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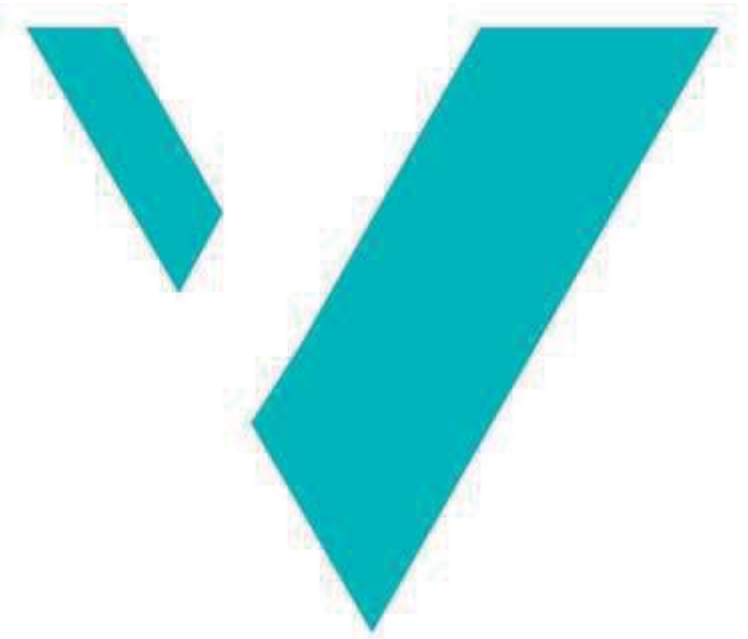
FAIR and Open Energy Data for the Wind Energy Sector



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Master Thesis in Climate Change Management

Department of Environmental Sciences, Faculty of Engineering and Science

WESTERN NORWAY UNIVERSITY OF APPLIED SCIENCES

Sogndal
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FAIR and Open Energy Data for the wind Energy Sector

Master thesis in Climate Change Management

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This thesis is a part of the master's program in Climate Change Management (Planlegging for klimaendringer) at the Department of Environmental Sciences, Faculty of Engineering and Science at the Western Norway University of Applied Sciences. The author(s) is responsible for the methods used, the results that are presented and the conclusions in the thesis.	

Preface

This study was conducted to complete a master's degree in Climate Change Management at the Western Norway University of Applied Sciences. It was conducted over one semester and counted as 30 ECTS. Figures are produced by the author unless stated otherwise.

Firstly, I would like to thank all my teachers and classmates in Sogndal for making these two years a great experience for me.

I would like to express my thanks to my supportive supervisor, Assoc. Prof. August Hubert Wierling, and my co-supervisor, Prof. Valeria Jana Schwanitz, for all their support and precise advice during the thesis.

I like to thank Ph.D. Mark D Wilkinson for his valuable help during the assessment part of the thesis.

Finally, I would love to thank my dear family for their unconditional constant support and dear friends who supported me during the last two years; This would not have happened without their help.

Sincerely,

Mehran Ziaabadi

Sogndal, 10 June 2021

Western Norway University of Applied Sciences

Abstract

The future of the planet depends on how we produce energy. A reliable, affordable, sustainable, and decarbonized energy system is vital for the energy sector. Clean energy development is essential for tackling climate change and mitigate its worst consequences. Transitioning to an energy system based on renewable technologies will have significant environmental and economic benefits worldwide. Wind energy is one of the most important sources of clean and renewable energy. The development of this industry will increase its contribution to the global energy supply chain and thus mitigate climate change. Increases in energy production technically increase greenhouse gas (GHG) emissions only if renewable energies replace fossil fuels, leading to lower GHG emissions.

Data sharing and data governance enable humans and machines to interact and collaborate more efficiently, enabling the deployment of Artificial Intelligence-supported smart energy systems. For example, improved data access and collaboration in the wind energy sector will help better predict wind energy and improve the integration of this intermittent energy source into the electricity grid.

FAIR data refers to a database that meets principles of Findability, Accessibility, Interoperability, and Reusability. FAIR and open data are seen as a way forward to ensure data sharing in the wind energy sector. Consequently, this thesis evaluates the state of FAIR and opens data in the wind industry. 47 databases were evaluated using a manual and an automatic assessment method. Manual assessment is done by the 'self-FAIR assessment tool' developed by the Australian Research Data Common (ARDC). The automatic assessment is done by 'The FAIR Maturity Evaluation Service' developed by Mark D Wilkinson.

Findings show that FAIR principles are not well implemented in the wind industry. Of the assessed databases, only 28% comply with FAIR principles based on automatic assessment, and 45% based on manual assessment. Furthermore, only 30% of the databases are open.

The thesis concludes with identifying barriers and recommendations to improve the overall score for FAIRness.

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Samandrag på norsk

Fremtiden til planeten avhenger av hvordan vi produserer energi. Et pålitelig, rimelig, bærekraftig og karbonfritt energisystem er viktig for energisektoren. Utvikling av ren energi er viktig for å takle klimaendringene og redusere de verste konsekvensene. Overgang til et energisystem basert på fornybar teknologi vil ha betydelige miljømessige og økonomiske fordeler over hele verden. Vindenergi er en av de viktigste kildene til ren og fornybar energi. Utviklingen av denne industrien vil øke sitt bidrag til den globale energiforsyningskjeden og dermed redusere klimaendringene. Økninger i energiproduksjon øker teknisk klimagassutslipp (GHG). Bare hvis fornybar energi erstatter fossilt brensel enn dette, kan det føre til lavere GHG-utslipp.

Datadeling og datastyring gjør det mulig for mennesker og maskiner å samhandle og samarbeide mer effektivt, noe som muliggjør distribusjon av smarte energisystemer som støttes av kunstig intelligens. For eksempel vil forbedret datatilgang og samarbeid i vindenergisektoren bidra til å bedre forutsi vindenergi og forbedre integrasjonen av disse intermitterende energikildene i strømnettet.

FAIR-data refererer til en database som oppfyller prinsippene Findability, Accessibility, Interoperability, and Reusability. Rettferdig og åpen data blir sett på som en vei fremover for å sikre datadeling i vindenergisektoren. Derfor vurderer denne oppgaven tilstanden til FAIR og åpner data i vindindustrien. 47 databaser ble evaluert ved hjelp av en manuell og en automatisk vurderingsmetode. Manuell vurdering gjøres av 'self-FAIR assessment tool' utviklet av Australian Research Data Common (ARDC). Den automatiske vurderingen gjøres av 'The FAIR Maturity Evaluation Service' utviklet av Mark D Wilkinson.

Funn viser at FAIR-prinsipper ikke er godt implementert i vindindustrien. De vurderte databasene er bare 28% i samsvar med FAIR-prinsippene basert på automatisk vurdering, og 45% basert på manuell vurdering. Videre er bare 30% av databasene åpne.

Oppgaven avsluttes med å identifisere barrierer og anbefalinger for å forbedre den totale poengsummen for FAIRness.

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1. Introduction

All communities require energy resources to provide fundamental human necessities, such as access to electricity for cooking, room comfort, transportation, and communication. Energy is also needed for the economy, for example, to support manufacturing operations. Energy resources must be safe and have minimal environmental impacts in order to mitigate climate change and contribute to more sustainable resource use.

In 2015, the member states of the United Nations endorsed the 2030 Agenda for Sustainable Development, offering a shared roadmap for peace and prosperity for people and the planet today and in the future. The 17 Sustainable Development Goals (SDGs) are an urgent call to action for all nations, developed and developing, to work together in a global partnership. The sustainable development agenda requires energy use to be "affordable, reliable, sustainable and modern" in its goal No. 7. It urges "action to combat climate change and its impacts" in Goal No. 13 and asks to "ensure sustainable consumption and production patterns" in goal no. 12 [44].

Against this background, energy generation, distribution, and consumption should have minimal environmental effects and minimal greenhouse gas (GHG) emissions. However, according to the IPCC fifth assessment report (AR5), CO_2 emissions from fossil fuel combustion and industrial activities produced roughly 78% of overall GHG emissions from 1970 to 2010, with a similar percentage contribution from 2000 to 2010 [29]. At the same time, the demand for energy and electricity continues to grow. Figure 1 illustrates the annual global energy consumption by source from 1970 to 2019 [61].

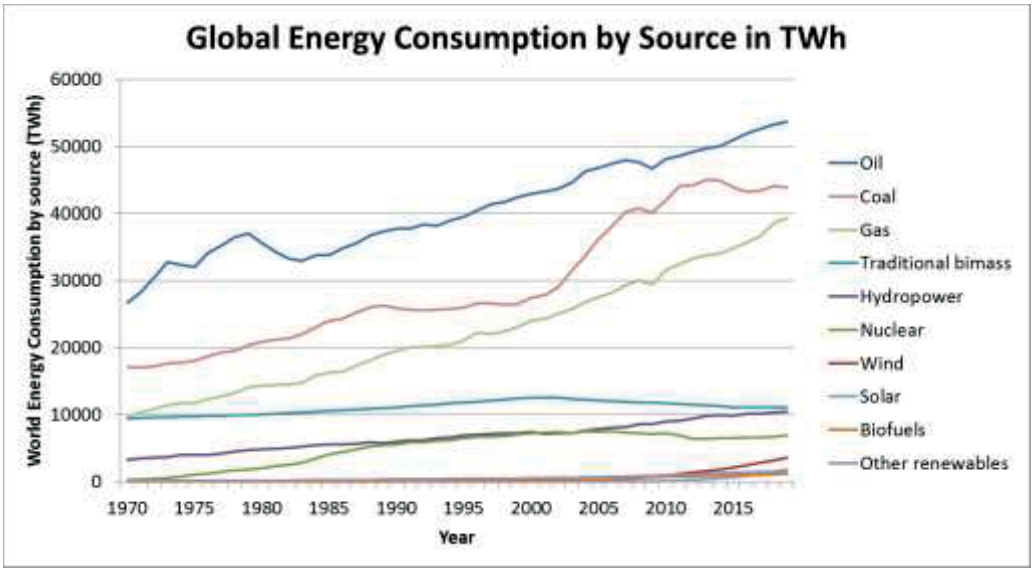


Figure 1. Annual Global Primary Energy Consumption by Source in TWh – Data gathered from [61]

Renewable energy (RE) sources have an essential role to play in sustainably providing energy supply and enabling to tackle climate change [29]. Renewable energy is energy derived from resources that are renewed naturally on a human timescale [1]. Biomass, solar energy, hydropower, tides and waves, geothermal heat, ocean thermal energy, and wind energy are all examples of renewable energy. However, there are challenges in increasing RE, in particular, if the sources are intermittent, as is the case for solar and wind. The governance of data is a crucial tool to address this problem because data management and analysis have an important role in the wind energy industry. This thesis explores data governance issues for wind energy.

Wind energy is an important source of clean energy, and one of the most important renewable energy sources as its fuel is offered by nature without any GHG emissions. Now that wind technology became economically competitive, wind farms are being built at an increasing rate across the world. In 2018, wind power generated 48% of total capacity for electricity generation in the European Union (EU), and 15% of the EU's power demand was met by wind [35]. As Figure 2 illustrates, wind energy contributes 6% to global electricity production [41].

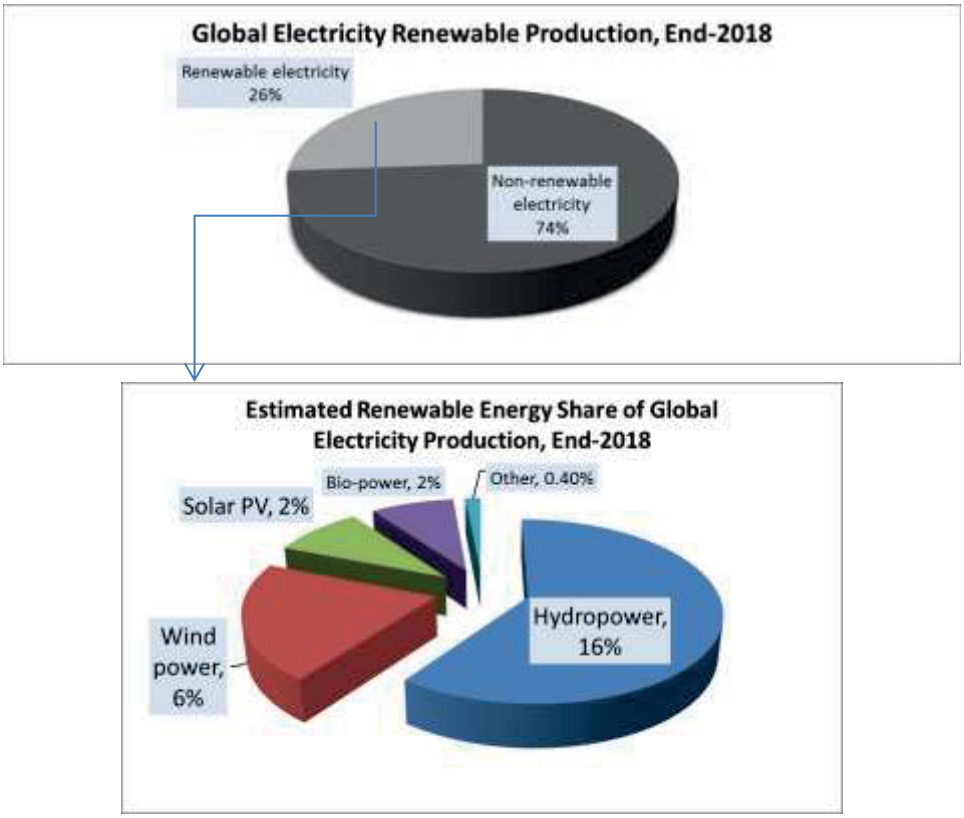


Figure 2. Estimated Renewable Energy Share of Global Electricity Production, End-2018 – Data gathered from [41]

The construction of wind farms is a complicated process that requires consideration of several factors, including selecting the right place, a site with a high wind power density, consistent wind speed, and little interference with nature or the view of people. Also, it should have limited environmental impacts, convenient maintenance access, optimizing access to the electricity grid, etc. [3]. Several factors, such as wind speed, temperature, location, torque, power, and speed of the wind turbine's main parts, must be continuously monitored for an efficient wind farm performance. While wind energy offers a way to lower greenhouse gas emissions, it should also provide a reliable supply of affordable energy for consumers. Continuous monitoring and data collection help to ensure wind turbine maintenance, optimization of production as well as minimizing failures that might cause downtime or even put people or property at risk. Data collection can also bring down the cost of maintaining turbines and supporting infrastructure considerably. For example, by monitoring wind turbines and analyze the data acquired using data analysis tools, it is possible to predict the probable point of failure [3].

Wind turbine generators are data-intensive equipment with various sensors that generate massive and complicated information that would be difficult and costly to analyse and process using ordinary relational databases and manual techniques. The volume of data places excessive pressure on local industrial computers and data centers, which is why end-user applications must find the right balance between query flexibility and request response times [11].

Data generated in the wind energy sector can be categorized as so-called 'big data.' Big data is defined as data with a significant volume, value, complexity, exponential arrival, and growth rate that makes it impossible to gather, efficiently manage, process, and analyze using traditional methodologies within a specific time period [31]. Gartner, an American research and advisory firm [43], established a 3Vs model to characterize big data and the challenges and prospects connected with it in a research study published in 2001. The 3Vs represent volume, Velocity, and Variety. Later, other scientists added more V to the 3Vs model, including Value, Visualization, Veracity, Viscosity, Virality, and Validity, known as a 9Vs model described in [43].

Data sharing is seen as a way forward to reform the energy system in a sustainable way. It will enhance database maintenance, generation projections, and the integration of wind energy into the existing energy system. Data sharing enables academics to interact and collaborate more and lead to significant discoveries in the sector. Students, researchers, engineers, and designers may develop their expertise and apply it to improve their ideas if they have access to actual databases [30].

Against this context, this project compiles a relevant corpus of databases for the wind energy sector and identifies best practices of sharing data and giving open access. Guiding principles for data sharing and data governance has been formulated by Wilkinson et al. (2016). This thesis assesses the level of compliance of databases in the wind energy sector with the FAIR guiding principles of Wilkinson et al. (2016) [12]. The term "FAIR" stands for Findability, Accessibility, Interoperability and, Reusability. Two manual and automatic assessment methods are used to assess the current state. The thesis identifies barriers and makes recommendations for improving the level of FAIRness for databases, and suggests means to improve the current practices.

To that end, 47 open databases from four categories are studied:

1. Data related to wind sources (geographical location, speed, and direction),
2. Technical information related to the equipment required in wind farms,
3. Databases related to the required infrastructure in wind farms, and
4. Environmental impacts of wind farms both onshore and offshore.

The thesis links to the Horizon 2020 project No. 883823, "Towards a FAIR and open data ecosystem in the low carbon energy research community" (EERAdata). This project aims at establishing a FAIR and open data ecosystem with and for the low carbon energy research community [19].

2. Development of wind energy

Wind and solar power account for 90% of all renewable energy. These two sources have seen a tremendous increase in investment, and they are now competitive with traditional power sources [6]. For centuries, wind energy has been applied to generate energy. Since the 1970s, wind energy utilization to generate electricity on a commercial scale has been possible because of technological improvements and government support [1]. By now, wind energy has evolved into one of the most significant low-carbon energy sources. Various small and large wind farms have been constructed in many nations in recent decades due to a global push to increase clean energy output from renewable energy sources and because wind energy became competitive with electricity generation from fossil fuels [6].

Many wind farms are located offshore to capture more wind energy while having a lower environmental impact on land use [3]. Investors are becoming more interested in offshore wind technology, particularly floating wind turbines. Offshore wind costs are steadily decreasing, and also deeper seas have more significant and more consistent wind speeds [6].

The implications of climate change have put a lot of pressure on governments to explore alternative and sustainable energy production to reduce carbon footprint and GHG emissions. When power systems need to be improved and developed, renewables are the first option to examine as an alternative energy source. In recent years, the development of wind power technology and the reduction of wind turbine construction costs have increased the share of wind energy in the global energy supply chain. Figure 3 shows the global cumulative installed wind power capacity (MW) from 1980 to 2019 [6].

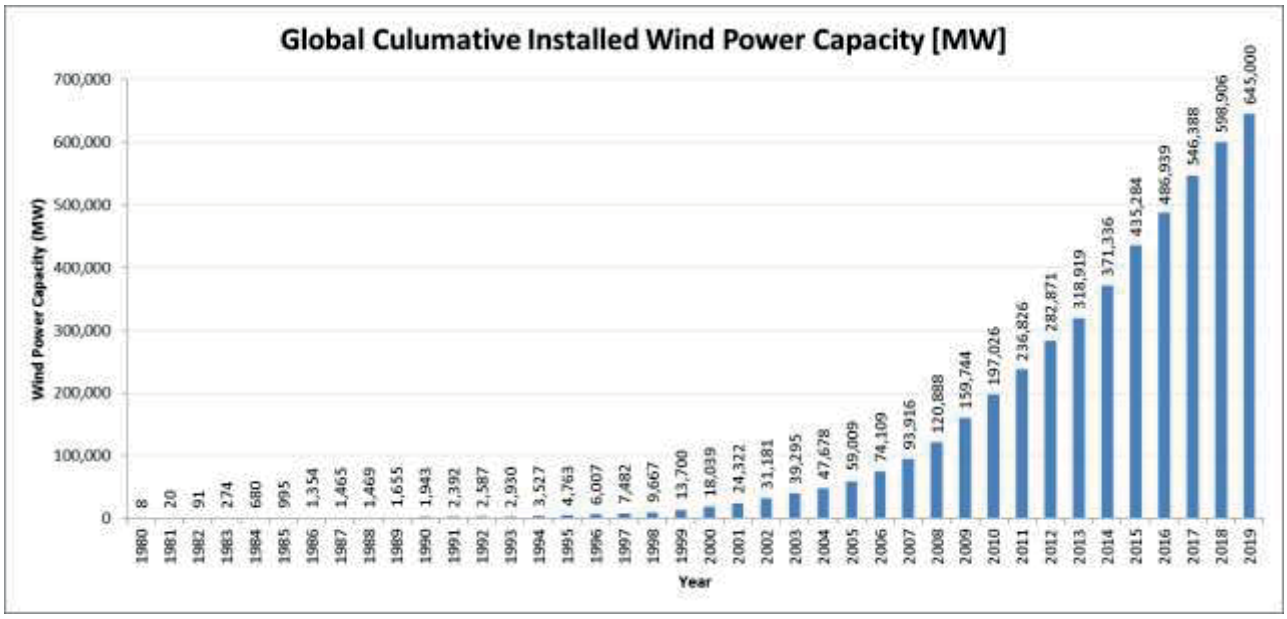


Figure 3. Global cumulative installed wind power capacity (MW) – Data gathered from [6]

Table 1 shows the share of different countries in global electricity production from wind power from 2014 to 2020 [38], and Figure 4 illustrates the top 10 countries by cumulative wind capacity in 2020 (MW). The leading country is China (38.5%), followed by United States (16.1%) and Germany (8.5%).

