European Maritime Safety Agency

Meeting: 9th SSN / LRIT Group Meeting

Place and date: Videoconferencing, 25 May 2021

Agenda item: Traffic Density Maps – progress report

Document number: SSN/LRIT 9.6.4

Submitted by EMSA

Summary	Presents the status of the Traffic Density Mapping service and its future enhancement.
Action to be taken	As per paragraph 3.
Related documents	1) HLSG DM 6 (Brussels, 20 January 2020), Agenda item 4.2. 2) HLSG DM 7 (Brussels, 2 and 3 July 2020), Agenda item 5.2

1. Background

Following the decision of the HLSG 2 (20 June 2017), EMSA started developing the Traffic Density Mapping Service (TDMS). The methodology to construct TDM was approved by the HLSG 3 (28 February 2018) and the service became operational in September 2019. Since then, traffic density maps have been produced and made available to Member States and EU Institutions via the SSN Ecosystem's Graphical User Interface (SEG) and to the public via the EMODnet portal. Maps were calculated starting from January 2019.

2. Current Status

2.1 TDM services

Currently, the TDM service produces traffic density maps on a monthly basis and calculates 612 maps per year (i.e. 432 monthly maps, 144 seasonal maps and 36 yearly maps).

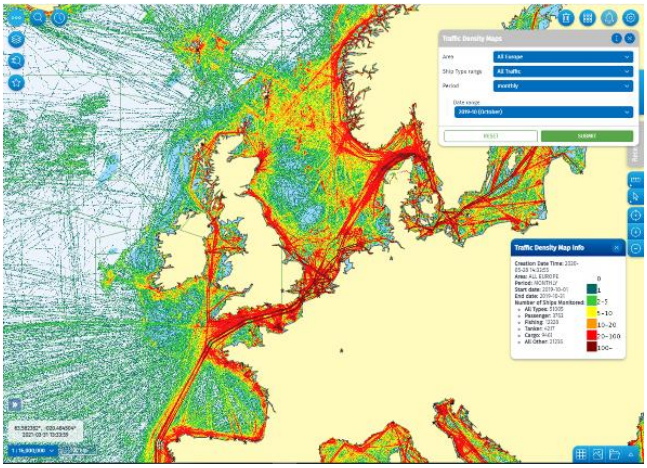


Fig.1: A traffic density map in SEG

These maps are made available to the VTMIS users through EMSA's SEG application.

The Service Level Agreement (SLA) between EMSA and DG MARE for the provision and use of vessel traffic density mapping data by EMSA to the European Marine Observation and Data Network (EMODnet) was signed on 13 March 2019 and renewed automatically in 2020 and 2021. As per the SLA requirements, EMSA produces and provides traffic density maps to EMODnet monthly.

In May 2020, DG MARE provided EMSA with an annual report on the results of the use of the data and noted the effectiveness and efficiency of the service and highlighted that traffic density maps were the second most used data layer relating to human activities in EMODnet.

2.2. Ongoing developments

A plan for enhancing the TDM service and producing new types of maps (i.e. detailed, vector and comparative TDMs) was presented at HLSG 6 (Brussels, 20 January 2020). The HLSG approved the plan and requested MSs to identify areas of interest that would be used to produce the detailed and vector maps. The areas which were defined by EMSA and MSs are presented in Figure 2.

