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A future for historical LRIT data

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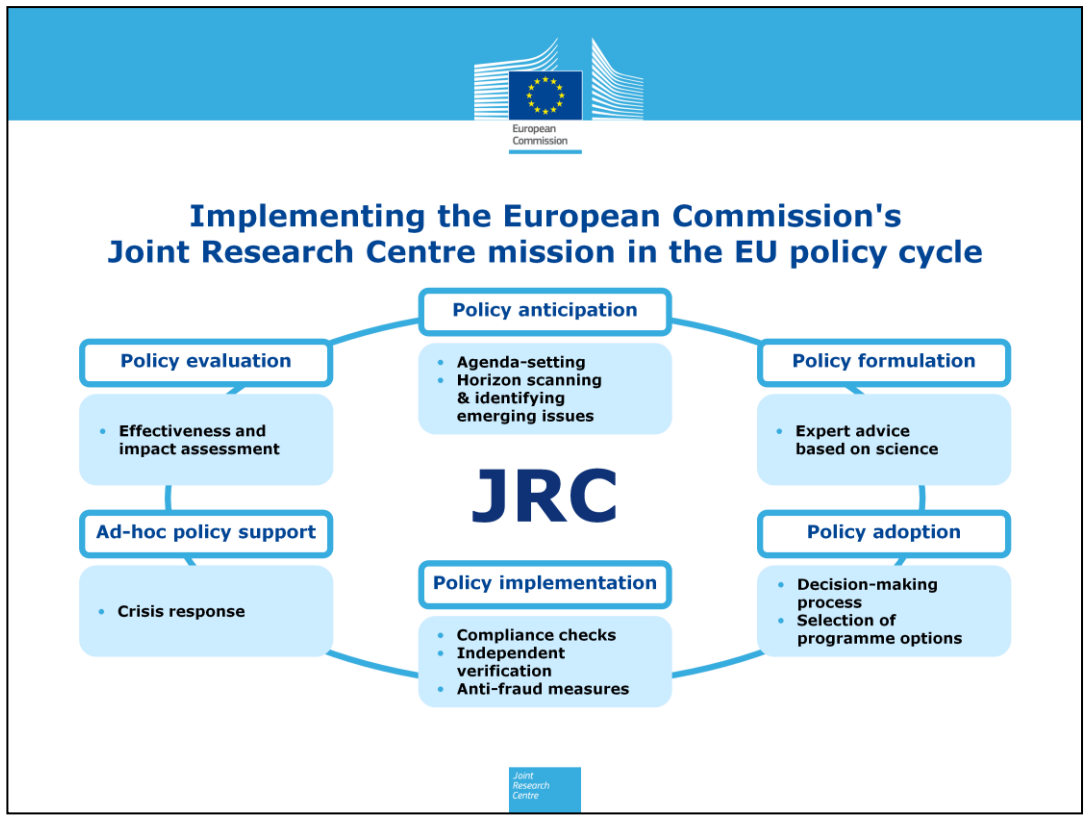
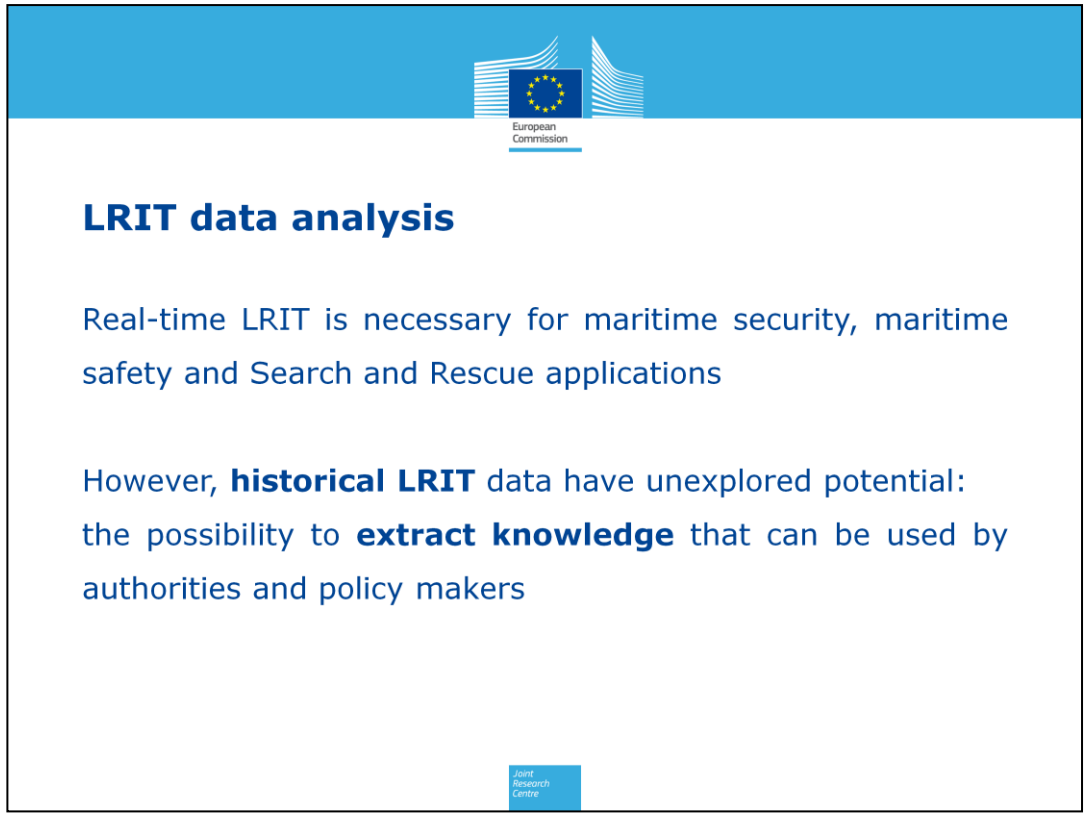