Table 1: Installed wind power capacity (MW) - Data gathered from [38]

No.	Country	2014	2015	2016	2017	2018	2019	2020
1	China	114,763	145,104	168,690	188,232	211,392	236,320	281,993
2	United States	65,879	74,472	82,183	89,077	96,665	105,466	117,744
3	Germany	39,165	44,947	50,019	56,132	59,311	61,357	62,184
4	India	22,465	27,151	28,665	32,848	35,129	37,506	38,559
5	Spain	22,987	23,025	23,075	23,170	23,494	25,808	27,089
6	United Kingdom	12,440	13,603	15,030	18,872	20,970	23,515	24,665
7	France	9,285	10,358	12,065	13,759	15,309	16,643	17,382
8	Brazil	5,939	8,715	10,740	12,763	14,707	15,452	17,198
9	Canada	9,694	11,205	11,898	12,239	12,816	13,413	13,577
10	Italy	8,663	8,958	9,257	9,479	9,958	10,512	10,839
11	Rest of the world	58,273	64,881	76,035	83,010	91,798	104,766	122,046
Total		**369,553**	**432,419**	**487,657**	**539,581**	**591,549**	**650,758**	**733,276**

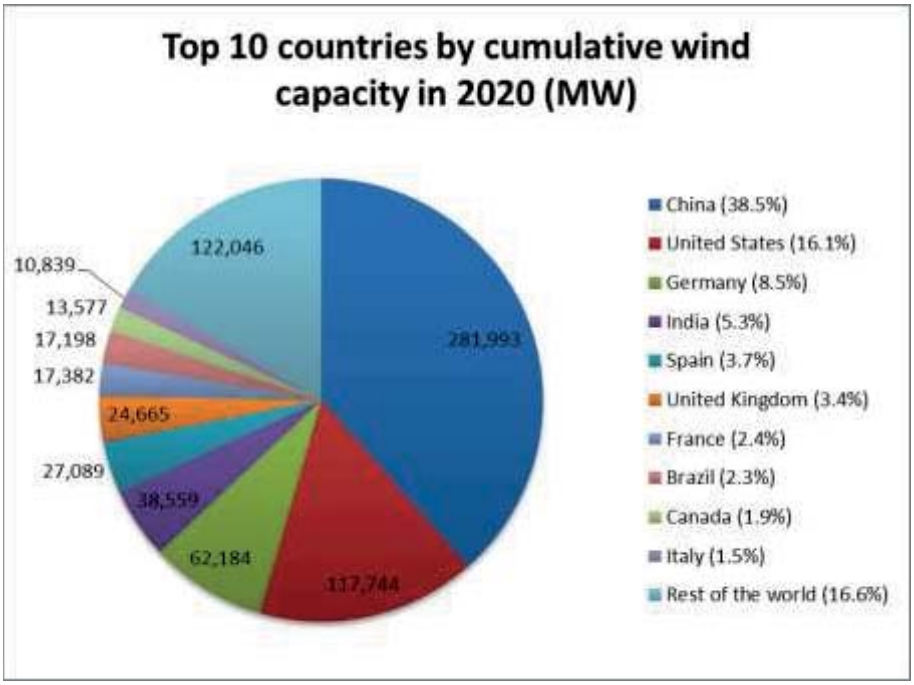


Figure 4. Top 10 countries by cumulative wind capacity in 2020 (MW) – Data gathered from [38]

The Global Wind Energy Council has proposed various scenarios that predict wind energy systems might satisfy 20% of global electricity consumption by 2030 [39]. Figure 5 shows that it is expected to generate

2110 GW electricity by the wind power worldwide by 2030. Wind energy is also seen to play a significant part in achieving the Paris Agreement's goal of a totally decarbonized electrical supply by 2050 [6].

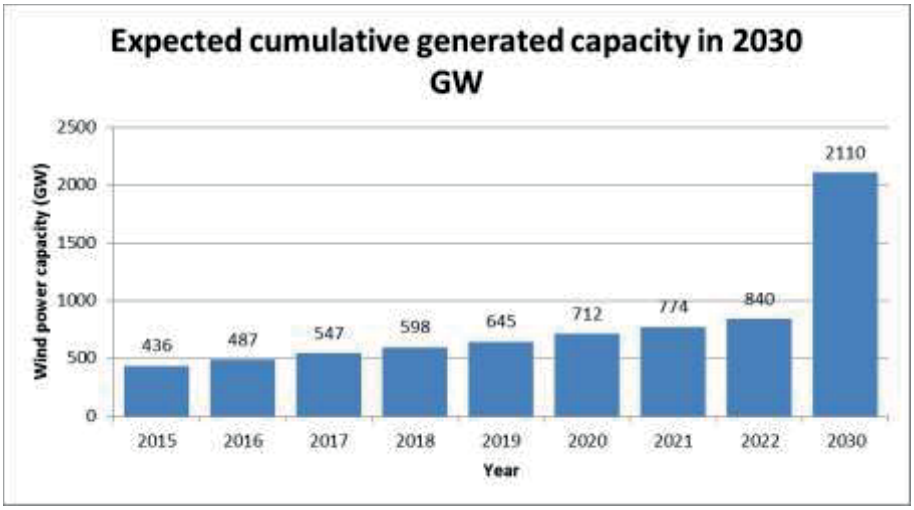


Figure 5. Expected cumulative generated capacity in 2030 (GW) – data gathered from [6].

Since 2009, the cost of wind turbines has dropped by about one-third. By the first quarter of 2019, the world's total deployed wind power capacity had surpassed 645 GW. Renewable energy funding has exceeded USD 289 billion, and wind energy accounts for USD 134.1 billion. This amount has overcome the amount invested in fossil fuels in 2018 [6].

The extensive installation of condition monitoring (CM) systems for wind turbine generators has come from the recent fast expansion of wind farm capacity. The purpose of these systems is to offer information to the wind farm operator in order to improve operational efficiency through better decision-making. As the number of operating wind farms grows, a greater emphasis will be placed on the effective and efficient utilization of these systems, which has not been a top concern in the past. Wind farm owners want to run their plants as efficiently as possible; therefore, they choose the best maintenance plan [34]. With high-quality databases, a suitable model can be developed to repair and maintain turbines, which can be repaired only when necessary and in appropriate conditions. For example, in 2007, a study was conducted in a wind farm in UK with 10GW capacity to measure the benefits of a condition-based maintenance plan. In comparison to the frequently used maintenance plan, condition-based maintenance has a mean yearly value of slightly over £2000. This corresponds to a saving of £40,000 per turbine throughout the turbine's 20-year life, corresponding to considerable additional revenue for a medium-sized wind farm with 20 turbines [34]. However, the information

produced by wind turbine control systems may have value beyond informing maintenance, such as information on how turbines react to various operating situations.

2.1. Technical background for wind energy deployment

2.1.1. Wind energy prediction

A slight change in wind speed induces a significant difference in wind turbine output power because of the cubic bond relationship between these two factors. As a result, an accurate evaluation of wind resources at every location is deemed crucial. Wind resource assessment investigations have proven to be quite valuable for the installation of various wind energy technologies such as nano, micro, small, medium, and large scale for wind energy generation [36].

Daily, yearly, seasonal, and diurnal patterns vary from place to place and time to time worldwide. However, it is critical to determine the wind power potential for any specific site or area to determine the capability of a wind resource for electricity generation within the available wind period databases. As a result, it's critical to pay attention to the wind characteristics and the type of wind turbine technology appropriate for every particular potential area [36].

Global climate change also has the potential to alter the geographic distribution of wind resources and the frequency of extreme weather events, all of which might impact an efficient wind turbine design and operation. Those findings, however, are unlikely to have a substantial influence on the worldwide potential for wind energy adoption [1]. Changes in geographic distribution, and performance of the wind resource, and the intensity of storms might all affect wind turbine design and service. According to current research, multi-year annual mean wind speeds in much of Europe and North America are unlikely to vary by more than a quarter this century. In contrast, multi-year annual mean wind power densities in northern Europe are predicted to remain within 50% of present levels. While more study is needed in this area, current research shows that global climate change would affect the geographic distribution of the wind resource, but that the effects are unlikely to have a substantial influence on worldwide wind energy deployment potential [1].

On a country-by-country basis, the results for potential electricity generated by wind are shown in Figure 6 for onshore (A) and offshore (B) regions [37].

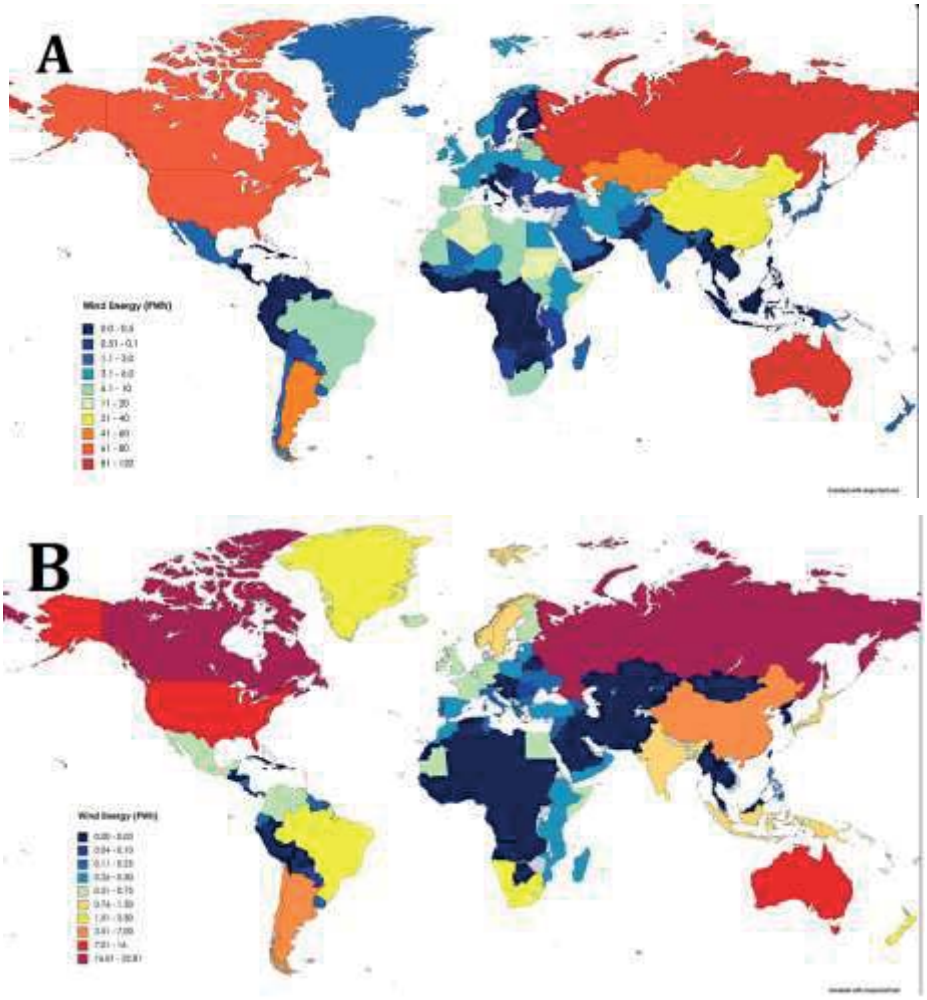


Figure 6. Annual wind energy potential country by country restricted to installations with capacity factors >20% with siting limited. (A) Onshore. (B) Offshore. – Data gathered from [37]

2.1.2. Wind power equipment

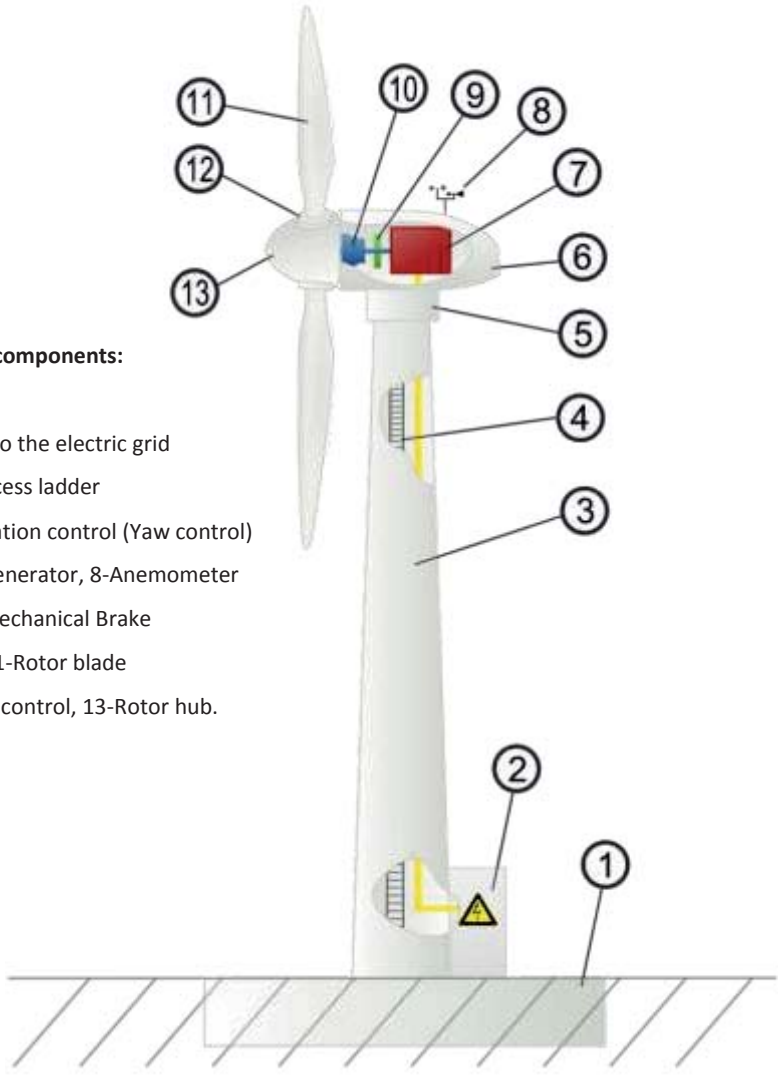
Wind turbines are mechanical systems that catch wind energy and convert it to electricity using sophisticated technology to achieve optimal conversion efficiency. Aerodynamics, mechanics, structural dynamics, meteorology, and electrical engineering are among the technical disciplines involved.

Since the 1980s, wind turbine technology has advanced at a breakneck pace. Wind turbines feature variable speed and active control at the moment. They may be placed onshore or offshore and are particularly useful in areas where the wind is consistent. Their operation may be broken down into three key steps:

1. The blades rotate and propel the rotor due to the wind pressure applied to them. The rotor, which is connected to the main shaft, is responsible for moving the generator.
2. Inside the turbine, a speed modifier can spin at 1500 rotations per minute, allowing the generator to convert mechanical energy into electrical energy.
3. The electricity is transmitted to the outside power lines through the interior of the tower.

The following components make up the majority of wind turbine technology [3]:

- **Rotor**: The rotor is the initial component in a wind turbine's chain of functional parts. It transfers the power generated by the blades into kinetic mechanical energy. It usually consists of two or three blades. The horizontal axis rotor is the most used design in wind technology today.
- **Transmission System**: The rotor shaft, mechanical brake(s), and gearbox are all part of the transmission system. Mechanical brakes supplement the aerodynamic braking method. The gearbox functions as a rotary retractor, turning slow rotations into faster rotations.
- **Generator**: An electromechanical device that transforms mechanical energy into electrical energy. Synchronous and asynchronous generators are the two primary types of generators utilized in the industry.
- **Power Electronic Interface**: The generator's electrical power is supplied into the power grid. It sits between the generator and the electricity grid, meeting the needs of both components. The interface ensures that the turbine's rotation speed is modified to harvest the most power from the wind and route it to the grid while also managing active and reactive power, frequency, and voltage.
- **Control System**: Ensures that the wind turbine operates properly under all operating situations. It uses passive or active techniques to maintain the wind turbine within its typical operating range, optimizing power production and longevity while lowering structural stresses on mechanical components and, therefore, their costs.



Wind turbine components:

1-Foundation

2-Connection to the electric grid

3-Tower, 4-Access ladder

5-Wind orientation control (Yaw control)

6-Nacelle, 7-Generator, 8-Anemometer

9-Electric or Mechanical Brake

10-Gearbox, 11-Rotor blade

12-Blade pitch control, 13-Rotor hub.

Fig. 7 Wind turbine components, By Arne Nordmann (norro), Picture from [63].

2.2. The role of data in the wind energy sector

Here it is vital to mention the role of data in the wind industry. Running a wind farm is a difficult task. Choosing the right place, a good place with good wind power density, stable wind speed, a small environmental footprint, and easy access to maintenance, is among the challenges of designing and implementing these projects.

Wind turbine generators, like industrial equipment, are data-intensive systems with a variety of sensors. The sensors allow for real-time monitoring and supervision of the condition and the creation of statistical

dependability models. Wind turbines work in a constantly changing, sometimes harsh environment. Handling a wide range of environmental influences is a complex undertaking that necessitates modern statistical and Artificial Intelligence (AI) techniques. Data gathering in a variety of settings is required, as are advanced data processing tools. To have an imagination of data volumes, an average turbine (with an average capacity of 2 MW) contains 20-30 sensors and produces 60-100 different signals, which is about 8 bytes/sec [11]. Considering 645 GW of globally installed wind capacity [6] and an average of 2 MW capacity of a typical wind turbine leads to around 20TB raw data per day. It's a massive amount of data, and it is necessary to apply big data solutions to extract valuable knowledge and enable the storage of raw data.

The recent increase in the number of wind farms has led to increased attention to a wide range of wind power-related topics, including information on wind resources, equipment required in the industry, location and maintenance of wind turbines, the necessary infrastructure for these projects, and the environmental impact of wind farms. In general, data for wind power can be divided into the following four categories:

1. Data related to wind sources such as geographical location, speed, and direction,
2. Technical information related to the equipment required in wind farms,
3. Databases related to the wind farms infrastructure,
4. Environmental impacts of wind farms.

Current wind turbine's data processing systems contain the following typical elements [11]:

- **Sensors**: the primary source of data for capturing physical-electrical processes.
- **Programmable Logic Controllers (PLCs):** collect data from sensors and convert electrical impulses to digital data. They also make several changes and modifications to the functioning behavior of wind turbines.
- **Supervisory Control and Data Acquisition (SCADA):** systems that sensors and PLCs are physically connected to them and gather signals and other data.
- **Condition Monitoring (CM) systems**: capture important signal data and create reasonably high-frequency data series in addition to the PLC and SCADA components.
- **Industrial computers**: provide local storage and basic computation operations inside the turbine.
- **Data transmission systems**: mobile devices that provide a data transmission link between turbines and data centers.
- **Data canters**: individual turbine data is collected, stored, and archived in them.

- **Functional servers**: receive data from data centres and perform data extraction, transformation, and loading (ETL) and reporting and analytic duties.
- **End-user interfaces:** provided by client computers, which are linked to functioning servers.

A big wind farm with different wind parks needs a wind farm cluster management system (WCMS) that is responsible for aggregating and regulating scattered big wind farms into a cluster. This system operates the wind farm based on the power transition system demands. The structure of the system is shown in Figure 8 [42].