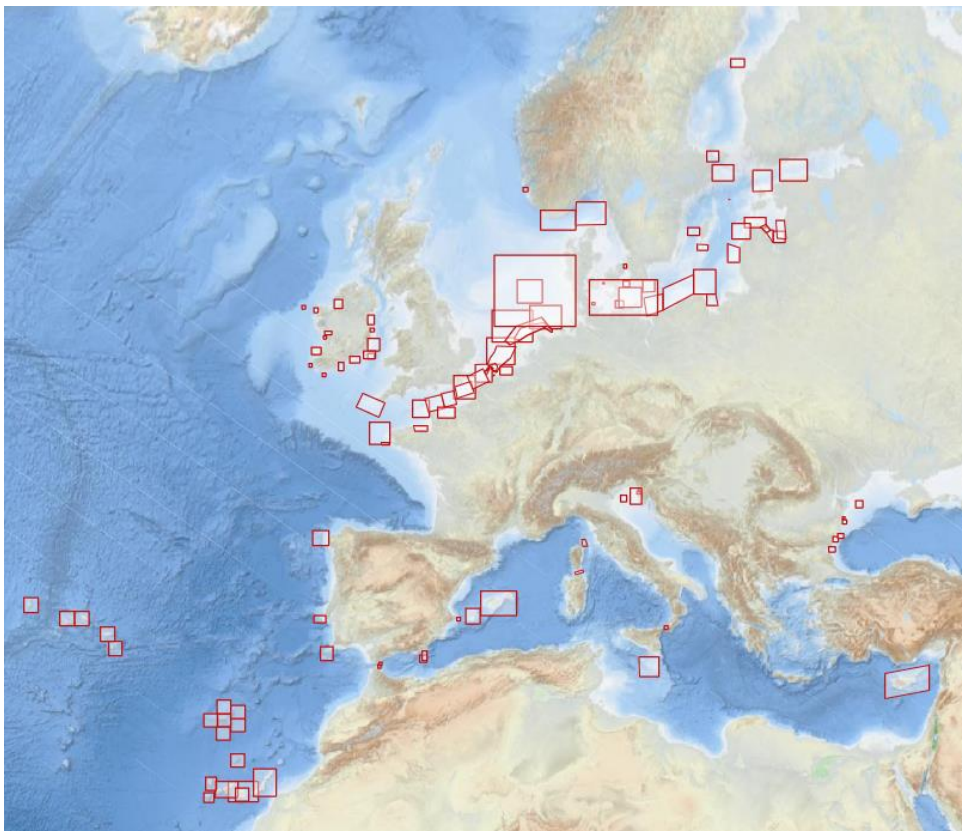


Fig.2: Specific areas of interests considered in the Detailed and Vector TDMs.

In addition to an existing Standard TDM, the following new types of maps will be developed:

- **Comparative TDMs** – Such maps compare traffic density values from two TDMs and present differences in values per cell using colour codes. Comparative TDMs will be constructed on the user's request (i.e. "on the fly") by comparing two selected TDMs of the same type, area, time category and ship type range but

different time periods. The calculated differences in values per cells will present e.g. a lower density - green; an equal density - yellow, a higher density - red. An example of Comparative TDM is presented in Figure 3 below.

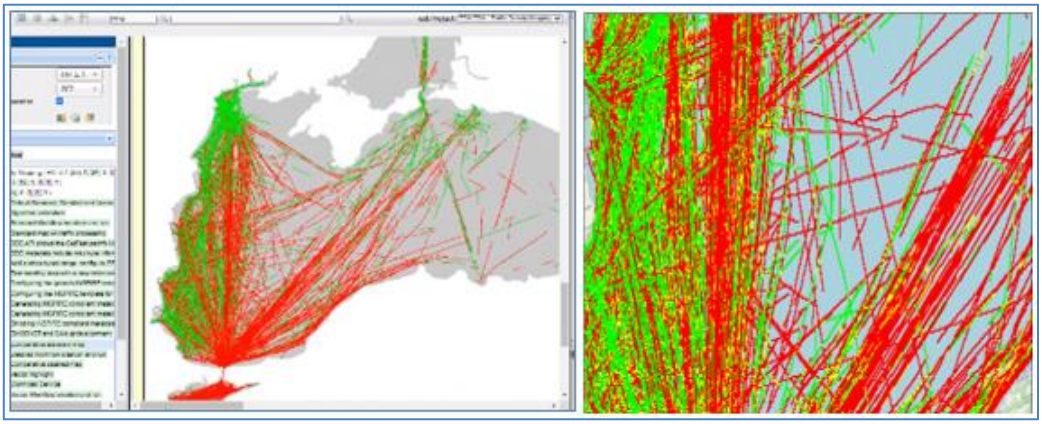


Fig. 3. Comparative TDM for the Black Sea area (sample from the test environment).

- **Vector TDMs** – Such maps will present routes of ships (as polylines) within predefined specific areas of interest. The Vector TDM will be generated for all time categories (i.e. month, season, year), but only for the ship type range "All traffic".

Fig. 4: Vector TDMs (sample from the test environment)

- **Detailed TDMs** – Such maps will present traffic densities using smaller grid cells (200 x 200 m). These maps will be generated for all time categories (i.e. month, season, year) and ship type ranges (i.e. Cargo, Tanker, Fishing, Passenger, All Other and All Traffic), but only for the predefined specific area of interest.

