

Muinín Catalyst STEAM Education for Sustainable Development and Futures Literacy

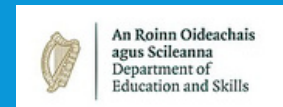
SDG14 The Future Of The Ocean



Programme Phase1: Research and Development

Micro-Module 3: Offshore Renewable Energy Century

Subject Areas: Climate Action and Sustainable Development, Design, English, Enterprise, Science



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MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Module Overview

**Subject Areas: Climate
Action and Sustainable
Development, Design,
English, Enterprise, Science**

7 AFFORDABLE AND
CLEAN ENERGY



9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



11 SUSTAINABLE CITIES
AND COMMUNITIES



13 CLIMATE
ACTION



Micro-module Summary: Offshore Renewable Energy

In the Offshore Renewable Energy module, learners begin to discover the critical role of renewable energy, with a particular focus on offshore wind in combating climate change. The module is designed to equip learners with a comprehensive understanding of various aspects related to offshore wind energy and its broader environmental and societal implications.

Learners will gain a holistic understanding of renewable energy's significance, its engineering aspects, environmental considerations, and the broader societal context. By cultivating teamwork, creativity, and a sense of responsibility, learners will be well-prepared to contribute to a sustainable and cleaner future for the planet.

In this Module, the learner will:

- Understand the importance of renewable energy, especially offshore wind, in fighting climate change.
- Discover the basics of engineering design and how it relates to building offshore wind turbine foundations.
- Learn about the environment and marine life and why we must protect them in our offshore wind adventures.
- Work as a team and make new friends while collaborating on projects.
- Use creativity and critical thinking to solve challenges faced in the world of renewable energy.
- Explore how wind turbines connect with nature and our communities.
- Learn how we can all play a role in creating a sustainable and cleaner world for everyone.

Materials

- Lesson plans
- Accompanying resources
- Optional assessments
- Internet Access required

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MM3: Offshore Renewable Energy



Offshore Renewable Energy

Lesson 1: Introduction to Wind Energy and Sustainability

This lesson plan introduces learners to renewable energy, focusing on wind power's environmental impact and advantages. By the end of the lesson, learners are primed with the foundational knowledge necessary to embark on an exploration of wind energy's intricacies and its broader implications.

Resources: Yes / No Worksheet

Lesson 2: Analyze Maps Related to Onshore Wind Farms

In this lesson, learners engage with interactive online maps displaying wind turbine generation capacity. This lesson fosters digital navigation, data interpretation, and analytical skills in understanding wind energy's geographical distribution and impact.

Resources: Onshore Wind Farms Worksheet, Teacher's Notes

Lesson 3: Exploring Offshore Wind Farms

In this engaging lesson, learners virtually explore the world of wind energy through three videos. They begin with a tour of Arbuckle Wind Farm, gaining insight from the Operations Manager's drive-through. After exploring a number of professions Learners craft 'day-in-the-life' diaries for construction workers, considering elements like weather, safety, turbine size, and the offshore environment.

Resources: Day-In-The-Life Worksheet

Lesson 4: Protecting Our Ocean Friends

In this lesson, the topic of offshore wind's impact on marine life is explored. After a video, a whole-class discussion encourages learners to share their viewpoints on offshore wind, influenced by the video, and debate its pros and cons. The discussion aims to foster critical thinking while capturing the exchange on a visual platform.

Resources: Offshore Wind Farms and Animal Life Worksheet

Lesson 5: Classroom Debate on Onshore vs. Offshore Wind

In this lesson, learners engage in a debate comparing offshore and onshore wind energy. The lesson begins with a brief introduction to the debate topic, with Learners conducting individual research identify the pros and cons of each type of wind energy. The facilitated debate where teams present their viewpoints using the synthesised information to encourage critical thinking, research skills, and collaborative discussion on renewable energy sources.

Resources: Debate Questions Worksheet

Lesson 6: Building Strong Foundations 1

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MM3: Offshore Renewable Energy



Offshore Renewable Energy

In this lesson, learners engage in a comprehensive exploration of foundations and their significance across various structures. The lesson starts with an introductory video on foundation concepts and functions, leading to a whole-class discussion. The lesson concludes with a hands-on activity where learners create tall, stable towers to solidify their understanding of strong shapes and foundations.

Resources: Foundations and Their Functions Worksheet

Lesson 7: Building Strong Foundations 2

Building on the last lesson, the focus shifts to wind turbine foundations through a brief video, followed by brainstorming, concluding with a brief brainstorm and 2D prototype of a strong offshore wind turbine which will be built on in the next lesson.

Resources: Foundation Design Worksheet

Lesson 8: Learners Design Wind Turbine Foundations

In this lesson, learners become offshore wind turbine engineers who design and construct strong and stable foundations for wind turbines at sea. Working in small groups, they are provided with materials to create their turbine foundations. The learners are challenged to think critically about stability, the weight of the turbine, the depth in the sand that their foundation will be buried, and the ability to withstand waves and strong winds.

Resources: Turbine Foundation Options Worksheet

Lesson 9: Learners Test Wind Turbine Foundations

In this lesson, learners will test the foundations they built in the previous lesson in a simulated sea environment using a large plastic crate filled with water and sand. Working in small groups, the learners are challenged to think critically about stability, the weight of the turbine, the depth in the sand that their foundation will be buried, and the ability to withstand waves and strong winds.

Resources: Teacher's Notes

Lesson 10: Teamwork and Problem Solving

In this lesson, learners engage in a practical activity to select suitable sites for a wind farm through online research. Divided into teams, they explore the Marine Atlas Tool on the Marine Institute's website to identify potential locations for a wind farm. They consider factors like water depth, wind speeds, fishing patterns, and challenges such as shipwrecks. To conclude, teams present their selections to the class, providing justifications for their choices. This activity encourages hands-on learning about renewable energy and marine environments.

Resources: Site Selection Worksheet

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MM3: Offshore Renewable Energy



Offshore Renewable Energy

Lesson 11: The Future of Offshore Wind

This lesson introduces learners to the concept of a super-grid, a vast interconnected electricity network spanning countries – which is the future of offshore wind. The lesson aims to foster awareness of offshore wind's potential, the role of super-grids in energy distribution, and their significance in international electricity trade.

Resources: The Super-Grid Worksheet

Lesson 12: Offshore Wind in the Community

In this lesson, two engaging activities explore the benefits of wind farms within communities. In Activity 1, learners watch a series of brief videos showcasing testimonials from various communities benefiting from wind farms, Activity 2 follows, prompting learners to create posters advocating the advantages of wind farms for public display. The lesson aims to deepen learners' understanding of renewable energy's positive impact and develop their communication skills through poster creation.

Module development and expertise: Dr. Jennifer Keenahan, University College Dublin, Assistant Professor, School of Civil Engineering

Using the Resources:

If you wish to use these resources, we can offer an induction and online support throughout the module to help you plan integration into your projects and timetable. To register for this option, please contact us e:hello@futurefocus21c.com

For more information on the resources please visit www.muinincatalyst.com

Setting up an online learning environment for the lessons on this module:

Our lessons integrate the use of virtual learning environments. To ensure seamless use of our lessons, a module should be setup on your school's virtual learning environment such as Teams, Google Classroom, etc. Learners are encouraged to upload documents to share with their peers. You can also use Google Sites or Microsoft Sway to encourage learners to present their work over the year - this can easily be set up to reflect the aims of TY and provide a showcase for their work as well

Setting up a Canva Education account:

As our lessons integrate design, our lessons also refer to Canva. Educators and schools are able to open a free Canva for Education account by registering here: <https://www.canva.com/education/>

Canva for Education provides primary and secondary school teachers and students with premium features and templates. You can then also set up lessons and invite your learners to the class.

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Offshore Renewable Energy



Offshore Renewable Energy

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Offshore Renewable Energy



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SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 1: Introduction to Wind Energy and Sustainability

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: Introduction to Wind Energy and Sustainability

This lesson plan introduces learners to renewable energy, focusing on wind power's environmental impact and advantages. Engaging questions prompt critical thinking about fossil fuels' consequences, wind energy's role in sustainability, and its potential to enhance air quality and energy independence. Learners reflect on their roles in sustainable practices and technological advancements for reliable wind energy. They explore the visual and economic aspects of wind farms, culminating in envisioning a renewable-powered community. By the end of the lesson, learners are primed with the foundational knowledge necessary to embark on an exploration of wind energy's intricacies and its broader implications.

Vocabulary: Renewable energy, Wind Power, Sustainability, Energy Independence, Environmental Impact

In this lesson, the learner will:

- Explore the significance of renewable energy, particularly wind power, and its positive effects on the environment.
- Engage in thought-provoking discussions about the drawbacks of fossil fuels, the potential of wind energy, and their role in promoting sustainable practices.
- Develop critical thinking skills by considering technological advancements to enhance the reliability of wind power and balancing aesthetic and ecological concerns.

Materials

- Paper, pens
- Supporting Resource: Yes / No

MM3: Offshore Renewable Energy

L1 Introduction to Wind Energy and Sustainability



ACTIVITY INSTRUCTIONS

Activity 1: Introduction (10 minutes)

1. Invite learners to watch this National Geographic video [[link](#) 3:16mins] on Renewable Energy 101.
2. Invite learners to brainstorm the following questions:
 - a. What is renewable energy?
 - b. Why do they think renewable energy is important?
 - c. What impact does it have on the environment?

Activity 2: Walking Debate (40mins)

1. Place a 'YES' sign at one end of the room and a 'NO' sign at the other end.
2. Read out the following questions and have learners show whether they agree with the statement by standing under the appropriate signs.
3. Ask some people to explain why they chose a particular answer and give people the freedom to change sides if they are convinced by other people's arguments.
4. Allow some time for discussion between each question.
 - a. Do fossil fuels impact the environment and contribute to climate change?
 - b. Are there advantages to using renewable energy sources?
 - c. Do you think it's possible for all our energy needs to be covered by renewable energy sources? (or will we always need to rely on some fossil fuels?)
 - d. Do you think it's possible for the world to achieve 'energy independence'?
 - e. Could the use of wind turbines help reduce air pollution and improve air quality?
 - f. Do you think wind energy can be unpredictable?
 - g. Is there a role for young people in promoting sustainable energy practices and influencing future energy policies?
 - h. Are wind turbines beautiful? Do they look well in the natural landscape?
 - i. Will wind turbines help us save money? Will they create jobs for communities?

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L1 Introduction to Wind Energy and Sustainability



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, skip thought questions in Activity 2: Depending on time constraints, omit a few thought questions while ensuring coverage of critical aspects like environmental impact, benefits, and challenges.

Extension: For a longer class, prompt learners to create a glossary by looking up the meaning of the following words:

- climate change,
- energy crisis,
- clean energy generation,
- reduction of carbon emissions,
- renewable energy,
- wind turbine,
- carbon neutral.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

National Geographic video on Renewable Energy 101 [3:16mins]

https://www.youtube.com/watch?v=1kUE0BZtTRc&ab_channel=NationalGeographic

Website: Sustainable Energy Authority of Ireland: <https://www.seai.ie/>

Website: Government Energy website on advantages and challenge of wind energy:

<https://www.energy.gov/eere/wind/advantages-and-challenges-wind-energy>

Local Trip / Expertise / Additional Work and Assessments

Find out if there is any offshore wind energy in your county? If not, find out if there is any offshore-wind around Ireland?

Does anyone in your community have an onshore wind turbine? Perhaps a local farmer might? If so, ask them why they chose wind energy over other renewable energy sources?

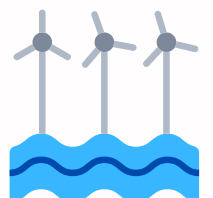
Interview older members of your community about windmills.



