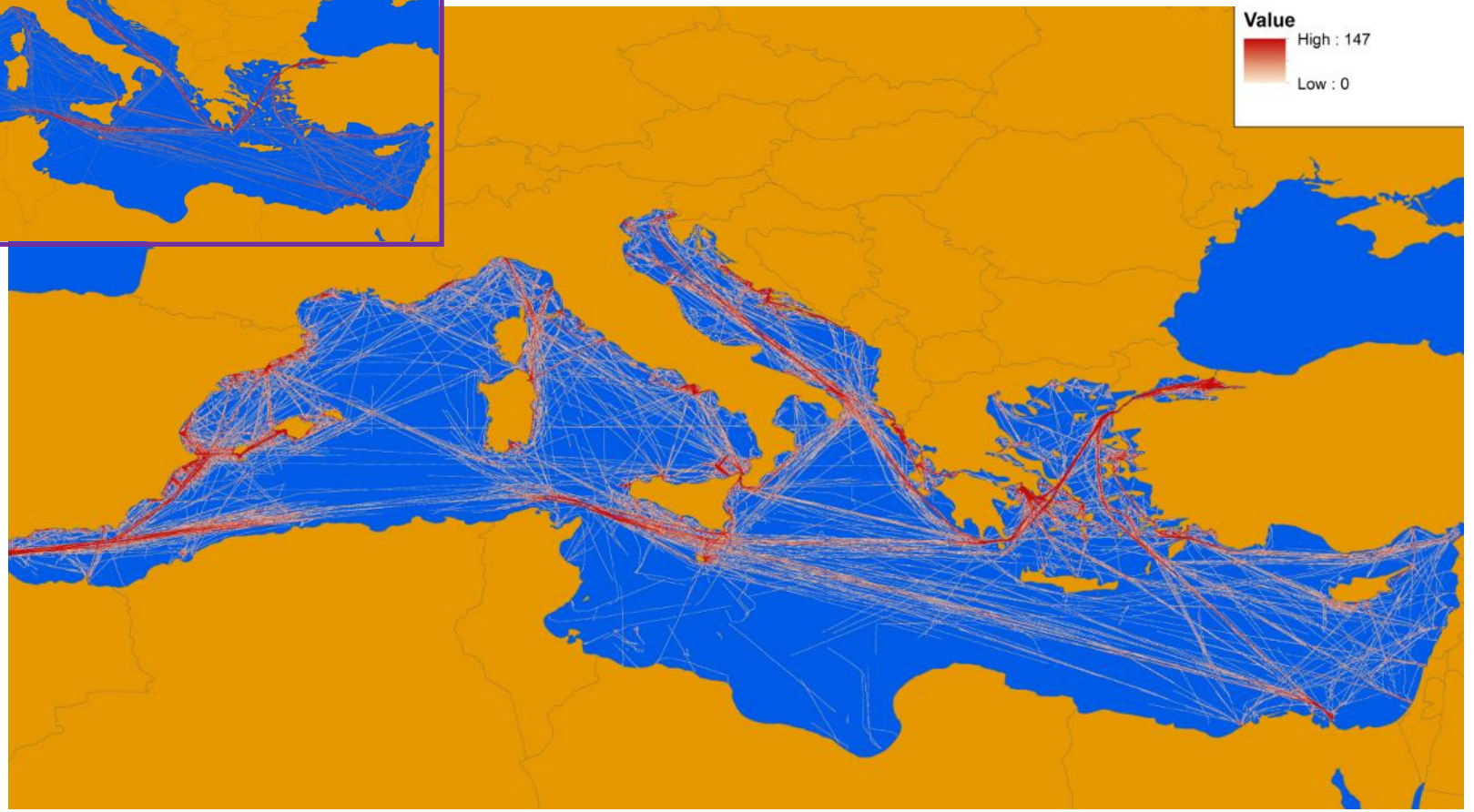
Examples

- **Baltic Sea (1 day data, 11th August 2017))**



Examples

- **Mediterranean Sea (1 day data, 11th August 2017))**

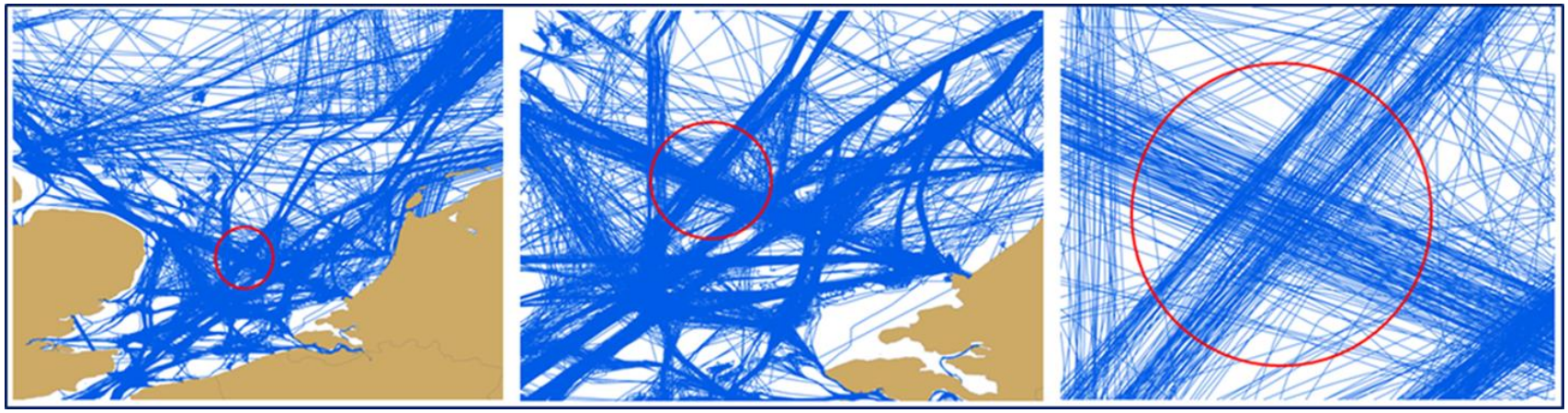


A phased in approach

- **Initial phase:**
  - **The parameters on which the initial service will be fixed:**
    - **per predefined period** (e.g. monthly);
    - **per areas:** (Baltic Sea; North Sea/North Atlantic; Atlantic; Mediterranean Sea; Black Sea)
    - **per 4 basic ship types** (Cargo, Tanker, Passenger, Fishing) and Other.
  - **The existing maritime infrastructure and application environment (e.g. SEG) could be used develop the TDMS.**
  - **The proposed methodology will be presented to the next HLSG**

A phased in approach

- **Further steps:**
  - **Once more experience will be gained (e.g. from the user requirements and EMSA allocated resources) the TDM service may evolve to provide more sophisticated services, e.g.:**
    - **configurable areas, periods and types of ships;**
    - **distribution of TDM via a “geoserver”;**
    - **production of “vectorised” maps etc.**



Actions required

Member States are invited to:

- take note of the information provided
- provide feedback on the proposed methodology and the way forward

emsa.europa.eu

twitter.com/emsa_lisbon

facebook.com/emsa.lisbon

EMSA

European Maritime Safety Agency