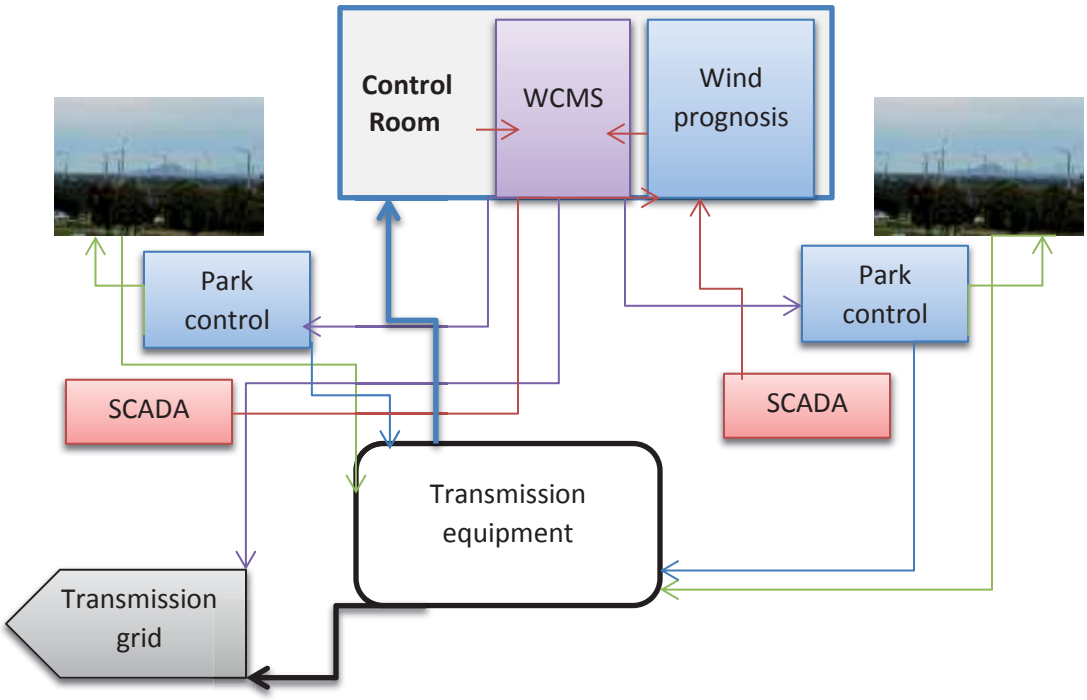


Figure 8: Wind cluster management system. Data gathered from [42], Images from [65]

Due to scalability challenges with standard databases, today's wind farm operators either do not gather all accessible data in a central, easy-to-access database or discard vital data. Emerging "Big Data" techniques and algorithms make it possible to capture all data, and data may never be removed. This is a tremendous benefit for wind farm operators since accurate data may be (re)used for various purposes in the future, such as creating failure detection and prognosis models and ad-hoc study of the past. Modern machine learning systems and Big Data algorithms rely on these data. In the literature, there are several definitions of Big Data [11]. While some researchers concentrate on the ontological aspects of the data,

others focus on the computational challenges of data processing. According to [9], Big Data datasets have the following common characteristics.

- **Volume**: space needed for data storage,
- **Velocity**: a crucial characteristic that determines how often data is created, managed, recorded, or published,
- **Variety**: data that is organized, unstructured, or semi-structured and obtained from a wide range of sources,
- **Exhaustively**: the data set for Big Data is often as large as possible, emphasizing whole recorded data rather than sampling. This term describes the scope of Big Data,
- **Resolution:** a process aims to determine whether several records are referring to the same thing**,**
- **Relationally**: a sort of database that is made up of one or more relations and is represented by tables, and
- **Extensionality**: the ability of the data extension, the more flexible the data system, the more degree of extensibility.

In addition to data quantity requirements and definitions, the quality of data is essential. A dataset's quality is closely linked to the organization that created it and is often defined by data's value and accuracy. Other aspects of data quality include originality, completeness, validity, and consistency. For example, modeling future wind conditions in a given area requires a complete database of wind conditions in the area over a specified period of time. Suppose complete and consistent information is not available during this period. In that case, the quality of the database will be reduced, and as a result, modeling will not be done with high accuracy. A high-quality dataset should also be free of defects such as missing data, as well as syntactic and semantic problems.

To summarize, excellent open datasets include a plethora of information that is freely accessible and should meet the following features and requirements:

1. **Available**: A high-quality database should be designed to be finable and accessible by machine and human on the web and assigned by a standard machine-readable license that permits users to reuse the database.
2. **Database format**: The database should be stored with a standard machine readable format such as Comma Separated Value (CSV) files or another standard data format.

3. **Well connection to metadata**: database needs to connect to the related metadata to provide access to the whole raw data for the user,
4. **Database with no gaps**: The sampling frequency must be high enough to catch and characterize the critical variables. There should be no gaps in the data, or if there are, they should be small enough not to disturb the patterns.

The most common definition of data quality determines that the data can fulfill the function for which it was collected [3].

3. Method

The main task of the thesis is to identify the FAIR and Open status of databases critical in the wind energy sector. The term FAIR stands for Finable, Accessible, Interoperable, and Reusable. This requires, at the first step of the study, the identification of relevant databases. To this end, we designed the criteria to select databases and investigated what information is needed to operate a wind farm sustainably.

The wind is an intermittent resource depending on geographical location. Therefore, it is necessary to obtain information on the availability of wind. The most significant phase in developing a local wind project is wind resource evaluation, which serves as the foundation for evaluating initial feasibility and cash flow predictions and obtaining finance. This stage of running a wind farm will go through several rounds of evaluation like initial evaluation, site characterization in detail, validation of data over time, creating a detailed cash flow forecast, and obtaining finance [49]. Thus, the data related to the fundamental science of wind energy like site investigation, climate data, wave roses and wind roses, wind sources, geographical distribution, speed, density, and directions are crucial for the wind power project. Depending on the wind resources, the proper equipment needs to be selected and technical information related to the equipment required in wind farms, such as different kinds of turbines, sensors, condition monitoring systems, generations, structural features of turbines, capacity, etc., play an important role. The other important category is databases related to grid systems to distribute power to local or national networks and totally infrastructures needed to run a wind farm. All relevant databases describing the environmental impact of the wind farm and the broader context are vital, for example, impacts of offshore wind farms on sea bird migration, the carbon footprint of building turbine and construction of wind farm, CO_2 released from the peat land during construction of onshore wind parks, wind turbines may make noise, and the movement of the blades can cause shadow flicker at

certain areas. For some people who live close, both the noise and the shadow flicker might be distracting and considered as aesthetic impacts of Wind Parks.

Finally, based on the above considerations, we defined four crucial categories related to the wind industry and started searching databases. This study assessed wind power databases in 4 categories:

1. Data related to wind sources such as geographical location, speed, and direction,
2. Technical information related to the equipment required in wind farms,
3. Databases related to the wind farms infrastructure,
4. Environmental impacts of wind farms.

The study's next step was to find out the databases; once the criteria were set; I started web search and literature study to find open-access databases. Meanwhile, I communicated with many companies working in the wind industry, most in Norway and some in other European countries, and asked them if they have any accessible wind power databases. These efforts lead to collect 47 databases which are described in the next section.

The third step was to operationalize FAIR and openness evaluation. There are various approaches to implementing the FAIR principles, some of which are customized to certain types of digital resources. Documents that can guide implementation decisions have already been issued by communities [15]. Some of the FAIR implementation tools are: the “FAIR metrics” [22] and the “follow-up Maturity Indicators” [23], the “FAIRy tale” [24], “Top 10 FAIR Data & Software Things” [25], the RDA FAIR Data Maturity Model [26], the EC report on “turning FAIR into reality” [27], and the “FAIR principles explained” described on the GO FAIR website [28].

I assessed the selective database with two methods, human assessment is done by FAIR self-assessment tool, which is developed by the Australian Research Data Commons (ARDC) [4], and machine assessment repeated by the automatic procedure using FAIR Evaluation Services [5], and studied if a human assessment and a machine assessment lead to similar results.

3.1. FAIR and Open database principles

The open science movement is growing rapidly. The European Council and the G7 conference in Japan have made Open Science and the reusability of research data a priority. This created an ideal ground for the FAIR Data Principles' rapid adoption since their recent publication. The European Commission's DG RTD (Directorate General for Research and Innovation) assumed the lead but working closely with other directorates, including the NIH's (National Institutes of Health) Big Data to Knowledge (BD2K) program in

the United States. Science Europe has adopted FAIR principles as the foundation for sharing administrative data on funding [13].

Good data management isn't a goal by itself; it's the key to knowledge discovery and development and data and knowledge integration and reuses by the community when the data is published [12].

Because we, as human, are capable of identifying and interpreting a wide variety of contextual cues, whether they take the form of structural/visual/iconic cues in the layout of a Web page or the content of narrative notes, humans have an intuitive sense of semantics (the meaning or intent of a digital object). As a result, we're less likely to make mistakes when choosing relevant data or other digital items, yet humans will face similar challenges if contextual metadata isn't available. On the other hand, humans are incapable of operating at the breadth, scale, and speed required by the size of current scientific data and the complexity of e-Science. As a result, people are increasingly relying on computational agents to perform exploration and integration activities for them. Machines must be able to operate autonomously and responsibly when confronted with the enormous diversity of kinds, formats, and access mechanisms/protocols that they will encounter throughout their self-guided exploration of the global data ecosystem [12].

The FAIR principles are intended to support both human and machine knowledge discovery and innovation, as well as data and knowledge integration, data sharing and reuse, and data and metadata that is machine-readable. They also support new findings through the harvesting and analysis of multiple datasets and outputs. However, the use of the FAIR principles will vary for each discipline.

These infrastructure requirements have been – and continue to be – addressed extensively at the European Commission level, particularly in the context of the 2016 Dutch EC Presidency and the European Open Science Cloud (EOSC), the e-IRG roadmap, and the NIH Data Commons projects in the United States. ANDS and AARNet in Australia take a similar strategy, while the East African Community endorsed the Dakar Declaration on Open Science in Africa. The African Data Intensive Research Cloud is also on the South African research infrastructure plan. The notion of creating an infrastructure based on rich information for resources in the research environment that supports their optimal re-use is common to all of them. All of these resources and services will need to be provided by various parties, both commercial and public [13].

3.1.1. Open Data

Open Data is the concept that specific data should be freely available for anybody to use and republish as they like, with no limitations imposed by ownership or other control mechanisms [66]. While there are different definitions of open data, the majority of them focus on the same features. To summarize, open data is information that is freely available to download in a reusable format and license with few constraints [4[. According to the Open Knowledge Foundation [67], data is open if it "may be freely used, modified, and shared by anyone for any purpose." In this regard, researchers must be able to do the followings [45]:

- **Retrieving the data:** make a copy of the database without any restrictions,
- **Modification of data:** make any changes to the database, repair, combine and modify, especially in case of low-quality databases that have inconsistency or incompleteness,
- **Sharing the data**: researcher can share the original or modified database with other users.

In most jurisdictions, data is protected by intellectual property rights, which prevents third parties from exploiting, reusing, or transmitting information without permission. Even if there is a doubt about the existence of rights, it is vital to apply for a license for the sake of clarity. As a result, any researcher or data source who wants to make their data publicly available should do so under the terms of a license. The license is vital if they wish for the data to be accessible since it permits people in regions where their usage is generally limited to access it [47].

Open data licenses have received a lot of attention in recent years due to the emergence of big data and associated technologies. Data and software licensing are critical in the age of data sharing. Making data or software publicly available is not a simple process due to privacy issues, competing interests of the parties involved, and various other considerations. The legal information on who may access and use the data and software and how they may be utilized must be stated clearly. As a result, a variety of licenses have emerged [46]. The Followings are some of the standard types of license. Each of them has its own definition and should be used as needed in different situations. It is the task of the data providers to find and assign a suitable license to the shared database.

Public Domain Mark (CC-0), Creative Commons Public Domain Dedication (PDDL), Open Data Commons Public Domain Dedication and License (CC-BY), Creative Commons Attribution 4.0 International (CDLA-Permissive-1.0), Community Data License Agreement – Permissive, Version 1.0 (ODC-BY), Open Data Commons Attribution License (CC-BY-SA), Creative Commons Attribution-ShareAlike 4.0 International (CDLA-Sharing-1.0), Community Data License Agreement – Sharing, Version 1.0 (ODC-ODbL), Open Data

Commons Open Database License (CC BY-NC), Creative Commons Attribution-NonCommercial 4.0 International (CC BY-ND), Creative Commons Attribution-NoDerivatives 4.0 International (CC BY-NC-SA), and Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-ND) are examples of common licenses in order of most open to most restrictive[48].

3.1.2. FAIR Data

FAIR is a set of principles aimed at guaranteeing that research items are reusable and will be reused as often as feasible and become as useful as possible. They are a set of guiding principles that allow for a continuum of growing reusability via many diverse implementations rather than technical requirements [13].

The FAIR principles are described below:

Findable: Both people and machines should have simple access to digital materials. Extensive machine-actionable information is required to automatically discover relevant datasets and services and is a necessary part of the FAIRification process [15]. Assigning a persistent identification (such as a Digital Object Identifier - DOI - or ORCID), having rich metadata to characterize the material, and ensuring that it is discoverable through disciplinary local or worldwide discovery portals are all examples of findability.

Accessible: Humans and machines should have clear protocols for accessing digital resources, including well-defined processes for obtaining permission to access protected data [15]. This might involve adopting a common protocol to open the data. On the other hand, the data does not have to be public such as sensitive data like privacy issues, national security issues, and business interests need the licensing conditions to access and reuse should be clear and transparent [4].

Interoperable: When two or more digital resources are connected to the same topic or thing, computers should be able to combine the data into a more comprehensive, unified picture of that object. Similarly, when an online service may process a digital entity, a machine should be able to automatically recognize this compliance and facilitate the data's interaction with that tool. This necessitates that each participating resource - whether its data or service - has a defined meaning [15]. In the data and metadata, this entails employing community-accepted languages, formats, and vocabularies. Metadata should use identifiers to refer to and define connections to other data, metadata, and information.

Reusable: For both humans and machines, digital resources are sufficiently well described that a machine can determine whether or not a digital resource should be reused (i.e., is it relevant to the task at hand?); if a digital resource can be reused, and under what conditions (i.e., do I meet the

requirements of reuse?); and who to credit if it is reused [15]. The fundamental richness of reusable data should be preserved. For example, it should not be lowered to explain the findings of a single article. It requires a machine-readable license as well as details on how the data was created. It should also adhere to discipline-specific data and metadata standards to provide rich contextual information that may be reused.

The FAIR Guiding Principles and sub-principles developed by Wilkinson et al. (2016) are quoted in box 1 below [12].

The FAIR Guiding Principles
To be Findable: ➢ F1. (meta)data are assigned a globally unique and persistent identifier ➢ F2. data are described with rich metadata (defined by R1 below) ➢ F3. metadata clearly and explicitly include the identifier of the data it describes ➢ F4. (meta)data are registered or indexed in a searchable resource **To be Accessible:** ➢ A1. (meta)data are retrievable by their identifier using a standardized communications protocol ➢ A1.1 the protocol is open, free, and universally implementable ➢ A1.2 the protocol allows for an authentication and authorization procedure, where necessary ➢ A2. metadata are accessible, even when the data are no longer available **To be Interoperable:** ➢ I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation. ➢ I2. (meta)data use vocabularies that follow FAIR principles ➢ I3. (meta)data include qualified references to other (meta)data **To be Reusable:** ➢ R1. meta(data) are richly described with a plurality of accurate and relevant attributes ➢ R1.1. (meta)data are released with a clear and accessible data usage license ➢ R1.2. (meta)data are associated with detailed provenance ➢ R1.3. (meta)data meet domain-relevant community standards

Making research data more FAIR will provide a range of benefits to researchers, research communities, research infrastructure facilities, and research organizations.

Wind energy has been the primary renewable energy source in recent decades. It can continue growing, good quality and open datasets of wind resources, wind farms technical data, and wind farm operational data are fundamental for researchers to extract knowledge and advance future research.

3.2. The selection process of databases

Based on the criteria, wind energy related databases have been identified by web search and literature study. The main resource is the website: www.thewindpower.net, a robust database of accurate raw information on rapidly increasing wind power and related industries. Although it is not available for free, the database includes information from many players in the global wind industry, including investors, operators, and owners of wind farms and turbine manufacturers. It also gives the user clear and immediate access to data about locations, turbine types, numbers, etc. It is not entirely accessible to the general public. To explore and view all of the files, we had to buy a license.

Using this website and analyzing existing databases and web searching, literature study, and corresponding with wind industry development companies in Norway and other countries for possibilities to access their databases, I made a collection of databases for assessments. Multiconsult, Statkraft, Norce research institute, Sintef research institute, Equinor, DNV, Automasjon, Head energy, and Aker are examples of Norwegian companies and institutes, and Van oord, Orsted, Engie group are among the European companies I asked them about wind power databases. Among all founded databases, 47 databases with full or partial open access and have downloadable files or details that can be analyzed online were found.

Table 2 shows the name of assessed databases, technology, and related county/region and description for each database. Also, it is mentioned that each database belongs to which categories are defined in section 3.

Table2: List of assessed databases related to the wind industry

NO.	Name of Database	Technology	Country	Description
1	Norwegian wind power data Published by NVE (Category 1,2)	Offshore and Onshore Wind	Norway	Norwegian Water Resources and Energy Directorate (NVE) provide a list of all wind farms in Norway and information about Norwegian wind power production. The database includes various data, including an overview of wind farms, development per year, production data, usage time, and distribution map.
2	Hywind Scotland Dataset By Equinor Norway (Category 1,2)	Offshore Wind	Norway	The collection is made up of 11 interval measurements taken from a single wind turbine at the Hywind Scotland wind farm. From 2018, each interval will last 30 minutes. Within the data sharing initiative, the following information is shared: wind speed, privilege wave height (Hs), wave period (Tp), wave direction for wind and swell, nacelle yaw

				direction, and roll/pitch movements, floater movements of roll, pitch, and yaw, surge and sway motions measured using GPS, and mooring system tension
3	Offshore wind data By Orsted Denmark (Category 1)	Offshore Wind	Denmark	The wind data from two wind farms in Denmark, Anholt and Westermost Rough (in a specific period), was supplied via Orsted Offshore Operational Data Sharing. LiDAR was installed for wind measuring at both the Anholt and Westermost Rough wind farms. The metadata tables provide information on the manufacturer, model, location, and data corrections for proper data usage.
4	The 1st open data windfarm By Engie group France (Category 1,2)	Onshore Wind	France	The ENGIE firm has published data from its ENGIE Green subsidiary's "La Haute Borne" wind farm (in the Meuse region, France) available to the public. Data related to four wind turbines and consists of a variety of datasets about wind and technical information varied from 2013 to 2020.
5	4C Offshore Wind Database (Category 1,2,3)	Offshore Wind	International	4C Offshore is a maritime advisory and business analysis firm that maintains an international directory of offshore wind farms. The database includes information on over 1,800 offshore wind projects in 52 countries, such as their location, timeline, and ownership, as well as the turbine, transmission, and vessel technologies used. The website also includes an interactive map that allows users to look up offshore wind turbines, planned projects, important ports, wind speed, water depth, and other details.
6	American Wind-Wildlife (Category 4)	Wind Energy	USA	The American Wind Wildlife Institute (AWWI) is a non-profit organization that performs and funds science research to better understand the dangers of wind energy to wildlife and create ways to prevent, mitigate, and offset those risks. Peer-reviewed wind-wildlife studies, written papers, reviews, and widely accessible yet unpublished reports planned for wind energy facilities in North America are all available in the American Wind-Wildlife Documents Library (both before and after construction).
7	Atlantic Offshore Seabird Dataset (Category 4)	Offshore Wind	USA	The Atlantic Offshore Seabird Dataset Catalogue includes historical and current databases on survey effort and bird observations along the Atlantic Outer Continental Shelf, thanks to a partnership between several bureaus within the US Department of Interior. Each observation report provides a point position, date, and period, and the complete database contains over 70 datasets.

8	Australian Renewable Energy Mapping Infrastructure (AREMI) (Category 1,3)	Marine Energy, Wind Energy	Australia	AREMI (Australian Renewable Energy Mapping Infrastructure) is a geographic data network for the energy industry in Australia. AREMI's website offers links to clean energies and general knowledge from a variety of third-party data providers. AREMI is a project created by Data61 in collaboration with Geoscience Australia and financed by the Australian Renewable Energy Agency.
9	Belgian Marine Data Centre (Category 1,4)	Marine Energy, Wind Energy	Belgium	The Belgian Marine Data Centre (BMDC) is a National Oceanographic Data Centre (NODC) at the Royal Belgian Institute of Natural Sciences devoted to the technical collection and long-term storing of marine environmental and fisheries data and the manufacture of data items. BMDC's main goal is to protect and effectively handle oceanographic data and information, including collecting, formatting, quality control, cataloging, archiving, disseminating, and sharing marine data and information.
10	Biofouling Database (Category 2,3)	Marine Energy, Wind Energy, Offshore Wind	International	The European Biofouling Database is a basic production of the OCEANIC project that aims to provide producers, operators, and regulators with a short analysis of regional biofouling distribution, allowing them to make informed decisions. The database offers information to the MRE sector on the occurrence of species and essential biofouling parameters to inform developers in preparing projects. The database is maintained on a regular basis, and a final version can be requested via the website's form.
11	California Offshore Wind Energy (Category 1,2,3,4)	Offshore Wind	USA	The Offshore Renewable Wind Energy Gateway brings together geospatial data on ocean wind infrastructure, ecological and natural resources, industrial and recreational uses of the ocean, and community values. In support of the Intergovernmental Renewable Energy Task Force, Data Basin hosts the gateway on their mapping and research website. The data is intended to aid in identifying areas off the coast of California that could be appropriate for wind energy production.
12	Data Basin (Category 4)	Marine Energy, Wind Energy	International	Data Basin is a science-based mapping and visualization tool that promotes environmental stewardship, learning, and study. The center of Data Basin is accessible, and it gives you access to thousands of scientifically validated biological, physical, and socioeconomic datasets on various subjects, geographies, and programs. Data Basin's Gateways showcase geographic information about a specific initiative or agency by displaying a subset of the data available on Data Basin.