YES / NO



YES

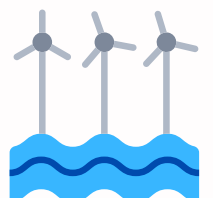




YES / NO



NO



SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 2: Analyze Maps Related to Onshore Wind Farms

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: Analyze Maps Related to Onshore Wind Farms

In this lesson, learners engage with interactive online maps displaying wind turbine generation capacity. The introduction outlines objectives—note-taking, record-keeping, and data analysis. Learners are divided into small groups with devices or utilize a shared display. They explore maps on Eirgrid and Wind Energy Ireland websites, noting wind farm details, locations, and toggling different generation types. Data analysis involves note-taking, producing graphs to highlight trends like yearly wind farm commissioning, and calculating energy production per county or province. This lesson fosters digital navigation, data interpretation, and analytical skills in understanding wind energy's geographical distribution and impact.

Vocabulary: Interactive Maps, Data Analysis, Geographic Distribution, Onshore Wind

In this lesson, the learner will:

- Explore interactive wind energy maps online.
- Analyze and interpret data from wind farm maps.
- Create visual representations like bar charts to showcase trends.
- Develop skills in note-taking, record-keeping, and digital navigation.

Materials

- Worksheet: Onshore Wind Farms
- Teacher's Notes
- Internet access
- Notepad and pen, or word-processor on laptop
- Calculator

MM3: Offshore Renewable Energy

L2 Analyse Maps Related to Onshore Wind Farms



ACTIVITY INSTRUCTIONS

Activity 1: Introduction (5 minutes)

1. Explain to learners that there are online interactive maps showing the wind turbine generation capacity.
2. Explain to learners that they are going to visit the websites containing these maps and explore the information they contain.
3. Highlight the key objectives of the lesson: note taking, record keeping, and data analysis.

Activity 2: Set-up online (5 minutes)

1. Depending on the number of resources (iPads/ laptops/ computers etc) and the number of learners, divide the class into small groups. If there is only one device in the classroom, consider projecting it onto the whiteboard/ wall for the entire class to follow.

Activity 3: Visit the websites and answer Questions on Worksheet 4 (20 minutes)

1. Invite learners to navigate to the [map on Egrid's website](#). Learners can explore the number of wind farms, and their names and locations via the map. They can also toggle-on and -off the wind-farms with other types of generation.
2. Invite learners to navigate to the [map on Wind Energy Ireland's website](#). Additional information on this map includes the energy capacity of the wind farm, and the year it was commissioned.
3. Have learners answer the questions on Worksheet: Onshore Wind Farms.

Activity 4: Present the findings (20mins)

1. Invite learners to present their findings to the class and to highlight the top three most interesting things they found.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L2 Analyse Maps Related to Onshore Wind Farms



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, answer only questions 1-7 on the worksheet or reduce the time for class discussion of their results.

Extension: For a longer class, invite learners to create a poster of their findings to the questions in the worksheet.

See Media Communications 3: Research - this micro module supports a learners micro-project to share their research findings. The micro-module supports learners who may consider taking Leaving Certificate Design and Communications Graphics as well as providing transferable skills in visual communication methods.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Website: Wind farm maps on Eirgrid website: <https://www.smartgriddashboard.com/#all/transmission-map>

Website: Wind farm maps on Wind Energy Ireland Website: <https://www.windenergyireland.com/about-wind/interactive-map>

Local Trip / Expertise / Additional Work and Assessments

Organise a visit to [Eirgrid's National Control Centre](#). It is the nerve-center of the country's entire electricity grid, and its where the Engineers work to make sure the lights stay on in everyone's homes.

Organise a talk with a local electrical engineer or electrician who can talk more about how we connect wind farms to the electricity network. Develop some interview questions to ask them.

Encourage and support learners to undertake the SEAI One Good Idea competition - <https://www.seai.ie/blog/one-good-idea/>

MM3: L2 TG OFFSHORE WIND FARMS

14 LIFE BELOW WATER



TEACHER'S NOTES

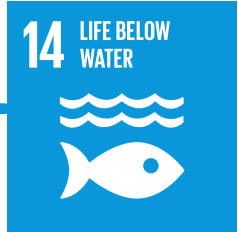
Online interactive maps

There are online interactive maps showing the location and size (in electrical terms) of the On-land (aka onshore) wind farms in Ireland. Wind farm (electrical) size is typically measured in MegaWatts (MW). Typically household appliances use KiloWatts (KW). A kilowatt is 1000 Watts and a Megawatt is a 1,000,000 Watts.

The figures below are screenshots taken of the maps on the Eirgrid website and the Wind Energy Ireland Website. The maps should be identical – depending on how well they are updated by the respective authors – but the level of detail provided for each wind farm is different on both sites.



MM3: L2 WS OFFSHORE WIND FARMS



OFFSHORE WIND FARMS

Answer the following questions based on information you can find on Eirgrid's website and Wind Energy Ireland's website:

Website: Wind farm maps on Eirgrid website:

<https://www.smartgriddashboard.com/#all/transmission-map>

Website: Wind farm maps on Wind Energy Ireland Website:

<https://www.windenergyireland.com/about-wind/interactive-map>

1. How many wind farms are in Ireland?

2. Where are they mostly located?

3. Name 5 different wind farms; why do you think they were named that?

1. _____

2. _____

3. _____

4. _____

5. _____

4. What other types of renewable energy do you see on the map?

5. Which wind farm has the largest energy capacity, and what is that capacity?

6. What is the wind farm with the least amount of energy capacity; what is that capacity?

MM3: L2 WS OFFSHORE WIND FARMS



OFFSHORE WIND FARMS

7. Why do you think there are such differences in capacity?

8. Which year had the most new wind farms constructed?

9. When was the first turbine constructed?

10. Try and produce a bar chart showing the number of new wind farms commissioned each year – which will show an interesting trend. What is that trend?

11. Calculate the amount of energy produced in each county or each province by adding the amounts quoted in the maps for each individual wind farm.

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 3: Exploring Offshore Wind Farms

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: Exploring Offshore Wind Farms

In this engaging lesson, learners virtually explore the world of wind energy through three videos. They begin with a tour of Arbuckle Wind Farm, gaining insight from the Operations Manager's drive-through. Next, they visit Hornsea Wind Farm, the world's largest offshore wind farm, with a 360° tour led by a wind turbine technician. Then, they explore Burbo Bank Offshore Wind Farm in the UK. Following the videos, learners brainstorm the diverse roles in wind farm development. Finally, they craft 'day-in-the-life' diaries for construction workers, considering elements like weather, safety, turbine size, and the offshore environment.

Vocabulary: Wind Energy, Virtual Tour, Roles and Jobs, Construction Worker Diary

In this lesson, the learner will:

- Explore virtual tours of real-world wind farms, including Arbuckle, Hornsea, and Burbo Bank, gaining insights into their operations and significance.
- Identify and discuss various roles and jobs involved in the design, construction, and maintenance of both onshore and offshore wind farms.
- Engage in brainstorming sessions to collaboratively compile a comprehensive list of roles and responsibilities within the wind energy sector.
- Apply their understanding by creating imaginative "day-in-the-life" diaries for construction workers, depicting the challenges, routines, and unique aspects of wind farm development.

Materials

- Worksheet: Day-In-The-Life
- Internet access
- Notepad and pen, or word-processor on laptop

MM3: Offshore Renewable Energy

L3 Exploring Offshore Wind Farms



ACTIVITY INSTRUCTIONS

Activity 1: Virtual visit to Arbuckle Wind Farm (10 minutes)

1. Watch the [video](#) Virtual Wind Farm Tour Ep 3: Wind Farm Drive [3:02 mins] of a virtual tour of the Arbuckle Mountain wind farm in Oklahoma in the USA given by Operations Manager Andy Woods.
2. After watching the video, invite learners to share with the class what the most interesting part of the video was for them.

Activity 2: Virtual visit to Hornsea Wind Farm (10 mins)

1. Watch the [video](#) 360° Look Inside the World's Largest Offshore Wind Farm: Hornsea 2 [4:53 mins] of a 360° tour of the world's largest offshore wind farm – called Hornsea 2.
2. After watching the video, invite learners to brainstorm as a group, all the different roles/ jobs that feature in the design, construction, and maintenance of wind farms.

Activity 3: Create a day-in-the-life diary (30 mins)

1. After watching the three videos, have learners fill in the worksheet: a day-in-the-life for a typical construction worker involved in the development of wind farms. You might consider including information on the weather conditions, safety protocols, the journey out to sea, the shift times, the size of the turbines being constructed and the remoteness of the work.
2. From this worksheet, have learners create an infographic for their day-in-a-life.
3. Have each group share with the class.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L3 Exploring Offshore Wind Farms



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, skip viewing the second video, or leave out the infographic.

Extension: For a longer class, watch the additional video in the media box and create a series of three diary entries in Activity 3.

Option B: Have learners create a digital infographic using [canva.com](https://www.canva.com) and share with the class. Or have learners create a short tik-tok on a day in their life as a construction worker on an offshore wind farm. See Media Communication Video Micro-Module.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Virtual Wind Farm Tour Ep 3: Wind Farm Drive [3:02 mins] https://www.youtube.com/watch?v=uZci8D1JQmg&ab_channel=EDPRenewables

360° Look Inside the World's Largest Offshore Wind Farm: Hornsea 2 [4:53 mins] https://www.youtube.com/watch?v=M6g96aLHmQs&ab_channel=%C3%98rsted

A virtual of tour Burbo Bank offshore wind farm in 360° [2:26 mins] https://www.youtube.com/watch?v=BCgww3dCGg8&ab_channel=%C3%98rsted

Local Trip / Expertise / Additional Work and Assessments

Search online to see if you can find other virtual tours of other wind farms. There might also be other interviews with people who work on wind farms that could be interesting to watch.

Do you know anyone in your local community that works on wind farms? Perhaps invite them to deliver a talk to the class, or to interview them about their job?

MM3: L3 WS A-DAY-IN-THE-LIFE

14 LIFE BELOW WATER



Complete the following chart with what you think a day-in-the-life of a typical offshore wind-farm construction worker is like:

Location	
Date	
8am	
9am	
10am	
11am	
12pm	
1pm	
2pm	
3pm	
4pm	
5pm	

MM3: L3 WS A-DAY-IN-THE-LIFE

14 LIFE BELOW WATER



Complete the following chart with what you think a day-in-the-life of a typical offshore wind-farm construction worker is like:

6pm	
7pm	
8pm	
9pm	
10pm	
11pm	

MM3: L3 WS A-DAY-IN-THE-LIFE



Now, from your table above, create an infographic of your construction worker's day.

See examples of infographics here:

<https://visual.ly/community/Infographics/technology/day-life>

<https://www.behance.net/gallery/64936517/A-Day-In-The-Life>

Step 1: Define the Purpose

- Decide on the purpose of your infographic. What do you want to convey about the construction worker's daily routine?

Step 2: Plan Your Content

- Make a list of the key activities and events you want to include in your infographic. Think about what makes their day unique and interesting.

Step 3: Choose a Layout

- Determine the layout of your infographic. Will it be a vertical or horizontal design? You can also browse online templates for inspiration.

Step 4: Create Sections

- Divide your infographic into sections or time intervals (e.g., morning, afternoon, evening).
- Use a ruler or grid lines if you're drawing on paper to keep your sections neat.

Step 5: Design Icons and Graphics

- Create icons or small illustrations to represent each activity or event in their day. These visuals should be simple and easy to understand.
- If you're using digital tools, you can find free icons or design your own.

Step 6: Add Text

- Write short descriptions or labels for each activity or event. Be concise and use clear, legible fonts.
- Include the time or approximate time for each event to give a sense of their daily schedule.



Step 7: Add Colors

- Use colours to make your infographic visually appealing. You can assign specific colours to different sections or activities.
- Ensure that your colour choices are harmonious and easy to read.

Step 8: Create a Title and Introduction

- Add a catchy title to your infographic, such as "A Day in My Life" or something more creative.
- Include a brief introduction that sets the context for their day.

Step 9: Arrange Elements

- Arrange your icons, text, and graphics within each section, following a logical sequence from morning to night.
- Ensure that your infographic flows smoothly and is easy to follow.

Step 10: Review and Edit

- Double-check your infographic for accuracy, clarity, and any spelling or grammar errors.
- Ask a friend to review it for feedback.

Step 11: Finalise and Share

- Make any necessary revisions based on feedback.
- If you're creating a digital infographic, save it in a format suitable for sharing (e.g., JPEG, PNG, PDF).
- Share your "Day-in-the-Life" infographic with the class.