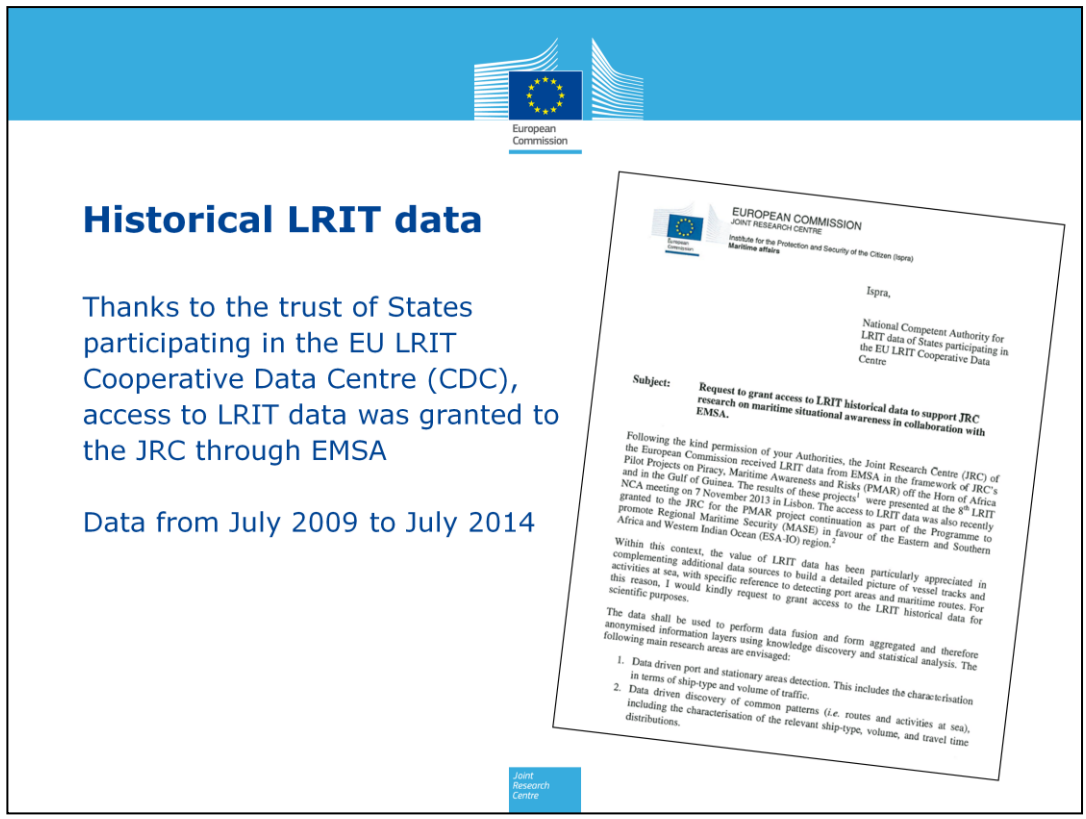
As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle. Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the EU Member States, the scientific community and international partners.

JRC Maritime Affairs Unit – Maritime Surveillance and Situational Awareness area overview.



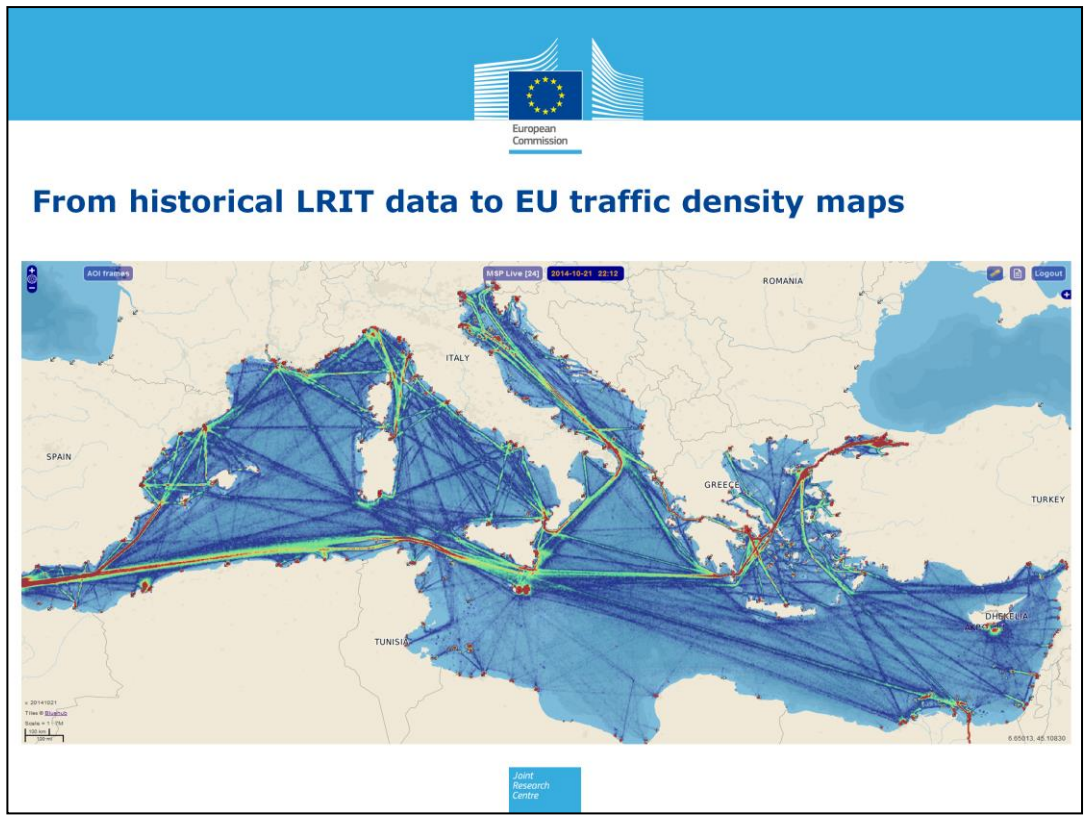
The JRC has been carrying out "knowledge discovery" research on ship tracking data (e.g. Automatic Identification System - AIS).

