

DTOcean+



Advanced Design Tools for Ocean Energy Systems
Innovation, Development and Deployment

Deliverable D9.8

Education and Training Plan

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EXECUTIVE SUMMARY

This document, Dg.8 Education and Training Plan, is a deliverable of the DTOceanPlus project, which is funded by the European Union's H2020 Programme under Grant Agreement N°785921.

The overarching objective of the DTOceanPlus project is to develop and demonstrate an open source, integrated suite of 2nd generation design tools for ocean energy technologies that support the entire technology innovation process. The suite of design tools will be applicable to different levels of technology (from sub-systems, to devices and arrays) and across all stages (from concept, to development and deployment). DTOceanPlus will assist users in working towards an optimal solution based on information available at a particular stage. The DTOceanPlus suite of design tools can help accelerate the development of the Ocean Energy sector and reduce the technical and financial risks of devices and arrays to achieve the deployment of cost-competitive wave and tidal arrays.

This report sets out the training and educational activities, and the materials that will be produced as part of the ongoing DTOceanPlus project. This will include online webinars to introduce the capabilities of the project, training materials and tutorials on how to use the software, and training sessions where this material can be delivered by an experienced user. The training sessions can be used to obtain feedback on the training materials and tutorials. The main target audience for this will be users and potential users of the DTOceanPlus design tools.



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ABBREVIATIONS AND ACRONYMS

Dx.x	Deliverable x.x from a task or work package
ESC	Energy Systems Catapult
FEM	France Energies Marines
FMEA	Failure Modes and Effects Analysis
QFD	Quality Function Deployment
Tx.x	Task x.x within a work package
TRIZ	<i>Teoriya Resheniya Izobretatelskikh Zadatch</i> , (theory of inventive problem solving)
TRL	Technology Readiness Level
UEDIN	University of Edinburgh
WEC	Wave Energy Converter
WES	Wave Energy Scotland
WP	Work Package



1. INTRODUCTION

1.1 SCOPE OF REPORT

This report is the first outcome of Task 9.4 'Education and training' of the DTOceanPlus project. Task 9.4 will include the development of education materials, presenting training sessions including organisation of webinars, and opening test facilities to stakeholders.

A strategy for the education and training planned as part of the DTOceanPlus project is presented in this report, D9.8. A subsequent report at the end of the project, D9.9, will collate all the education and training materials produced.

The education and training constitutes a subset of the wider dissemination and communication activities planned for the DTOceanPlus project. These wider activities are outlined in D9.2 Dissemination and communication plan [1]. Reporting of all activities undertaken, including education and training, will be undertaken as part of the wider dissemination and communication monitoring, as discussed in D9.2.

The training materials produced in WP9 will complement the software manuals and documentation produced during the project in WP7. Task T7.3 will thoroughly document the software tools as they are produced and integrated, released as part of Deliverable D7.6 at the end of the project. This will include user and technical manuals, a full database of reference data for components and logistics, and test files (input data and results of simplified examples).

1.2 OUTLINE OF REPORT

The remainder of the report is laid out as follows:

- ▶ A summary of the DTOceanPlus project is given in the following section 1.3.
- ▶ The proposed education and training strategy is outlined in section 2.
- ▶ Section 3 gives details of the various activities planned.
- ▶ Conclusions and next steps are then given in section 4.
- ▶ Annex A: Overall timeline of education and training activities.

1.3 SUMMARY OF THE DTOCEANPLUS PROJECT

The DTOceanPlus project will develop an open-source integrated suite of 2nd generation tools for ocean energy technologies [2]. The tools will support the entire technology innovation and advancement process from concept, through development, to deployment, and will be applicable at a range of levels: sub-system, device, and array. The requirements for the proposed tools are covered in more detail in D2.2 Functional requirements and metrics of 2nd generation design tools [3].