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 4: Protecting our Ocean Friends

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: Protecting our Ocean Friends

In this lesson, the topic of offshore wind's impact on marine life is explored. The lesson begins with a 12-minute video clip featuring insights from Patrice McCarron of the Maine Lobstermen's Association and lobsterman Jason Joyce, highlighting potential harms caused by offshore wind. Learners then engage in a 20-minute questionnaire based on the video, enhancing their media literacy skills. A 15-minute whole-class discussion follows, encouraging learners to share their viewpoints on offshore wind, influenced by the video, and debate its pros and cons. The discussion aims to foster critical thinking while capturing the exchange on a visual platform.

Vocabulary: Marine Life, Media Literacy, Environmental Impact

In this lesson, the learner will:

- Analyze Offshore Wind Impact
- Develop Media Literacy
- Participate in Group Discussion
- Formulate Informed Opinions

Materials

- Worksheet: Offshore Wind Farms and Animal Life
- Internet access
- Notepad and pen
- Flipchart or whiteboard and markers

MM3:Offshore Renewable Energy

L4 Protecting our Ocean Friends



ACTIVITY INSTRUCTIONS

Activity 1: Introduction (15 mins)

1. Watch the video Will Offshore Wind Harm Marine Life? [12:02 mins] on how offshore wind has the potential to harm marine life, which is a scene taken from Episode 2 of The Maine Reset.

Activity 2: Video Questions (20 mins)

1. After watching the video, invite learners to complete the questions in the worksheet: Offshore Wind Farms and Animal Life.

Activity 3: In-class discussion (15 mins)

1. Invite learners to participate in a whole-class discussion on their reaction to this video.
2. Poll learners on whether they are in favour of offshore wind, or against and whether this video might have influenced their thinking.
3. Moderate a discussion on the advantages and disadvantages of offshore wind, and whether one out-weighs the other. These questions can be discussed in small groups before moderating a whole-class discussion. Consider recording the discussion on a whiteboard or flip chart. Some questions to consider are:
 - a. What are the advantages of offshore wind?
 - b. How can offshore wind farms benefit communities economically?
 - c. How can offshore wind farms impact climate change beyond providing renewable energy?
 - d. What are the disadvantages of offshore wind?
 - e. How do you think offshore wind will affect fishermen and tourism which relies on the ocean (e.g. whale watching, deep sea fishing, boat tours of landmarks, parasailing, etc.)?
 - f. For each disadvantage, can you think of solutions?

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L4 Protecting our Ocean Friends



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, reduce the amount of time you spend on activity 3.

Extension: For a longer class, invite learners to read Bottom-Dwelling Marine Animals Thriving on Offshore Wind Farm Foundations by Ecowatch (see media box) on how some marine animals are thriving on offshore wind farm foundations. Use the Marine Atlas to lead a discussion on how learners think offshore wind farms would affect Irish Marine Life. Contrast this with the information provided in the video.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Will Offshore Wind Harm Marine Life? [12:02 mins] https://www.youtube.com/watch?v=6Y-oDszbFmQ&ab_channel=TheMaineReset

Article: Bottom-Dwelling Marine Animals Thriving on Offshore Wind Farm Foundations: <https://www.ecowatch.com/marine-animals-offshore-wind-farm-habitats.html#:~:text=There%20can%20be%20negative%20effects,change%20can%20benefit%20marine%20life.>

Ireland's interactive Marine Atlas: <https://atlas.marine.ie/#?c=54.0916:-8.3716:6>

Local Trip / Expertise / Additional Work and Assessments

Make a trip to your local aquarium to learn more about marine life.

Consider inviting a marine expert to talk to the class about the potential impact of infrastructure on the marine environment.

See SDG14 MM1 for WebQuest and Pledges related to marine life and ocean health.



OFFSHORE WIND FARMS AND ANIMAL LIFE

Answer the following questions:

Overall, do you think Patrice McCarron and Jason Joyce are in favour or against offshore wind farms?

Where do they say companies want to install offshore wind farms? Why do they think that?

Where do companies want to mount the wind turbines? Why is this significant?

What are they most concerned about in relation to offshore wind farms?

What animals do they think wind farms will affect?

What problems do they say wind farms cause for marine life?

What problems do they say wind farms cause for birds?



OFFSHORE WIND FARMS AND ANIMAL LIFE

What Island do they refer to? What birds live there? Why are they concerned?

How do they say the offshore wind farms will affect fishermen?

Why is the physical structure of wind turbines a concern?

What do they think is motivating the construction of offshore wind farms? Why do they say this is a problem?

What kinds of solutions do you think would be better?



OFFSHORE WIND FARMS AND ANIMAL LIFE

What evidence do they give to support their point of view?

Remember, evidence is based on data, scientific studies, statistics, observation, historical records, published peer-reviewed scientific papers, etc.

Do you think this video represents a fair reflection of the challenge, or is there some bias? Give reasons for your opinion.

Note: A biased argument is a type of argument that presents information, evidence, or reasoning in a partial, prejudiced, or one-sided manner, typically to support a particular viewpoint, perspective, or agenda while neglecting or downplaying opposing viewpoints or evidence. Biased arguments often lack objectivity and fairness and can be used to manipulate or persuade people without providing a balanced or complete picture of the topic under discussion.

In a biased argument, the presenter may selectively choose evidence that supports their position while ignoring contradictory evidence, use emotionally charged language to sway opinion, or rely on fallacious reasoning to make their case appear stronger than it is. These arguments can be misleading and are not conducive to open, rational, and constructive discourse.

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 5: Classroom Debate on Onshore vs Offshore Wind

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: Classroom Debate on Onshore vs Offshore Wind

In this lesson, learners engage in a debate comparing offshore and onshore wind energy. The lesson begins with a brief introduction to the debate topic. Learners then conduct individual research online to identify the pros and cons of each type of wind energy. Debating teams are formed, with learners either supporting offshore or onshore wind energy. During preparation, learners gather supporting arguments and compile flashcards. The lesson culminates in a facilitated debate where teams present their viewpoints using the synthesized information. This activity encourages critical thinking, research skills, and collaborative discussion on renewable energy sources.

Vocabulary: Offshore Wind, Onshore Wind, Argument, Counterargument, Rebuttal, Closing Statement, Debate

In this lesson, the learner will:

- Begin to understand the advantages and disadvantages of both onshore and offshore wind energy
- Engage in a debate:
- Conduct individual research
- Develop presentation and critical thinking skills

Materials

- Worksheet: Debate Questions
- Notepad, flashcards and pen
- Whiteboard and markers

MM3: Offshore Renewable Energy

L5 Classroom Debate on Onshore vs Offshore Wind



ACTIVITY INSTRUCTIONS

Activity 1: Introduction (5 minutes)

1. Explain that the class is going to have a debate on the advantages and disadvantages of offshore wind energy compared with onshore wind energy.
2. Have learners discuss in groups what a debate is and how a debate is structured.
3. Define the following terms as a class: argument, counterargument, rebuttal and final statement.

Activity 2: Research (10 minutes)

1. Divide learners into groups of 2.
2. Invite the learners to conduct online research to find the relative merits and drawbacks of offshore wind energy compared to onshore wind energy. Suggest that they can use the following websites as a starting point: [National Grid](#) and [GreenCoast](#). Use the questions in the Worksheet: Debate Questions to help structure their research.

Activity 3: Choose debating teams (5 mins)

1. Divide the class in half. Choose which half will be for the motion (in favour of offshore wind energy), and which half will be against (in favour of onshore wind energy).
2. Have each side choose 3-4 speakers for the debate.
3. Decide a running order for the debate, and the sequence in which each speaker will contribute.

Activity 4: Synthesizing the information (10 mins)

1. Invite the debating team members to prepare flash cards of the points they want to make, based on their own research, and the contributions of their classmates.

Activity 5: Facilitate the debate (20 mins)

1. Have the first speaker from the 'in favor of offshore wind energy' present their first argument.
2. Have the first speaker from the 'in favor of onshore wind energy' present their first argument.
3. Allow 2 minutes for each team to discuss as a group and develop a rebuttal or next speaking point.
4. Continue this process for the duration of the debate.
5. Allow each team to present a final closing statement at the end of the debate.
6. Vote as a class which team 'won' the debate.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L5 Classroom Debate on Onshore vs Offshore Wind



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, instead of researching both offshore and onshore wind energy, focus on just one type, allowing learners to delve deeper into the advantages and disadvantages of that specific option.

Condense the debate by having each team present only one main argument in favor of their assigned wind energy type and one counterargument against the opposing type.

Extension: For a longer class, after the debate, facilitate a class-discussion where learners can further explore nuanced aspects of wind energy by answering questions from their peers and engaging in a more open-ended dialogue.

Invite learners to create posters that summarize their findings, arguments, and counterarguments, encouraging a more comprehensive exploration of the topic. See Media Communications Micro-Module on Posters.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Onshore vs offshore wind energy: what's the difference?

<https://www.nationalgrid.com/stories/energy-explained/onshore-vs-offshore-wind-energy>

Onshore vs Offshore Wind: What Are the Differences and Facts? <https://greencoast.org/onshore-vs-offshore-wind/>

Local Trip / Expertise / Additional Work and Assessments

Which type of wind turbine do we have more of in Ireland – offshore wind turbines or onshore wind turbines?

See if you can organize a trip to visit a local wind turbine in your area? Which do you think might be easier – a visit to an onshore turbine or an offshore turbine?

Interview a number of people in your town to see if they are in favour of onshore or offshore wind, or neither. Why do they feel this way?

MM3: L5 WS DEBATE QUESTIONS



Use this worksheet to structure your research. Use the following websites as a starting point, but you will need to do more research on your own. You may need to use additional paper to take notes.

Onshore vs offshore wind energy: what's the difference?

<https://www.nationalgrid.com/stories/energy-explained/onshore-vs-offshore-wind-energy>

Onshore vs Offshore Wind: What Are the Differences and Facts?

<https://greencoast.org/onshore-vs-offshore-wind/>

Which is cheaper: onshore wind turbines or offshore wind turbines? Why?

What are the economic implications of investing in onshore wind energy compared to offshore wind energy?

How do onshore and offshore wind energy projects affect job creation and local economies?

Which is more environmentally sustainable: onshore wind turbines or offshore wind turbines? Why?

When thinking about the visual impact of wind turbines, are people more likely to be badly affected by offshore wind turbines or onshore wind turbines?

MM3: L5 WS DEBATE QUESTIONS



Which type of turbine is easier to build, onshore or offshore?

Which type of turbine can be connected to the electricity grid more easily: onshore or offshore?

Which type of turbine is likely to generate the most amount of electricity?

Could there be a negative impact on wildlife and sea-life because of the construction of wind turbines?

Which type of wind energy is more reliable and less susceptible to weather-related disruptions: onshore or offshore?

What are the geopolitical implications of relying on onshore or offshore wind energy for a nation's energy needs?

How do the permitting and regulatory processes differ for onshore and offshore wind projects, and which is more efficient?

MM3: L5 WS DEBATE QUESTIONS



Are there safety concerns related to onshore wind turbines (e.g., blade failures) or offshore wind turbines (e.g., maintenance in harsh marine environments) that should influence the choice between the two?

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 6: Building Strong Foundations 1

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: Building Strong Foundations 1

In this lesson, learners engage in a comprehensive exploration of foundations and their significance across various structures. The lesson starts with an introductory video on foundation concepts and functions, leading to a whole-class discussion. The lesson concludes with a hands-on activity where learners create tall, stable towers to solidify their understanding of strong shapes and foundations.

Vocabulary: Foundation, Structure, Monopile, Floating Foundation, Bearing Capacity of Soil, Load Path, Super-structure, Sub-structure

In this lesson, the learner will:

- Gain insight into the fundamental concepts and functions of various types of foundations.
- Delve into the intricacies of foundation design, focusing on key visual elements for effective understanding.
- Explore prototyping.