This presentation will introduce the results of several applications of processing Long Range Identification and Tracking (LRIT) data, giving an insight into the potential of the data for policy support.



Through EMSA, access to LRIT historical data was granted to the JRC for scientific and statistical purposes. It enabled the JRC to perform data fusion and to form aggregated information layers in which ships are anonymised. The aim was to investigate patterns in terms of ship-type and volume of traffic as well as ship routes and activities, and therefore be able to detect anomalies as deviations from the detected "normal" behaviour.

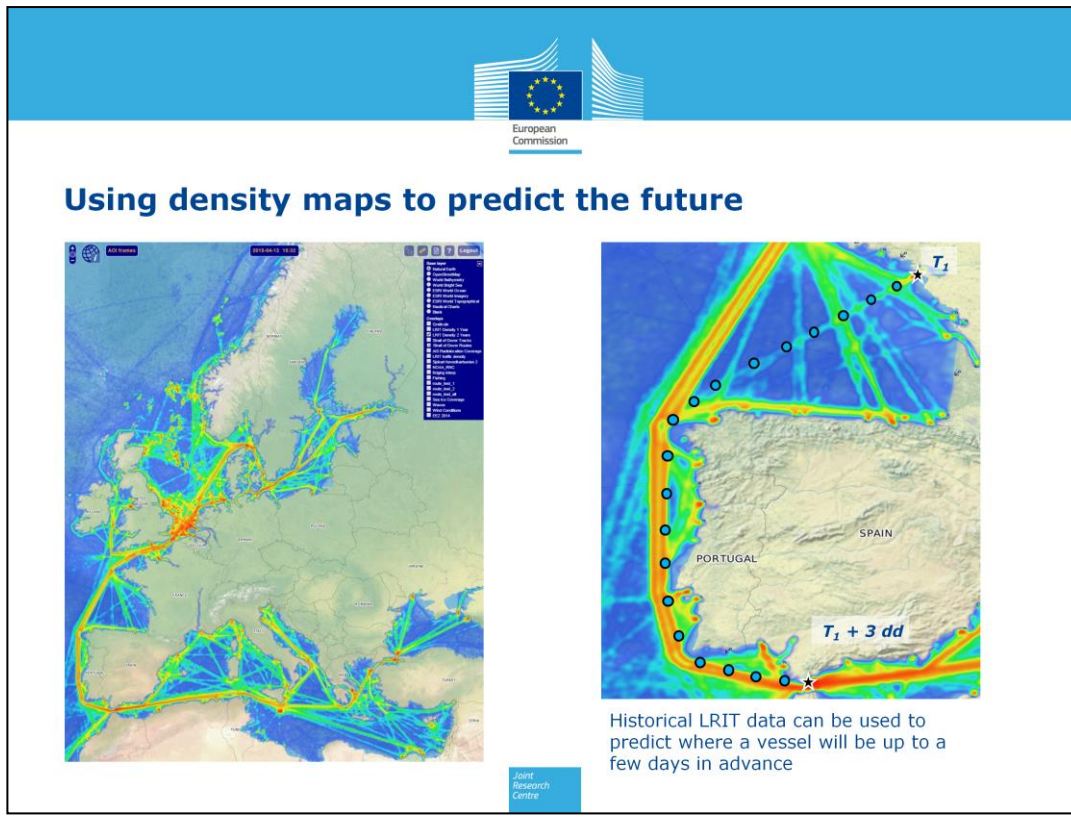
The EU LRIT Data Centre was set up as a cooperative data centre. There are currently approximately 40 States participating in the EU LRIT CDC: all EU Member States, Iceland and Norway, and four Overseas Territories of EU Member States (Greenland, Curacao, French Polynesia and New Caledonia).



Unlike other tracking systems, LRIT offers uniform, homogeneous and reliable density maps.

Although the LRIT refreshment interval is relatively long (6 hours) compared to other tracking systems (e.g. AIS), LRIT provides a more reliable traffic density map as it is virtually not affected by reception coverage limitations.