At a high level, the suite of tools developed in DTOceanPlus will include:

- ▶ **Structured Innovation Tools**, (QFD, TRIZ, and FMEA) for concept creation, selection, and design.
- ▶ **Stage Gate Tools**, using metrics to measure, assess and guide technology development.
- ▶ **Deployment Tools**, supporting optimal device and array deployment:
 - Site Characterisation (e.g. metocean, geotechnical, and environmental conditions);
 - Energy Capture (at an array level);
 - Energy Transformation (PTO and control);
 - Energy Delivery (electrical and grid issues);
 - Station Keeping (moorings and foundations);
 - Logistics and Marine Operations (installation, operation, maintenance, and decommissioning).
- ▶ **Assessment Tools**, to quantify key parameters:
 - System Performance and Energy Yield;
 - System Lifetime Costs;
 - System Reliability, Availability, Maintainability, Survivability (RAMS);
 - Environmental and Social Acceptance.

These will be supported by underlying common digital models and a global database, as shown graphically in Figure 1.1.

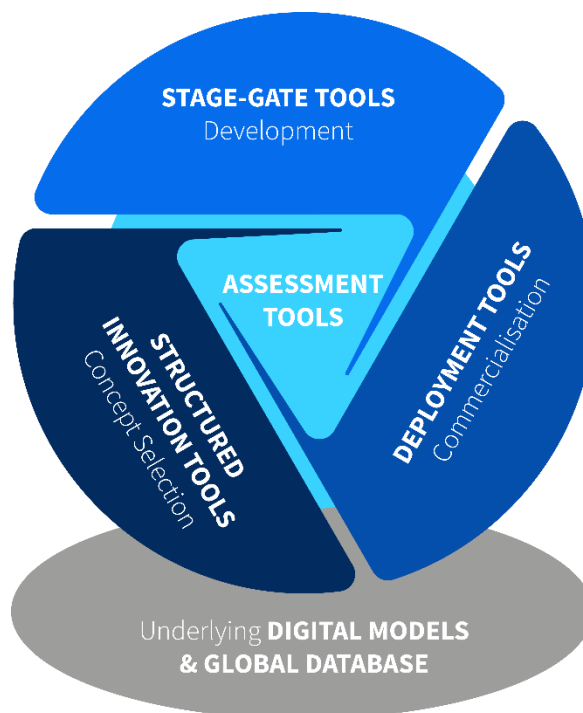


FIGURE 1.1: REPRESENTATION OF DTOCEANPLUS TOOLS

2. STRATEGY FOR EDUCATION AND TRAINING

2.1 OBJECTIVES

The primary objectives of this education and training task are twofold:

- ▶ Firstly, to promote the suite of tools and showcase the capabilities thereof.
- ▶ Secondly, to develop a range of open-source materials to help end users understand and learn to use the software.

The education and training materials will be in addition to the manuals and technical documentation produced as part of the project. They will be designed to support both users and potential users, with their understanding and use of the software, and will also show the wider applicability to the ocean energy sector.

The aim for education and training in the DTOceanPlus project is to provide at least three webinars, five tutorials, four training sessions, two workshops, and two visits to test facilities or demonstration projects.

2.2 TARGET AUDIENCE GROUPS AND OTHER STAKEHOLDERS

As noted in Dg.2 [1], the target audience for the dissemination activities fall into three broad groups as shown in Table 2.1. Much of the technical training on how DTOcean works will be aimed at users or potential users, however wider training activities will also be directed towards all audience groups.

The main users that the software tools will be designed for are device and project developers, together with public and private investors. Other key stakeholders are also expected to use the software, particularly researchers, and university students/teachers.

TABLE 2.1 DTOCEANPLUS TARGET AUDIENCE GROUPS

Target groups	Subgroups
Primary users of the design tools	<ul style="list-style-type: none"> ▫ Technology developers ▫ Project developers ▫ Design offices ▫ Public funding bodies ▫ Private investors
Other key stakeholders	<ul style="list-style-type: none"> ▫ Policy makers ▫ Regulators ▫ Standards organizations ▫ Insurance providers ▫ Other actors in the supply chain ▫ Research organizations
General public	<ul style="list-style-type: none"> ▫ Environmental NGOs ▫ Citizen organisations ▫ Students ▫ Individual citizens



In addition to the DTOceanPlus consortium members, a number of other organisations and projects may be able to support the publication and provision of the education and training materials during the DTOceanPlus project. Existing links with these organisations will be utilised to maximise the exposure and effectiveness of the education and training materials produced in DTOceanPlus. These external organisations include:

- ▶ European Energy Research Alliance (EERA) – <https://www.eera-set.eu>
- ▶ Ocean Energy Europe (OEE) – <https://www.oceanenergy-europe.eu>
- ▶ International Energy Agency Ocean Energy Systems (IEA OES) – <https://www.ocean-energy-systems.org>
- ▶ International Network on Offshore Renewable Energy (INORE) – <https://inore.org>
- ▶ European association for Women in Science, Engineering and Technology (WiTEC) – <http://www.witeceu.com>
- ▶ European Technology and Innovation Platform for Ocean Energy (ETIP/ETIP2 project) – <https://www.etipocean.eu>
- ▶ Marine Infrastructure Network (MaRINET2 project) – <http://www.marinet2.eu>

2.3 KEY MESSAGES

The DTOceanPlus main message is that the “*DTOceanPlus project will develop and demonstrate an advanced open source suite of tools for the selection, development, deployment and assessment of ocean energy systems.*” Other complimentary messages are covered in the Dissemination and communication plan [1].

2.4 OVERALL TIMELINE OF ACTIVITIES

DTOceanPlus is a three-year project, running from May 2018 to April 2021. The project has six-monthly milestones, culminating in the release of alpha, beta, and final versions of the software.

Education and training activities will occur throughout the project, although a large percentage of these will be concentrated towards the end of the project, as shown in Figure 2.1. Initial activities will focus on education and promoting the software capabilities, as the requirements are defined and software is developed. It will only be possible to produce effective training materials once the tools have been produced. Training on how to use the software can then be delivered following the Beta release of the integrated suite of tools.



FIGURE 2.1: OVERALL TIMELINE OF EDUCATION AND TRAINING ACTIVITIES



The training materials will continue to be made available after the end of the project, via the website at <https://www.dtoceanplus.eu/Publications/Training>.

2.5 PARTNER INPUT

This task is led by the University of Edinburgh (UEDIN), with the support of WP9 leader France Energies Marines (FEM) and the project coordinator (Tecnalia). It will involve all of the partners within the DTOceanPlus consortium in developing and disseminating the education and training materials. The materials will be primarily developed by the partners involved in that activity in conjunction with UEDIN and supported by FEM to maintain consistent branding. All project partners will be involved in contributing ideas, reviewing materials produced, and assisting with delivery to end users.



3. CHANNELS AND TOOLS

Three key instruments for education and training materials are envisaged, as summarised below and detailed in the following sections. These will be in addition to the manuals and technical documentation produced as part of the software development.

1. Online webinars to explain the suite of tools and approach planned.
2. Production of tutorials for self-training on how to use the software.
3. Training sessions for strategic targeted audiences.

It is also proposed to hold a couple of workshops, and that visits to the facilities of project partners will be co-ordinated as part of the education and training offered within the DTOceanPlus project.

3.1 ONLINE WEBINARS

3.1.1 PURPOSE

The purpose of the online webinars is to present information about the DTOceanPlus project and the software produced as part of this to a wide audience. These will introduce the project, the tools being developed, and showcase the advanced capability planned. The online webinars will also cover relevant background and approaches taken for the Structured Innovation and Stage Gate design tools, and how these can be used to benefit the entire ocean energy sector.

3.1.2 TARGET AUDIENCE

The main target audience for the online webinars is potential users of the software tools, who wish to learn more about the capabilities of the tools and relevant background. The content of the webinars should be accessible to other interested parties as well, to offer benefit to a wide range of stakeholder groups.

3.1.3 PROPOSED CONTENT

An initial webinar was held to introduce the DTOceanPlus project as part of the user consultation conducted in WP2 [4] [5]. This webinar was aimed at potential users of the DTOceanPlus tools. It introduced the proposed scope of the project, and promoted the questionnaire to solicit feedback on what areas should be prioritised during the development of the functional requirements.

