





## Document history

| Version | Date | By whom | Main area of changes |
|---------|------|---------|----------------------|
| 0.1     |      |         |                      |
|         |      |         |                      |
|         |      |         |                      |

## Summary sheet

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| Project Name          | COVE SEED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Title of the document | Evaluation report: Partnerships, HUBS and competitions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Deliverable           | D 4.5: D4.3-1 / D4.3-2 / D4.3-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Work Package          | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Programme             | ERASMUS+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| Website               | www.coveseed.eu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| Status                | Draft/Public                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Dissemination level   | Public                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Reviewed by           | Michelle Hoffmann, Nora Abel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Submission date       | 31.05.2024                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Starting date         | December 2023                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Summary               | Work Package 4 oversees the description and implementation of identified good practices, aiming to apply regional best practices internationally. This requires a comprehensive assessment to match practices with compatible regions' needs. Improvement strategies have been devised to aid regions in overcoming implementation barriers. Owners of identified practices offer practical suggestions and lessons learned to facilitate adoption by other regions. Good practices in cooperation and partnership within higher education and vocational training are crucial for regional development, fostering knowledge sharing and synergistic solutions. Partnerships also provide opportunities for capacity building and skill development among stakeholders, ultimately enhancing resilience and contributing to sustainable regional development. Deliverable D 4.5 initiates implementation processes, consolidating gathered practices for shareability and serving as a support base for implementing regions. |



## COVE SEED

COVE SEED (Centre of Vocational Excellence – Sustainable Energy Education) is focused on providing excellent and innovative vocational education to become a fossil free energy continent. While challenges on the energy transition develop rapidly and technologies are constantly evolving, well-equipped students, professionals and suitable labor capacity are needed. SEED sees vocational education as an important driver for innovation and growth, agile in adapting to the labor market. The objectives of the project are therefore focused on innovative energy education that meets the needs of the labor market: a) Preparing learners, students and professionals with skills and competences for the future; b) Empowering regional innovation based on regional needs; c) Upscaling and promote work-based education, and will lead to d) the establishment of an international learning community and e) establishment of Centres of Vocational Excellence (COVES) in five regions. SEED consists of educational VET providers (EQF level 2-7), working professionals and policymakers from The Netherlands, Finland, Spain, Germany and Greece. The result is an international community on vocational excellence dedicated to sustainable energy. During the project the partners will co-create and increase not only regional cooperation, but also transnational cooperation. Good practices and innovative approaches for learning with impact will be exchanged and developed.

Funded by the European Union. Erasmus+, EU Solidarity Corps under grant agreement No 101056147. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



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# 1. Introduction

## 1.1 Context

The Erasmus-funded SEED Project aims to foster collaboration among European partners in the realm of energy education. A notable deficiency persists in the availability of suitably trained professionals specializing in renewable and fossil-free energy technologies. Particularly in light of the climate crisis, the demand is urgent for skilled professionals well-versed in sustainable energy practices. Through the SEED project, efforts are underway to establish a transnational network devoted to the exchange of knowledge and expertise, creating an international learning community to pave the path towards a fossil-free Europe.

Each of the five regions participating in the project contributes and demonstrates best practices in energy education. One aim of the project is to delineate these exemplary practices, refine them and facilitate their adoption in other regions. This endeavor will facilitate the dissemination of lessons learnt from these practices to prevent potential pitfalls and accelerate the progress of sustainable energy education.

## 1.2 Objectives of the Deliverable

Work package 4 is responsible for the description and implementation of the identified good practices. At the end of the project, several regional best practices will have been applied at international level. To achieve this goal, it is essential to carry out a comprehensive assessment of these practices. At the same time, other work packages are formulating regional descriptions and needs. By carefully assessing practices against regional requirements and specifications, we can effectively match best practices to the most compatible regions. Therefore, a detailed framework for the description of best practices (Task 4.1.1) is essential.

We have also formulated improvement strategies to help interested regions overcome potential barriers to implementing these good practices. Finally, the owners of the identified good practices have formulated specific and practical suggestions and lessons learnt. These contributions are intended to facilitate the adoption of the good practices or parts of them by other regions wishing to include them in their energy education initiatives.

Good practices in cooperation and partnership within higher education and vocational training are crucial for regional development. Through collaboration, regions can combine resources and expertise to address shared challenges more effectively. This fosters knowledge sharing, allowing regions to learn from each other's successes and failures. Collaborative efforts also promote the development of synergistic solutions that leverage the strengths of each partner. Additionally, partnerships provide opportunities for capacity building and skill development among stakeholders. Ultimately, fostering trust and relationships through cooperation enhances resilience and contributes to sustainable regional development in the energy sector.

This deliverable (D 4.5, but with sub categories D4.3-1, D4.3-2 and D4.3-3) marks the initiation of the implementation processes for good practices. The document consolidates all gathered good practices in the domain of cooperation and partnership, rendering them shareable for implementation in other regions. Simultaneously, it serves as a base for support for the implementing regions.