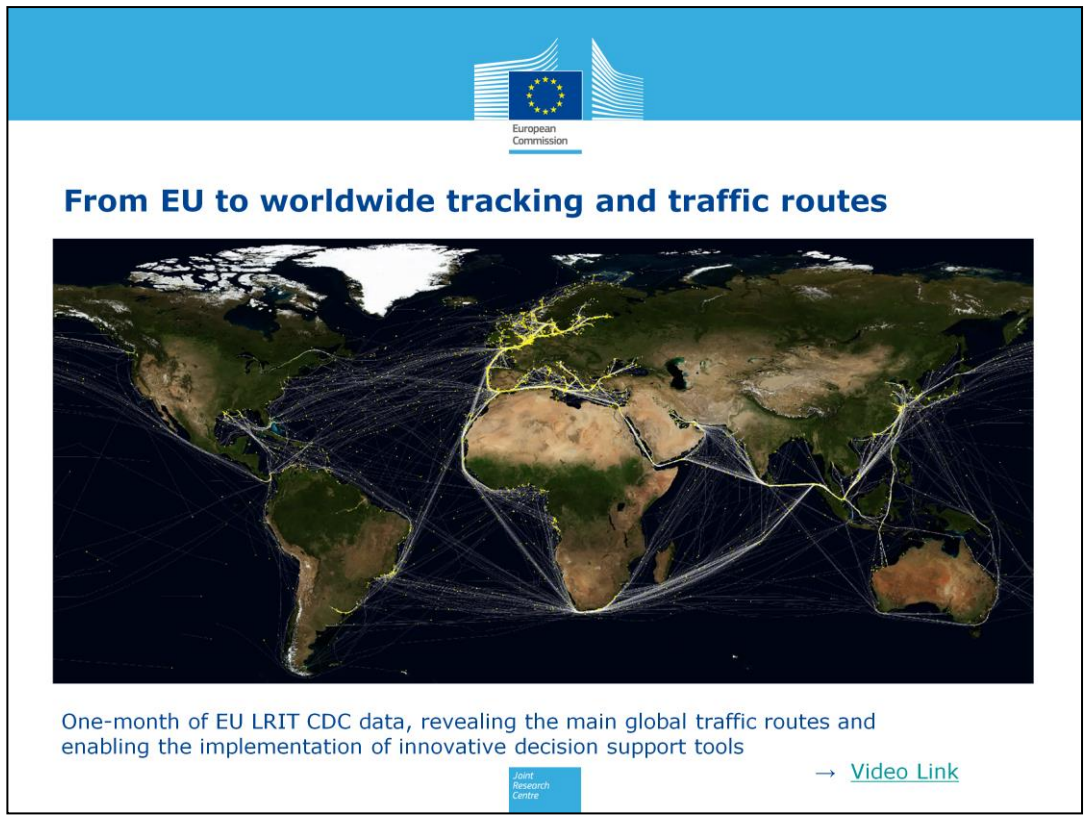
Similar work of producing traffic density maps has also been undertaken by EMSA.



The density of vessels can be used for many different applications.

As an example, historical data can be used to predict future vessel positions.

On the right: Knowing the route Nantes Saint-Nazaire – Gibraltar and the average duration of the journey (3 days), it is possible to predict the vessel positions during the journey based on its time of departure (T1).

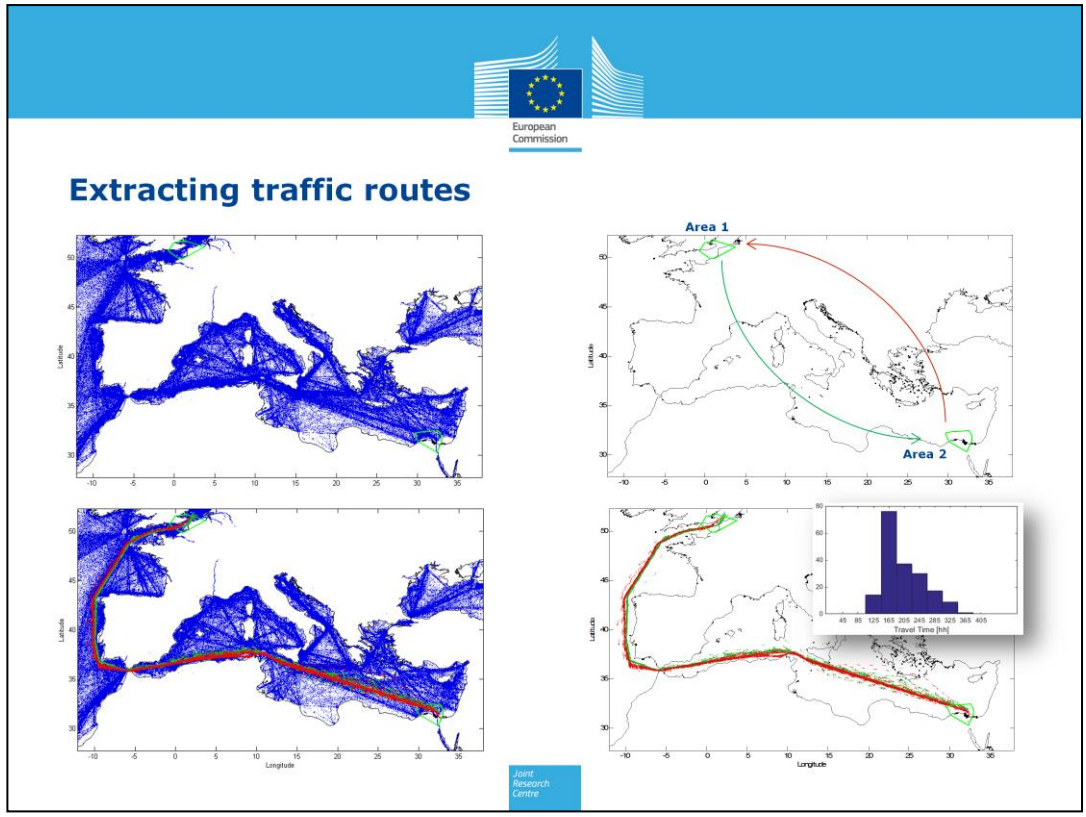


An additional processing level was achieved by playback of global vessel tracks using the JRC's Blue Hub data fusion technology.

In the figure, the main maritime routes are shaped by LRIT CDC tracks in a relatively short time interval: 15 May 2014 - 15 June 2014.

This paves the way for the extraction of maritime *de facto* routes and patterns.

