BIG DATA FOR IMTS, AIS DATASETS AND TRADE STATISTICS

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United Nations Statistics Division
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Global Working Group on Big Data for Official Statistics

- Access and Partnerships
- Big Data and the SDGs
- Mobile Phone Data
- AIS Data
- Satellite Imagery and Geo-Spatial Data
- Scanner Data
- Social Media Data
- Training, Skills and Capacity-building
- Global Platform for Data, Services and Applications
WHAT IS AIS DATA – BASIC INFORMATION

- The automatic identification system (AIS) is a tracking system for ships, originally developed for collision avoidance.

Reference: Lloyd's List Intelligence (2017). Understanding AIS.
WHAT IS AIS DATA – BASIC INFORMATION

Dynamic information
- Automatically transmitted
- Every 2 to 10 seconds when moving
- Every 3 to 6 minutes when anchored

Maritime Mobile Service Identity number (MMSI) – nine-digit number
- AIS navigational status
- Rate of turn
- Speed over ground
- Position coordinates (longitude/latitude)
- Course over ground
- Heading
- Bearing at own position
- UTC second

Static information
- Manually transmitted
- Every 6 minutes

International Maritime Organization number (IMO) – IMO + seven-digit number, unique reference for ships
- Call sign
- Name
- Type
- Dimensions
- Location of the positioning system’s antenna on board the vessel
- Type of positioning system
- Draught
- Destination
- ETA (estimated time of arrival)

Reference: MarineTraffic (2018). What kind of information if AIS-transmitted?
WHAT IS THE UN GLOBAL PLATFORM

- Global platform for
  - Exchanging ideas and methods for processing, analyzing and visualizing Big Data
  - Storing Big Data sources and enable processing, analyzing and visualizing the data
  - Demonstrating the value of Big Data in better decision making through pilots and case studies
  - Providing training materials and workshops for capacity building
AIS DATA - HOW DOES IT LOOK LIKE

- Get a first overview on ships in the selected area
- Get more information by clicking on a single vessel

Nicer presentation of information
OVERVIEW AND MORE SYSTEMS/TOOLS

Platform providing data, methods and code for various fields of official statistics

Receiving and providing AIS data → Storage of data → Processing and visualizing data → Tools for analysis

**ORBCOMM**
Data aggregator

**exactEarth**
Database storing AIS data

**APACHE HBASE**
Service provider for advanced analytical techniques

**CCRI**
Analytics engine for large-scale data processing

**APACHE SPARK**
Interactive web-application for creating documents

**STEALTH**
Browser-based visualization

**GEOMESA**
Tool for large-scale geospatial analytics

**JUPYTER**
Version control and code sharing
COMPARISON OF MARITIME DATA AGGREGATOR

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<th>Dataset</th>
<th>Median</th>
<th>Mean</th>
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1. Introduction
   a. About Global Working Group
   b. About AIS Task Team
   c. About AIS

2. Overview of AIS datasets
   a. Description
   b. Data providers
   c. Source and data aggregator
   d. Limitations – update frequency, interval
   e. Quality (input)

3. Data cleaning and preparation
   a. Data recording processes
   b. Methods to identify data gaps
   c. Gaps in coverage
   d. General and specific data cleaning

4. Case studies
   a. UK ONS: Port traffic, time spent in ports
   b. UNCTAD/MarineTraffic: Maritime indicators
   c. EU JRC: Fishery
   d. UN Global Pulse: Ship in distress, disease distribution
   e. CBS Netherlands: Inland waterway

5. AIS data at the UN Global Platform
   a. Data cleaning and preparation
   b. Step-by-step guidelines with sample scripts
   c. Visualization

6. Future work
   a. Inventory of relevant data sources (i.e., global ship registers, trade data)
   b. Linking with other data sources
   c. Other experimental data form AIS
UK USE CASE

- UK uses AIS data to get early economic indicators
- Indicator 1: Time in port – aggregated time in seconds of shops in UK ports
- Indicator 2: Total traffic – number of unique ships entering UK ports

Table: Correlation coefficients for the month-on-month growth rates for the shipping indicators and the economics statistics

<table>
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<tr>
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<th>Imports (ONS)</th>
<th>Exports (ONS)</th>
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<tbody>
<tr>
<td>Time-in-Port</td>
<td>0.43</td>
<td>0.06</td>
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<tr>
<td>Port traffic</td>
<td>0.64</td>
<td>0.23</td>
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Reference: Data Science Campus (2019). Faster indicators of UK economic activity: shipping
## Future Ideas

<table>
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<tr>
<th>Issue</th>
<th>Idea</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Ships might not cover total trade</td>
<td>Use AIS data for countries that predominantly use shipping as mode of transport for trade</td>
<td>Better coverage of total trade</td>
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<tr>
<td>Correlation is low for total imports and exports</td>
<td>Get indicators for specific goods, e.g., oil exports and imports of specific countries</td>
<td>Higher correlation between AIS indicators and benchmark</td>
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<td>AIS data does not include information about the cargo the ships carry</td>
<td>Combine AIS data customs data: with information on vessel type, trade flows, and the countries of departure and destination</td>
<td>More exact and current picture of trade flows</td>
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<td>Economic forecasts are not timely</td>
<td>Use information on the speed of vessels, port departures and idle ships</td>
<td>Nowcasts and forecasts of trade and economic growth</td>
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<tr>
<td>Lack of custom data</td>
<td>Use AIS data and other sources to estimate trade</td>
<td>Proxy for missing trade statistics</td>
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THANK YOU

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