13	EMODnet (Category 1,4)	Marine Energy, Wind Energy	International	EMODnet (European Marine Observation and Data Network) is a group of organizations that collects European marine data, data items, and metadata from various sources. Within EMODnet, data portals provide access to information such as the spatial scale of a sequence of sea-related events, their temporal variation, and characteristics that signify the severity of each activity. Users will also use the Human Activities portal's dynamic map to find aquatic clean energy facilities and offshore wind turbines in different stages of construction across Europe.
14	Energy Marine Map (EMMap) (Category 1)	Marine Energy	Chile	The Energy Marine Map (EMMap) is an interactive tool created by the Marine Energy Research & Innovation Center (MERIC) that aims to bring together knowledge from various sources that are important to the production of marine renewable energy in Chile into a single forum. All information on EMMap is made available in real-time for the benefit of those who are involved.
15	Environmental Studies Program Information System (ESPIS) (Category 1,2,4)	Marine Energy, Wind Energy	USA	The Environmental Research Program Information System (ESPIS) provides information on current and completed environmental studies conducted by the Bureau of Ocean Energy Management (BOEM). Downloadable electronic records with research profiles, scientific summaries, and final findings, as well as links to related publications and digital data, are included in the study material.
16	FERC eLibrary (Category 1)	Marine Energy	USA	The Federal Energy Regulatory Commission's (FERC) eLibrary keeps track of all permit-related records for sites within its oversight, covering all MHK programs in the United States. Users may perform general searches or scan the eLibrary for a given docket number. Notice that the eLibrary incorporates both MHK and traditional hydrokinetic project filings.
17	GRIP Database (Category 1,2)	Offshore Wind	International	The GRIP Database is a complex tool that offers strategic insights into the global green energy industry through a variety of technologies. Currently, the program is only available for offshore wind projects, although it will be expanded to include other developments in the near future. The business research team at Renewables Consulting Group (RCG) updates the system on a regular basis, allowing consumers to stay on top of the rapidly evolving offshore wind sector around the world. A subscription may be required to access the data.
18	Hydrodynamic Testing Facilities (Category 1,4)	Marine Energy	USA	The Hydrodynamic Testing Facilities Database, hosted on OpenEI, combines a map-based viewer with a directory of hydrodynamic testing facilities to

				provide information on various testing capabilities and resources available at the private, college, and government facilities, as well as offshore berths, in the United States.
19	MARENDATA (Category 1,3)	Marine Energy	International	The MARENDATA Data Management Platform (formerly the SOWFIA Data Management Platform) is an interactive framework for presenting wave energy and related data. MARENDATA may be used to look up basic statistics about a project, a test site, or details about one or more environmental criteria. In the light of two ongoing programs, SeaWAVE and WESE, the original platform was converted to this current iteration. The data sets that have been made available on the SOWFIA Data Management Platform will remain open to the public. SeaWAVE and WESE's collaborators are gathering new data sets.
20	Marine & Hydrokinetic Technology (Category 1)	Marine Energy	International	The Marine and Hydrokinetic Technology Database, hosted on OpenEI by the US Department of Energy, offers up-to-date information on marine and hydrokinetic clean energy in the US and worldwide. The database provides information on wave, tidal, current, and ocean thermal energy, information on energy conversion systems, businesses working in the area, and the advancement of water-related ventures.
21	Marine Cadastre (Category 1,2,4)	Marine Energy, Wind Energy	USA	Marine Cadastre is an interconnected marine information system that offers ocean and Great Lakes planning data, equipment, and technological support. Marine Cadastre was created due to collaboration between the National Oceanic and Atmospheric Administration (NOAA) and the Bureau of Ocean Energy Management (BOEM) in the United States. It offers information on biologically sensitive regions, maritime borders, depth zones for offshore wind technology, offshore tidal streams, wave and wind resource potentials, and more.
22	Marine Data Exchange (Category 2)	Offshore Wind	United Kingdom	The Crown Estate created the Maritime Data Exchange to store, monitor, and disseminate offshore survey data and project reports generated by offshore renewable and marine aggregates customers.
23	MHKTech Papers Blog (Category 1,2,4)	Marine Energy	USA	MHKTech Papers is a blog that collects scientific papers on the advancement of marine and hydrokinetic technologies, with an emphasis on technological development, economics, and resource evaluation.

24	Northeast Ocean Data Portal (Category 1,2)	Offshore Wind	USA	The Northeast Ocean Data Portal is a consolidated, peer-reviewed data and interactive map resource for the northeastern United States' ocean ecology and ocean-related human activities. The Portal is used to advise ocean planning, offshore wind production, fisheries management, and other applications by various government departments, businesses, academic institutions, and individuals.
25	OBIS-SEAMAP (Category 1,3)	Map	International	Ocean Biogeographic Information System (OBIS) is a database that contains information about the OBIS-SEAMAP (Spatial Ecological Analysis of Megavertebrate Populations) is a spatially referenced web database that collects data on aquatic mammals, seabirds, and sea turtles from around the world. The Marine Geospatial Ecology Lab at Duke University's Nicholas School of the Environment hosts OBIS-SEAMAP. The Ocean Biogeographic Information System includes the OBIS-SEAMAP project as a node (OBIS).
26	Offshore Wind Hub (Category 1,2)	Offshore Wind	USA	All significant papers, regulations, environmental studies, and other records relating to offshore wind strategy, technology, economy, and sitting in the Atlantic Coast states are collected in the Offshore Wind Hub. Many Atlantic Coast states from Maine to Georgia are now up to date, and lists for other states and the federal government will be included over time.
27	OpenEI (Category 2,3)	Marine Energy, Wind Energy	USA	OpenEI is a wiki-based crowd-sourced website that houses various content and data contributed by contributors ranging from professionals to hobbyists. Over 200,000 pages are currently available on OpenEI, covering a broad range of subjects such as clean energy infrastructure and technology, policies and legislation, and examined and raw data.
28	Quest Floating Wind Energy (Category 1,2)	Wind Energy, Offshore Wind	USA	Quest Floating Wind Energy (Q FWE) is a business research firm that offers a number of subscription-based solutions focused on the offshore wind energy market and supply chain. The Quest Offshore Wind Turbine Database, as well as a directory of wind firms and their supply chain categories, the Q FWEconomics Calculator, and the Quest Offshore Wind Turbine Database, are all free to use.
29	Resource (Category 1,2,4)	Marine Energy, Wind Energy	International	The International Renewable Energy Agency (IRENA) is a non-profit organisation that helps countries move to a more secure energy future. Users may search for renewable energy content, publications, data, and statistics by energy source, region, or technology on IRENA's REsource portal.

30	Supergen ORE Hub Research (Category 1,2)	Marine Energy, Wind Energy	United Kingdom	The Supergen ORE Hub Research Landscape is an interactive online tool that lets you look at the most up-to-date statistics, research, and technological challenges in the offshore wind, wave, and tidal energy sectors. The tool is designed to provide an open and readily available database of current research in offshore renewable energy that can be accessed by a variety of stakeholders, with knowledge taken from academics, businesses, and policymakers.
31	The Wind Power (Category 1,2,3,4)	Wind Energy	International	The Wind Power database is a global repository of information and documentation on wind plants, generators, suppliers, developers, and operators. The index contains information on more than 19,000 wind turbines and 650 offshore projects.
32	UK Marine Energy Database (Category 1,4)	Marine Energy	United Kingdom	The UK Marine Energy Database (UKMED) is a growing map and database of wave and tidal sites in the UK, maintained by RenewableUK. Users may display project information such as technology type, ownership, and status on the interactive map.
33	UK Wind Energy Database (UKWED) (Category 2)	Wind Energy	United Kingdom	The UK Wind Energy Database (UKWED) from RenewableUK provides valuable data and knowledge about the UK's onshore and offshore wind projects. RenewableUK Members have access to an automated search and interactive map and a project intelligence portal with updates on contracts, project ownership, generator sort, and news on onshore and offshore projects.
34	UKSeaMap 2010 Interactive Map (Category 4)	Map	United Kingdom	The UKSeaMap 2010 Project of the Joint Nature Conservation Committee (JNCC) produced a seabed biodiversity map for the UK marine environment. The interactive mapping portal includes a large-scale projected seabed ecosystem map based on EUNIS habitat classifications, a modified map of coastal physiographic characteristics, and the details used in the modeling process.
35	US Wind Turbine Database (Category 2)	Wind Energy	USA	The US Wind Turbine Database (USWTDB) contains information on the positions of land-based and offshore wind turbines in the United States and wind project information and turbine technical requirements. The website now contains information on over 58,000 turbines in 43 states (plus Guam and Puerto Rico).
36	Wave & Tidal Knowledge Network (Category 1,2,3,4)	Marine Energy	United Kingdom	The Wave & Tidal Knowledge Network (WTKN) of the Offshore Renewable Energy Catapult is an open access database that includes studies, databases, and project details on environmental effects and consents, grid interactions, health, and safety, and more.

37	West Coast Ocean Data Portal (Category 1,4)	Marine Energy, Wind Energy	USA	The West Coast Governors Alliance on Ocean Health is working on a partnership to improve ocean and coastal data and residents' exploration and connectivity to help inform regional resource management, policy creation, and ocean planning. The Portal provides information on important West Coast ocean topics such as monitoring the origins and trends of underwater debris, sea-level rise adaptation, identifying the effects of ocean acidification on our coasts, and marine preparation.
38	GWEC launches global offshore wind project database (Category 1,2)	Offshore Wind	International	The Market Intelligence team at the Global Wind Energy Council (GWEC) has compiled a comprehensive database of global offshore wind projects that are either under development or in operation. The Global Wind Energy Council (GWEC) is an international trade group for the wind energy sector. More than 80 countries throughout the world deliver comprehensive research and analysis on the wind power business. The new offshore database keeps track of key information for each project, including the developers, nation, kind of turbine and foundation, capacity, and project progress.
39	UKERC ENERGY DATA CENTRE (Category 2,3)	Offshore and Onshore Wind	United Kingdom	UK Energy Research Canter provides a catalog of datasets in all aspects of the energy sector. Wind Power is a collection of datasets providing market data that covers wind farms, turbines, manufacturers, developers, operators, and owners worldwide. There are downloads for each database, as well as images and maps, as well as market analyses for wind power. There is a map that you may interact with.
40	AWESCO Wind Field Datasets published by Zenodo (Category 1)	Offshore and Onshore Wind	International	The current datasets comprise three-dimensional wind field data that has been time-resolved. For offshore and onshore circumstances, wind field data is supplied for three distinct roughness classes. For time series of 15 minutes, 45 minutes of wind data, sampled every second, is accessible and recorded in HDF5 format for each roughness class.
41	Frøya wind data published by Zenodo (Category 1)	Offshore Wind	Norway	Wind data from the Skipheia meteorological station on the island of Froya in Norway's western coast, Trondelag. Zenodo has released data samples from full data recovery. Temperature, pressure, relative humidity, wind speed, and direction (from a nearby metrostation).
42	Aerodynamic data of WiRE-01 Blade published by Zenodo (Category 2)	Wind Technology	International	WiRE-01 blade lift and drag coefficients calculated using well-resolved LES in OpenFOAM at Reynolds numbers ranging from 4000 to 10000.

43	Energy potential of wind published by Zenodo (Category 1)	Wind resources	International	The data show the total energy potential of wind in the EU28. Raster data with wind power density at 50, 100, and 200 m are presented and then aggregated at the nuts3 level in grass gis, using the corine land cover and excluding urban areas, bird connectivity corridors, mountain peaks over 2500m, and protected areas from the natural 2000 framework.
44	Wind Farm 1 - Failures 2016 (Category 2,4)	Offshore and Onshore Wind	International	Historical Failure Logbook from the year 2016
45	The U.S. Wind Turbine Database (Category 3)	Map	USA	The U.S. Wind Turbine Database provides onshore and offshore wind farms located in the U.S.
46	The Wind Power (Category 1,2)	Offshore and Onshore Wind	International	The Wind Power database contains quantitative and qualitative information about wind farms worldwide, and that is routinely verified and updated at least twice a year.
47	Oklahoma High-Resolution Wind Resource (Category 1)	Offshore and Onshore Wind	USA	The annual average wind resource potential for the state of Oklahoma at a 50-meter height from November 2014

3.3. Manual Assessment

There are several methods for evaluating compliance with Wilkinson's (et al. 2016) FAIR principles. Only a few of these can be automated. The majority of them are tools for humans to self-assess databases in order to facilitate data FAIRification. Some of the manual assessment tools are listed below.

- FAIR self-assessment tool: an online self-assessment tool developed by the Australian Research Data Commons (ARDC) [4].
- SATIFYD: the DANS Self- Assessment Tool, an online assessment tool developed by Data Archiving and Networked Services (DANS) [50].
- Fair enough?: Online checklist to evaluate FAIR score developed by Data Archiving and Networked Services (DANS) [51].
- OzNome: The CSIRO 5 star Data Rating tool, an online assessment tool developed by Common wealth Scientific and Industrial Research Organisation, Australia [52].
- Stewardship Maturity Mix “Scientific Data Stewardship Maturity Assessment Model Template”: Online self-assessment template, developed by North Caroline Institute for Climate Studies (CICS-NC), the National Centers for Environmental Information (NCEI), and domain experts [53].

- Data Stewardship Wizard: Online questionnaire to create smart Data Management Plans (DMP) for FAIR Open Science tool, Developed by Data Stewardship Wizard (DSW) in cooperation with six research organizations [54].
- Checklist for Evaluation of Dataset Fitness for Use: Online checklist developed in cooperation with ICSU World Data System and Research Data Alliance [55].
- WMO-Wide Stewardship Maturity Matrix for Climate Data: Online assessment tool, developed by WMO Stewardship Maturity Matrix for Climate Data (SMM-CD) Working Group [56].
- Data Use and Services Maturity Matrix: Online assessment tool developed by MM-Serv Working Group adopting the approach of the NCEI (National Centers for Environmental Information)/CICS-NC Data Stewardship Maturity Matrix (DSMM) [57].

Manual FAIRness assessment of the selective databases is done using the FAIR data self-assessment tools developed by Australian Research Data Commons (ARDC) and determined how to increase its FAIRness where possible. An analysis in a forthcoming paper by Wierling et al. recommends using the ARDC tool because it is closest to the original Wilkinson's criteria and offers questions that avoid IT technical jargon [40].

The ARDC tools provide a web interface to their catalog of questions. Each question offers several choices of answers and assigns scores to the answers. It consists of 12 questions related to the principles underpinning Findable, Accessible, Interoperable, and Reusable (FAIR). I answered the questions by using a drop-down menu. After answering all the questions in each section, a green bar indicator was given based on my answers. When all sections were completed, an overall score for the FAIRness indicator was provided.

In addition to the green bars, each answer has specific points. Therefore, based on the points obtained in each section, it is possible to calculate the percentage of each F, A, I, and R then calculate the total amount of FAIR score.

There are five different values: One score each for findability, accessibility, interoperability, and reusability. In addition, there is an overall score giving the total FAIR status (Figure 9).

There are four options with different points for openness, which lead to the overall score of openness of the database.

Figure. 9 ARDC FAIR assessment tool, an example for one of the assessed databases, also indicate the maximum score for each section and equation to calculate the total FAIR score [4].

For more information, I list the questions and answers and assigned points for each answer in Appendix A. The following questions and answers related to each part are quoted from ARDC tool's webpage [4].

3.4. Automatic Assessment

FAIR is not only about sharing data between humans but also improving the data sharing between machines. Therefore, it is important to assess the level of FAIR implementation for an automatized processing of data. There are currently only two tools providing such a test: FAIR evaluating service developed by Wilkinson [5] and F-UJI Automated FAIR Data Assessment Tool [58].

Here is the automatic assessment, which is run by a tool developed by Wilkinson. The procedure is similar to the manual assessment, but it includes more detailed questions (22 questions instead of 12 questions of manual assessment) and runs the assessment automatically, and gave me the results for each database that how many questions are passed or failed. Then I could calculate the overall FAIRness score. The software needs a database's URL, user identification (typically ORCID number), and a title for the assessment. Then the assessment starts automatically, and after some minutes (vary from 10 min to 45 min for each test), the results will be appeared to see how many tests are passed and how many are failed.

For more information, I provide a list and description of the topics which are in line with FAIR principles and automatically tested by the FAIR evaluation service in Appendix B. All the topics and descriptions are quoted from the FAIR maturity service [5].

4. Results

Applying the assessment methods for a manual and machine-based evaluation outlined in Section 3, the 47 databases selected have been assessed. This section summarizes the results obtained from both evaluation methods.

Figure 9 shows the overall score for FAIRness in percentage for each of the 47 databases for both assessment methods (manual and automatic). The vertical axis indicates the number of databases (D1 to D47), corresponding to the numbers in the database description table (Table 2). The blue bars show the manual score, and the red bars show the automatic evaluation scores. As shown in the figure, In general, all scores are low for most of the criteria, and especially in automatic evaluation, scores are lower than manual assessment. Only seven databases (15% of all databases) scored more than 40% in the automatic evaluation, and the maximum score is 82% belongs to database D40. In the case of manual assessment, only four databases (8% of all databases) scored the highest score, which is 88%, and the rest are mostly below 50%. The average FAIRness score in percent for automatic evaluation is 28% and for manual assessment is 45%.

Table 3 shows the scores in percent obtained from the manual assessment and the automatic assessment for all 47 databases. Separate values for the four guiding principles F, A, I, and R are listed, and an overall score for FAIRness. Furthermore, the openness score is shown in case of the manual assessment.

The openness scores come from the status of openness. The different choices about openness and associate scores are provided in Appendix A. If the database is publicly accessible by humans and machines alike by standard protocol (open, no login, etc. required), get a higher score (100%), but in the cases that it requires human intervention (e.g., it may require login to download, etc.) or meet explicitly stated conditions, (e.g., ethics approval for sensitive data) get lower points and data that are not open got 0%. In my case studies, only 30% of the databases (14 out of 47 databases) are open.

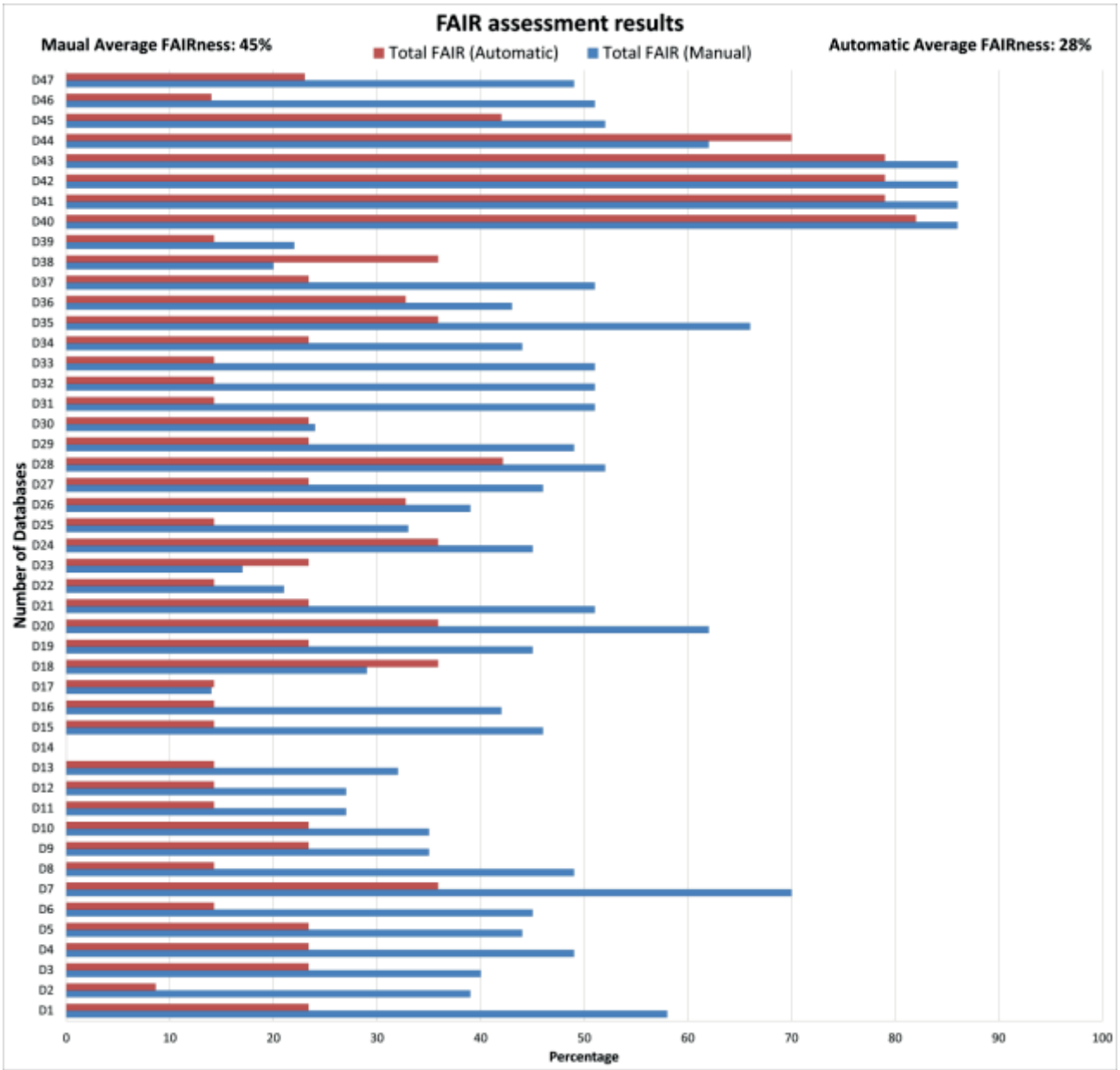


Figure 9: The overall scores for FAIRness in percent for each of the 47 databases for manual assessment and automatic assessment. The vertical axis shows the number of databases (D1 to D47), which corresponds to the numbers in the database description table (Table 2), the blue bars show the manual score, and the red bars show the automatic evaluation scores in percent

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Table3: Summary of manual and automatic assessment results. Separate values for the four guiding principles F, A, I, and R and the openness score and overall score for FAIRness are shown.