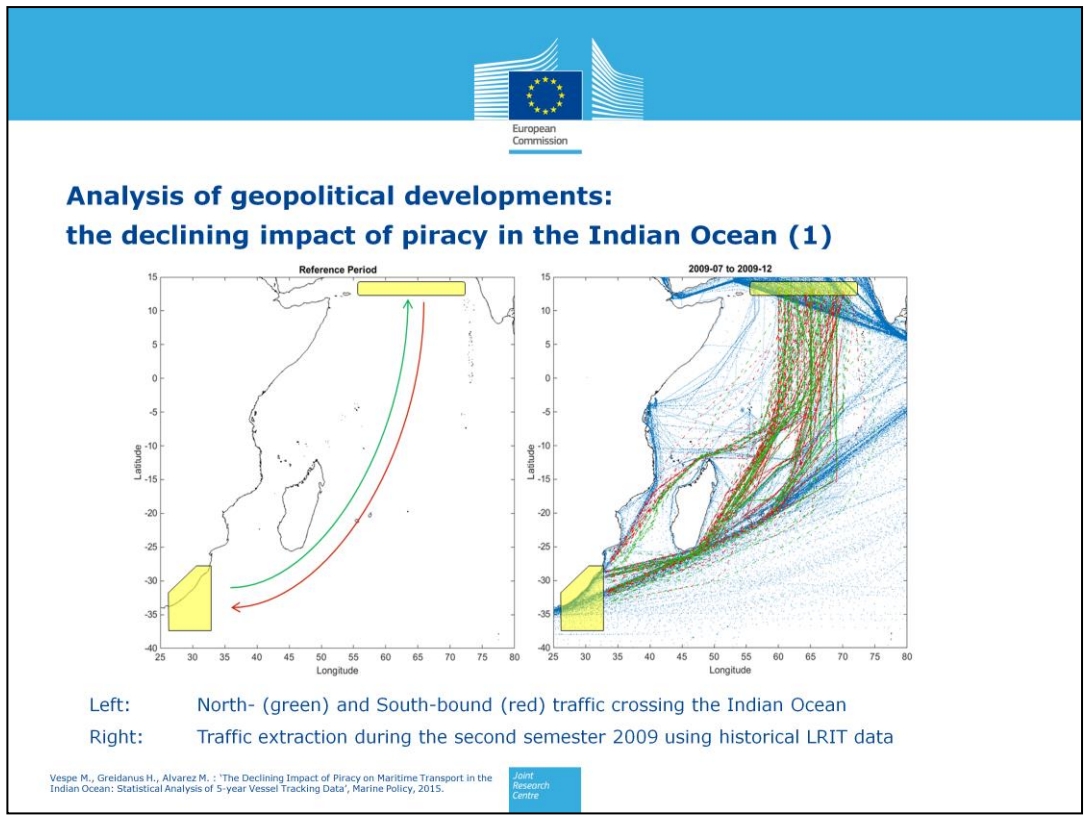
Video Link



Through research, the JRC has developed tools to reliably extract traffic patterns and routes.

In this case, out of the available historical data (blue), it is possible to isolate the direct trajectories connecting Area 1 (the Channel) to Area 2 (Suez canal) and vice versa, with the result of highlighting the main routes.

Furthermore, it is possible to analyse the travel time statistics of such routes.

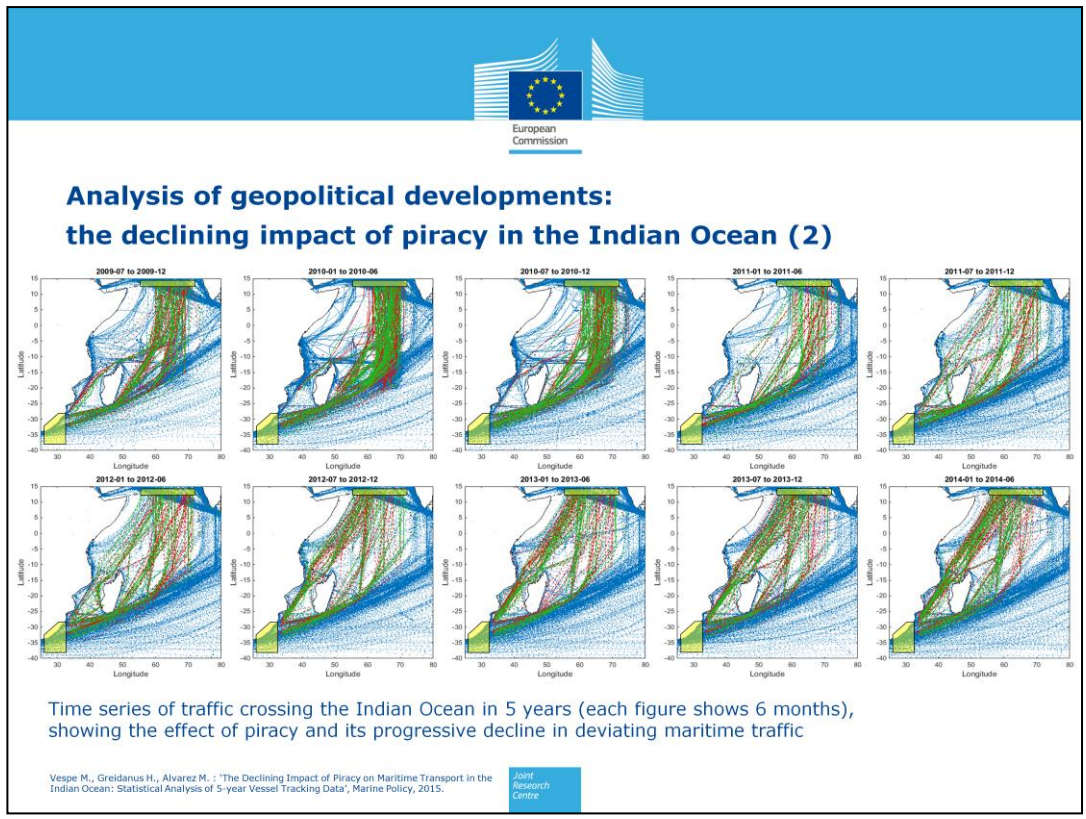


Thanks to counter-piracy initiatives – such as EU Naval Force ATALANTA, NATO Operation Ocean Shield as well as the application of Best Management Practices (BMP) – a decline of piracy events has been observed in the Horn of Africa and Western Indian Ocean.