Three additional topics for online webinars are proposed to introduce and explain a subset of the tools developed in DTOceanPlus:

- ▶ **General methodology and the digital twin concept.** This will summarise the methodology and data models proposed. It will also cover the digital representation of ocean energy converters, designed to form a common language for the entire sector, offering a standard framework to describe sub-systems, devices, and arrays.
- ▶ **Structured Innovation approach.** This will introduce the first of two completely new design tools that will be developed in DTOceanPlus. The overarching objective of the integrated Structured



Innovation tools is to support the entire technology innovation process from concept, through development, to deployment using the three individual methodologies (QFD, TRIZ and FMEA) all of which have been extensively implemented in industrial applications. This approach is intended to provoke innovation and help represent the voice of the stakeholder through the design process, managing the arising risks, and therefore produce new concepts in the wave and tidal energy sector. The tool will allow the designer to understand the logical “art of the possible” when considering the design targets, which is critical to the success of the design, and commercial realisation. The webinar will provide an overview of what Structured Innovation is, what will be implemented in DTOceanPlus, and how this can assist the ocean energy sector.

- ▶ **Stage Gate approach.** This will introduce the second new design tool that will be developed in DTOceanPlus. The Stage Gate design tool will enable users to manage the technology development process in a structured fashion, using the Deployment and Assessment design tools to provide consistent evaluation of technologies with increasing detail and confidence as technology maturity progresses. The tool will present evaluation results with the clarity required to support decision making, focussing funding and R&D on the most promising solutions. The Stage Gate approach will cover the full range of Technology Readiness Levels and will engage with the Structured Innovation design tools to manage the onward development of new technology concepts and to prompt targeted ‘improvement cycles’ where shortfalls have been identified in the key evaluation metrics. This webinar will cover the functions of the tool, its interactions with the wider DTOceanPlus suite of tools and international collaborations seeking consensus on evaluation processes in Ocean Energy, alongside discussion of the benefits the approach will provide to the users.

3.1.4 PROPOSED TIMING

It is proposed to hold the online webinars during the first half of the project, as detailed in Table 3.1. Holding the two webinars on Structured Innovation and Stage Gate approaches in relatively quick succession will allow synergies between them to be highlighted. The webinar including the digital twin concept will be held towards the end of the year, following completion of deliverable D7.1 ‘Standard data formats of Ocean Energy systems’.

All of these webinars will be made available to view at any time after the event on the DTOceanPlus website, at <https://www.dtoceanplus.eu/Publications/Training>.

TABLE 3.1 PROPOSED ONLINE WEBINAR DATES AND SUBJECTS

Date	Webinar subject	Lead partners
6 July 2018	DTOceanPlus User needs consultation – Introductory webinar	UEDIN/Tecnalia/ESC/WES
Summer 2019	Structured Innovation approach	ESC
Autumn 2019	Stage-gate approach	WES
Late 2019	General methodology and the digital twin concept	Tecnalia/EDF/OCC



3.2 TUTORIALS

3.2.1 PURPOSE

The tutorials will be designed to explain the capabilities of the software and also to assist users on how to use the software. It is envisaged that these can be used by individuals or groups in a self-training scenario, but will also support the training sessions covered in section 3.3.

3.2.2 TARGET AUDIENCE

The main target audience for the educational materials and tutorials is actual users of the design tools. Potential users interested in learning more are a secondary target audience.

3.2.3 PROPOSED CONTENT

Education materials will be developed as part of the DTOceanPlus project complimenting the documentation produced for the software. These will include screen-casts of the software developed in the project, explaining the user interfaces and showing how to accomplish the main tasks. A series of at least five illustrated tutorials will be developed, with written instructions on how to complete the key activities within DTOceanPlus. Suggested topics for these tutorials include:

- ▶ Installing the software, understanding the database and digital models
- ▶ Using the Structured Innovation design tools
- ▶ Using the Stage Gate design tools
- ▶ Using the Deployment design tools (may be split into six parts)
- ▶ Using the Assessment design tools (may be split into four parts)

Where applicable, the content of these tutorials may cover specific aspects of the potential use cases for the DTOceanPlus software, which were identified whilst developing the functional requirements, D2.2 [3]. They may also make use of the sample data provided with DTOceanPlus.

Feedback on tutorials

It may be possible to use the (draft) tutorials in some of the training sessions. This will offer the dual benefits of reducing the preparation required for the training sessions whilst also offering an opportunity to test out the materials where there is an experienced user/trainer on hand to offer additional help as required.

It is acknowledged that important steps may be missed if the tutorials are written by people very familiar with the software, which may only be picked up when a less experienced user tries to follow them, a lesson learnt from the original DTOcean project.