				Manual Assessment						Automatic Assessment				
NO.	Name of Database	Technology	Country	F%	A%	I%	R%	Total FAIR %	Openness %	F%	A%	I%	R%	Total %
1	Norwegian wind power data Published by NVE	Offshore and Onshore Wind	Norway	53	90	50	38	58	100	36	45	13	0	23
2	Hywind Scotland Dataset By Equinor Norway	Offshore Wind	Norway	53	40	25	38	39	33	12	23	0	0	9
3	Offshore wind data By Orsted Denmark	Offshore Wind	Denmark	41	70	13	38	40	67	36	45	13	0	23
4	The 1st open data windfarm By Engie group France	On shore Wind	France	53	70	38	38	49	67	36	45	13	0	23
5	4C Offshore Wind Database	Offshore Wind	International	53	50	25	50	44	33	36	45	13	0	23
6	American Wind-Wildlife	Wind Energy	USA	47	70	25	38	45	67	12	45	0	0	14
7	Atlantic Offshore Seabird Dataset	Offshore Wind	USA	88	90	38	63	70	100	36	45	63	0	36
8	Australian Renewable Energy Mapping Infrastructure (AREMI)	Marine Energy, Wind Energy	Australia	53	70	38	38	49	67	12	45	0	0	14
9	Belgian Marine Data Centre	Marine Energy, Wind Energy	Belgium	47	30	25	38	35	67	36	45	13	0	23
10	Biofouling Database	Marine Energy, Wind Energy, Offshore Wind	International	47	30	25	38	35	33	36	45	13	0	23
11	California Offshore Wind Energy	Offshore Wind	USA	29	30	13	38	27	33	12	45	0	0	14
12	Data Basin	Marine Energy, Wind Energy	International	29	30	13	38	27	33	12	45	0	0	14
13	EMODnet	Marine Energy, Wind Energy	International	47	30	13	38	32	33	12	45	0	0	14
14	Energy Marine Map (EMMap)	Marine Energy	Chile	0	0	0	0	0	0	0	0	0	0	0
15	Environmental Studies Program Information System (ESPIS)	Marine Energy, Wind Energy	USA	53	70	25	38	46	100	12	45	0	0	14
16	FERC eLibrary	Marine Energy	USA	47	70	13	38	42	100	12	45	0	0	14
17	GRIP Database	Offshore Wind	International	12	30	13	0	14	0	12	45	0	0	14
18	Hydrodynamic Testing Facilities	Marine Energy	USA	35	30	13	38	29	100	36	45	63	0	36
19	MARENDATA	Marine Energy	International	47	70	25	38	45	67	36	45	13	0	23
20	Marine & Hydrokinetic Technology	Marine Energy	International	47	90	63	50	62	100	36	45	63	0	36
21	Marine Cadastre	Marine Energy, Wind Energy	USA	53	40	63	50	51	67	36	45	13	0	23
22	Marine Data Exchange	Offshore Wind	United Kingdom	47	0	13	25	21	0	12	45	0	0	14
23	MHKTech Papers Blog	Marine Energy	USA	29	0	13	25	17	0	36	45	13	0	23
24	Northeast Ocean Data Portal	Offshore Wind	USA	47	70	38	25	45	100	36	45	0	0	36
25	OBIS-SEAMAP	Map	International	53	30	25	25	33	67	12	45	0	0	14
26	Offshore Wind Hub	Offshore Wind	USA	47	70	13	25	39	100	36	45	50	0	33
27	OpenEI	Marine Energy, Wind Energy	USA	65	80	13	25	46	67	36	45	13	0	23
28	Quest Floating Wind Energy	Wind Energy, Offshore Wind	USA	53	30	75	50	52	33	36	45	88	0	42
29	REsource	Marine Energy, Wind Energy	International	47	60	38	50	49	33	36	45	13	0	23
30	Supergen ORE Hub Research	Marine Energy, Wind Energy	United Kingdom	35	0	25	38	24	0	36	45	13	0	23
31	The Wind Power	Wind Energy	International	53	40	63	50	51	67	12	45	0	0	14
32	UK Marine Energy Database	Marine Energy	United Kingdom	53	40	63	50	51	67	12	45	0	0	14
33	UK Wind Energy Database (UKWED)	Wind Energy	United Kingdom	53	40	63	50	51	67	12	45	0	0	14
34	UKSeaMap 2010 Interactive Map	Map	United Kingdom	53	60	13	50	44	100	36	45	13	0	23
35	US Wind Turbine Database	Wind Energy	USA	82	70	63	50	66	67	36	45	63	0	36
36	Wave & Tidal Knowledge Network	Marine Energy	United Kingdom	53	70	13	38	43	67	36	45	50	0	33
37	West Coast Ocean Data Portal	Marine Energy, Wind Energy	USA	47	80	38	38	51	67	36	45	13	0	23
38	GWEC launches global offshore wind project database	Offshore Wind	International	41	0	13	25	20	33	36	45	63	0	36
39	UKERC ENERGY DATA CENTRE	Offshore and Onshore Wind	United Kingdom	41	10	13	25	22	0	12	45	0	0	14
40	AWESCO Wind Field Datasets	Offshore and Onshore Wind	International	88	80	88	88	86	100	51	90	88	100	82
41	Frøya wind data	Offshore Wind	Norway	88	80	88	88	86	100	39	90	88	100	79
42	Aerodynamic data of WiRE-01 Blade	Wind Technology	International	88	80	88	88	86	100	39	90	88	100	79
43	Energy potential of wind	Wind resources	International	88	80	88	88	86	100	39	90	88	100	79
44	Wind Farm 1 - Failures 2016	Offshore and Onshore Wind	International	47	90	63	50	62	100	39	90	50	100	70
45	The U.S. Wind Turbine Database	Map	USA	53	30	75	50	52	67	36	45	88	0	42
46	The Wind Power	Offshore and Onshore Wind	International	53	40	63	50	51	33	12	45	0	0	14
47	Oklahoma High Resolution Wind Resource	Offshore and Onshore Wind	USA	47	60	38	50	49	33	36	45	13	0	23

Table 4 illustrates an example of detailed results for one of the databases (Norwegian wind power data), detailed questions, and scores of manual assessment and automatic assessment, respectively. For the manual assessment, detailed scores of each of the 12 questions, scores of each principle, openness, and overall score for FAIRness are shown in percent. For the automatic assessment, results (0 for the failed questions and 1 for the successful questions in the automatic assessment procedure) for each of the FAIR category questions are shown. The weights are used to calculate the scores for each of them. In an unpublished article, Wierling et al. compared the criteria in the manual assessment of the ARDC with the automated assessment developed by Wilkinson. Based on the compilation, scores for the automatic assessment were derived. These scores are shown in table 5. All the tables and figures for each database are provided in Appendix C.

Table 4: Detailed results of manual and automatic assessment for Norwegian wind power data (D1)

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test	Weight	Answer	Test	Weight	Answer
Norwegian wind power data Published by NVE	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	**9/17**	**53%**	**Findability Score**			**0.36**		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	4		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	**9/10**	**90%**	**Accessability Score**			**0.45**		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	**1/2**	**50%**	**I Score**			**0.125**		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	**3/8**	**38%**	**R Score**			**0**		
	FAIR total score	**58%**		**FAIR Total Score**			**0.23**		
	Openness score	**100%**							

Table 5: The weight of each of the automated evaluation process tests to convert and compare the results with the manual assessment, developed by Wierling et al. in a forthcoming article.

Test #	Weight	Answer	Test #	Weight	Answer	Test #	Weight	Answer	Test #	Weight	Answer
1	0.12		9	0.225		14	0.0625		21	0.57142857	
2	0.12		10	0.225		15	0.0625		22	0.42857143	
3	0.24		11	0.225		16	0.0625				
4	0.12		12	0.225		17	0.0625				
5	0.12		13	0.1		18	0.125				
6	0.03					19	0.25				
7	0.03					20	0.375				
8	0.24										
F score:			A score:			I score:			R score:		
Total score:											

Figure 10 - 14 represents each Findable, Accessible, Interoperable, and Reusable score and the overall score for FAIRness based on both machine and human assessment.

In Figure 10, according to the automatic evaluation, 87% of the databases have a score of 12% or 36%, and only one database (D40) has the highest score of 52%. In manual evaluation, the variety of scores is greater, and the highest score is 88%, and all manual values are above the corresponding automatic scores.

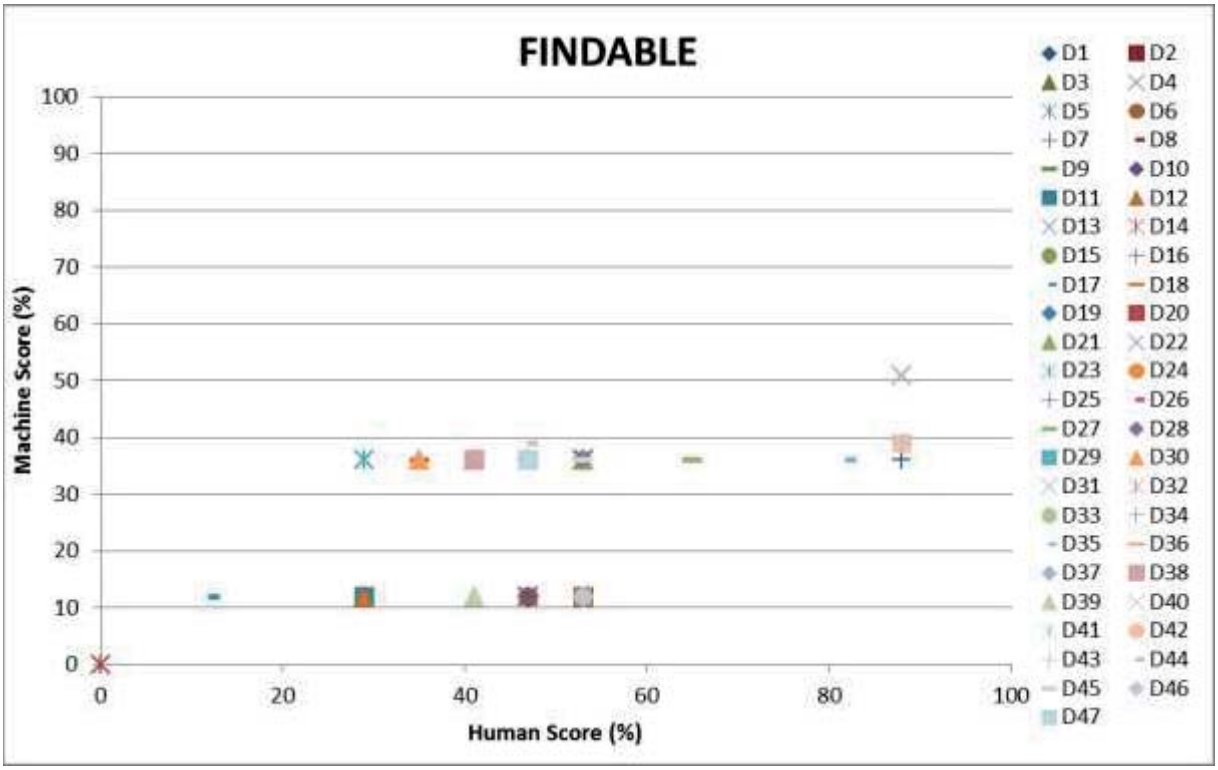

Figure 10. Illustrates the Findability scores for both manual (horizontal axis) and automatic (vertical axis) assessment

In Figure 11, most databases have a 45% score in the automatic Accessibility component evaluation, but it is noteworthy that five databases (D40 to D44) have earned the highest score (90%) among the databases. The highest score of manual evaluation is 90% as well.

The database number 38 (D38) has a 45% score in machine assessment but 0 in manual assessment, which means that no data was found or available to download at the time of evaluation.

Again the variation of the manual assessment is greater than the automatic assessment because of the wide range of choices available in the ARDC self-assessment tools mentioned in Appendix A.

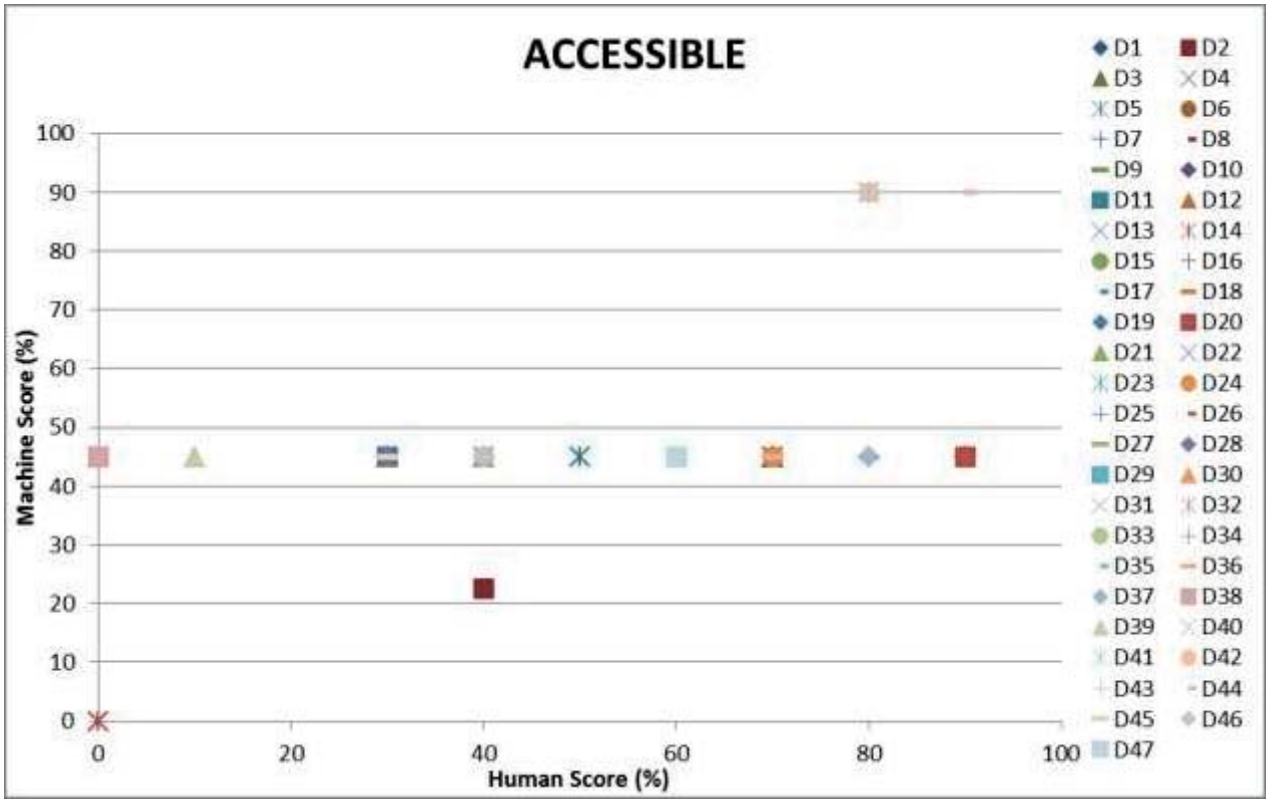

Figure 11. Illustrates the Accessibility scores for both manual (horizontal axis) and automatic (vertical axis) assessment

Figure 12 shows the scores of interoperability in both manual and automatic evaluation, and as expected, most databases obtained a low score in this principle. The reason is that the most challenging part to increase the FAIR score is the Interoperable part and requires a proper link between data and metadata as well as other related databases. The databases number 40 to 43 and 45 (D40 to D43 and D45) obtained the highest point of interoperability both in manual and automatic assessment. These databases are from repositories, and that the metadata support the repositories offer/require leads to this ranking. These are great examples to further develop interoperability enhancement methods in other databases.

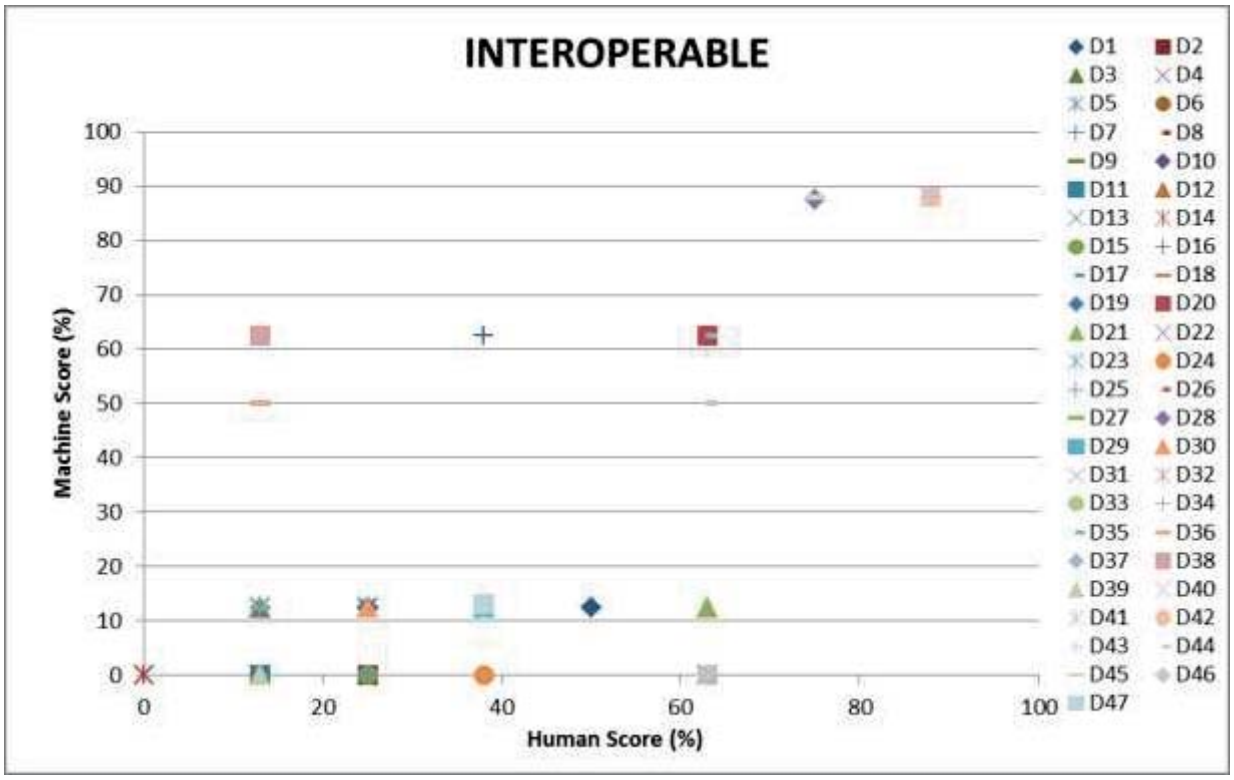

Figure 12. Illustrates the Interoperability scores for both manual (horizontal axis) and automatic (vertical axis) assessment

In terms of reusability (Figure 13), both manual and automatic evaluation methods are limited to assessing whether the database in question has a suitable machine-readable license or only a text-based license that humans can only read, or in lastly, there is generally no license or instruction to reuse.