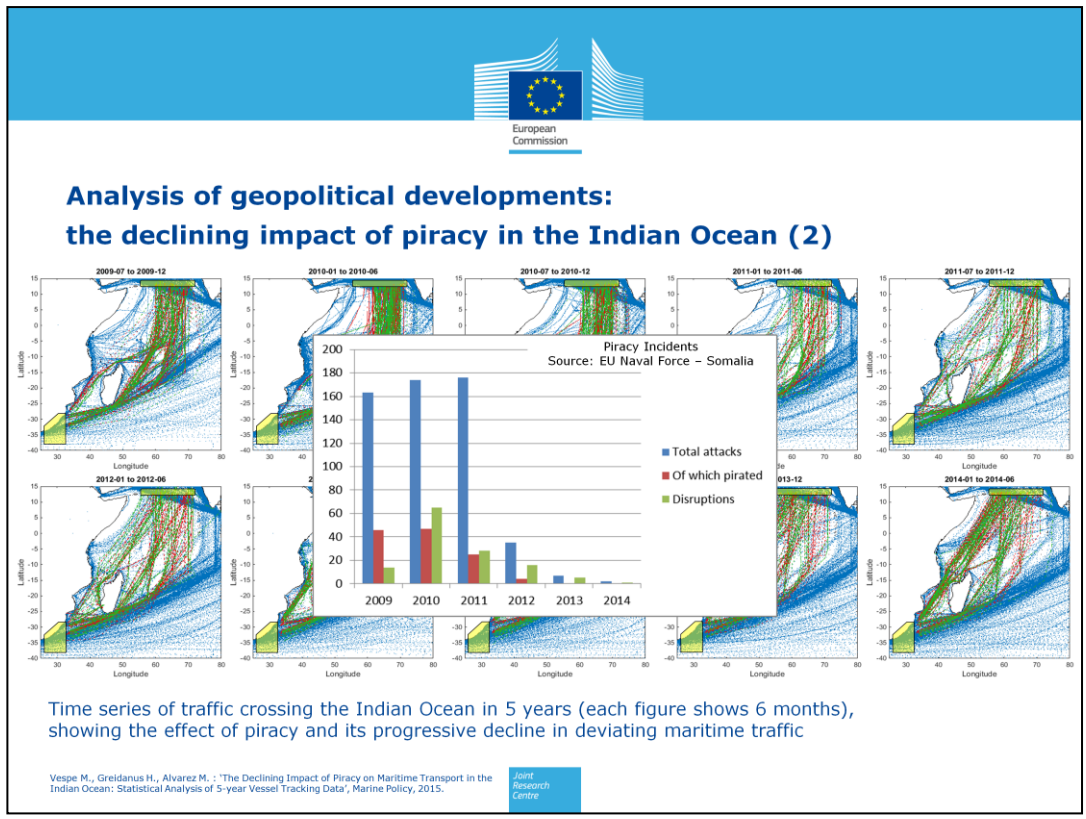
Unlike other positioning systems such as AIS, which was commonly switched off in the area in order to reduce the vulnerability of being tracked by pirates, LRIT continued to provide uninterrupted position reports.

It the figures, the Northbound (green) and Southbound (red) traffic crossing the Indian Ocean and connecting the two yellow polygons (left) are shown. On the right, the traffic extraction results are shown following the scheme on the left during the second semester 2009.

It can be concluded that navigation in piracy high risk areas extending over the Somali Basin was avoided by most of the ships, extending the average length of both routes.

