The future of data in the maritime sector: driving change through geospatial data
About GeoSpock

GeoSpock brings sensor data to life – translating complex connections into meaningful visualisations that reveal the bigger picture. Its state-of-the-art spatial big data platform has the power to transform lives and businesses – whether its cutting harmful emissions by reducing traffic congestion or maximising profitability by optimising commercial operations.

www.geospock.com

About Baltic Exchange

The Baltic Exchange is the world’s only independent source of maritime market information for the trading and settlement of physical and derivative contracts. Its international community of over 650 members encompasses the majority of world shipping interests and commits to a code of business conduct overseen by the Baltic.

www.balticexchange.com
Since its 1744 founding in a London coffee house, the Baltic Exchange has provided a trusted, independent source of information on the world’s maritime markets.

In its 275 years, the Baltic Exchange has sought to provide clarity to its members across the shipping industry, from the pioneering maritime venturers of the past, to today’s modern, multinational organisations who serve as the arteries of international commerce for our globalised world.

Throughout the Baltic Exchange’s history, the shipping industry has undergone myriad changes, many of those driven by new technology. From the development of the first ocean-going steamships, to containerisation and the engineering marvels of the Suez and Panama Canals, technological innovation has ensured shipping’s ability to survive and thrive at the centre of the turbulent forces of the global economy.

The wave of digitalisation sweeping the world today means the maritime industry is once again on the cusp of evolution. Access to up-to-date, accurate sources of information is now as critical to success as the reliable availability of fuel. For those organisations who are able to harness data successfully, the future will be cleaner, more efficient, more agile, and ultimately more profitable.

The Baltic Exchange has partnered with GeoSpock, the geospatial big data company, to enable continued provision of independent, impartial assessment of the maritime industry as it enters into the data age. This partnership aims to work together with the Exchange membership and broader industry to provide data access at a scale never before seen in the maritime sector.

This document outlines our vision, and the first stepping stones in our initiative to help the entire maritime industry uncover value from the vast store of data sat just beyond their fingertips. Together, we can chart a course through the new, digital ocean, to ensure future sustainability, strength and prosperity for all.

The Baltic Exchange
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1 Where are we now?

1.1 The dawn of the data age in maritime

The 21st Century is often regarded as the dawn of the data age. The rise of the internet, smartphone and digital technology has completely revolutionised methods of communication and commerce, heralding seismic changes in the way society and organisations engage and transact with one another. Technology has enabled the instant access of large volumes of data and information from anywhere on the planet.

However, whilst digitalisation has revolutionised the transmission of information around the world, the ceaseless flow of physical goods also continues unabated. Older and more tangible than the electronic signals of the data age, physical trade remains no less vital to the globalised world of today. The internet and e-commerce may have brought companies into the homes of their customers, but it is still the job of the asset and logistics sectors to deliver. In this regard, the maritime industry reigns supreme, accounting for 90% of global trade volumes and delivering cargo more efficiently than any other method of global transportation.

Of course, the partnership between physical and digital methods of commerce and communication is also providing great benefits within the maritime sector. As international commerce increases, new markets are uncovered and trade routes developed to service them. Within the industry, organisations must now begin to leverage digital technologies to uncover the vast potential of their data. The improvement in location data records provided by the widespread deployment of satellite constellations and improved ship broadband connectivity have already begun improving vessel operational performance as well as quality of life for thousands of seafarers. Round the clock connectivity facilitates oversight of even the most remotely operating vessels, allowing crews and companies to understand and react to changing local and global events as they occur. As ships, ports and governments install more sensor systems, the volume of measurement data collected and collated for analysis is also rising exponentially. For the maritime sector, harnessing the potential of this data is now the industry’s greatest opportunity, but also its greatest challenge. The dispersed, global nature of the sector, combined with strong competition between operators, does not easily facilitate the collaboration and cooperation required to fully harness value from data. In addition, a lack of effective methods of knowledge communication risk damaging the reputation of the industry in the face of greater scrutiny from customers and governments. The industry must therefore seize the moment itself and come together to unlock the full value of its pooled data, whilst demonstrating its credentials and importance on the global stage.

SWOT analysis of the maritime sector shows how its size, position, and existing data reserves make it a force to be reckoned with, and provide opportunities for significant value to be unlocked. However, the industry needs to come together to overcome its decentralised nature now, as the long life of many of its largest assets means decisions made today have impacts well into the future. Only by doing so can the industry seek to reduce, or at least understand, its exposure to economic and climate risk, and confidently portray its ambitions to a wider audience.
1.2 The maritime data landscape

The maritime industry already collects and records a wealth of data associated with its activities and operations. Noon reports provide regular information on vessel performance, progress and fuel consumption at sea, whilst bills of lading are vital documents detailing cargo histories and receipts which facilitate international trade. Some data, such as vessel specification information and performance benchmarking, is static, rarely changing. However, the majority of data is dynamic, requiring updates to remain valid and relevant. Even relatively fixed information can become out of date if vessels undergo substantial refitting or modification over the course of their lives. Ensuring the validity of data therefore requires the constant transfer of information between parties.