Since most databases did not have a machine-readable license, their automatic evaluation score was zero, except for databases 40 to 44 (D40 to D44). The rest of the databases had text-based licenses or reuse instructions that humans could only read and analyze. It has caused different databases to get different scores in the manual evaluation.

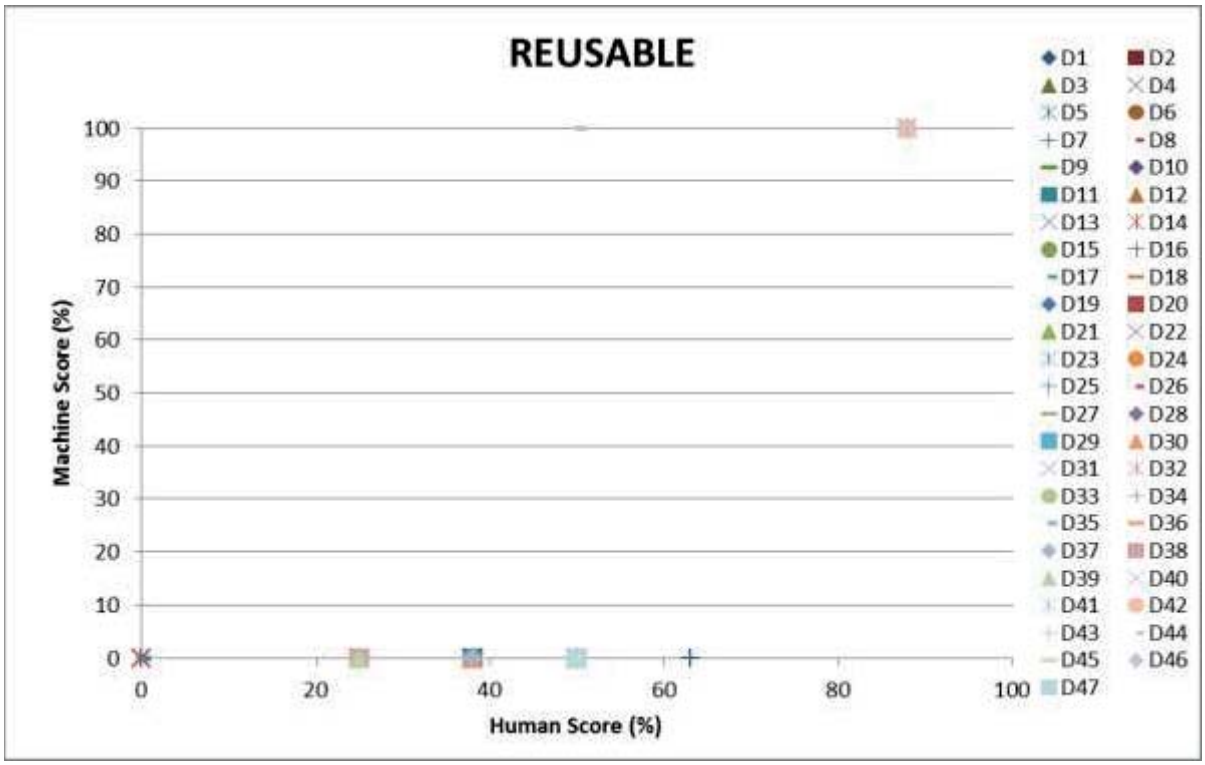

Figure 13. Illustrates the Reusability scores for both manual (horizontal axis) and automatic (vertical axis) assessment

Figure 14 shows the overall scores for FAIRness. The highest score belongs to database number 40 (D40: AWESCO Wind Field Datasets published by Zenodo), with 82% FAIR in automatic assessment and 86% FAIR in manual assessment.

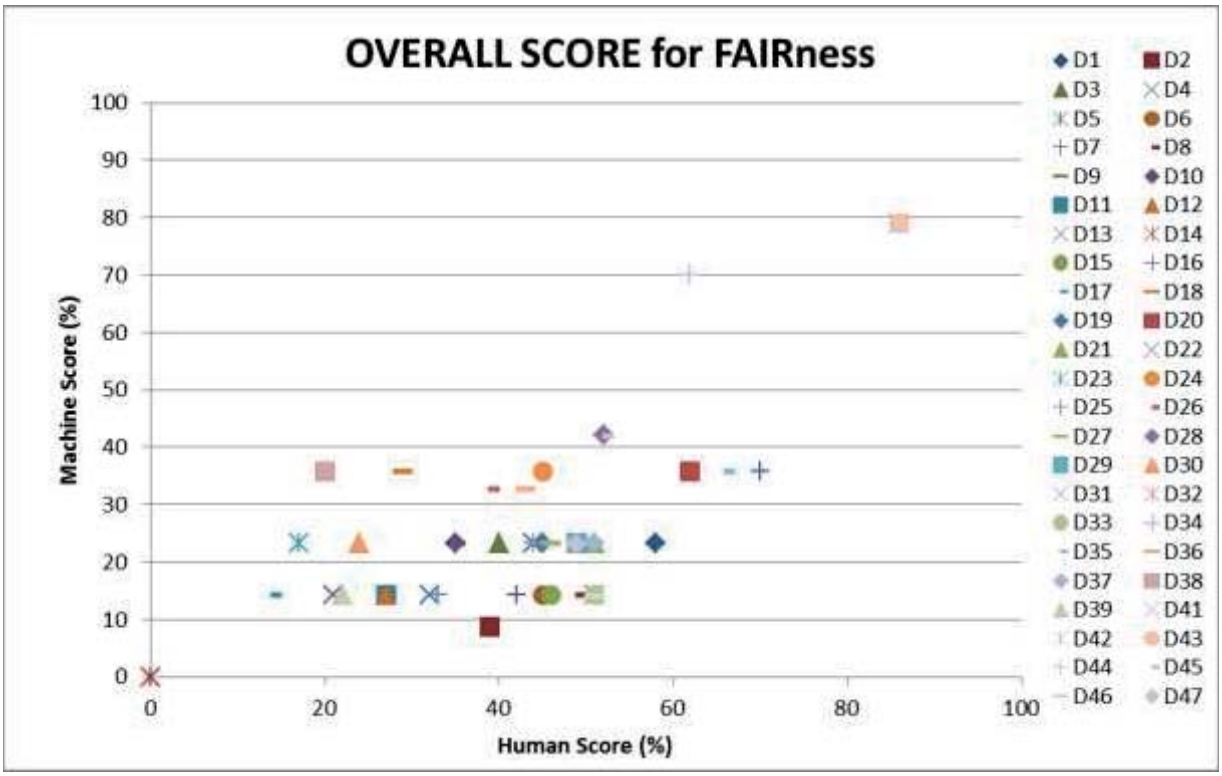

Figure 14. Illustrates the Total FAIR scores for both manual (horizontal axis) and automatic (vertical axis) assessment

From observing the graphs, it is concluded that the machine test often results in similar answers and that the variation is lower than the manual assessment. A reason here is that the machine test typically is unable to find the data at all. Many of the databases are web pages organized so that someone (a human) has to make some manual choices before getting specific data (like a selection on a map, particular years, and so on). The machine cannot do this and runs immediately into trouble. The connection from the general metadata, which is in the header of the webpage, to the actual data, is in that way impossible to do for the machine.

For that reason, databases on repositories like Zenodo [59] score higher (Database number 40 to 43) because there, this selection process is avoided, and a better connection between metadata and data is implemented.

5. Discussion

5.1.Means to improve the overall score for FAIRness

According to evaluations of 47 databases related to the wind energy industry, it seems that the databases in question, being representative of all databases in this sector, are generally poor in terms of compliance with the FAIR data principles. Increasing the databases' overall score of FAIRness will increase their efficiency in providing data to be shared and, in turn, contribute to the development of the wind industry and lead to increase the share of wind energy in the production of clean energy in the global energy supply chain and contribute to mitigating climate change.

Wind industry stakeholders (including researchers, investors, and data producers) are producing databases in all stages of feasibility studies, design, implementation, operation, and maintenance of wind farms, and also electricity distribution in local, national, and international networks. They can improve the quality of databases by considering not such complex and costly solutions and save time, money and speed up the rate of research and development of the wind industry.

Based on the assessment of the databases, this thesis recommends four important improvements to increase the level of FAIRness:

- The use of persistent identifiers,
- The ubiquitous use of metadata and its standardization,
- Design web page of the databases more machine-readable which is called Application Programming Interface (API service), and
- The use of machine-readable licenses for all published datasets.

These recommendations are discussed in the following paragraphs.

The four basic principles (F, A, I, and R) enable machines to make maximum use of data resources, therefore making them valuable for humans. Both people and machines should have simple access to digital materials. Extensive metadata (such as wind power information) is required for the automated discovery of relevant datasets and services, and it is an important part of the reaching more FAIR databases [15].

Persistent Identifier (PID): Any label used to name anything uniquely is referred to as an identifier (whether online or offline). An identifier is something like a URL, serial numbers, personal names, etc. A persistent identification of a digital resource is guaranteed to be handled and kept up to date over a certain time period by the data provider. The URL for accessing the data may change, and anyone using

the old URL will be unable to access the new data. When a persistent identifier is used instead of a URL to link to data, the URL is guaranteed to stay up-to-date. Some of the PID schemes include PURL, ARK, DOI, XRI, ORCID, and LSID [4]. The persistent identification of digital things (such as articles, datasets, photos, and multimedia data) as well as non-digital items (such as publishers, organizations, companies, geographic locations, and so on) is a critical issue for the entire information community. A primary aim of a persistent identifier is to assist data consumers in citing and finding specific data sets. All the databases that received a good score in Findability have a DOI as a persistent identifier.

Among the databases examined, the databases stored in a repository database, like the databases numbered D40 to D43, stored in the Zenodo repository, received a high score in terms of findability. The reason for this is that in order to store databases in a repository system, the database providers are required to allocate a specific type of PID to their databases (which were DOI in my assessed databases). Therefore, this increases the findability score (The data repository is a huge database system that collects, manages, and stores data sets for data analysis, data sharing, and reporting). In the more advanced stage of the PID usage, we can point to its expansion to sub-sections of huge databases. For example, generally, the data providers assigned a DOI to a database, but for large and advanced databases, in addition to the general DOI, they can also define a separate DOI for each section and each component of the database, thus significantly increasing the search and citation capability of the database. Therefore, in the first step, all wind energy stakeholders who are active in the field of preparation and production of databases, whether in the research and academic sectors or the industrial sector, should commit themselves to define a kind of PID for their databases (preferably DOI) and then plan to an expansion of the persistent identifier.

The following important point to discuss is the design of websites to access data. In the surveys conducted on selected databases in this thesis, the first 39 databases (number 1 to 39 in table2) were designed in such a way that access to databases and description files required human intervention. That's why the automatic score of Accessibility for them was low (45%). Web page services were designed entirely for human use and were not at all recognizable to machines. For example, to access the database, the user needs to do something like login, create an account and authenticate, filter databases by content, year, geographical location, etc. Also, in some cases, it is needed to contact the responsible person, send a project proposal, and describe why the user needs the data. Only after these procedures, the database convener will grant access to the database. Automated procedures currently are unable to provide this kind of information therefore the Accessibility score falls down consequently

the total score of FAIRness for the database will be low. Thus, data collectors should pay attention to putting their data in accessible conditions that can be traced and accessed by the machine. Protocols for retrieving digital resources should be made explicit, including well-defined ways to obtain authorization for access to protected data for both humans and machines [15]. This will increase the Accessibility score and consequently increase the overall score for FAIRness.

The next important point found in the evaluation of databases is that there is no proper connection between the databases available on the web and the relevant metadata. In general, many web pages provide metadata information in the header section of the web page's HTML code. This metadata often describes ownership and content description and intends to increase the findability of the web page by crawler programs. However, the metadata is not precise enough to link to the datasets in the webpage.

For all digital resources related to the wind industry, automatized data handlers (machines) should be able to combine the data into a more comprehensive, unified image of that item. Similarly, when an online service may process a digital entity, a machine should be able to automatically recognize this compliance and facilitate the data's interaction with that tool [15]. The first step to this purpose is to use data in the formats, languages, and vocabularies agreed upon in the wind industry community. Regarding the wind industry and the data used in this industry, the Technical University of Denmark (DTU) has prepared an excellent taxonomy in this field. They've proposed metadata and taxonomies for wind energy related topics. Associate data have been established as a standard vocabulary for tagging data in metadata cards that describe datasets [64]. Using a common taxonomy leads to a standardized understanding of the terms and topics in question. Defining this category for the machine and the proper relationship of the generated metadata with each other will increase the interoperability score and thus increase the overall FAIRness score.

In terms of reusability, the basic richness of reusable data should be preserved. For example, it should not be reduced to describe the conclusions of a single article. It requires an explicit machine-readable license as well as data provenance metadata. It should also use discipline-specific data and metadata standards to provide it with rich contextual information that can be accurately interpreted and reused [4].

The process of assigning a license to data is usually straightforward. The data provider is responsible for determining which form of license should be issued. In our case, the data provider usually collects, creates, and analyses data and enters them into a database. The list of different licensing types is mentioned in section 3.1.1. Data sharing is as important as data production. If all the data providers in

the wind energy sector share their data in the community, it leads to creating high-quality metadata with the same format and vocabularies. If stakeholders publish their data descriptions and licensing choices for each type of usage, other stakeholders may simply access it and access it according to their needs [60].

5.2.Overcoming barriers to make data FAIR and open

So far, the selected databases have been reviewed and evaluated, and some of their problems with compliance with FAIR principles and openness have been identified, and solutions have been proposed to improve them. Now we want to reflect on the issue that why the problems have arisen. Therefore, identify barriers and outline possibilities to overcome them.

The following barriers were found by studying the Technopolis report [68] and analyzing other relevant literature.

Economic assets: When researchers publish their findings before a rival team on the same topic, or when an idea or findings are released without proper acknowledgment to those who came up with the concept or had the first results, this is referred to as scooping in research. They choose the best time to make their data public.

Indeed, many academics have discovered that making their data public has substantially aided their study and improved their database, particularly for unresolved issues. In case of sensitive data about wind farms that are not suitable to make them public, data providers should set a corresponding machine-readable license and make data fully or partially open. In any wind power project, data ownership, maintenance, and access issues must be discussed in the project proposal and consider contractual and commercial interests [4].

Missing competencies: The second identified barrier is missing competencies. The proper definition of metadata, the use of repositories, and legal issues around licenses are usually not part of curricula at universities, nor are they included in many job training. Consequently, many researchers lack competencies regarding the methods, tools, and workflows to make data FAIR and open. One way to overcome this situation is to include topics around FAIRification into courses concerning data governance and data management. Another possibility is to hire experts in the academic as well as industrial workforce to explicitly support the FAIRification process. Here, the new profession of data stewards may offer a pool of experts that can be used.

The minimum activity by universities and academic institutions should be aware rising for the issues among researchers. Universities should promote data sharing from all research activities such as thesis work and either participate in global repositories or set up their own repositories.

Data governance: Data governance is a set of procedures, standards, and measurements that guarantee that information is used efficiently and effectively to help a company or researcher accomplish its objectives. Data governance establishes who has the authority to take what actions, based on what data, under what circumstances, and with what procedures.

Since competence is missing among the workforce, a way forward is to support FAIRification procedures with software tools. The problem is that software tools in this direction are not on the level of the ordinary researcher, and here development work has to be done.

5.3.Cost of not having FAIR data

Based on a study published in 2018, it is estimated that the annual cost of not having FAIR data to a minimum of €10.2bn per year. The actual cost is likely to be significantly greater because of the un-measurable parameters such as the value of improved research quality and other indirect positive effects of FAIR research data [16].

This report has been studied to estimate the amount of financial loss to the research community in the absence of FAIR data, as the cost of the following categories: storage, time, and licensing costs.

The cost of time spent because of non-FAIR research is estimated €4.5bn per year. It is because of the time researchers waste to find data in a specific research project with non-FAIR databases [16].

The FAIR principles would lower the cost of data storage for publishers and data repositories by decreasing the requirement for duplicated copies. The annual cost of duplicate storage due to non-FAIR research is €5.3 billion [16].

According to studies that quantified the license costs associated with not having FAIR and open-access databases, 71.5 % of academic research data could be accessible, but 28.5 percent must be kept confidential because of security concerns. The cost of licenses is estimated at €360 million per year because of the lack of open access [16].

6. Conclusion

Studies show the great potential of data sharing to improve the wind energy sector when it comes to:

a) better identifying wind resources,
b) advance equipment used in the wind industry and to fasten innovation,
c) improve operation and maintenance, and
d) integrate the wind energy into the sustainable development agenda.

The FAIR principles are seen as the guiding principles to ensure proper data sharing. Therefore, they should be taken up in the wind energy industry and academic fields working with wind energy issues.

This thesis assessed a representative set of databases with respect to their FAIRness. The main finding is that the level of FAIRness and Openness of the database in the wind industry is poor. It needs better implementation to speed up wind industry development. There are certain barriers that lead to this fact, but data providers can improve it with not such complicated and costly solutions. At first, stakeholders in the wind energy sector should realize that producing FAIR and open databases has great economic and technological benefits for them. To this end, they need to employ experts in data stewardship, train employees, create new FAIR databases, and upgrade existing databases to be more FAIR. The research institutes and universities should push this movement and illustrate to the wind energy sector that data sharing and FAIR databases have great benefits.

The main findings of the thesis to go beyond the barriers and improve the overall score of FAIRness, considering the current state of each F, A, I, and R, are the followings.

1. Assigning a persistent identifier (preferably DOI) to all newly produced databases in the wind sector and upgrading the existing databases,
2. Emphasizing metadata, developed them in a standard manner and most important make a good connection between databases and associated metadata,
3. Data sharing platforms of wind energy databases need to be improved and design for accessing machine and reduce any human intervention to access data, and
4. Among them, an obligatory use of licenses is seen as an immediate step.

It is worth mentioning here that the FAIR data is not necessarily open data. The organizations that produce sensitive and private data can create FAIR databases and store them in their own repositories system.

Assessment tools which are used in this study for both manual and automatic assessment were free online tools. The “ARDC self-assessment tool” was used for the manual assessment and the “FAIR

maturity evaluation servicer" for the automatic assessment. The automatic tool also has a premium version which is not free, and we made a short comparison between the paid version and the free online version. The results were almost the same, with a 5% incompatibility. In appendix D, a detailed comparison table is provided.

Those assessment tools were not developed just for the wind energy sector. They have some generic questions which work for any type of database and assess its FAIRness. For further studies, it is suggested to develop a customized version of the tools with specific questions regards the wind energy sector.

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7.1. URLs of the assessed databases

Here the URLs of the assessed databases are provided. The order is the same as in Table 2:

1. https://www.nve.no/energiforsyning/kraftproduksjon/vindkraft/vindkraftdata/
2. https://data.equinor.com/?_ga=2.31170687.1729835605.1619692936-1682413862.1603467436
3. https://orsted.com/en/our-business/offshore-wind/offshore-operational-data
4. https://opendata-renewables.engie.com/explore/dataset/d543716b-368d-4c53-8fb1-55addbe8d3ad/information
5. https://www.4coffshore.com/windfarms/
6. https://awwic.nacse.org/
7. https://www.ncei.noaa.gov/access/metadata/landingpage/bin/iso?id=gov.noaa.nodc%3A115356
8. https://www.nationalmap.gov.au/
9. http://bmdc.be/NODC/index.xhtml
10. http://oceanic-project.eu/biofouling-database/
11. https://caoffshorewind.databasin.org/
12. https://databasin.org/
13. https://www.emodnet-bathymetry.eu/search

14. https://www.emmap.cl/index
15. https://marinecadastre.gov/espis/#/
16. https://ferconline.ferc.gov/Login.aspx
17. https://grip.thinkrcg.com/login
18. https://openei.org/wiki/Hydrodynamic_Testing_Facilities_Database
19. http://www.emec.org.uk/press-release-sea-wave-wese-launch-a-platform-for-ocean-energy-data-sharing/
20. https://openei.org/wiki/PRIMRE/Databases/Technology_Database
21. https://marinecadastre.gov/
22. http://www.marinedataexchange.co.uk/
23. https://mhktechpapers.wordpress.com/
24. https://www.northeastoceandata.org/
25. https://seamap.env.duke.edu/
26. https://offshorewindhub.org/
27. https://openei.org/wiki/Main_Page
28. https://questfwe.com/
29. https://www.irena.org/statistics
30. https://landscape.supergen-ore.net/
31. https://www.thewindpower.net/index.php
32. https://www.renewableuk.com/page/UKMED2/UK-Marine-Energy-Database.htm
33. https://www.renewableuk.com/page/UKWEDhome/Wind-Energy-Statistics.htm
34. https://hub.jncc.gov.uk/assets/07a4513b-f04a-41c2-9be2-4135a14d0d15
35. https://eerscmap.usgs.gov/uswtdb/
36. https://www.waveandtidalknowledgenetwork.com/
37. https://portal.westcoastoceans.org/
38. https://www.windpowerengineering.com/gwec-launches-global-offshore-wind-project-database/
39. https://ukerc.rl.ac.uk/
40. https://zenodo.org/record/1418676#.YMCv5-szbIU
41. https://fairsharing.github.io/FAIR-Evaluator-FrontEnd/#!/evaluations/5560
42. https://zenodo.org/record/3460877#.YLFGm3UzbeQ
43. https://zenodo.org/record/4687579#.YLFH9nUzbeQ
44. https://opendata.edp.com/explore/dataset/htw-failures-2016/informatio
45. https://eerscmap.usgs.gov/uswtdb/viewer/#3/37.25/-96.25
46. https://www.thewindpower.net/statistics_countries_en.php
47. https://data.openei.org/submissions/388

8. Appendix

A: Detailed questions and choices regarding to manual assessmen tool, quote from ARDC online tool [4].