Using the tutorials in a led training session also allows feedback on effectiveness of the materials.



3.2.4 PROPOSED TIMING

As previously noted, these tutorials and educational materials can only be developed once the software coding is largely complete, i.e. in the final year of the DTOceanPlus project.

3.3 TRAINING SESSIONS

3.3.1 PURPOSE

As with the overall education and training materials, the training sessions have two purposes

- ▶ Outline capabilities and functionality of the tools and potential use-cases
- ▶ Provide directed training sessions for strategic targeted audiences to assist them in understanding and using the DTOceanPlus suite of tools

3.3.2 TARGET AUDIENCE

At least four training sessions will be held as part of the DTOceanPlus project. For reasons of practicality, similar content will be used for all of the training sessions, however it is proposed to tailor these sessions to meet the specific needs of the main stakeholder groups identified in section 2.2.

The presentation slides used for the online webinars could also be used in person by the trainer to introduce some of the training courses. While the screen-casts of the software are unlikely to form suitable materials for a training course, they could be provided as supplementary material to watch either beforehand or subsequently.

It may be possible during the training sessions to work through a case specific to the users, rather than just using generic data provided with DTOceanPlus. This should be investigated, but may only be possible as part of the extended support to be developed as part of the ongoing business plan, which will be developed in task T9.3 exploitation of project results.

3.3.3 PROPOSED TIMING

At least four training sessions are planned during the project, led by FEM, WES, WavEC, and AAU. As with the tutorials, these can only be developed once the software coding is largely complete, i.e. in the final year of the DTOceanPlus project.

3.4 WORKSHOPS

3.4.1 PURPOSE

The workshops offer an opportunity to present the DTOceanPlus project to a range of key stakeholders and more importantly gain feedback.



3.4.2 TARGET AUDIENCE

A wide range of stakeholders will be invited to the workshops to gain the best representation of different viewpoints. The target audience includes both potential users of the tools as well as other key stakeholders who may be interested in what has been achieved in the DTOceanPlus project.

3.4.3 PROPOSED CONTENT

There are two workshops planned for the DTOceanPlus project, which may support education and training activities, as detailed below and in Table 3.2.

- ▶ The first could showcase the draft software and importantly collect feedback from early users of the beta version of the software
- ▶ The final one could present results from the project, and use the tutorials in a training session

3.4.4 PROPOSED TIMING

TABLE 3.2 PROPOSED WORKSHOP DATES AND SUBJECTS

Date	Workshop subject	Lead partners
Winter 2020/21	Beta software tools demonstration and feedback	UEDIN, TECNALIA (TBC)
Spring 2021	Present project results, combined with training session. Possibly held in conjunction with a suitable conference.	EDF, TECNALIA (TBC)

3.5 VISITS TO TEST FACILITIES AND DEMONSTRATION PROJECTS

3.5.1 PURPOSE

Visits to the test facilities and demonstration projects that DTOceanPlus project partners are involved with provides an opportunity for practice-oriented education, training and knowledge exchange. This offers a number of benefits including:

- ▶ Raising further awareness to the offshore renewable energy sector. Showing the real-life applications for the testing/deployment activities being modelled in DTOceanPlus
- ▶ Showcasing real deployments to investors to increase confidence in the sector.

3.5.2 TARGET AUDIENCE

The target audience for these visits is the wider stakeholder groups covered in Table 2.1. Visits may be arranged alongside other events such as conferences, or offered in conjunction with the training courses discussed above.



3.5.3 POTENTIAL SITES/PROJECTS

The sites and projects that can be visited will depend on the ongoing work of the DTOceanPlus project consortium. Dates will also be subject to availability and potentially the weather conditions.

A number of potential options have been identified, which cover a range of technology development statuses. These are given in Table 3.3.

An option which will be explored is to combine visits to multiple sites located in a similar geographical area, however this may not be possible for logistical reasons.