Materials

- Worksheet: Foundations and their Functions
- Pen and paper
- For each team of 3: 20 sticks of dry spaghetti, one metre of string, one metre of tape, one marshmallow (or a similar size ball of Blu Tack)
- Scissors
- Measuring tape or metre stick

MM3: Offshore Renewable Energy

L6 Building Strong Foundations 1



ACTIVITY INSTRUCTIONS

Activity 1: Introduction to foundations (15 mins)

1. Play the video Foundations and Their Functions || What is foundation in building? || Types of Foundation|| #1 [3:11 mins] on 'foundations and their functions'.
2. Have learners answer the questions on Worksheet: Foundations and Their Functions.
3. Share as a class.

Activity 2: Tower Building (35mins)

1. Divide the class into groups of 3.
2. Explain that they will need to build the tallest, freestanding tower out of the given materials. They cannot use any other materials, lean the tower against something, hold the tower, or tie the tower to something else (e.g. the light above the desk).
3. Give each group the following materials: 20 sticks of dry spaghetti, one metre of string, one metre of tape, one marshmallow (or a similar size ball of blutack).
4. The learners will have 20 minutes to build their towers.
5. After 20 minutes, measure the towers from floor (or desk, depending on what it is built on) to the top. The tallest freestanding tower wins. Have learners help clean up.
6. Give learners 5-10 minutes to discuss what did / didn't work and roughly draw a new, stronger prototype.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L6 Building Strong Foundations 1



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, give less time to build the towers and skip step 6 of activity 2.

Extension: For a longer class, give learners more time to build their towers and / or allow learners to have a second round of building towers with new materials after discussing what did / didn't work for their first tower.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Foundations and Their Functions || What is foundation in building? || Types of Foundation|| #1 [3:11 mins] https://www.youtube.com/watch?v=sFT2h7uhrgl&ab_channel=Anime_Edu-CivilEngineeringVideos

Local Trip / Expertise / Additional Work and Assessments

Is there a construction site nearby? If so, they often have viewing windows. See if you can get a view of what type of foundation they are using – is it a shallow one or a deep one?

For the Arklow bank wind farm in Ireland, can you find out what type of foundations were used in its construction? Were they monopile foundations or floating foundations?

Learners could visit [Codling Wind Park](#) online and look at their [Phase 1](#) and [Phase 2 consultation](#) documents and consider the process for its ethics and community engagement



FOUNDATIONS AND THEIR FUNCTION

Answer the following questions after watching the video. You may need to use Google to help.

What are the two basic components of a building?

1. _____
2. _____

What are the main functions of a foundation?

What are the requirements of a good foundation?

What is a dead load?

What is an imposed load?

What are the two classifications of foundations?

1. _____
2. _____

Write a definition for both classifications.

1. _____

2. _____

Why do you think foundations might be important for offshore wind turbines?

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 7: Building Strong Foundations 2

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

Lesson Title and Summary: Building Strong Foundations 2

Building on the last lesson, the focus shifts to wind turbine foundations through a brief video, followed by brainstorming. A detailed video on foundation design delves into essential information for proper design, encouraging visual analysis. The lesson concludes with a brief brainstorm and 2D prototype of a strong offshore wind turbine which will be built on in the next lesson. This dynamic approach empowers learners to grasp foundation principles and apply them to real-world scenarios.

Vocabulary: Foundation, Structure, Monopile, Floating Foundation, Bearing Capacity of Soil, Load Path, Super-structure, Sub-structure

In this lesson, the learner will:

- Explore the unique challenges and solutions associated with wind turbine foundations, particularly in offshore environments.
- Delve into the intricacies of foundation design, focusing on key visual elements for effective understanding.

Materials

- Worksheet: Foundation Design
- Pen and paper
- Internet Access

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



MM3: Offshore Renewable Energy

L7 Building Strong Foundations 2



ACTIVITY INSTRUCTIONS

Activity 1: Wind turbine foundations (15 mins)

1. Play the video The Foundation of Wind Turbines - IN 60 SECONDS [1:22 mins] by DOB-Academy.
2. Have learners answer the questions on Worksheet: Foundation Design Part 1.
3. Share as a class.

Activity 2: Foundation design (20 mins)

1. Play the video Fugro Offshore Wind Farm Foundation Design [1:50 mins].
2. Ask learners to complete the worksheet: Foundation Design Part 2.
3. Share as a class.
4. After playing the video once through, pause the video at 0:23 sec, 0:30 sec, 0:52 sec, 1:19 min, 1:26 min and 1:28 min. At each pause point, have learners discuss the image using the questions on the worksheet: Foundation Design Part 3.
5. Discuss as a class.

Activity 3: Brainstorming (15 mins)

1. Tell learners that they will build a wind turbine next class.
2. Divide learners into groups of 2.
3. Have learners brainstorm how they would design their wind turbine based on the information they have learned in the module so far.
4. Learners may wish to draw or sketch their design and bring this to the next class.
5. Share as a class.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L7 Building Strong Foundations 2



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, skip activity 3.

Extension: For a longer class, consider playing the videos a second time, as there is a significant amount of information included in each one, even though they are short videos. Allow learners more time to brainstorm.

Option B: Utilise Codling Wind Park as a case study - see Local Trip / Expertise / Additional Work and Assessments Box, as an extension activity over a number of lessons that could contribute to a walking debate and introduce them to the public consultation process

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

The Foundation of Wind Turbines - IN 60 SECONDS [1:22 mins] https://www.youtube.com/watch?v=NQwuRV2MFs8&ab_channel=DOB-Academy

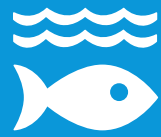
Fugro Offshore Wind Farm Foundation Design [1:50 mins] https://www.youtube.com/watch?v=38CSrh8l3il&ab_channel=Fugro

Local Trip / Expertise / Additional Work and Assessments

Is there a construction site nearby? If so, they often have viewing windows. See if you can get a view of what type of foundation they are using – is it a shallow one or a deep one?

For the Arklow bank wind farm in Ireland, can you find out what type of foundations were used in its construction? Were they monopile foundations or floating foundations?

Learners could visit [Codling Wind Park](#) online and look at their [Phase 1](#) and [Phase 2 consultation](#) documents and consider the process for its ethics and community engagement



Part 1

After the video, answer the following questions.

What are the types of support structures for wind turbines?

What is the industry favourite?

What are the parts of the monopile?

Why is it popular?

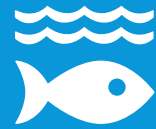
What depths of water is it used in?

What must be done to the monopile if there is a heavier structure or it is placed in deeper water?

What are the limiting factors?

MM3: L7 WS FOUNDATION DESIGN

14 LIFE BELOW WATER



What is an alternative method for deeper waters?

How is it connected to the seabed?

What is the limiting factor?

What are the benefits?

Part 2

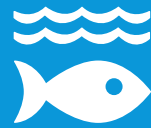
After the video, answer the following questions.

What is Fugro? What do they do?

What challenges are they facing when building new wind turbines? Why are they using site-specific information to build turbines?

MM3: L7 WS FOUNDATION DESIGN

14 LIFE BELOW WATER



What are their selling points (e.g. cost effective)?

Why is having the right kind of foundation important? What do the turbines need to withstand?

Part 3

Your teacher will pause on a number of images from the video. For each image, discuss the following questions with your partner. You may want to take notes of your discussion on a separate piece of paper.

What do you see in the image?

What kind of foundation are they using in each image? Why do you think they chose this type of foundation for the turbines shown in the each image?

Which types of foundation do you like? Which ones do you think are the best?

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 8: Learners Design Wind Turbine Foundations

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

Lesson Title and Summary: Learners Design Wind Turbine Foundations

In this lesson, learners become offshore wind turbine engineers who design and construct strong and stable foundations for wind turbines at sea. Working in small groups, they are provided with materials to create their turbine foundations. The learners are challenged to think critically about stability, the weight of the turbine, the depth in the sand that their foundation will be buried, and the ability to withstand waves and strong winds. After a brief building time, the groups present their designs.

Vocabulary: Prototype, Design and Build, Offshore Wind Turbine, Stability, Foundation

In this lesson, the learner will:

- Develop hands-on prototyping skills
- Environmental awareness and responsibility
- Basic engineering concepts, adaptability and refinement
- Critical thinking and problem-solving

Materials

- Worksheet: Turbine Foundation Options
- Straws
- Match sticks/ lollipop sticks
- Markers/ stickers,
- Playdough or clay
- Tape
- String
- Cardboard
- Scissors
- Rulers/ measuring tapes
- Mini-turbines (in any form – could be some lollipop sticks stuck together)

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



MM3: Offshore Renewable Energy

L8 Learners Design Wind Turbine Foundations



ACTIVITY INSTRUCTIONS

Activity 1: Introduction (10 minutes)

1. Use the image provided in the worksheet and have learners brainstorm the pros and cons of each design.
2. Have learners discuss what the qualities of a strong offshore wind turbine might be, and what they need to consider (i.e. wind, tide, waves) when building a wind turbine. Remind learners of their last two lessons as the information discussed may be useful.
3. Share as a class.

Activity 2: Group Formation and Materials (5 minutes)

1. Divide the class into small groups of 3-4 learners.
2. Provide each group with the materials, including straws/matchsticks/lollipop sticks, playdough or clay, tape, string/cardboard, scissors, mini-turbines (e.g., lollipop sticks), a large plastic crate filled with water, and sand.

Activity 3: Design and Construction (25 minutes)

1. Instruct the learners to collaboratively design and construct their wind turbine foundations using the provided materials. They may refer to their brainstorming from the previous lesson.
2. Encourage them to consider stability, weight distribution, and the foundation's ability to withstand waves and strong winds.

Activity 4: Presentation (10 minutes)

1. Give each group a few minutes to present their foundation designs to the class.
2. During the presentation, have the other learners ask questions or provide feedback on each design.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L8 Learners Design Wind Turbine Foundations



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, reduce the number of materials provided to the groups to simplify the activity and save time. Skip the presentation part and instead, have each group explain their foundation design briefly to the class while showing it in action during the testing phase in Lesson 5. Instead of having each group present their design choices, facilitate a brief group discussion where learners share one thing they learned from designing their turbines and foundations.

Extension: For a longer class, after the initial 25-minute building time, give groups an additional 5 minutes for modifications and improvements to their foundations based on feedback from other groups. Introduce additional variables for testing, such as varying the wind speed or changing the angle of the turbine blades to explore how these factors impact the stability and performance of the turbine and foundation. Have groups record their observations and create charts or graphs to compare to different foundation designs.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

The Foundation of Wind Turbines - IN 60 SECONDS – DOB Academy [1:22 mins]
https://www.youtube.com/watch?v=NQwuRV2MFs8&ab_channel=DOB-Academy