Manual Assessment

Findable

1. Does the dataset have any identifiers assigned?
   - Globally Unique, citable and persistent (e.g. DOI, PURL, ARK or handle). (4 Points)
   - Web addresses (URL). (3 Points)
   - Local identifier. (2 Points)
   - No identifier. (0 Points)

2. Is the dataset identifier included in all metadata records/files describing the data?
   - Yes. (1 Points)
   - No. (0 Points)
3. How is the data described with metadata?
   - Comprehensively (see suggestion) using a recognised formal machine-readable metadata schema. (4 Points)
   - Comprehensively, but in a text-based, non-standard format. (3 Points)
   - Brief title and description. (2 Points)
   - The data is not described. (0 Points)
4. What type of repository or registry is the metadata record in?
   - Data is in one place but discoverable through several registries. (4 Points)
   - Generalist public repository. (2 Points)
   - Domain-specific repository. (2 Points)
   - Local institutional repository. (2 Points)
   - The data is not described in any repository. (0 Points)

Accessible

5. How accessible is the data?
   - Publicly accessible. (5 Points)

- Fully accessible to persons who meet explicitly stated conditions, e.g. Ethics approval for sensitive data. (5 Points)
- A de-identified / modified subset of the data is publicly accessible. (4 Points)
- Embargoed access after a specified date. (3 Points)
- Unspecified conditional access e.g. contacts the data custodian for access. (2 Points)
- Access to metadata only. (1 Points)
- No access to data or metadata. (0 Points)

6. Is the data available online without requiring specialised protocols or tools once access has been approved?

- Standard web service API (e.g. OGC). (4 Points)
- Non-standard web service (e.g. OpenAPI/Swagger/informal API). (3 Points)
- File download from online location. (2 Points)
- By individual arrangement. (1 Points)
- No access to data. (0 Points)

7. Will the metadata record be available even if the data is no longer available?

- Yes. (1 Points)
- No. (0 Points)
- Unsure. (0 Points)

Interoperable

8. What (file) format(s) is the data available in?

- In a structured, open standard, machine-readable format. (2 Points)
- In a structured, open standard, non-machine-readable format. (1 Points)
- Mostly in a proprietary format. (0 Points)

9. What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?

- Standardised open and universal using resolvable global identifiers linking to explanations. (3 Points)
- Standardised vocabularies/ontologies/schema without global identifiers. (2 Points)
- No standards have been applied in the description of data elements. (1 Points)
- Data elements not described. (0 Points)

10. How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?

- Metadata is represented in a machine readable format, e.g. in a linked data format such as Resource Description Framework (RDF). (3 Points)
- The metadata record includes URI links to related metadata, data and definitions. (2 Points)
- There are no links to other metadata. (0 Points)

Reusable

11. Which of the following best describes the license/usage rights attached to the data?

- Standard machine-readable license (e.g. Creative Commons). (4 Points)
- Standard text based license. (3 Points)
- Non-standard machine-readable license (clearly indicating under what conditions the data may be reused). (3 Points)
- Non-standard text-based license. (2 Points)
- No license. (0 Points)

12. How much provenance information has been captured to facilitate data reuse?

- Fully recorded in a machine readable format. (3 Points)
- Fully recorded in a text format. (2 Points)
- Partially recorded. (1 Points)
- No provenance information is recorded. (0 Points)

Openness

Which of the following describes better the openness status of the selected database?

- Publicly accessible by humans and machines alike by standard protocol (open, no login, etc. required). (3 Points)
- Publicly accessible but requires human intervention (e.g., may require login to download, etc.). (2 Points)
- Fully accessible to persons who meet explicitly stated conditions (e.g., ethics approval for sensitive data). (1 Point)
- Data are not open. (0 Points)

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B: Automatic Assessment

Detailed heaalines and description regarding to atomatic assessmen tool, quoted from FAIR Evaluation Service [5].

Findability

- 1. Unique Identifier: Metric to test if the metadata resource has a unique identifier. This is done by comparing the GUID to the patterns (by regexp) of known GUID schemas such as URLs and DOIs. Known schema are registered in FAIRSharing
- 2. Identifier Persistence: Metric to test if the unique identifier of the metadata resource is likely to be persistent. Known schemas are registered in FAIRSharing
- For URLs that don't follow a schema in FAIRSharing we test known URL persistence schemas (purl, oclc, fdlp, purlz, w3id, ark).
- 3. Data Identifier Persistence: Metric to test if the unique identifier of the data resource is likely to be persistent. Known schema are registered in FAIRSharing. For URLs that don't follow a schema in FAIRSharing we test known URL persistence schemas (purl, oclc, fdlp, purlz, w3id, ark).
- 4. Structured Metadata: Tests whether a machine is able to find structured metadata. This could be (for example) RDFa, embedded json, json-ld, or content-negotiated structured metadata such as RDF Turtle
- 5. Grounded Metadata: Tests whether a machine is able to find 'grounded' metadata. i.e. metadata terms that are in a resolvable namespace, where resolution leads to a definition of the meaning of the term. Examples include JSON-LD, embedded schema, or any form of RDF. This test currently excludes XML, even when terms are namespaced. Future versions of this test may be more flexible.
- 6. Data Identifier Explicitly in Metadata: Metric to test if the metadata contains the unique identifier to the data. This is done by searching for a variety of properties, including foaf:primaryTopic, schema:mainEntity, schema:distribution, sio:is-about, and iao:is-about. schema codeRepository is used for software releases.

- 7. Metadata Identifier Explicitly in Metadata: Metric to test if the metadata contains the unique identifier to the metadata itself. This is done using a variety of 'scraping' tools, including DOI metadata resolution, the use of the 'extruct' Python tool, and others...
- 8. Searchable in Major Search Engine: Tests whether a machine is able to discover the resource by search, using Microsoft Bing

Accessibility

- 9. Uses Open Free Protocol for Data Retrieval: Data may be retrieved by an open and free protocol. Tests data GUID for its resolution protocol. Currently passes InChI Keys, DOIs, Handles, and URLs. Recognition of other identifiers will be added upon request by the community.
- 10. Uses Open Free Protocol for Metadata Retrieval: Metadata may be retrieved by an open and free protocol. Tests metadata GUID for its resolution protocol. Currently passes InChI Keys, DOIs, Handles, and URLs. Recognition of other identifiers will be added upon request by the community.
- 11. Data Authentication and Authorization: Test a discovered data GUID for the ability to implement authentication and authorization in its resolution protocol. Currently passes InChI Keys, DOIs, Handles, and URLs. It also searches the metadata for the Dublin Core 'accessRights' property, which may point to a document describing the data access process. Recognition of other identifiers will be added upon request by the community.
- 12. Metadata Authentication and Authorization: Tests metadata GUID for the ability to implement authentication and authorization in its resolution protocol. Currently passes InChI Keys, DOIs, Handles, and URLs. Recognition of other identifiers will be added upon request by the community.
- 13. Metadata Persistence: Metric to test if the metadata contains a persistence policy, explicitly identified by a persistencePolicy key (in hashed data

Interoperability

- 14. Metadata knowledge Representation Language (Weak): Maturity Indicator to test if the metadata uses a formal language broadly applicable for knowledge representation.

This particular test takes a broad view of what defines a 'knowledge representation language'; in this evaluation, anything that can be represented as structured data will be accepted

- 15. Metadata knowledge Representation Language (Strong): Maturity Indicator to test if the metadata uses a formal language broadly applicable for knowledge representation. This particular test takes a broad view of what defines a 'knowledge representation language'; in this evaluation, a knowledge representation language is interpreted as one in which terms are semantically-grounded in ontologies. Any form of RDF will pass this test (including RDF that is automatically extracted by third-party parsers such as Apache Tika)
- 16. Data knowledge Representation Language (Weak): Maturity Indicator to test if the data uses a formal language broadly applicable for knowledge representation. This particular test takes a broad view of what defines a 'knowledge representation language'; in this evaluation, a knowledge representation language is interpreted as one in which terms are semantically-grounded in ontologies. Any form of structured data will pass this test
- 17. Data knowledge Representation Language (Strong): Maturity Indicator to test if the data uses a formal language broadly applicable for knowledge representation. This particular test takes a broad view of what defines a 'knowledge representation language'; in this evaluation, a knowledge representation language is interpreted as one in which terms are semantically-grounded in ontologies. Any form of ontologically-grounded linked data will pass this test.
- 18. Metadata Uses FAIR Vocabularies (Weak): Maturity Indicator to test if the linked data metadata uses terms that resolve. This test only if they resolve, not if they resolve to FAIR data, therefore is a somewhat weak test.
- 19. Metadata Uses FAIR Vocabularies (Strong): Maturity Indicator to test if the linked data metadata uses terms that resolve to linked (FAIR) data.
- 20. Metadata Contains Qualified Outward References: Maturity Indicator to test if the metadata links outward to third-party resources. It only tests metadata that can be represented as Linked Data.

Reusability

- 21. Metadata Include License (Strong): Maturity Indicator to test if the linked data metadata contains an explicit pointer to the license. Tests: xhtml, dvia, dcterms, cc, data.gov.au, and Schema license predicates in linked data, and validates the value of those properties.
- 22. Metadata Include License (Weak): Maturity Indicator to test if the metadata contains an explicit pointer to the license. This 'weak' test will use a case-insensitive regular expression, and scan both key/value style metadata, as well as linked data metadata. Tests: xhtml, dvia, dcterms, cc, data.gov.au, and Schema license predicates in linked data, and validates the value of those properties .

Appendix

Detailed results of Manual and Automated assessments

No.1

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test	Weight	Answer	Test	Weight	Answer
Norwegian wind power data Published by NVE	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	4		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	9/10	90%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/2	50%	I Score			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	58%		FAIR Total Score			0.23		
	Openness score	100%							

No.2

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Hywind Scotland Dataset By Equinor Norway	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	0
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	1		3	0.225	0	-	-	-
	Accessability Score	2/5	40%	Accessability Score			0.225		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	2		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	25%	I Score			0		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	39%		FAIR Total Score			0.09		
	Openness score	33%							

No.3

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Offshore wind data By Orsted Denmark	Q1-F1	1		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	7/17	41%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	7/10	70%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	0			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	40%		FAIR Total Score			0.23		
	Openness score	67%							

No.4

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
The 1st open data windfarm By Engie group France	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	7/10	70%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	38%	I Score			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	49%		FAIR Total Score			0.23		
	Openness score	67%							

No.5

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
4C Offshore Wind Database	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.36		
	Q5-A1	4		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	1/2	50%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	25%	I Score			0.125		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	44%		FAIR Total Score			0.23		
	Openness score	33%							

No.6

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
American Wind-Wildlife	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.12		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	7/10	70%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	2		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	25%	I Score			0		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	45%		FAIR Total Score			0.14		
	Openness score	67%							

No.7

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Atlantic Offshore Seabird Dataset	Q1-F1	8		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	4		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	15/17	88%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	4		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	9/10	90%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	1	5	0.125	1
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	3/8	38%	I Score			0.625		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	2		2	0.42857143	0	-	-	-
	Reusability Score	5/8	63%	R Score			0		
	FAIR total score	70%		FAIR Total Score			0.36		
	Openness score	100%							

No.8

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Australian Renewable Energy Mapping Infrastructure (AREMI)	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.12		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	7/10	70%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	0	5	0.125	0
	Q9-I2	2		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	38%	I Score			0		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	49%		FAIR Total Score			0.14		
	Openness score	67%							

No.9

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Belgian Marine Data Centre	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.36		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	25%	I Score			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	35%		FAIR Total Score			0.23		
	Openness score	67%							

No.10

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Biofouling Database	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.36		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	25%	I Score			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	35%		FAIR Total Score			0.23		
	Openness score	33%							

No.11

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
California Offshore Wind Energy	Q1-F1	1		1	0.12	1	5	0.12	0
	Q2-F2	0		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	5/17	29%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	1		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	27%		FAIR Total Score			0.14		
	Openness score	33%							

No.12

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Data Basin	Q1-F1	1		1	0.12	1	5	0.12	0
	Q2-F2	0		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	5/17	29%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	1		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	27%		FAIR Total Score			0.14		
	Openness score	33%							

No.13

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
EMODnet	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	1		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	32%		FAIR Total Score			0.14		
	Openness score	33%							

No.14

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Energy Marine Map (EMMap)	Q1-F1	0		1	0.12	0	5	0.12	0
	Q2-F2	0		2	0.12	0	6	0.03	0
	Q3-F3	0		3	0.24	0	7	0.03	0
	Q4-F4	0		4	0.12	0	8	0.24	0
	Findability Score	0/1	0%	Findability Score			0.00		
	Q5-A1	0		1	0.225	0	4	0.225	0
	Q6-A1	0		2	0.225	0	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	0/1	0%	Accessability Score			0		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	0		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	0/1	0%	I Score			0		
	Q11-R1	0		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	0/1	0%	R Score			0		
	FAIR total score	0%		FAIR Total Score			0.00		
	Openness score	0%							

No.15

Name of Database	Manual Assessment		Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score	Test#	Weight	Answer	Test#	Weight	Answer
Environmental Studies Program Information System (ESPIS)	Q1-F1	3	1	0.12	1	5	0.12	0
	Q2-F2	1	2	0.12	0	6	0.03	0
	Q3-F3	3	3	0.24	0	7	0.03	0
	Q4-F4	2	4	0.12	0	8	0.24	0
	Findability Score	9/17 53%	Findability Score			0.12		
	Q5-A1	5	1	0.225	0	4	0.225	1
	Q6-A1	2	2	0.225	1	5	0.1	0
	Q7-A2	0	3	0.225	0	-	-	-
	Accessability Score	7/10 70%	Accessability Score			0.45		
	Q8-I1	1	1	0.0625	0	5	0.125	0
	Q9-I2	1	2	0.0625	0	6	0.25	0
	Q10-I3	0	3	0.0625	0	7	0.375	0
	-	-	4	0.0625	0	-	-	-
	Interoperablity Score	1/4 25%	I Score			0		
	Q11-R1	2	1	0.57142857	0	-	-	-
	Q12-R1	1	2	0.42857143	0	-	-	-
	Reusability Score	3/8 38%	R Score			0		
	FAIR total score	46%	FAIR Total Score			0.14		
	Openness score	100%						

No.16

Name of Database	Manual Assessment		Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score	Test#	Weight	Answer	Test#	Weight	Answer
FERC eLibrary	Q1-F1	3	1	0.12	1	5	0.12	0
	Q2-F2	1	2	0.12	0	6	0.03	0
	Q3-F3	2	3	0.24	0	7	0.03	0
	Q4-F4	2	4	0.12	0	8	0.24	0
	Findability Score	8/17 47%	Findability Score			0.12		
	Q5-A1	5	1	0.225	0	4	0.225	1
	Q6-A1	2	2	0.225	1	5	0.1	0
	Q7-A2	0	3	0.225	0	-	-	-
	Accessability Score	7/10 70%	Accessability Score			0.45		
	Q8-I1	0	1	0.0625	0	5	0.125	0
	Q9-I2	1	2	0.0625	0	6	0.25	0
	Q10-I3	0	3	0.0625	0	7	0.375	0
	-	-	4	0.0625	0	-	-	-
	Interoperablity Score	1/8 13%	I Score			0		
	Q11-R1	2	1	0.57142857	0	-	-	-
	Q12-R1	1	2	0.42857143	0	-	-	-
	Reusability Score	3/8 38%	R Score			0		
	FAIR total score	42%	FAIR Total Score			0.14		
	Openness score	100%						

No.17

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
GRIP Database	Q1-F1	0		1	0.12	1	5	0.12	0
	Q2-F2	0		2	0.12	0	6	0.03	0
	Q3-F3	0		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	2/17	12%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	1		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0		
	Q11-R1	0		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	0/1	0%	R Score			0		
	FAIR total score	14%		FAIR Total Score			0.14		
	Openness score	0%							

No.18

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Hydrodynamic Testing Facilities	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	0		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	6/17	35%	Findability Score			0.36		
	Q5-A1	1		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	1
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0.625		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	29%		FAIR Total Score			0.36		
	Openness score	100%							

No.19

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
MARENDATA	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	7/10	70%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	25%	I Score			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	45%		FAIR Total Score			0.23		
	Openness score	67%							

No.20

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Marine & Hydrokinetic Technology	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	4		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	9/10	90%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	1	5	0.125	1
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	5/8	63%	I Score			0.625		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	62%		FAIR Total Score			0.36		
	Openness score	100%							

No.21

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Marine Cadastre	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.36		
	Q5-A1	1		1	0.225	0	4	0.225	1
	Q6-A1	3		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	2/5	40%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/2	63%	I Score			0.125		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	51%		FAIR Total Score			0.23		
	Openness score	67%							

No.22

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Marine Data Exchange	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.12		
	Q5-A1	0		1	0.225	0	4	0.225	1
	Q6-A1	0		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	0/1	0%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	1		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	1/4	25%	R Score			0		
	FAIR total score	21%		FAIR Total Score			0.14		
	Openness score	0%							

No.23

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
MHKTech Papers Blog	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	0		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	0		4	0.12	1	8	0.24	0
	Findability Score	5/17	29%	Findability Score			0.36		
	Q5-A1	0		1	0.225	0	4	0.225	1
	Q6-A1	0		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	0/1	0%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	1/4	25%	R Score			0		
	FAIR total score	17%		FAIR Total Score			0.23		
	Openness score	0%							

No.24

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Northeast Ocean Data Portal	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	7/10	70%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	1
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	3/8	38%	I Score			0.625		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	1/4	25%	R Score			0		
	FAIR total score	45%		FAIR Total Score			0.36		
	Openness score	100%							

No.25

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
OBIS-SEAMAP	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	2		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	25%	I Score			0		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	1/4	25%	R Score			0		
	FAIR total score	33%		FAIR Total Score			0.14		
	Openness score	67%							

No.26

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Offshore Wind Hub	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	7/10	70%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0.5		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	1/4	25%	R Score			0		
	FAIR total score	39%		FAIR Total Score			0.33		
	Openness score	100%							

No.27

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
OpenEI	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	4		4	0.12	1	8	0.24	0
	Findability Score	11/17	65%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	3		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	4/5	80%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	1/4	25%	R Score			0		
	FAIR total score	46%		FAIR Total Score			0.23		
	Openness score	67%							

No.28

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Quest Floating Wind Energy	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.36		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	2		1	0.0625	1	5	0.125	1
	Q9-I2	2		2	0.0625	1	6	0.25	1
	Q10-I3	2		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/2	75%	I Score			0.875		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	52%		FAIR Total Score			0.42		
	Openness score	33%							

No.29

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
REsource	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	0		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.36		
	Q5-A1	4		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/5	60%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	3/8	38%	I Score			0.125		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	49%		FAIR Total Score			0.23		
	Openness score	33%							

No.30

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Supergen ORE Hub Research	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	0		4	0.12	1	8	0.24	0
	Findability Score	6/17	35%	Findability Score			0.36		
	Q5-A1	0		1	0.225	0	4	0.225	1
	Q6-A1	0		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	0/1	0%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/4	25%	I Score			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	24%		FAIR Total Score			0.23		
	Openness score	0%							

No.31

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
The Wind Power	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	1		3	0.225	0	-	-	-
	Accessability Score	2/5	40%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	0	5	0.125	0
	Q9-I2	2		2	0.0625	0	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/2	63%	I Score			0		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	51%		FAIR Total Score			0.14		
	Openness score	67%							

No.32

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
UK Marine Energy Database	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	1		3	0.225	0	-	-	-
	Accessability Score	2/5	40%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	0	5	0.125	0
	Q9-I2	2		2	0.0625	0	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	5/8	63%	I Score			0		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	51%		FAIR Total Score			0.14		
	Openness score	67%							

No.33

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
UK Wind Energy Database (UKWED)	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	1		3	0.225	0	-	-	-
	Accessability Score	2/5	40%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	0	5	0.125	0
	Q9-I2	2		2	0.0625	0	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/2	63%	I Score			0		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	51%		FAIR Total Score			0.14		
	Openness score	67%							