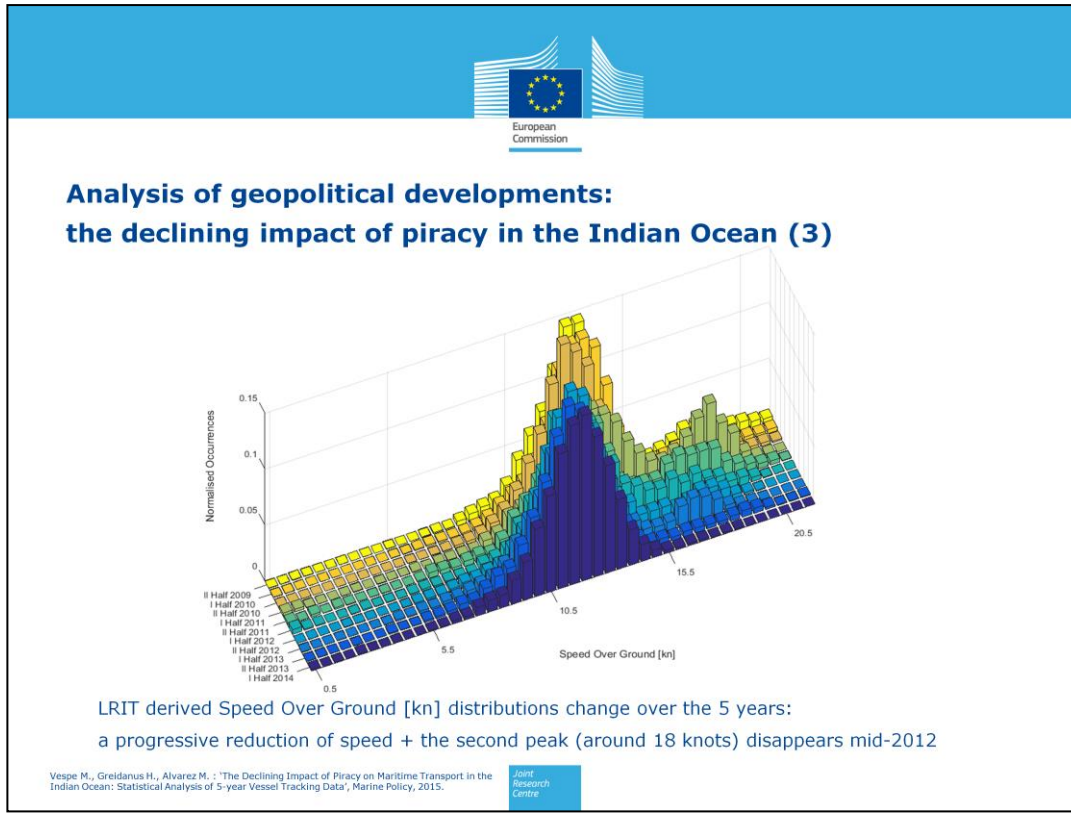


The time evolution of the routes is clearly correlated to the number of piracy attacks and disruptions recorded in the Indian Ocean: after 2010, progressively more vessels take advantage of a gradually reduced risk of being attacked and return to travelling along the shortest path.



The time evolution of the routes is clearly correlated to the number of piracy attacks and disruptions recorded in the Indian Ocean: after 2010, progressively more vessels take advantage of a gradually reduced risk of being attacked and return to travelling along the shortest path.

Note that the shortest and longest routes differ about 450 NM.



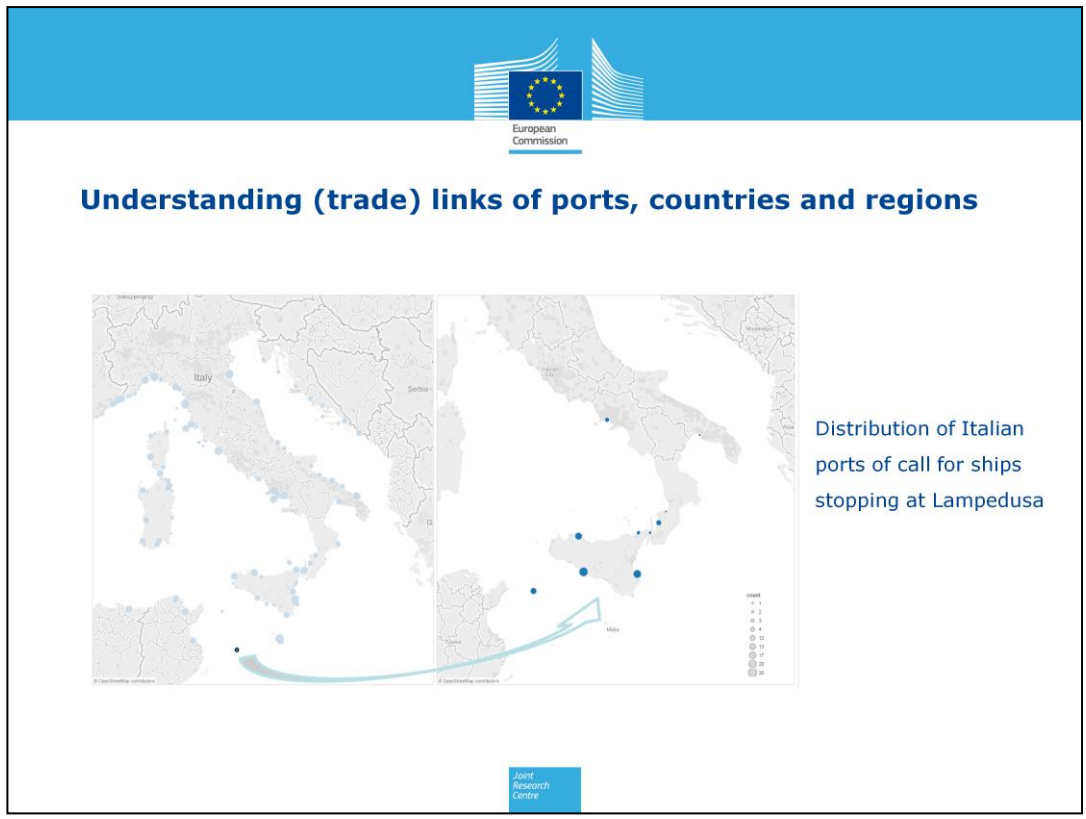
Fuel cost associated to increased speed outweigh the ones related to rerouting.

Sailing at higher speed reduces the likelihood of being boarded by pirates. Increasing speed is part of the Best Management Practices (BMPs) to be applied in the piracy high-risk area off Somalia.

In the figure, a progressive reduction of Speed Over Ground can be observed between July 2009 – July 2014.