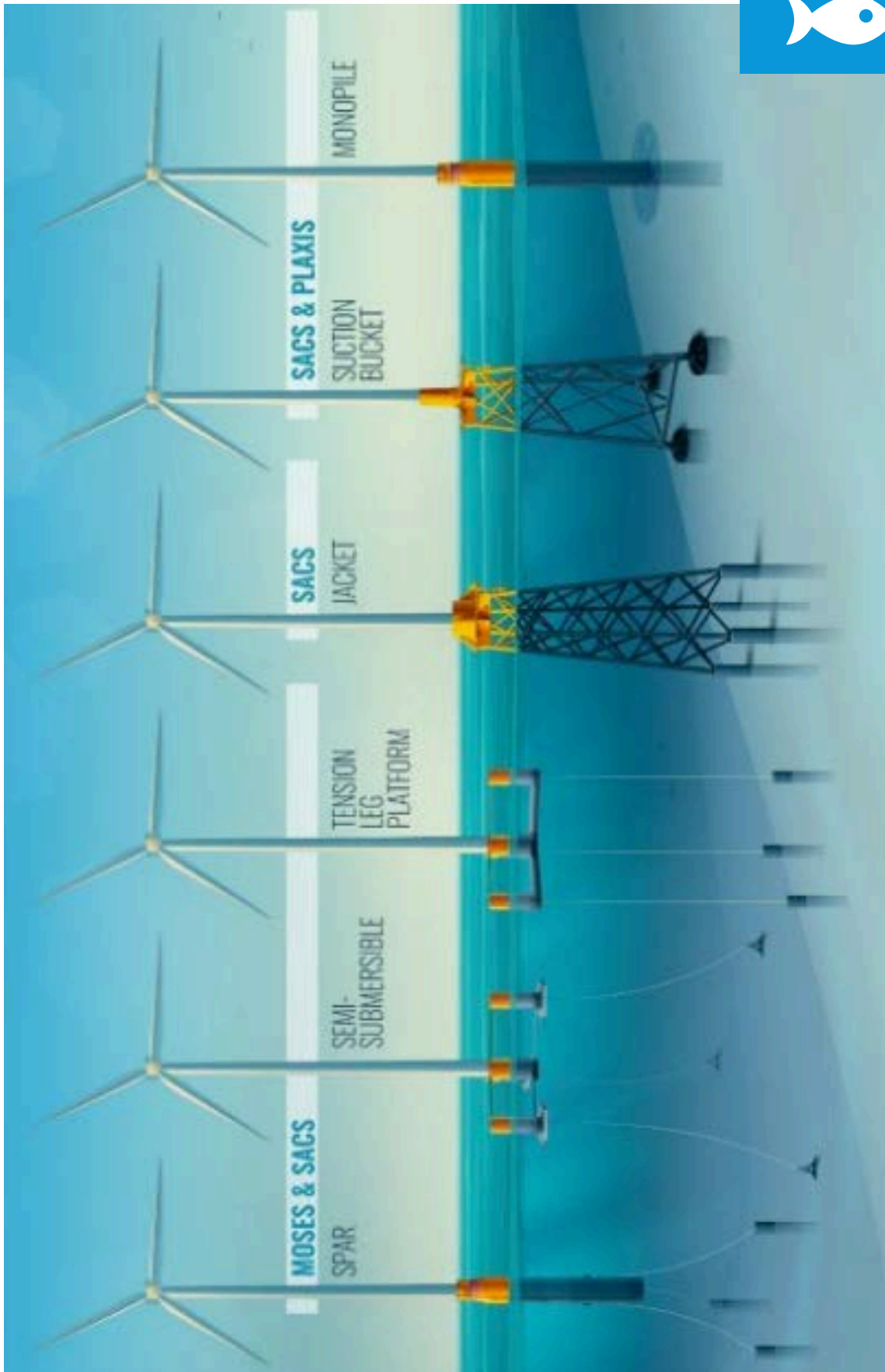
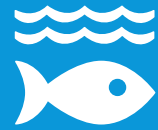
Watch the World's First Floating Wind Farm Ride the Waves | National Geographic [2:23 mins]
https://www.youtube.com/watch?v=sgCA5e7K7r8&ab_channel=NationalGeographic

Wind Energy Ireland wants more renewable energy targets [1:51 mins]
https://www.youtube.com/watch?v=52AR4W1vc10&ab_channel=RT%C3%89News

Report (22 pages): Erosion of foundations of Arklow Bank Wind Farm:
https://eprints.hrwallingford.com/595/1/HRPP320_Seabed_scour_assessment_for_offshore_windfarm.pdf

Local Trip / Expertise / Additional Work and Assessments

- Organize a trip to your local beach to see if you can pick a spot where you might construct a wind farm.
- Contact your county council and ask what their offshore plans are? Are offshore wind farms a county-level decision or a national level decision?
- If you have access to a 3D printer, have learners design and print their offshore wind turbine with the 3D printer.



Types of wind turbine foundations, and Bentley software to address each type of foundation, <https://blog.bentley.com/software/all-about-offshore-wind-turbine-foundations/>

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 9: Learners Test Wind Turbine Foundations

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

Lesson Title and Summary: Learners Test Wind Turbine Foundations

In this lesson, learners will test the foundations they built in the previous lesson in a simulated sea environment using a large plastic crate filled with water and sand. Working in small groups, the learners are challenged to think critically about stability, the weight of the turbine, the depth in the sand that their foundation will be buried, and the ability to withstand waves and strong winds. This hands-on testing phase allows the learners to observe the performance of their designs and consider what changes they might consider for better performance.

Vocabulary: Test, Prototype, Offshore Wind Turbine, Stability, Foundation

In this lesson, the learner will:

- Test a prototype in a simulated environment
- Iterating a design based on testing
- Environmental awareness and responsibility
- Basic engineering concepts, adaptability and refinement
- Critical thinking and problem-solving

Materials

- Teachers notes
- Large plastic crate that can be filled with water to test the turbine foundations (plus towels for any spills)
- Sand that can be put at the bottom of the crate to simulate the seabed
- Wooden spoon or spade/ paddle/ oar or something that can be used to mix/stir the water to generate movement
- Hair-dryer to simulate the wind

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



MM3: Offshore Renewable Energy

L9 Learners Test Wind Turbine Foundations



ACTIVITY INSTRUCTIONS

Activity 1: Testing – round 1 (20 mins)

1. Invite the groups to test their turbine foundations in the large plastic crate filled with water and sand. See teacher's notes.
2. Learners will need to take time to get their turbine to float/ balance on the water, and/ or embed the foundation into the sand at the bottom.
3. Generate movement in the water using the paddle/ oar/ spade/ wooden spoon.
4. Use the hair dryer to simulate the wind.
5. Encourage them to observe the performance of their designs and make notes of any adjustments needed.

Activity 2: Group Discussion (10 mins)

1. Gather the learners for a group discussion after all groups have tested their foundations.
2. Ask each group to share their findings, what they learned, and any modifications they would make.
3. Depending on the time available this can be done group by group or a selection from the class

Activity 3: Testing - round 2 (20 mins)

1. Invite learners to test their modified designs to see if they worked any better.
2. Encourage learners to observe the performance of their designs and make notes of any adjustments needed.
3. Depending on the time available, learners can share their findings. This can be done group by group or a selection from the class

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L9 Learners Test Wind Turbine Foundations



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, limit the testing time to a shorter period (e.g., 5 minutes per group) to streamline the activity while still allowing for meaningful testing and discussions. Instead of having each group present their design choices, facilitate a brief group discussion where learners share one thing they learned from testing their turbines and foundations.

Extension: For a longer class, introduce additional variables for testing, such as varying the depth of water, the depth of sand, the amount of movement in the water - to explore how these factors impact the stability and performance of the turbine and foundation. Have groups record their observations and create charts or graphs to compare the performance of different foundation designs.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

The Foundation of Wind Turbines - IN 60 SECONDS – DOB Academy [1:22 mins]
https://www.youtube.com/watch?v=NQwuRV2MFs8&ab_channel=DOB-Academy

Watch the World's First Floating Wind Farm Ride the Waves | National Geographic [2:23 mins]
https://www.youtube.com/watch?v=sgCA5e7K7r8&ab_channel=NationalGeographic

Wind Energy Ireland wants more renewable energy targets [1:51 mins]
https://www.youtube.com/watch?v=52AR4W1vc10&ab_channel=RT%C3%89News

Report (22 pages): Erosion of foundations of Arklow Bank Wind Farm:
https://eprints.hrwallingford.com/595/1/HRPP320_Seabed_scour_assessment_for_offshore_windfarm.pdf

Local Trip / Expertise / Additional Work and Assessments

Invite a Civil Engineer to come give a talk (or a video call) on the construction challenges of offshore wind turbines. Prepare some interview questions for them. For example, how long does it take to build an offshore wind farm? How much does it cost? How many people are needed to construct them?

Assessment Suggestion: Use Media Communication 2 - Research Poster for learners to share their findings within a public context, this could be as an exhibition at the school or local library or community centre

MM3: L9 TG TESTING THE FOUNDATIONS



If possible, it's best to use a plastic crate that is relatively shallow, but that is wide and long. Fill the plastic crate with water. Carefully add sand to the bottom of the crate so that it stays settled on the bottom and doesn't become suspended in the liquid. Using sand that has larger grain sizes, rather than soft powdery sand will help with this. You want to aim for at least 8-10 inches of sand, so depending on the size of the crate, this could require a couple of bags of sand.

We will be asking students to place their wind turbine into the water. Some students might have designed a turbine where the foundation is a long column that sticks directly into the sand. Others might have designed a turbine that is supposed to float on the water, with an anchor embedded in the sand. They will probably have used the image in the worksheet as inspiration.

We are generally never worried about the effect of the force of the wind on the turbine itself. We are more worried about the force of the sea causing erosion of our foundations on the seabed. If our wind turbine foundations became exposed, in theory our turbine could just float away, or flop over, or sink.

To 'simulate' the force of the waves acting on the seabed, use a large wooden, or perhaps a paddle/ oar. Ideally this will disturb the sand and cause erosion-type effects on the foundations of the students' turbines.

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 10: Teamwork and Problem Solving

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: Teamwork and Problem Solving

In this lesson, learners engage in a practical activity to select suitable sites for a wind farm through online research. Divided into teams, they explore the Marine Atlas Tool on the Marine Institute's website to identify potential locations for a wind farm. They consider factors like water depth, wind speeds, fishing patterns, and challenges such as shipwrecks. Each team proposes three optimal sites, with individual team members analyzing specific aspects. The lesson promotes teamwork, critical thinking, and geographic analysis. To conclude, teams present their selections to the class, providing justifications for their choices. This activity encourages hands-on learning about renewable energy and marine environments.

Vocabulary: Desktop study, Teamwork, Problem Solving, Geographic Analysis, Site Selection

In this lesson, the learner will:

- Engage in a collaborative "desktop study" activity to identify potential locations for a wind farm using online maps and tools.
- Work in a team, analyzing factors such as water depth, wind speeds, fishing patterns, and challenges like shipwrecks to determine suitable sites.
- Take responsibility for assessing specific aspects of the proposed locations, promoting individual contribution and expertise sharing.
- Articulate and justify their team's decision through presentations to the class, honing their communication and critical thinking skills.

Materials

- Worksheet: Site Selection
- Internet access
- Large printout of map taken from the worksheet, plus thumb-tacks (only needed for extension activity)

MM3: Offshore Renewable Energy

L10 Teamwork and Problem Solving



ACTIVITY INSTRUCTIONS

Activity 1: Introduction (5 min)

1. Explain to learners that they are going to complete a 'desktop study' in teams to identify where they are going to build a wind farm. This is going to be done using maps available online at the Marine Institutes website. We are going to use their [Marine Atlas Tool](#).
2. The class should be split into teams of 3-4 learners.

Activity 2: Teamwork Activity (30 mins)

1. Before exploring the website, have groups discuss the following questions based on their worksheet: Site Selection:
 - a. Why these 6 aspects would be important to consider when building offshore wind turbines? Which ones do you think are most important and least important? Can you think of any other aspect the government should consider when building offshore wind turbines?
2. Each team of learners will need to decide on three possible locations for their proposed wind farm, using the steps outlined in the worksheet: Site Selection and the Marine Atlas Tool. In working out the optimum locations for their wind farms, they will need to take account:
 - a. water depth
 - b. fishing patterns
 - c. wind speeds
 - d. Shipwrecks
 - e. several other challenges (all detailed in the worksheet)
3. Each learner should take responsibility for assessing their proposed location for 1-2 of these.

Activity 3: Presentation to the Class (15 mins)

1. Invite learners to present their top three locations to the rest of the class and include a justification for why they chose these locations.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L10 Teamwork and Problem Solving



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, reduce the number of criteria that learners need to consider (for example, leave out the map showing water depth or wind speeds). Furthermore, you could just ask learners to choose 1 optimum site, and not 3.

Extension: For a longer class, set up a map of the region and give some thumb-tacks to each team asking them to pin their proposed locations on the map. Once all thumb-tacks have been pinned, moderate a group-discussion on the overall advantages and disadvantages of the locations chosen. Highlight the variety in locations, indicating that different teams prioritized different things, and no one option is necessarily worse than another.

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Marine Atlas Tool on the Marine Institutes Website <https://atlas.marine.ie/#?c=53.3899;-13.0518;6>

Article: Ireland makes history with its first offshore wind auction:

<https://windeurope.org/newsroom/news/ireland-makes-history-with-its-first-offshore-wind-auction/>

Events page of the Marine Institute: <https://www.marine.ie/site-area/news-events/events>

Local Trip / Expertise / Additional Work and Assessments

Check out the events page of the Marine Institute to see if there are any events of interest to you in your area?