However, the web of maritime data is highly complex, with organisations and stakeholders in the industry often creating and curating only a relatively small part of the complete picture. This can expose parties to risks from beyond the limits of their own data horizons, from delays due to operational issues at ports, to fuel consumption disputes between vessel owners and charterers. Dealing with this in the current environment requires complex chains of communication, increasing transaction costs as well as uncertainty. Improving the visibility of information and value chains will help provide parties with much needed clarity across the industry and enable more confident, effective use of the significant quantities of data already encapsulated beneath the maritime umbrella.
2 Where are we going?

2.1 The connected world

We live in an increasingly connected world. By 2022, it is estimated that 60 billion devices will be connected to the internet. Each one will create a constant stream of data, much of it geospatial in nature. The ability to understand how people, items and objects move around and interact with each other in near real time will provide a step change in our understanding of everything from supply chains and urban planning, to advertising and consumer behaviour.

The maritime industry has also begun its foray into data driven locational intelligence. AIS data already tracks the position of the ocean-going fleet, relaying positional information to provide updates on global vessel movements many times an hour. With around 80,000 merchant vessels in service on our oceans each day, such technology generates significant quantities of data in its own right. However, this is just the starting point on the journey towards a much more closely integrated global ecosystem. Sensors are increasingly deployed to monitor a whole range of activities in real time, from flow meters which measure exactly how much fuel is injected into vessel engines, to automated detection systems for water ingress and other marine hazards. Tracking is becoming more precise, with systems in development to allow not only the monitoring of vessels, but the individual containers they carry from port to port and country to country.

The alliance of this dense web of locational intelligence with new automation technologies provides a tantalising window into the ships of the future. Remote operations are already becoming common on fixed offshore structures such as oil rigs, and the increasing reliability and bandwidth of wireless communications technology means the development of such solutions for more mobile vessels is close to reality. Although more distant, autonomous vessels are a research priority for many engineering firms. These intelligent craft provide the possibility of a safer maritime environment for vessel crews whilst also increasing operational productivity. All these technologies and their associated benefits depend on a world more connected than ever before, with the ability to harness data with confidence and at scale.
2.2 Baltic Exchange: data and digital strategy

As the world’s leading source of independent maritime market information, the Baltic Exchange is no stranger to the value inherent within the recording and collation of data. The members of the Baltic Exchange comprise in excess of 650 organisations acting as shipbrokers, charterers, owners and operators spanning the majority of world shipping interests. All rely on information provided by the Baltic Exchange to operate sustainably and profitably. Each day, the Baltic Exchange publishes a set of indices for use in the trading and settlement of physical and derivative shipping contracts, underpinning an international market performing millions of dollars worth of transactions daily. These indices cover the spot freight markets as well as sale & purchase, ship recycling and operational costs for the dry bulk, tanker and LNG sectors. They are based on the collated opinions of a global panel of independent shipbrokers.

The freight market has high volatility and can fluctuate due to a range of factors such as:

- vessel supply and commodity demand,
- seasonal and climatic changes in weather and the environment,
- variability in bunker fuel cost,
- geopolitical risk assessment of shipping lanes and crucial choke points, and
- general market sentiment.

Independent assessment of such complex variables and the analysis of data derived from them is therefore vital for the stability and sustainability of global maritime markets. The Baltic Exchange is, and always has been, a data company.

However, as the world embraces digital technology, new sources of data abound. Sensors are also being deployed increasingly ubiquitously to enable the recording and transmission of data. Measurements are becoming more diverse, more accurate, more precise and more instantaneous than ever before. In order to leverage such data successfully, the Baltic Exchange is defining an updated, data-first strategy to enable the organisation and its membership to benefit from these new and rapidly proliferating sources of information. Of primary importance in this vision is the need to not only efficiently collate this new information, but provide a platform allowing its effective communication to Baltic Exchange members and the wider maritime community. Through the data provided on this platform, the maritime market will have complete and instant visibility into the shipping landscape, allowing companies to analyse and optimise shipping on a global scale, while providing regulators and governments with a new level of transparency.