TABLE 3.3 POTENTIAL VISITS TO FACILITIES AND DEMONSTRATION PROJECTS

Test facilities
Biscay Marine Energy Platform (BiMEP), Arminza, Spain. Facilities and deployed projects
European Marine Energy Centre, Orkney, UK. Facilities and deployed projects
FASTBLADE Structural Composites Research Facility, Edinburgh, UK
FloWave Ocean Energy Research Facility, Edinburgh, UK. (Possibly in conjunction with MaRINET2 course at UEDIN)
IST Oscillating Flow rig, Instituto Superior Técnico, Universidade de Lisboa, Portugal.
ORE Catapult, Blythe, UK. Test rigs for drive trains and dynamic cables
WES Stage 3 PTO & sub-system test facilities (subject to timing, access): <ul style="list-style-type: none"> ▫ Artemis, Edinburgh, UK; ▫ CorPower (Orkney, UK or Stockholm, Sweden); ▫ Oceaneering, Fife, UK; ▫ UMBRA Group, Foligno, Italy; ▫ University of Edinburgh, UK.
Demonstration projects
Construction of mid/large-scale prototypes for WES Stage 3 Novel Wave Energy Converter project (subject to timing, access)
CorPower C3 or C4 prototype dry testing or ocean testing, (Stockholm, Sweden or Orkney, UK or other tbc)
Nova Innovation control centre and workshop, Edinburgh, UK.
Orbital Marine Power O2 2MW construction (Belfast, UK) and testing (Orkney, UK)
SIMEC Atlantis MeyGen project, North of Scotland, UK
WaveRoller Surge2 deployment location, Peniche, Portugal. (Possibly in conjunction with WavEC Annual Seminar in November)
WindFloat Atlantic (first of a kind deployment), Viana do Castelo, Portugal. (Estimated to be installed by Dec. 2019)

3.5.4 PROPOSED TIMING

Visits to test facilities or demonstration projects will likely be offered in conjunction with other events, and as such no specific timing has been planned at this stage.



4. CONCLUSIONS

This report sets out the training and educational activities and materials that will be produced as part of the ongoing DTOceanPlus project. This will include online webinars to introduce the capabilities of the project, training materials and tutorials on how to use the software, and training sessions where this material can be delivered by an experienced user. The training sessions can be used to obtain feedback on the training materials and tutorials. The main target audience for these education and training materials will be the users and potential users of the DTOceanPlus design tools, but they will also be more broadly applicable to all target audience groups and key stakeholders.

Visits to the test facilities and demonstration projects will also be offered where possible by project partners, potentially in conjunction with other events or training sessions.

4.1 NEXT STAGES

Training and educational materials will be produced over the course of the project, starting with content to showcase the proposed capabilities and approach planned. As the software is developed, documentation and training materials on how to use this will also be produced and delivered.

All of the education and training materials produced as part of the DTOceanPlus project will be made freely available via the project website and a report summarising these will be produced at the end of the project.



5. REFERENCES

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ANNEX A: OVERALL TIMELINE OF EDUCATION AND TRAINING ACTIVITIES

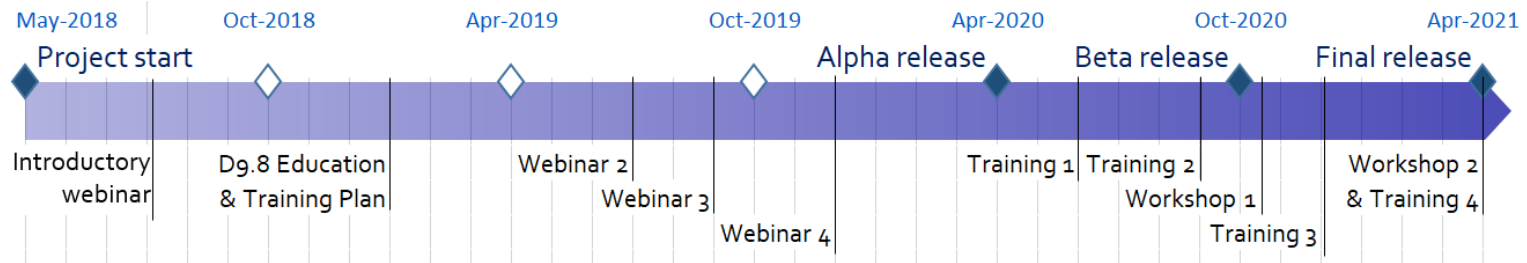


FIGURE A.1: PLANNED TIMELINE OF EDUCATION AND TRAINING ACTIVITIES





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