Consider a visit to the coast to one of the areas designated as a protected site based on the Marine Institute's Atlas Tool.

MM3: L10 WS SITE SELECTION



You will use the [Ireland's Marine Atlas tool](https://atlas.marine.ie/#?c=53.3899;-13.0518;6) on the Marine Institute's website to select a suitable site in Ireland for offshore wind turbines.

<https://atlas.marine.ie/#?c=53.3899;-13.0518;6>

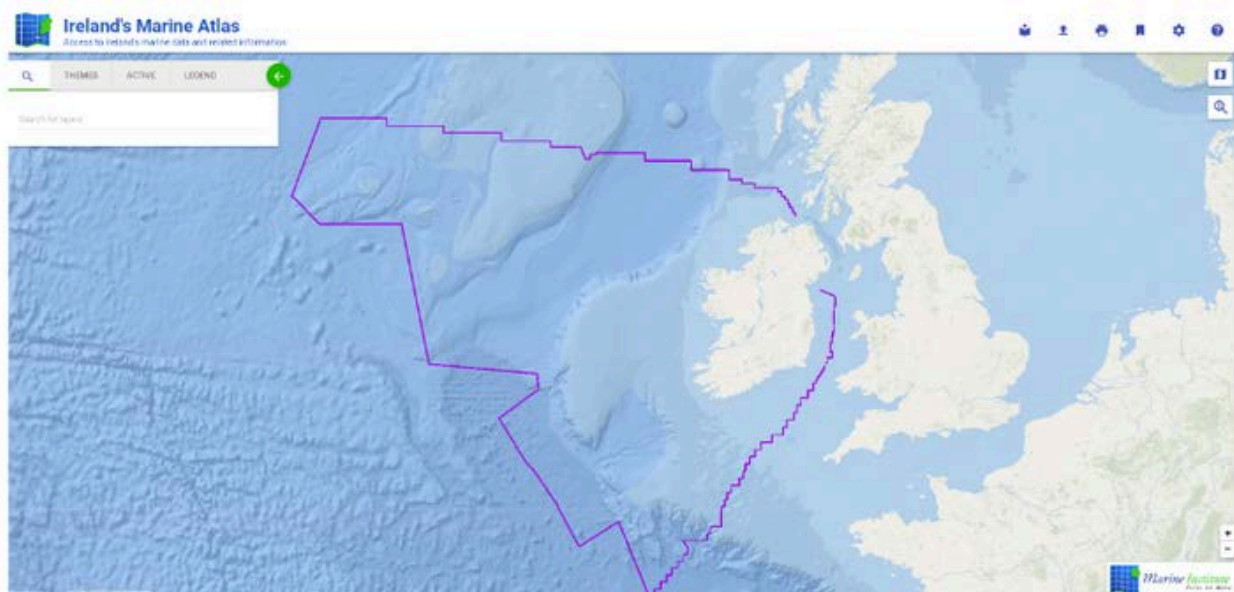
You will have to consider the following aspects when selecting a site:

1. Water depth
2. Fishing patterns
3. Wind speeds
4. Shipwrecks
5. Marine mammal species distribution
6. Protected areas

Before continuing, discuss as a group why these 6 aspects would be important to consider when building offshore wind turbines? Which ones do you think are most important and least important? Can you think of any other aspect the government should consider when building offshore wind turbines?

On the following pages, you will be guided through how to use the Ireland's Marine Atlas Tool to discover these six aspects.

The landing page will look something like the figure below. When you click on the 'themes' button, there are many opens for information that can be shown on map.

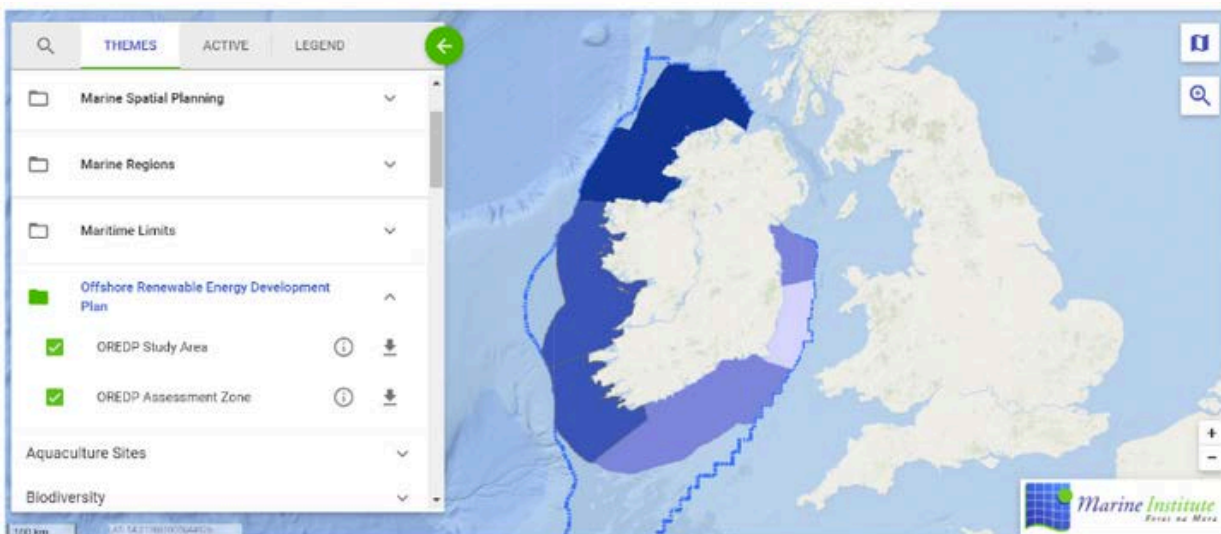


MM3: L10 WS SITE SELECTION

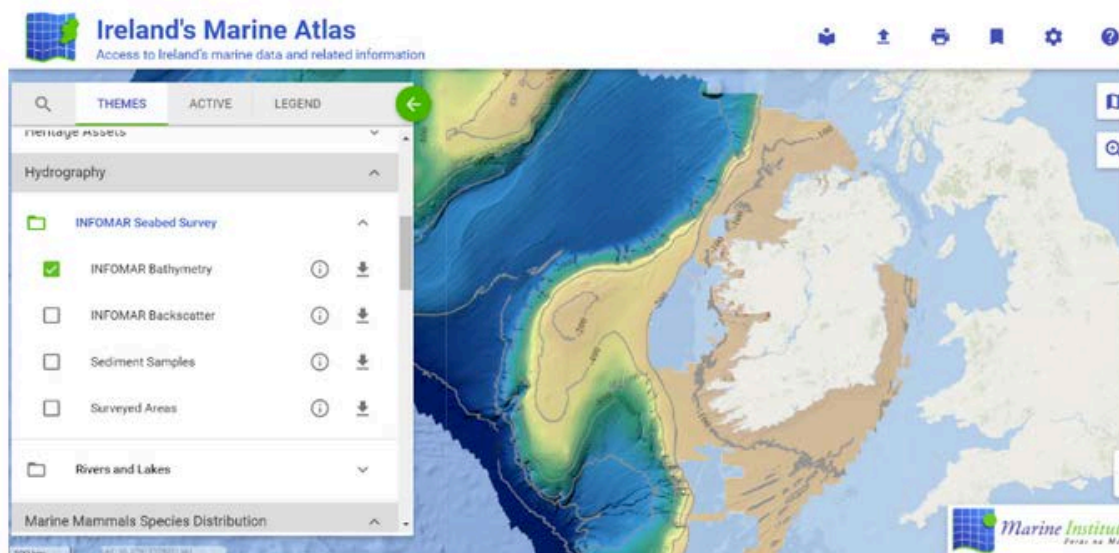
14 LIFE BELOW WATER



For example, you can turn on the view that shows the regions allocated as part of the Offshore Renewable Energy Development Plan under the heading 'administrative boundaries'. The Department of Communications, Climate Action and Natural Resources commissioned the Offshore Renewable Energy Development Plan Strategic Environmental Assessment boundary of full assessment area for tidal, wave and wind assessments and definition of zones into specific strategic renewable sectors. These are the zones the government is potentially targeting for offshore wind farms.



Then, if you turn off this setting, and then turn on 'INFOMAR Bathymetry' under the 'Hydrography' tab, as per the image below, you will see a map showing how deep the water is in the areas surrounding Ireland. It's relatively shallow (100m) near land, and gets much deeper (up to 1000m) off the west coast. The depth of water is something that needs to be considered, as in shallow water we can use monopile turbines, but in deep water we may need to use floating turbines.

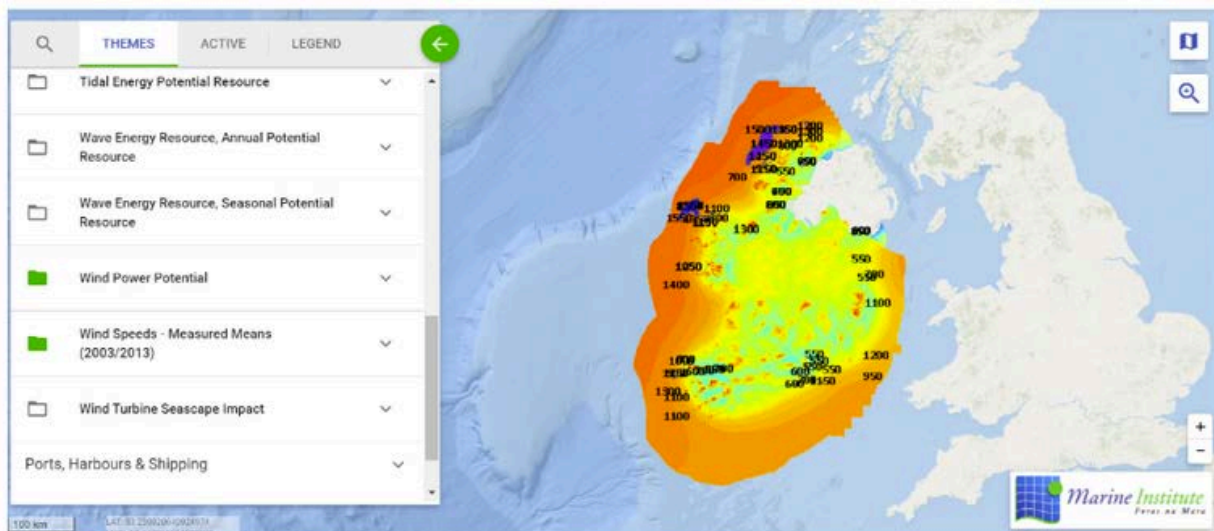


MM3: L10 WS SITE SELECTION

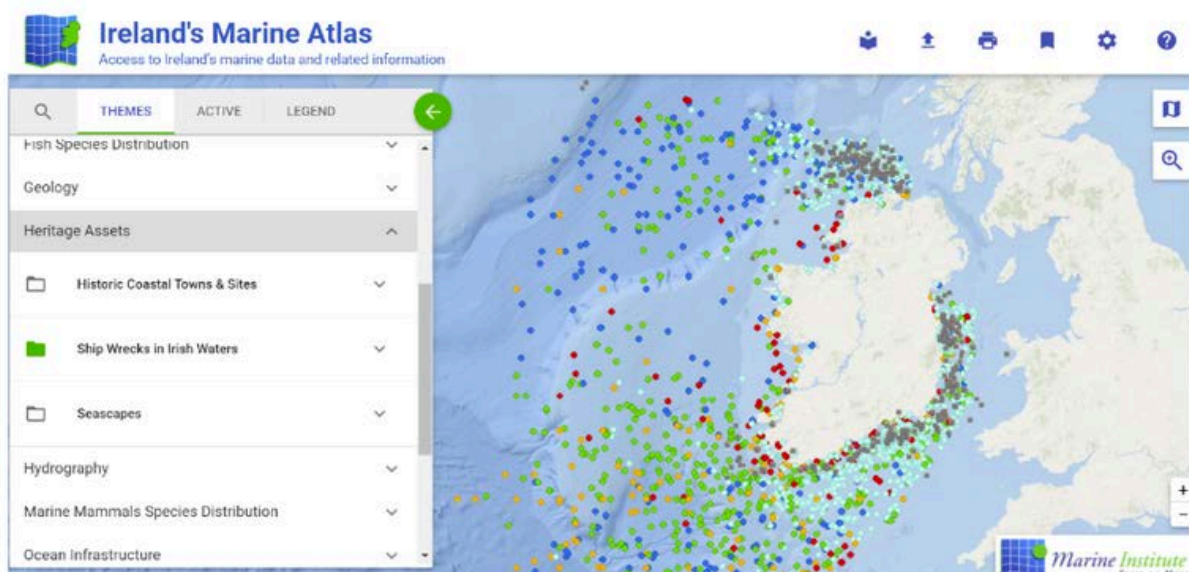
14 LIFE BELOW WATER



If you turn off this setting, and instead turn on the view that shows 'wind power potential' and 'wind speeds' under the tab called 'Offshore Energy – Resource Potential'. This should give you a map that looks something like the figure below and gives an indication of how high the winds speeds are in the regions offshore around Ireland, and consequently, the potential energy that might be generated. Choosing a site that's going to be windy enough is important.