The developments are currently in the testing phase. It is expected that the new maps will be made available to SEG users during the 2nd half of 2021.

The developments are financed by the European Maritime and Fisheries Funds through the grant agreement between EMSA and DG MARE for the "promotion of interoperability between industry and competent

authorities in the European Maritime Single Window environment (EMSWe) under the CISE Process" (see agenda item SSN/LRIT 9.6.1).

2.3 Planned developments

The TDM service is developing gradually considering technological possibilities and new user requirements. Several suggestions for improvements of the service have been received from the MSs. Some of the proposals are being addressed in the developments of phase 2 (e.g. visualisation of density values, more detailed TDMs for specific areas, TDMs comparing feature and the TDMs downloading function). Some others are planned to be implemented during the next phase of the TDMS project (phase 3).

The following improvements are being considered for phase 3:

1) Additional types of traffic density maps for:
   - user-defined time periods (customised TDMs),
   - pre-defined ranges of the following ships particulars: gross tonnage, keel laying date, fuel type and engine RPM.
2) Statistics.

More details on such improvements are provided in Annex. The development should start by mid-2021.

3. Actions required

Member States are invited to take note of the above information.

Annex

TDMS phase-3 developments

The objective of the new developments planned for phase 3 is to provide additional types of traffic density maps and statistics to users of the SSN Ecosystem Graphical user interface (SEG).

Customised TDMs

The **Customised TDM** will present the traffic density for selected ship type ranges in selected geographical areas during time periods define by the user and expressed in a start month and an end month. The Customised TDM may be constructed for all ship types ranges and basic areas (as for Standard TDMs). The grids used as reference to build Customised TDMs will be the same as for Standard TDMs (i.e. 1x1 km). The minimum time period for the Customised TDM will be 2 months. The methodology to create Customised

TDMs will be the same as the Standard TDMs, except the time period, which will be defined by the user. Customised TDMs will be constructed on-the-fly on the user's request through SEG, by summing traffic density values in the selected monthly Standard TDMs.

Ships particulars TDMs

The "Ships particulars" TDMs will present the traffic density of ships with user-selected particulars. The following types of TDMs will be created: **Gross Tonnage TDMs, Keel Date TDMs, Engine RPM TDMs** and **Fuel Type TDMs**.

The methodology to generate these maps will follow same methodology as for the Standard TDMs but instead of sorting ships per types, all corresponding MMSIs will be sorted per ranges of ships particulars, depending on the type of map:

- for **Keel Date TDMs**, the following ranges of keel laying dates will be considered:
  - Keel date: ≤ 31.12.1999 (incl.);
  - Keel date: between 01.01.2000 and 31.12.2010 (incl.);
  - Keel date: between 01.01.2011 and 31.12.2020 (incl.);
  - Keel date: ≥ 01.01.2021 (incl.);
  - Keel date: Unknown (i.e. for ships without or with incorrect keel laying date).

- for **Fuel Type TDMs**, the following fuel types will be considered:
  - Fuel type: Residual;
  - Fuel type: Distillate;
  - Fuel type: LNG;
  - Fuel type: Other (includes all other values not listed above);
  - Fuel type: Unknown (for ships without or with incorrect a fuel type value).

- for **Engine RPM TDMs**, the following ships main engines speed ranges will be considered:
  - RPM: 0 – 129;
  - RPM: 130 – 1999;
  - RPM: ≥ 2000;

        - RPM Unknown (i.e. relates to ships without or with incorrect value of main engine RPM).

    - for **Gross Tonnage TDMs**, the following ranges of gross tonnage will be considered:
        - GT: ≤ 499
        - GT: 500 – 4999
        - GT: 5000 – 9 999
        - GT: 10 000 – 19 999
        - GT: 20 000 – 49 999
        - GT: 50 000 – 99 999
        - GT: ≥ 100000
        - GT: Unknown (for ships without or with incorrect gross tonnage value).

Maps will be created for each of the above ranges of ships particulars using the same areas and time periods as for Standard TDMs but only for ship type range “All traffic”. The grids used as reference to build the maps will be the same as for Standard TDMs (1x1 km). The colour coding will be applied to the ranges of values in each grid cell.

To construct Ships Particulars TDMs, the service will use Central Ships Database (CSD) as a reference to collect the ships particulars: gross tonnage, keel laying date, engine RPM and fuel type. The system will use the ship’s MMSI number to find the corresponding ship record in the CSD.