As a trusted organisation with a long maritime history, the Baltic Exchange is well positioned to act as the independent custodian of such a platform. The data housed within such a repository may be new, but the standards of independence and propriety espoused by the daily activities of the Baltic Exchange will remain the same. The success of such a platform requires its users to have confidence in the data on which it is built, reducing uncertainty and allowing decisive actions to be taken based upon accurate insight. The Baltic Exchange is therefore committed to ensuring that the data housed within the repository meets its existing, established modes of governance as enshrined within the Baltic Code. Such action ensures that both those who provide and those who access data can have confidence that its sourcing and usage is governed fairly across all stakeholders.
2.3 A geospatial big data platform for the maritime industry

Geospatial information has always been of paramount importance to the maritime industry. Understanding exactly where a ship is located with respect to fixed objects such as shoreline hazards has been a key skill of captains, navigators and pilots for many centuries. More recently, the widespread launch of satellites, facilitating GPS and AIS location data, have allowed near real-time tracking of vessels across the globe, as well as the integration of new data sources related to more transient environmental phenomena, such as weather fronts and current streams. However, as more data are stored and recorded, existing legacy systems struggle to cope with the increased demands placed upon them, limiting the ability of organisations to use their data effectively. Such challenges require solutions designed specifically for the big data age, able to handle and process large volumes of data from a variety of sources at high velocity. These are the three Vs of big data management which the GeoSpock geospatial platform addresses.

**Volume:** The GeoSpock platform allows large volumes of data to be stored remotely in the cloud. Capacity is virtually limitless, with the ability to store and process data on demand.

**Variety:** Data is linked and indexed to allow disparate threads of information to be brought together to provide new context. A wide variety of data can be incorporated, both numeric and textual, with powerful processing techniques able to extract value from even the most partial or incomplete of sources.

**Velocity:** Indexing of data allows rapid querying of the dataset at macro and micro levels. Patterns in the global fleet can be assessed before instantly switching to localised analysis of local port or vessel operations, without the need to redefine workflows or rerun programs.

By building a geospatial big data platform with the ability and flexibility to cater to the requirements of the maritime industry of tomorrow, GeoSpock and the Baltic Exchange are enabling the sector to embrace data science as a fundamental technology within shipping. The development of the platform also affords an opportunity for the community to innovate and collaborate on global standards that will define a data-first strategy across all of maritime, setting all of shipping onto the path towards a more productive and profitable future.
3 How do we get there?

3.1 The Maritime Emissions Project

In the maritime industry, the international regulatory regime is applying concerted pressure against sulphur oxide emissions. Emissions control areas (ECAs) off the North American coasts and within North Sea and Baltic waters, already enforce stringent limits of 0.1% sulphur content in fuel. The enactment of the IMO global sulphur cap in 2020 represents a significant further milestone in the maritime emissions landscape, as it aims to reduce the maximum permitted sulphur content of fuel from 3.5% to 0.5% in all waters globally, a decrease of 85%.

With future control areas mooted in Asia and the Mediterranean, vessel owners must plan not only for immediate regulatory changes, but also understand the potential impacts of further disruption. Decisions can require substantial investments to be made, be it deciding to install scrubbers on vessels to remove sulphur from emissions as they are produced, or choosing to switch to cleaner but more costly fuel sources, such as low sulphur fuel oil blends, marine gas oil, LNG or methanol. With an average asset lifespan of 20 years, the types and specifications of vessels commissioned today will set the standard of performance well into the 2030s. Those who correctly follow existing trends, piece together accurate data sources and predict the future regulatory landscape will be well positioned to capitalise on new developments, whilst avoiding costly technology retrofits or even wholesale fleet updates.

Longer term, shipping has also begun its journey to decarbonisation. The IMO aims to achieve a 50% reduction of greenhouse gas emissions by 2050, compared to 2008 levels, and the governments of major maritime nations, such as the UK, have also outlined strategies to realise zero-emission shipping by the middle of the century. Although the precise pathways are yet to be clearly defined, such ambitions are only two fleet generations away from requiring widespread industry adoption. Continued innovation to apply downward pressure on emissions to satisfy regulators, governments and end customers is no longer an option, it is a necessity for survival and success.

Despite the challenge, the maritime industry should celebrate its achievements. The truth is that shipping is already the cleanest, most cost-efficient method of global transportation and will remain so into the foreseeable future. As both business and individual customers seek greater transparency in supply chains, the maritime industry should be ready to prove its credentials on a global stage.