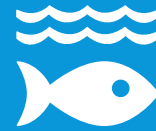


Now turn off this setting, and turn on the setting called 'Shipwrecks in Irish Waters' under the tab called 'Heritage Assets'. This should give you a map that looks like the figure below showing all the thousands of shipwrecks that lie on the bottom of the seabed in the waters around Ireland. When choosing a site for your wind farm, you'll need to make sure you avoid the locations of these shipwrecks.

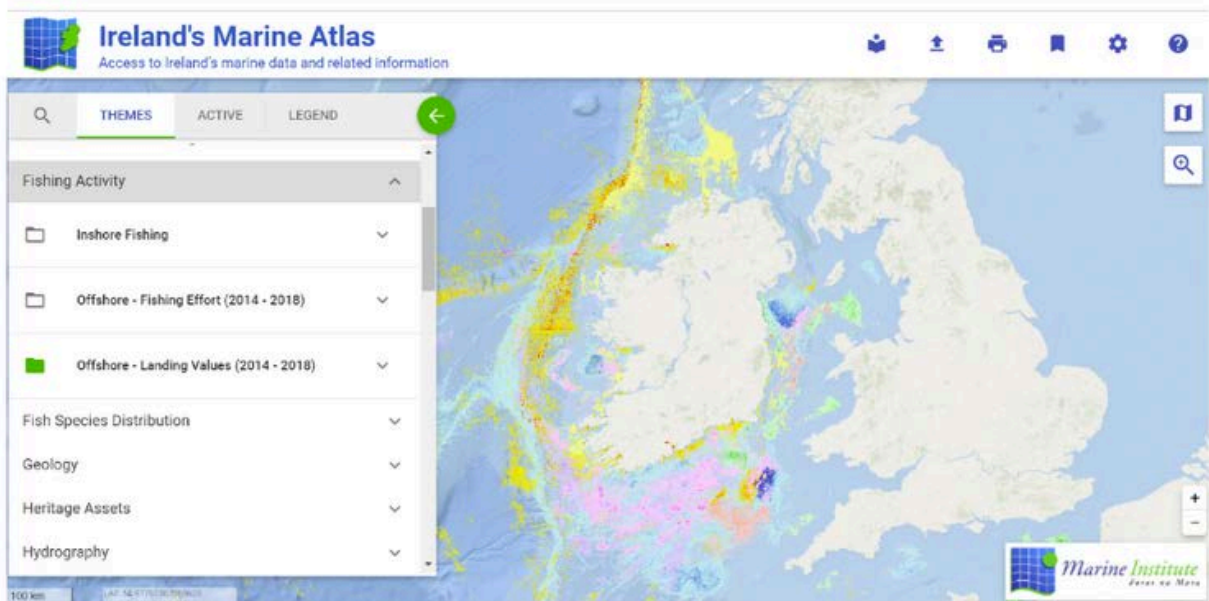


MM3: L10 WS SITE SELECTION

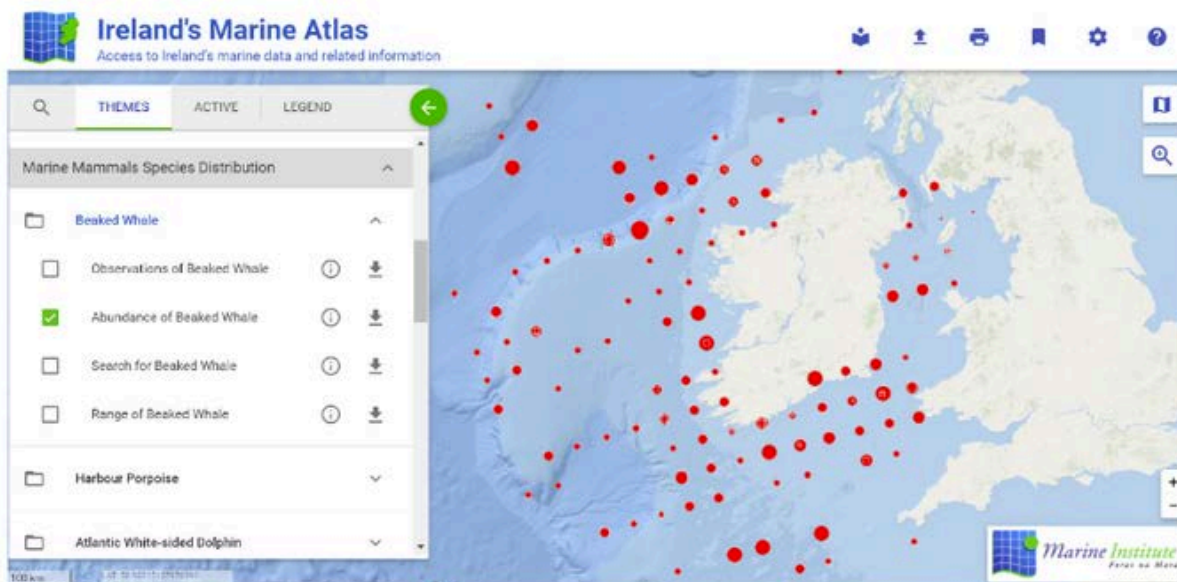
14 LIFE BELOW WATER



Turn off the shipwreck setting, and instead turn on the setting for 'offshore landing values' under the tab 'fishing activity'. This gives an indication of the value of the fishing industry in the waters around Ireland, and this is something that can't be interrupted due to the construction of a wind farm. When choosing your site, consider the fishing patterns in the area.

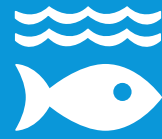


Linked to this, you'll also need to consider the regions of water where certain marine species tend to congregate. By turning off the previous settings, and instead turning on the settings for 'marine mammals species distribution', you'll get a map showing something like the figure below. It will be equally important to avoid these areas not just for the construction of the turbines, but also so as not to displace wildlife into the future due to the presence of the turbines.



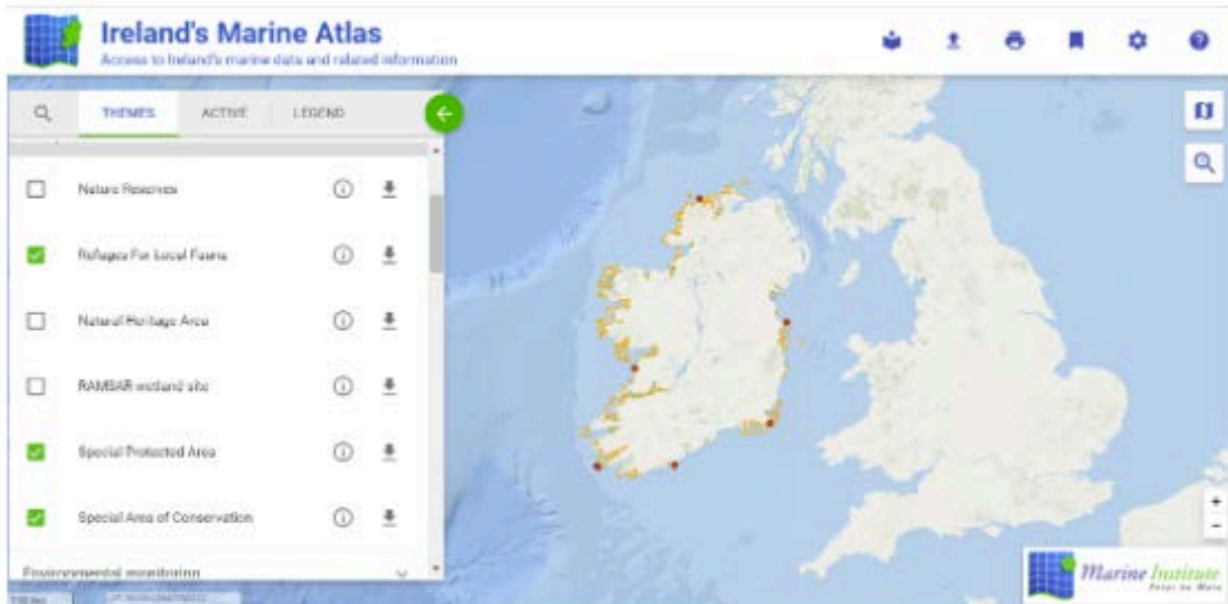
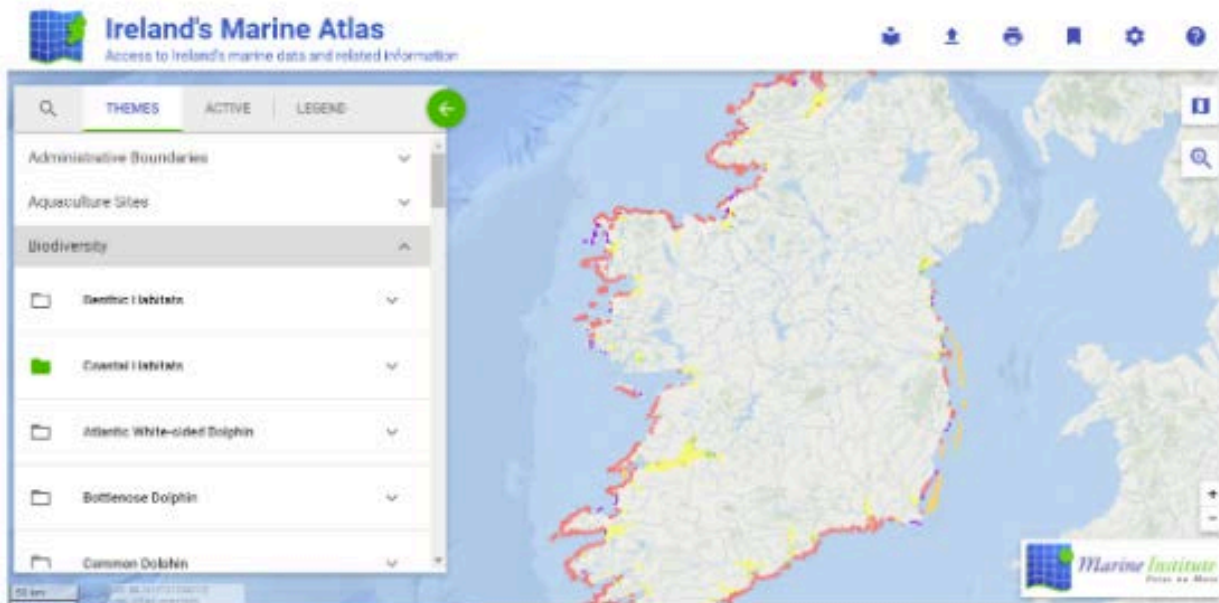
MM3: L10 WS SITE SELECTION

14 LIFE BELOW WATER



In case you were tempted to put the turbines really near the shoreline, in shallow water to avoid all these challenges, you should also be aware that the coastlines around Ireland tend to be protected areas.

Take a look at the two images below – for ‘coastal habitats’ under the ‘biodiversity’ tab and the various options under the ‘Designated sites’ tab.