TDMS statistics

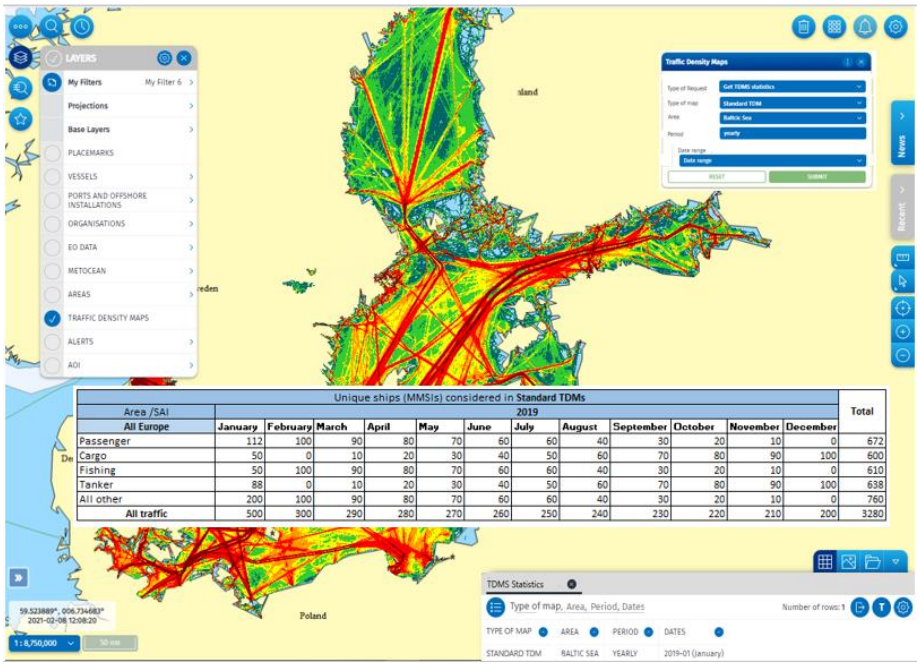
The TDMS will allow consulting and downloading the following statistics from SEG:

- shipping density statistics for the TDMS areas;
- shipping activity statistics for the predefined passage lines;
- shipping routes statistics for the predefined sectors of passage lines.

Shipping density statistics

These statistics will present the number of unique ships (MMSIs) counted in all corresponding TDMS areas during the time period. The corresponding metadata of Standard TDMs, Detailed TDMs, Vector TDMs and the Ships particulars group TDMs will be used as a reference to calculate the shipping density statistics.

The shipping density statistics will be produced for all TDMS areas and SAIs corresponding to Standard TDMs, Detailed TDMs, Vector TDMs and maps of the Ships particulars group (i.e. Gross Tonnage TDM, Fuel Type TDM, Engine RPM TDM and Keel Date TDM), and sorted per all related ship type ranges and ships characteristics (when applicable). Statistics will be produced for the seasonal and yearly time periods. The SEG will be adapted to allow users to display the TDMS statistics and to download them.



Unique ships (MMSIs) considered in **Standard TDMs**

Area /SAI	2019												Total
All Europe	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	
Passenger	112	100	90	80	70	60	60	40	30	20	10	0	672
Cargo	50	0	10	20	30	40	50	60	70	80	90	100	600
Fishing	50	100	90	80	70	60	60	40	30	20	10	0	610
Tanker	88	0	10	20	30	40	50	60	70	80	90	100	638
All other	200	100	90	80	70	60	60	40	30	20	10	0	760
All traffic	500	300	290	280	270	260	250	240	230	220	210	200	3280

Fig.5: TDMS shipping density statistics displayed in SEG (indicative example)

Shipping activity statistics

The metadata of Standard TDMs and the Ships particulars group TDMs will be used as a reference to calculate the shipping activity statistics. The statistics will be calculated on a monthly basis, for all time periods (i.e. month, season, year), ship type ranges and ships characteristics (when applicable) related to the Standard TDMs and the Ships particulars group TDMs (Gross Tonnage TDM, Fuel Type TDM, Engine RPM TDM and Keel Date TDM), but only for the area “All Europe”.