The maritime emissions project is the first step on such a journey. By providing an accurate, independent source of emissions collection and collation with dynamic, flexible access at local and global scales, the maritime emissions project aims to provide the shipping industry with newfound clarity regarding its emissions footprint. Historic data will allow for improvements over time to be tracked, while the integration of up to date emissions models will provide the industry with an enhanced understanding of vessel emissions profiles and how they are affected by operating conditions. This helps owners and operators make informed decisions with an understanding of their effect on the triple bottom line of profitability, the environment and social impact. As data sources proliferate, modelling will give way to measuring, allowing the industry to show its commitment to emissions reduction with a certainty not seen in any other logistics sector. The maritime air emissions project will provide all companies with the ability to harness the power of data for collective good.
3.2 Data sources and project outcomes

Data Sources

As with any database, the value of the maritime emissions project arises from the data which is collected and collated and stored within. However, although data has value in its own right, it is often limited in isolation. Disparate, unconnected sources lack the wider contextual information needed to bring clarity to the complex relationships that characterise the world around us. The maritime emissions project database solves this problem by linking these previously isolated datasets, forming chains of actionable information with a greater value than the sum of their individual parts. Layers of data will be combined to understand correlations between data from different sources such as vessel location and type, weather, air quality and many others. Whilst no single layer provides full understanding, each additional data source adds clarity and context, building up a complete picture of the maritime emissions landscape. At its heart is geospatial data on vessel location, containing both reference vessel identifiers allowing a profile of specifications to be linked to the vessel, as well as contextual information on time and place allowing weather, currents, and other local impacts to be incorporated.

Outcomes

The outcomes of the maritime emissions project will be as diverse as the sources of data entered therein. Historical records of ship movements, profiles and contextual information will allow emissions to be understood in a dynamic, multi-level manner. Access to global fleet data allows thousands of data points to be analysed effectively
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at both micro and macro levels, with the ability to track these changes over time, enabling regulatory compliance to be monitored, and the evolving profile of the global fleet visualised. Ports and urban areas will also benefit through greater understanding of how vessel emissions influence the air quality of urban areas and impact public health. As the platform matures and sensor data from new sources are entered, there will be the opportunity to reconcile the modelled predictions of emissions against actual measurements. This is important because the models deployed to predict emissions on a global scale are used by governments and other organisations as justification for new regulations and accountability measures. Ensuring these models are an accurate reflection of reality is therefore vital for generating a sustainable and feasible regulatory code which works with vessel owners and operators to improve the industry emissions footprint.

The contribution of anthropogenic emissions to global warming and climate change has led to a growing call for international action. To achieve the aims of the 2016 Paris climate accords and limit warming to below 2° Celsius will require concerted action from all industries, including maritime. The understanding of fleet emissions will assist in the development of global carbon reduction initiatives such as the implementation of carbon taxation policies. By profiling the emissions intensity of individual vessels and routes, it will become possible to develop accurate carbon related indices similar to the Baltic Exchange’s existing financial measures. This will provide:

- ship owners, traders and brokers with a mechanism to understand their carbon emissions and to take action to limit their carbon risk, and
- governments, ports and other associated parties the means to more accurately incorporate these factors into their business strategies.

Together, the Baltic Exchange and the maritime industry can take a proactive stance on emissions reduction and ensure continued prosperity at the heart of global trade.
4 Driving value beyond emissions

4.1 Spatial data use cases in maritime

While the maritime emissions project serves as a starting point for an industry wide data repository, there are potential use cases extending into other developing areas of maritime.

**FOR THE ENVIRONMENT**

- Supply chain life cycle analysis
- Reconciliation of modelled environmental impact with measurements
- Insight into carbon costs for vessels and routes, for use in the development of carbon trading schemes based on actual vessel/route footprints

**FOR VESSELS AND CARRIERS**

- Improved route profiling and intelligent route planning in the face of weather events
- Accurate benchmarking of vessel performance versus the global fleet
- Improved understanding of the impact of certain routes on fuel consumption, vessel performance and changes over time

**FOR THE MARITIME SERVICE INDUSTRY**

- Greater access to information for risk profiling and insurance premium determination
- Refined data on trade flows for financial services
- Anomalous behaviour tracking for surveillance and fraud detection

**FOR PORTS**

- Real time visibility for just-in-time port operations optimisation
- Improved enforcement capabilities through heightened knowledge of vessel operations
- Intelligent profiling for audit and environmental inspection
- Linkage between offshore and onshore logistics operations
- Understanding of maritime sector impacts on surrounding urban areas
- Enhanced incident detection and response
- Digital twin development for scenario planning and impact modelling across a range of criteria
4.2 Get involved

The maritime air emissions project seeks to enable a data first strategy for all of maritime. The knowledge and insights facilitated by the project will raise the entire industry up, improving understanding, efficiency and performance for emissions reduction and in wider maritime operations.

Effective, lasting change requires participation from all parties within maritime to create and shape a platform with true industry value. It is only through collaboration and partnership that the maritime emissions project will achieve its full potential.

Join us to share ideas, contribute data and shape the future of maritime. Together, the maritime industry can unlock a cleaner, greener, more productive future for all.

themaritimeemissionsproject.com