After considering these six aspects, what are your top three sites where you would build wind turbines (you may write the coordinates and / or show on a map):

1. _____
2. _____
3. _____

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 11: The Future of Offshore Wind

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: The Future of Offshore Wind

This lesson introduces learners to the concept of a super-grid, a vast interconnected electricity network spanning countries – which is the future of offshore wind. They watch videos explaining the super-grid's importance for harnessing offshore wind energy and enabling cross-border electricity trading. Afterward, they complete a worksheet to comprehend technical challenges, differences from national systems, and Ireland's potential benefits. In a group discussion, learners share their answers, enhancing understanding. The lesson aims to foster awareness of offshore wind's potential, the role of super-grids in energy distribution, and their significance in international electricity trade.

Vocabulary: Supergrid, Interconnected Network, Cross-border Electricity Trading, Energy Distribution, Development Plan

In this lesson, the learner will:

- Watch informative videos about the concept of a super-grid, its role in offshore wind energy, and its potential impact on cross-border electricity trading.
- Engage with a worksheet designed to help them understand the technical challenges involved in adopting widespread offshore wind energy and the key differences between traditional national electricity systems and super-grids.
- Through a group discussion, learners will consolidate their understanding by sharing their responses to the worksheet questions, contributing to a collective exploration of the topic.

Materials

- Worksheet: The Super-grid
- Internet access
- Pen, Paper
- Whiteboard

MM3: Offshore Renewable Energy

L11 The Future of Offshore Wind



ACTIVITY INSTRUCTIONS

Activity 1: Understanding the super-grid (25 mins)

1. Watch the video Module 2: 2050 Supergrid [3:55 mins] describing the super-grid, which is the giant, interconnected electricity network of the future. It will be an EU-wide network that will harness our offshore wind and allow us to trade all forms of electricity across our borders.
2. After watching the video, complete the questions in the worksheet: The Super-Grid part 1 in small groups.
3. Watch the video Ireland's opportunity to transform Europe into a "supergrid" in 300 seconds | Pat Cox [5:10 mins] describing the super-grid technology being developed by Supernode, a Dublin-based company.
4. After watching the video, complete the questions in the worksheet: The Super-Grid part 2 in small groups.
5. Share both part 1 and 2 as a class discussion.

Activity 2: Complete worksheet (25 mins)

1. Divide the learners into groups of 2. Have learners complete the worksheet: The Super-Grid part 3.
2. Have a class discussion.
3. From this discussion, make a list of terms and concepts that learners didn't understand in the videos and offer learners the opportunity to look these up online to deepen their learning.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L11 The Future of Offshore Wind



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, shorten the amount of time spent on the group activity discussing the answers to the questions.

Extension: For a longer class, watch the additional videos in the media box. Have learners explore the government report on Ireland's offshore renewable energy development plan. Based on these have learners decide:

1. What are the pros and cons of the government's plan?
2. What would they suggest the government do?

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Module 2: 2050 Supergrid [3:55 mins] https://www.youtube.com/watch?v=SQWzyNVhpVU&ab_channel=MainstreamRenewablePower

Ireland's opportunity to transform Europe into a "supergrid" in 300 seconds | Pat Cox [5:10 mins] https://www.youtube.com/watch?v=_a0sxscVA28&ab_channel=TheRDS

Government Report: Ireland's offshore renewable energy development plan. <https://www.gov.ie/en/publication/71e36-offshore-renewable-energy-development-plan-ii-oredp-ii/>

'Supergrid Super Solution' by Eddie O'Connor and Kevin O'Sullivan - Limerick Launch [2:35 mins] https://www.youtube.com/watch?v=rXdFL-OD8Yk&t=152s&ab_channel=SuperNodeLtd

'Supergrid Super Solution' by Eddie O'Connor and Kevin O'Sullivan - Limerick Launch V2 [1:50 mins] https://www.youtube.com/watch?v=rdsnl6e49bl&ab_channel=SuperNodeLtd

Local Trip / Expertise / Additional Work and Assessments

Look into whether a local councilor or academic could come and talk to the class about Ireland's offshore renewable energy development plan. Prepare interview questions for them.



Part 1

After watching the video, answer the following questions:

What is a super-grid?

What are the benefits of a super-grid?

Will the EU share wind energy that is generated or will each country produce / use their own?

What are supernodes?

Where will supernodes be built?

What voltages do supernodes use? What does each voltage do?

What is the process of bringing energy to the consumer?

MM3: L11 WS THE SUPER GRID



When is the super-grid supposed to be created / implemented? Do you think this is soon enough? Do you think it is feasible?

Part 2

After watching the video, answer the following questions:

Who is Pat Cox? What is his view on climate change and the government's actions?

What does he think the government needs to do?

What is Supernode? What do they do?

What is their main technological challenge?

What are they developing?

What are superconductors?

MM3: L11 WS THE SUPER GRID



Why are superconductor cables beneficial?

What challenges do they talk about?

What do they think Ireland's role in wind energy could be?

What do they hope to do by 2030?

What is the Gore Street Energy Storage Fund?

What are the strengths of renewables they mentioned?

What are the weaknesses of renewables they mentioned?

MM3: L11 WS THE SUPER GRID



Part 3

After watching the two videos about the super-grid, answer the following questions:

What are the biggest technical challenges to the adoption of widespread offshore wind energy? (For example, the wind isn't always blowing where we need the energy, and so we need a fast and efficient way of transporting it).

Currently, most electricity systems (i.e. the cables that transport electricity from the generator to people's homes and businesses) are developed and operated at a national level (country by country). How does a super-grid differ from this?

What potential does Ireland have when it comes to the idea of a super-grid? How can we participate and how might we benefit?

Can a super-grid help with exporting and importing electricity to and from other countries?

What words or concepts did you not understand in these videos?

SDG14 Future of the Ocean

MM3: Offshore Renewable Energy



Micro-Module 3: Offshore Renewable Energy

Research and Development

Lesson 12: Offshore Wind in the Community

Subjects: Climate Action and Sustainable Development, Design, English, Engineering Science

7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



13 CLIMATE ACTION



Lesson Title and Summary: Offshore Wind in the Community

In this lesson, two engaging activities explore the benefits of wind farms within communities. In Activity 1, learners watch a series of brief videos showcasing testimonials from various communities benefiting from wind farms. These videos highlight aspects such as community ownership models, educational advantages, and broader societal benefits. Between videos, learners brainstorm and compile a list of benefits on a shared platform. Activity 2 follows, prompting learners to create posters advocating the advantages of wind farms for public display. The lesson aims to deepen learners' understanding of renewable energy's positive impact and develop their communication skills through poster creation.

Vocabulary: Community Ownership, Testimonial, Public Engagement

In this lesson, the learner will:

- Explore community benefits from wind farms
- Engage in Group Brainstorming
- Develop Communication Skills
- Deepen Understanding of Renewable Energy

Materials

- Worksheet: Community Testimonials
- Internet access
- Pen, Paper
- Whiteboard
- Materials for poster creation

MM3: Offshore Renewable Energy

L12 Offshore Wind in the Community



ACTIVITY INSTRUCTIONS

Activity 1: Testimonials from Communities and benefits brainstorm (30 mins)

1. Watch the video Allt Dearg wind farm | Interview, James Lithgow [2:50 mins] and answer the questions on the worksheet: Community Testimonials part 1.
2. Watch the video Wind Power: A Superintendent's Story [1:07 mins] and answer the questions on the worksheet: Community Testimonials part 2.
3. Watch the video AWEA Wind Power 101: Community Benefits [2:38 mins] and answer the questions on the worksheet: Community Testimonials part 3.
4. Watch the video BladeBridge installation in Cork, Ireland [2:16 mins] and answer the questions on the worksheet: Community Testimonials part 4.
5. After watching all of the videos, have learners complete the worksheet: Community Testimonials part 5.
6. Briefly discuss their answers.

Activity 2: Poster creation (20 mins)

1. Invite learners to make posters to be displayed to the public on the community benefits of wind farms. They should consider:
 - a. What are the benefits?
 - b. What problems could wind turbines help solve in their community?
 - c. What would they suggest the community do with the revenue generated from wind turbines?
2. If time allows, have learners present their posters.

REFLECTIVE EXERCISE: 3-2-1

- Three things they feel they have learnt from the exercise
- Two things they found most interesting and would like to explore more
- One – their opinion they have about the site / exercises

Use Post-its or a Mentimeter survey - [mentimeter.com](https://www.mentimeter.com) to gather reflections

MM3: Offshore Renewable Energy

L12 Offshore Wind in the Community



EXTENSION / REDUCTION ACTIVITIES:

Reduction: For a shorter class, reduce the number of videos that learners watch of the community benefits. Consider skipping the poster creation activity.

Extension: For a longer class, have learners explore the articles in the media box. Give more time to create their posters. Have each group share their poster. This could also be a series of lessons, culminating in presenting their posters to the community. See Media Communications Micro-Module 2: Research Poster

MEDIA BOX: (materials, online video links, extra resources, case studies etc)

Allt Dearg wind farm | Interview, James Lithgow [2:50 mins] https://www.youtube.com/watch?v=C7Ltr97RYYY&ab_channel=NetZeroWeek%E2%84%A2

Wind Power: A Superintendent's Story [1:07 mins] https://www.youtube.com/watch?v=iD_Oh3K9UC8&t=61s&ab_channel=AmericanCleanPowerAssociation

AWEA Wind Power 101: Community Benefits [2:38 mins] https://www.youtube.com/watch?v=Ubj3ZS5jYy4&list=PLKzbiB_o8fSdobj9jJyvp0tFuLdt_mfMS&t=110s&ab_channel=AmericanCleanPowerAssociation

BladeBridge installation in Cork, Ireland [2:16 mins] https://www.youtube.com/watch?v=8bmWAX_6uAY&ab_channel=CompositesWorld

Article: The concrete benefits of wind power for farmers: <https://cleanpower.org/blog/concrete-benefits-wind-power-farmers/>

Article: 5 Ways Rural Communities Can Win with Wind: <https://cleangridalliance.org/blog/45/6-ways-wind-projects-can-win-with-wind>

The Re-Wind Project: <https://www.marei.ie/project/re-wind/>

Local Trip / Expertise / Additional Work and Assessments

1. Consider a visit to Cork bridge made from Wind Turbine Blades.
2. Explore more about the [Re-Wind project](#) of repurposing wind turbines after that have been taken out of use.
3. Find out if there's a community-owned wind farm in your area and how the community is benefitting from it?



Part 1

After watching the video, answer the following questions:

1. What wind farm do they discuss?

2. What is unusual about the ownership of this wind farm?

3. What do they say about the economic benefit of the wind farm to the community?

4. How do they help support local young people? What do you think of this?

5. How did they name the turbines?

6. What two types of turbines do they have?

7. How do you they us AI - Artificial Intelligence?

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8. What do they say the wind farm brings to the table?

Part 2

After watching the video, answer the following questions:

1. How much money do they generate per year?

2. How much will they have have made?

3. What do they do with that money?

Part 3

After watching the video, answer the following questions:

1. Why might wind turbines be the new 'cash crop' for farmers?

2. What did the farmer say wind turbines have done for them?

MM3: L12 WS COMMUNITY TESTIMONIES

14 LIFE BELOW WATER



3. What challenges did the farmers say they are facing at the moment (e.g. drought)?

4. How much does one of the farmers make per year from the wind turbines?

5. What were the broader benefits of the wind turbines to the community?

6. What impact does it have on young adults? Does your area in Ireland face a similar problem?

7. What do the wind turbines help pay for in the community?

Part 4

After watching the video, answer the following questions:

1. What do you see in this video?

2. What do you think of the process of installing a wind turbine?



3. How do you think this relates to community benefits?

4. How could old parts from a wind turbine be reused for the community?

Part 5

Now that you have watched the videos, discuss these questions in your groups. You may want to use a separate piece of paper to take more notes:

1. Does your town in Ireland face any of the same problems as the communities in the videos (e.g. young people moving away due to lack of opportunities)? If so, what?

2. What other social and economic problems does your community face?

3. How could wind turbines benefit your town?

4. What would you want your community to do with the revenue from wind turbines?