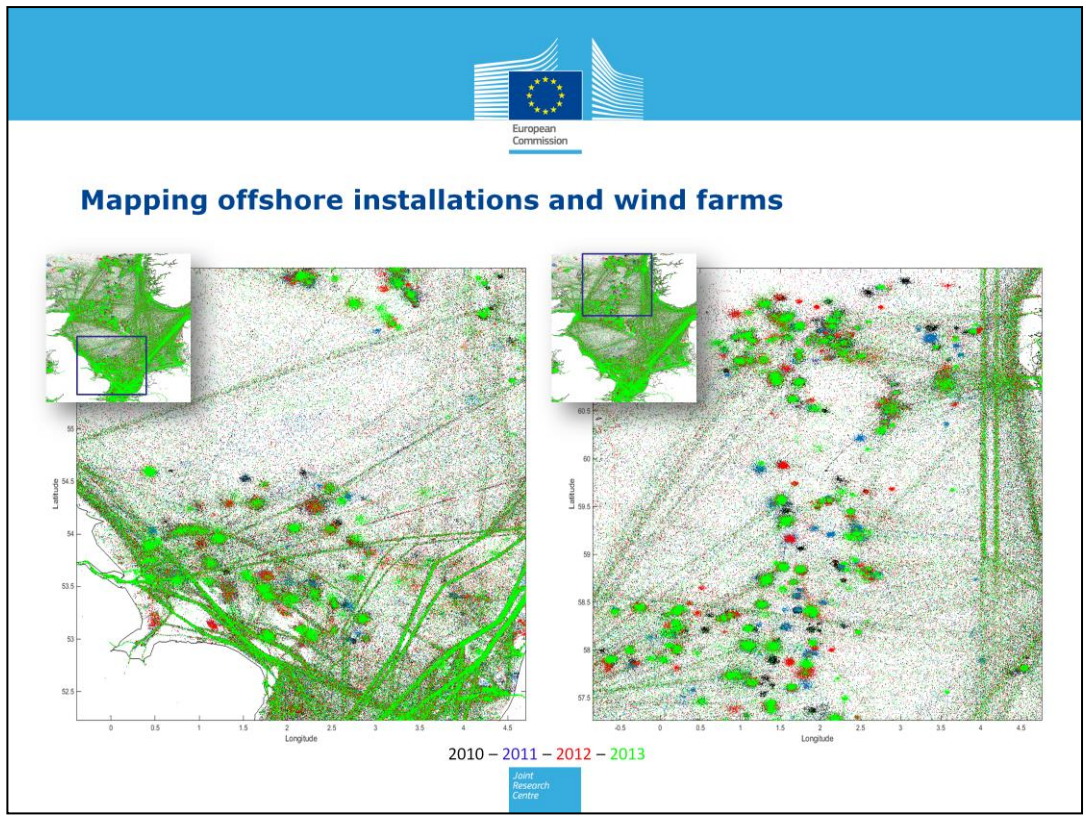
In addition, the second peak around 18 knots has disappeared around mid-2012.

The analysis demonstrates how spatial data mining - applied for the first time to LRIT data - can be used to understand the impact of geopolitical issues on maritime trade routes, a key element for policy and decision makers.



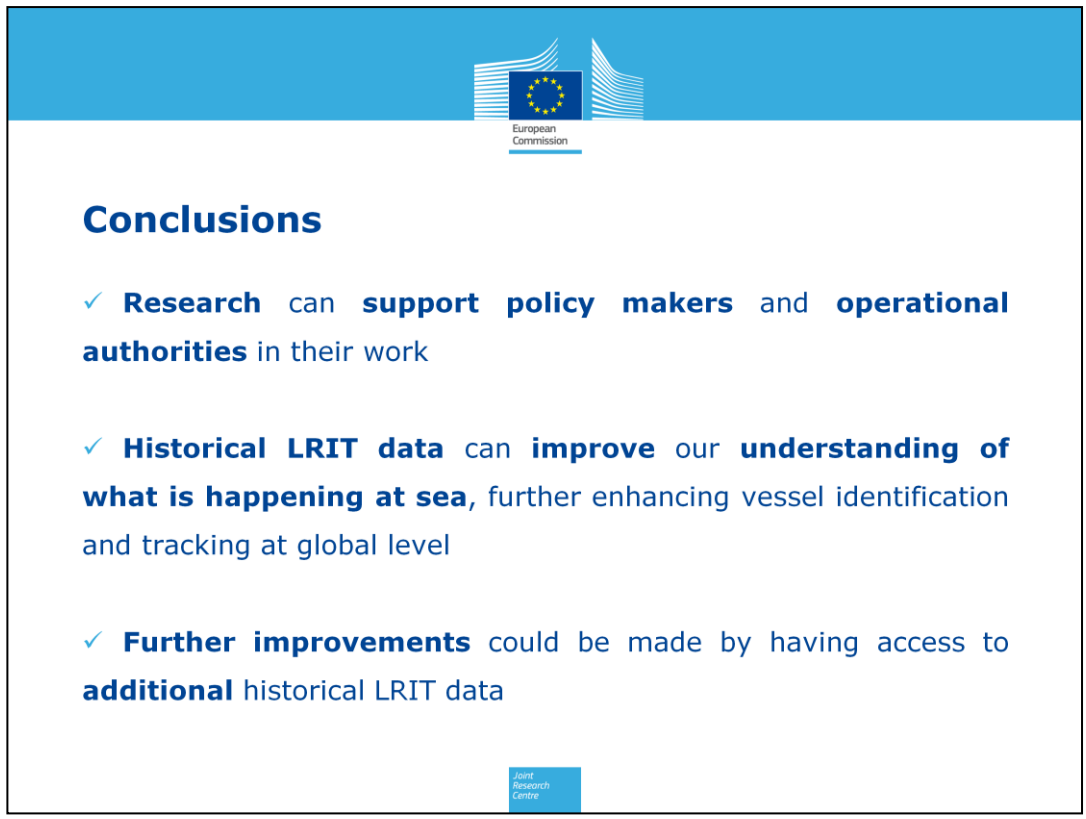
Historical LRIT data can also be used to provide policy makers with independent geospatial data for the analysis of trade flows.

In this slide, using one-month LRIT data, the ports of call to/from Lampedusa (left) are highlighted (right). The preliminary analysis shows the expected gravitation with the ports of Sicily.



Historical LRIT data can also contribute to knowledge necessary for the off-shore wind energy sector, providing information on the installations and its cost-benefits.

In the pictures, platform supply vessels clearly cluster around offshore facilities (e.g. during the installation phase) in two areas of the North Sea, colour-coded from 2010 to 2013.



Historical data from the EU LRIT CDC have demonstrated the value of LRIT to improve the understanding of what is happening at sea, further enhancing the global vessels identification and tracking.

This has many useful emerging applications such as situational prediction, routes characterisation, trade analysis, offshore platforms knowledge base and impact of geopolitical issues on transport.

Further developments at global scale could be obtained by accessing LRIT historical data of additional LRIT data centres.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