The shipping activity statistics will present both the number of ships routes and the number of unique ships (MMSIs) recorded when crossing pre-defined passage lines during the statistics periods. The statistics will include the total numbers of crossings and the numbers of crossings in each of the pre-defined passage directions (e.g. N-S/S-N or E-W/W-E) for each passage line.

For the Standard TDM criteria, the above numbers will be sorted also per the ships types ranges. For the Ships particulars group TDMs criteria the above numbers will be sorted per ranges of ships particulars (depending on the type of map).

The passage lines for the statistics calculation will be predefined in the system. The system administrator, however, will have the possibility to configure new passage lines.

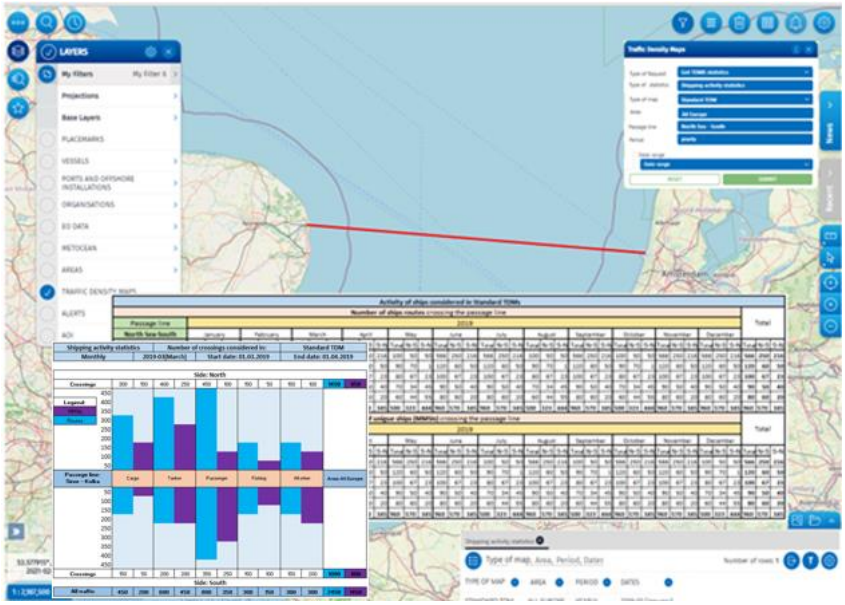


Fig.6: TDMS shipping activity statistics displayed in SEG

Shipping routes statistics

The shipping routes statistics will present the numbers of ships routes that crossed pre-defined sectors of passage lines during time periods (i.e. month, season, year). To create statistics, each of the predefined passage lines will be divided in 20 equal sectors (segments).

Statistics will include the total numbers of crossings and the numbers of crossings in each direction (i.e. N-S/S-N or E-W/W-E) for each sector of the passage line.

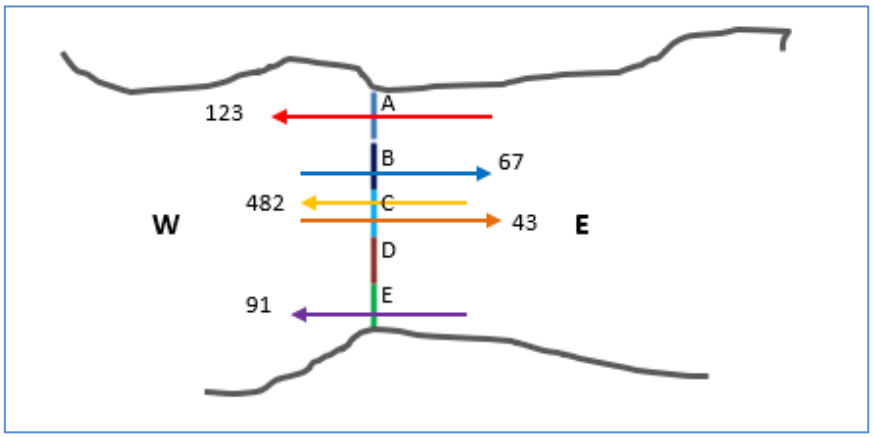


Fig.7: The passage line's sectors (indicative example).

The shipping routes statistics will be provided for the ships' types range "All traffic", without sorting per individual ships types ranges. The statistics will be created for all time periods: monthly, seasonal and yearly. As for shipping activity statistics, the system administrator will have the possibility to configure new passage lines and their sectors.