No.34

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
UKSeaMap 2010 Interactive Map	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.36		
	Q5-A1	4		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/5	60%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0.125		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	44%		FAIR Total Score			0.23		
	Openness score	100%							

No.35

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
US Wind Turbine Database	Q1-F1	8		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	14/17	82%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	7/10	70%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	1	5	0.125	1
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	5/8	63%	I Score			0.625		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	66%		FAIR Total Score			0.36		
	Openness score	67%							

No.36

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Wave & Tidal Knowledge Network	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	7/10	70%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0.5		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	43%		FAIR Total Score			0.33		
	Openness score	67%							

No.37

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
West Coast Ocean Data Portal	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.36		
	Q5-A1	5		1	0.225	0	4	0.225	1
	Q6-A1	3		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	4/5	80%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	0
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	3/8	38%	I Score			0.125		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	3/8	38%	R Score			0		
	FAIR total score	51%		FAIR Total Score			0.23		
	Openness score	67%							

No.38

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
GWEC launches global offshore wind project database	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	0		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	7/17	41%	Findability Score			0.36		
	Q5-A1	0		1	0.225	0	4	0.225	1
	Q6-A1	0		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	0/1	0%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	1	5	0.125	1
	Q9-I2	1		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0.625		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	1/4	25%	R Score			0		
	FAIR total score	20%		FAIR Total Score			0.36		
	Openness score	33%							

No.39

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
UKERC ENERGY DATA CENTRE	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	0		2	0.12	0	6	0.03	0
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	7/17	41%	Findability Score			0.12		
	Q5-A1	1		1	0.225	0	4	0.225	1
	Q6-A1	0		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	1/10	10%	Accessability Score			0.45		
	Q8-I1	0		1	0.0625	0	5	0.125	0
	Q9-I2	1		2	0.0625	0	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/8	13%	I Score			0		
	Q11-R1	2		1	0.57142857	0	-	-	-
	Q12-R1	0		2	0.42857143	0	-	-	-
	Reusability Score	1/4	25%	R Score			0		
	FAIR total score	22%		FAIR Total Score			0.14		
	Openness score	0%							

No.40

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
AWESCO Wind Field Datasets	Q1-F1	8		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	1	6	0.03	1
	Q3-F3	4		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	15/17	88%	Findability Score			0.51		
	Q5-A1	5		1	0.225	1	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	1		3	0.225	1	-	-	-
	Accessability Score	4/5	80%	Accessability Score			0.9		
	Q8-I1	2		1	0.0625	1	5	0.125	1
	Q9-I2	2		2	0.0625	1	6	0.25	1
	Q10-I3	3		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	7/8	88%	I Score			0.875		
	Q11-R1	4		1	0.57142857	1	-	-	-
	Q12-R1	3		2	0.42857143	1	-	-	-
	Reusability Score	7/8	88%	R Score			1		
	FAIR total score	86%		FAIR Total Score			0.82		
	Openness score	100%							

No.41

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Frøya wind data	Q1-F1	8		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	1
	Q3-F3	4		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	15/17	88%	Findability Score			0.39		
	Q5-A1	5		1	0.225	1	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	1		3	0.225	1	-	-	-
	Accessability Score	4/5	80%	Accessability Score			0.9		
	Q8-I1	2		1	0.0625	1	5	0.125	1
	Q9-I2	2		2	0.0625	1	6	0.25	1
	Q10-I3	3		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	7/8	88%	I Score			0.875		
	Q11-R1	4		1	0.57142857	1	-	-	-
	Q12-R1	3		2	0.42857143	1	-	-	-
	Reusability Score	7/8	88%	R Score			1		
	FAIR total score	86%		FAIR Total Score			0.79		
	Openness score	100%							

No.42

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Aerodynamic data of WiRE-01 Blade	Q1-F1	8		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	1
	Q3-F3	4		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	15/17	88%	Findability Score			0.39		
	Q5-A1	5		1	0.225	1	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	1		3	0.225	1	-	-	-
	Accessability Score	4/5	80%	Accessability Score			0.9		
	Q8-I1	2		1	0.0625	1	5	0.125	1
	Q9-I2	2		2	0.0625	1	6	0.25	1
	Q10-I3	3		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	7/8	88%	I Score			0.875		
	Q11-R1	4		1	0.57142857	1	-	-	-
	Q12-R1	3		2	0.42857143	1	-	-	-
	Reusability Score	7/8	88%	R Score			1		
	FAIR total score	86%		FAIR Total Score			0.79		
	Openness score	100%							

No.43

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Energy potential of wind	Q1-F1	8		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	1
	Q3-F3	4		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	15/17	88%	Findability Score			0.39		
	Q5-A1	5		1	0.225	1	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	1		3	0.225	1	-	-	-
	Accessability Score	4/5	80%	Accessability Score			0.9		
	Q8-I1	2		1	0.0625	1	5	0.125	1
	Q9-I2	2		2	0.0625	1	6	0.25	1
	Q10-I3	3		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	7/8	88%	I Score			0.875		
	Q11-R1	4		1	0.57142857	1	-	-	-
	Q12-R1	3		2	0.42857143	1	-	-	-
	Reusability Score	7/8	88%	R Score			1		
	FAIR total score	86%		FAIR Total Score			0.79		
	Openness score	100%							

No.44

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Wind Farm 1 - Failures 2016	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	1
	Q3-F3	2		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	8/17	47%	Findability Score			0.39		
	Q5-A1	5		1	0.225	1	4	0.225	1
	Q6-A1	4		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	1	-	-	-
	Accessability Score	9/10	90%	Accessability Score			0.9		
	Q8-I1	1		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	5/8	63%	I Score			0.5		
	Q11-R1	3		1	0.57142857	1	-	-	-
	Q12-R1	1		2	0.42857143	1	-	-	-
	Reusability Score	1/2	50%	R Score			1		
	FAIR total score	62%		FAIR Total Score			0.70		
	Openness score	100%							

No.45

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
The U.S. Wind Turbine Database	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.36		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	3/10	30%	Accessability Score			0.45		
	Q8-I1	2		1	0.0625	1	5	0.125	1
	Q9-I2	2		2	0.0625	1	6	0.25	1
	Q10-I3	2		3	0.0625	0	7	0.375	1
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	1/2	75%	I Score			0.875		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	52%		FAIR Total Score			0.42		
	Openness score	67%							

No.46

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
The Wind Power	Q1-F1	3		1	0.12	1	5	0.12	0
	Q2-F2	1		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	0	8	0.24	0
	Findability Score	9/17	53%	Findability Score			0.12		
	Q5-A1	2		1	0.225	0	4	0.225	1
	Q6-A1	1		2	0.225	1	5	0.1	0
	Q7-A2	1		3	0.225	0	-	-	-
	Accessability Score	2/5	40%	Accessability Score			0.45		
	Q8-I1	1		1	0.0625	0	5	0.125	0
	Q9-I2	2		2	0.0625	0	6	0.25	0
	Q10-I3	2		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	5/8	63%	I Score			0		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	1/2	50%	R Score			0		
	FAIR total score	51%		FAIR Total Score			0.14		
	Openness score	33%							

No.47

Name of Database	Manual Assessment			Automatic Assessment					
	Answers to Q1-Q12 (ARDC)	Score		Test#	Weight	Answer	Test#	Weight	Answer
Oklahoma High Resolution Wind Resource	Q1-F1	3		1	0.12	1	5	0.12	1
	Q2-F2	0		2	0.12	0	6	0.03	0
	Q3-F3	3		3	0.24	0	7	0.03	0
	Q4-F4	2		4	0.12	1	8	0.24	0
	Findability Score	**8/17**	**47%**	**Findability Score**			**0.36**		
	Q5-A1	4		1	0.225	0	4	0.225	1
	Q6-A1	2		2	0.225	1	5	0.1	0
	Q7-A2	0		3	0.225	0	-	-	-
	Accessability Score	**3/5**	**60%**	**Accessability Score**			**0.45**		
	Q8-I1	1		1	0.0625	1	5	0.125	0
	Q9-I2	2		2	0.0625	1	6	0.25	0
	Q10-I3	0		3	0.0625	0	7	0.375	0
	-	-		4	0.0625	0	-	-	-
	Interoperablity Score	**3/8**	**38%**	**I Score**			**0.125**		
	Q11-R1	3		1	0.57142857	0	-	-	-
	Q12-R1	1		2	0.42857143	0	-	-	-
	Reusability Score	**1/2**	**50%**	**R Score**			**0**		
	FAIR total score	**49%**		**FAIR Total Score**			**0.23**		
	Openness score	**33%**							

Figures related to the manual assessment done by ARDC tool

1

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	Standard web service API (e.g. OGC)
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

2

Norwegian wind power data Published by NVE

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Yes

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Hywind Scotland Dataset
By Equinor – Norway

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Local identifier
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Domain-specific repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Offshore wind data
By Orsted – Denmark

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

The 1st open data windfarm
By Engie group - France

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	A de-identified / modified subset of the data is p
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

4C Offshore Wind Database

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Globally Unique, citable and persistent (e.g. DOI
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively (see suggestion) using a recog
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	Standard web service API (e.g. OGC)
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Fully recorded in a text format

Total across F.A.I.R

Atlantic Offshore Seabird Dataset

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Australian Renewable Energy Mapping Infrastructure (AREMI)

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Local institutional repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Belgian Marine Data Centre

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Local institutional repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Biofouling Database

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Local identifier
Is the dataset identifier included in all metadata records/files describing the data?	No
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Local institutional repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Local identifier
Is the dataset identifier included in all metadata records/files describing the data?	No
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Local institutional repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Local institutional repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	No identifier
Is the dataset identifier included in all metadata records/files describing the data?	No
How is the data described with metadata?	The data is not described
What type of repository or registry is the metadata record in?	The data is not described in any repository

Accessible

How accessible is the data?	No access to data or metadata
Is the data available online without requiring specialised protocols or tools once access has been approved?	No access to data
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Data elements not described
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	No license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	No license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	No license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	No identifier
Is the dataset identifier included in all metadata records/files describing the data?	No
How is the data described with metadata?	The data is not described
What type of repository or registry is the metadata record in?	Local institutional repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	No license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	The data is not described
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Access to metadata only
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	No license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Hydrodynamic Testing Facilities

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Fully accessible to persons who meet explicitly s
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

MARENDATA

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	Standard web service API (e.g. OGC)
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Access to metadata only
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Marine Cadastre

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	No access to data or metadata
Is the data available online without requiring specialised protocols or tools once access has been approved?	No access to data
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Marine Data Exchange

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	No
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	The data is not described in any repository

Accessible

How accessible is the data?	No access to data or metadata
Is the data available online without requiring specialised protocols or tools once access has been approved?	No access to data
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

OBIS-SEAMAP

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Data is in one place but discoverable through se

Accessible

How accessible is the data?	Fully accessible to persons who meet explicitly s
Is the data available online without requiring specialised protocols or tools once access has been approved?	Non-standard web service (e.g. OpenAPI/Swagg
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Domain-specific repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, machine-readabl
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned? Web address (URL)

Is the dataset identifier included in all metadata records/files describing the data? No

How is the data described with metadata? Comprehensively, but in a text-based, non-stand

What type of repository or registry is the metadata record in? Generalist public repository

Accessible

How accessible is the data? A de-identified / modified subset of the data is p

Is the data available online without requiring specialised protocols or tools once access has been approved? File download from online location

Will the metadata record be available even if the data is no longer available? Unsure

Interoperable

What (file) format(s) is the data available in? In a structured, open standard, non-machine-rea

What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements? Standardised vocabularies/ontologies/schema w

How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)? There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data? Standard text based license

How much provenance information has been captured to facilitate data reuse? Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	No
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	The data is not described in any repository

Accessible

How accessible is the data?	No access to data or metadata
Is the data available online without requiring specialised protocols or tools once access has been approved?	No access to data
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Domain-specific repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Yes

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Yes

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard machine-readable license (clearly
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

UK Marine Energy Database

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Yes

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard machine-readable license (clearly
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

UK Wind Energy Database (UKWED)

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	A de-identified / modified subset of the data is p
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

UKSeaMap 2010 Interactive Map

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Globally Unique, citable and persistent (e.g. DOI
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
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Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

1

US Wind Turbine Database

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned? Web address (URL)

Is the dataset identifier included in all metadata records/files describing the data? Yes

How is the data described with metadata? Comprehensively, but in a text-based, non-stand

What type of repository or registry is the metadata record in? Generalist public repository

Accessible

How accessible is the data? Publicly accessible

Is the data available online without requiring specialised protocols or tools once access has been approved? File download from online location

Will the metadata record be available even if the data is no longer available? Unsure

Interoperable

What (file) format(s) is the data available in? Mostly in a proprietary format

What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements? No standards have been applied in the descripti

How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)? There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data? Non-standard text-based license

How much provenance information has been captured to facilitate data reuse? Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	Non-standard web service (e.g. OpenAPI/Swagg
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
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Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	No
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	No access to data or metadata
Is the data available online without requiring specialised protocols or tools once access has been approved?	No access to data
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

GWEC launches global offshore wind project database

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	No
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Access to metadata only
Is the data available online without requiring specialised protocols or tools once access has been approved?	No access to data
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	Mostly in a proprietary format
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	No standards have been applied in the descripti
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard text-based license
How much provenance information has been captured to facilitate data reuse?	No provenance information is recorded

Total across F.A.I.R

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Globally Unique, citable and persistent (e.g. DOI
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively (see suggestion) using a recog
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Yes

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, machine-readabl
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	Metadata is represented in a machine readable

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard machine-readable license (e.g. Creativ
How much provenance information has been captured to facilitate data reuse?	Fully recorded in a machine readable format

Total across F.A.I.R

AWESCO Wind Field Datasets

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Globally Unique, citable and persistent (e.g. DOI
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively (see suggestion) using a recog
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Yes

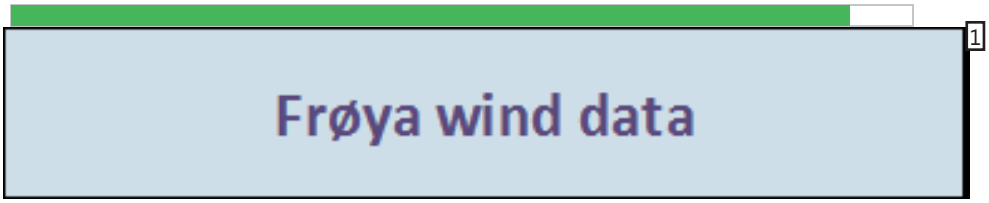
Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, machine-readabl
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	Metadata is represented in a machine readable

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard machine-readable license (e.g. Creativ
How much provenance information has been captured to facilitate data reuse?	Fully recorded in a machine readable format

Total across F.A.I.R



Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Globally Unique, citable and persistent (e.g. DOI
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively (see suggestion) using a recog
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Yes

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, machine-readabl
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	Metadata is represented in a machine readable

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard machine-readable license (e.g. Creativ
How much provenance information has been captured to facilitate data reuse?	Fully recorded in a machine readable format

Total across F.A.I.R

Aerodynamic data of WiRE-01 Blade

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Globally Unique, citable and persistent (e.g. DOI
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively (see suggestion) using a recog
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Yes

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, machine-readabl
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
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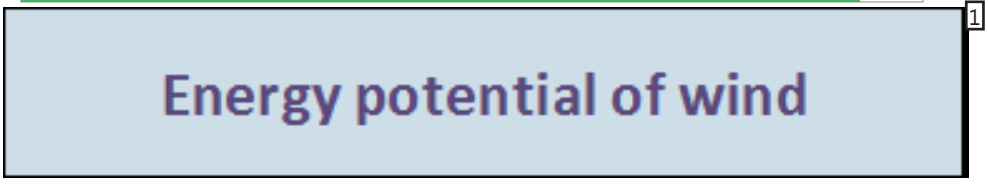
Which of the following best describes the license/usage rights attached to the data?	Standard machine-readable license (e.g. Creativ
How much provenance information has been captured to facilitate data reuse?	Fully recorded in a machine readable format

Total across F.A.I.R



Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Brief title and description
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Publicly accessible
Is the data available online without requiring specialised protocols or tools once access has been approved?	Standard web service API (e.g. OGC)
Will the metadata record be available even if the data is no longer available?	No

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Wind Farm 1 - Failures 2016

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Domain-specific repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, machine-readabl
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

The U.S. Wind Turbine Database

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	Yes
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	Unspecified conditional access e.g. contact the
Is the data available online without requiring specialised protocols or tools once access has been approved?	By individual arrangement
Will the metadata record be available even if the data is no longer available?	Yes

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
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How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	The metadata record includes URI links to relate

Reusable

Which of the following best describes the license/usage rights attached to the data?	Non-standard machine-readable license (clearly
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

The Wind Power

Total across F.A.I.R

Findable

Does the dataset have any identifiers assigned?	Web address (URL)
Is the dataset identifier included in all metadata records/files describing the data?	No
How is the data described with metadata?	Comprehensively, but in a text-based, non-stand
What type of repository or registry is the metadata record in?	Generalist public repository

Accessible

How accessible is the data?	A de-identified / modified subset of the data is p
Is the data available online without requiring specialised protocols or tools once access has been approved?	File download from online location
Will the metadata record be available even if the data is no longer available?	Unsure

Interoperable

What (file) format(s) is the data available in?	In a structured, open standard, non-machine-rea
What best describes the types of vocabularies/ontologies/tagging schemas used to define the data elements?	Standardised vocabularies/ontologies/schema w
How is the metadata linked to other data and metadata (to enhance context and clearly indicate relationships)?	There are no links to other metadata

Reusable

Which of the following best describes the license/usage rights attached to the data?	Standard text based license
How much provenance information has been captured to facilitate data reuse?	Partially recorded

Total across F.A.I.R

Oklahoma High Resolution Wind Resource

Automatic test results:

A comparison between free online tool with paid version

Data base number	Findability																				Accessibility										Interoperability																Reusability				
	Unique Identifier:		Identifier Persistence		Data Identifier Persistence:		Structured Metadata:		Grounded Metadata:		Data Identifier Explicitly in Metadata:		Metadata Identifier Explicitly in Metadata		Searchable in Major Search Engine:		Uses Open Free Protocol for Data Retrieval		Uses Open Free Protocol for Metadata Retrieval		Data Authentication and Authorization:		Metadata Authentication and Authorization:		Metadata Persistence:		Metadata knowledge Representation Language (Weak):		Metadata knowledge Representation Language (Strong):		Data knowledge Representation Language (Weak):		Data knowledge Representation Language (Strong):		Metadata Uses FAIR Vocabularies (Weak):		Metadata Uses FAIR Vocabularies (Strong):		Metadata Contains Qualified Outward References:		Metadata Include License (Strong):		Metadata Include License (Weak):		
	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	P.v	On.v	
1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	A: 23 --> 45 , **Total: 9** --> **14**
3	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	F: 36 --> 12 , I: 13 --> 0 , **Total: 23** --> **14**
4																																																	
5	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	
8	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	I: 0 --> 63 , **Total: 14** --> **30**
9	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	F: 36 --> 12 , I: 13 --> 0 , **Total: 23** --> **14**
11	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
12	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14																																																	
15	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
16																																																	
17																																																	
18	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	I: 63 --> 13 , **Total: 36** --> **23**

Appendix D

Automatic test results:

A comparison between free online tool with paid version

	Findability																Accessibility										Interoperability														Reusability				
Data base number	Unique Identifier:		Identifier Persistence		Data Identifier Persistence:		Structured Metadata:		Grounded Metadata:		Data Identifier Explicitly in Metadata:		Metadata Identifier Explicitly in Metadata		Searchable in Major Search Engine:		Uses Open Free Protocol for Data Retrieval		Uses Open Free Protocol for Metadata Retrieval		Data Authentication and Authorization:		Metadata Authentication and Authorization:		Metadata Persistence:		Metadata knowledge Representation Language (Weak):		Metadata knowledge Representation Language (Strong):		Data knowledge Representation Language (Weak):		Data knowledge Representation Language (Strong):		Metadata Uses FAIR Vocabularies (Weak):		Metadata Uses FAIR Vocabularies (Strong):		Metadata Contains Qualified Outward References:		Metadata Include License (Strong):		Metadata Include License (Weak):		
19																																													
20																																													
21																																													
22																																													
23	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
24	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	F: 36 --> 12 , I: 63 --> 0 , **Total: 36** --> **14**
25	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
26																																													
27																																													
28	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	1	0	1	0	0	0	0	0	1	0	1	0	1	0	0	0	0	F: 36 --> 12 , I: 88 --> 0 , **Total: 42** --> **14**
29	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
30	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
31	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
32	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
33																																													
34	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	