leanwind

Logistic Efficiencies And Naval architecture for Wind Installations with Novel Developments

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GIS database of manufacturing facilities, transportation links and port locations
Work Package 5 - Deliverable 5.2 – Executive Summary

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Definitions

ArcGIS	Proprietary GIS software
Attribute table	Table containing underlying data from map in a GIS
CRS	Co-ordinate reference system
GIS	Geographical Information System
GUI	Graphical User Interface
Layer	Description of map as shown in a GIS
MapInfo	Proprietary GIS software
Maritime Exclusive Economic Zones (EEZ)	Designated offshore territory for each country
O&M	Operations and Maintenance
Plugin	Small program used to do a specific task in the QGIS software
PostGIS	Spatial database extension for Postgre-SQL
Postgre-SQL	Open-source object-relational database system
QGIS	Open-source GIS software used in the project (Quantum GIS)
Shapefile	Specific file-type used to store spatial data in a GIS
Spatialite	Spatial database extension system for an alternative database

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Executive Summary

One of the key objectives in the LEANWIND project is to "Reduce lead time and transport/logistics costs for wind farm components through supply chain optimisation". The fundamental challenge for WP 5 is to address this objective by increasing the efficiency of the entire supply chain including installation, operation and maintenance, and decommissioning. Task 5.2 specifically focuses on the section of the supply chain relating to the transport of components from the site of manufacture to the port that has been selected as the deployment base for the wind farm. In order to understand the transportation requirements for the various components involved, data on the locations of component manufacturing sites, the transport networks and the potential ports must be gathered together and presented in a form that will allow further interrogation for the analysis of costs and optimal pathways.

Since the information concerned is a collection of spatial data, a GIS (Geographical Information System) database is the preferred solution for collating and visualising it. An open-source GIS software package called QGIS (Quantum GIS) was chosen as the method for presenting the database in D5.2, as it is widely available, simple to download, install and use, and has a configurable back-end through which bespoke tools can be created for the project. The main objective of the GIS is to act as the source of spatial data relating to the supply chain for WP 5 – i.e. presentation and calculation of transport options in terms of choice of road/rail/sea, routes and distances. This is a crucial input to the cost analysis to take place as part of Task 5.2, later to be integrated with the cost models in WP 8. Additionally, the GIS currently provides a set of basic tools to consider the supply chain for specific scenarios. These tools will be built upon and their capability expanded as the project progresses, in order to integrate with the supply chain optimisation model being developed in Task 5.5. The GIS will also provide visual representations of supply chain maps and selection algorithms for Tasks 5.2, 5.3 and 5.5.

The three key datasets required for the deliverable were: manufacturing locations for the various components of an offshore wind farm, the locations of suitable ports for deployment of offshore wind turbines (including nacelles, towers, blades, foundations and cables) and the main transportation networks that link these two sets of points.

Manufacturing

Identification of suppliers and data on the manufacturing locations was gathered from direct information provided by suppliers via the industrial knowledge and experience of VGSC/KALEIDO, and from extensive literature review and input to the GIS. In the current database version, the area of interest has been limited to Europe, as suppliers with proven experience in offshore wind components are mainly based in this region or already have manufacturing facilities in Europe. Future versions will include data for additional future capabilities as new players, especially from Asia, are likely to enter the market. This will allow the GIS to act as a tool for addressing the effects of including supply chain actors outside Europe, as specific objective within WP 5.

Ports

Work is ongoing in Task 5.3 to collate data on suitable ports, particularly in the regions identified for the case studies in WP 2, WP 3 and WP 4. T5.3 partners have defined a set of parameters which are critical to assess the suitability of a port for an offshore wind

deployment (including nacelle, tower, substructures and cabling), and for the list of ports being considered, this data is in the process of being collated. The current version of the data for the T5.3 ports, along with their locations, has been added to the GIS.

Transportation networks

The three main methods of transport for offshore wind componentry are road, rail and sea transport. In the case of roads, given the large sizes of many of the components, category 1 roads – equivalent to UK/Ireland motorway or German Autobahn – have been isolated from the full road network. The user can select either the full network or only category 1 roads for their study. .The full European rail network has been included with the GIS, on the assumption that all of it is accessible for freight purposes but this, in reality, will be limited to smaller components. For sea transport, for simplicity at this stage of the work it has been assumed that all ships will endeavour to minimise travelling distances. For additional information, however, key ferry routes, and an estimate of shipping density around European waters has also been added, to provide a sense-check that the path selected for travel is feasible. In addition, all available airfields have been added as point locations to the GIS – knowledge of these may be useful for transport of small components and personnel, and so can be visualised on maps within the GIS.

The datasets described can all be visualised individually or together, so that the user can see on a map the spatial distribution of each and how they relate to each other. In addition to the main datasets, some additional information has been added – a basic coastline, maritime EEZ boundaries and the locations of LEANWIND case studies being investigated in other WPs. The GIS software has some in-built functionality that can be used to interact with the data and, for example, visualise subsets of the data, or measure straight-line distances on the map.

To assist with specific interactions and analyses that will be relevant for later work in the project, two bespoke tools have been programmed for use along with the main QGIS software specifically for the LEANWIND project. Project partners using the GIS can install these along with the database, and they work specifically with the datasets included in the project. The first tool allows the user to select their offshore site of interest, and the port parameters that are relevant for their project (suitability for O&M (Operations and Maintenance), installation, country of interest etc.) and the radial distance in which they would like to search, and the tool will identify ports within that distance that meet their requirements. The second tool is to aid the visualisation of transportation routes, and will later feed information into the supply chain optimisation model being developed in T5.5. The user can select a start and end point for their journey, and the type of transport (road, rail, offshore) and the tool will return the distance travelled in kilometres and plot the route on their map.

An in-depth user-guide (provided as an appendix to this report) has been developed for the database and tools, and to help the novice user with some of the basic GIS functionality. This is intended to be an iterative document, and as further functions and tools are developed, the user-guide will be updated accordingly.

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