### 1.3 Outline

The document is organized based on the categorization of the Good Practices and their corresponding sections in the Grant Agreement. Each chapter corresponds to a specific Good Practice category and is structured according to the tasks completed for this deliverable. Chapter 2 is concerned with D4.3-1 on business education partnerships for sharing and exchange. Chapter 3 discusses D4.3-2 on innovation hubs and chapter 4 details D4.3-3 skills competitions. Each chapter begins with a description of the respective Good Practice, followed by strategies for improvement and potential outcomes. Finally, each chapter concludes with a list of characteristics, lessons learned, and suggestions aimed at aiding other regions in implementing the identified Good Practice.



## 2. D4.3-1 Business education partnerships for sharing, exchange (UOWM/Spain)

The deliverable consists of two good practices. The first good practice from the University of Western Macedonia (UOWM) on cooperation between the VET centre of UOWM and the HEDNO network, will be explained in paragraph 2.1. The second good practice from Spain on applied research project 'Inclusive Energy' will be discussed in paragraph 2.2.

### 2.1 Cooperation between the VET centre of UOWM and the HEDNO network - Greece

The University of Western Macedonia, Greece is cooperating with the HEDNO Human resources and Education departments to upskill the personnel of the Hellenic Electricity Distribution Network Operator S.A. (HEDNO) on the new challenges that the electricity grid is facing, such as the renewable energy sources and energy storage units commissioning and connection to the network, groundings, the legally required certification of some of the personnel as electrotechnicians and safety technicians.

In 2013, the Hellenic Ministry of Development and Industry issued a Law that requires from the Electrical engineers and electrotechnicians of any level of education (except from EQF 6 and higher) to give exams in order to obtain their license (108/2013-class B). Before this Law, the electrotechnicians obtained their license to sign or undertake projects of certain installed capacity (power) according to their years of experience and level of education.

Since 2013, the procedure is more demanding: Except from the electrotechnician degree and years of experience, one has to take exams at the ministry's regional department and if successful, the license class B of various levels-installed capacity is obtained by the applicant.

In this framework, many of the employees of HEDNO that were hired before 2013, did not comply with that law. Therefore, all these employees had to attend five days of training on the scientific fields defined by the Law and then be submitted to the exams.

#### Guideline

##### Description of the current situation

The key results from the training courses held for HEDNO to date include:

- Approximately 180 trainees successfully upgrading their licenses to a Class B electro-technician working license.
- A total of 112 engineers acquiring updated certifications in Renewable Energy Sources (RES), RES commissioning, and groundings.
- The certification of 15 safety technicians for HEDNO.

At the moment, the HEDNO intends to replicate training sessions on Renewable Energy Sources (RES) and safety in both Athens and Kozani, Greece, from February 2024 to December 2024. To be specific, there are plans for 10 seminars, with 6 to be held in Athens and 4 in Kozani, covering topics such as Groundings (3 seminars), RES (3 seminars), and RES commissioning (4 seminars). Additionally, 12 seminars focusing on health and safety will be conducted for 300 HEDNO technicians. For this reason, new contracts have been awarded to the University of Western Macedonia (UoWM) and its



spinoff, INNORA, the staff of which working on the preparation of the training material. It's important to note that all these seminars must receive certification from the National Accreditation Authority (ESYD).

Furthermore, there are efforts to expand the scope of these seminars. A postgraduate professional course, scheduled to commence in February 2024, will include all the aforementioned training topics in its curriculum. This postgraduate course, rated as a Level 7 course, has already received certification from the National Higher Education Authority of Greece with a Grade A. This achievement serves as a significant indicator of the success and high quality of all the training courses mentioned above.

The following Figure 1 shows pictures captured during the on-site and laboratory training sessions:



Figure 1. On- site and laboratory training

### Difficulties / what works well

The primary challenge encountered was coordinating human resources, specifically scheduling staff participation in seminars due to the unpredictable nature of working on the electricity grid, such as emergency situations arising from severe weather-induced line faults. Addressing these challenges required adaptable planning and responses to the industry's fluctuating demands and operational requirements. To overcome these obstacles, it was necessary to plan and react flexibly to the dynamic nature of the industry and its operating needs. Nonetheless, through a collaborative effort with HEDNO's Human Resources and Education department, it was possible to organize the course schedules effectively.

Another challenge was the constrained timeframe for developing the postgraduate course curriculum due to the company's push to launch the courses at the beginning of 2024. Nevertheless, outstanding





collaboration between UoWM - INNORA professors and staff, along with the HEDNO training department's head and team, ensured the curriculum was prepared and certified in time for its introduction.

### **Evaluation process and measurement of current success**

In order to measure the effectiveness and impact of the extensive training programs, a comprehensive evaluation process has been put in place. As a first step, the trainees were asked to provide anonymous feedback by means of evaluation forms that were provided by both the University and HEDNO. These forms used a scoring system from 1 to 5, with all types of evaluations consistently above the commendable score of 4. This shared feedback shows that the training programs were very successful.

The second step was external examination and certification, achieved through independent validation. All trainees underwent examinations conducted by independent institutions, including the Ministry of Development and the National Assurance System. The high pass rate of over 90% shows that the training was effective in preparing individuals for the challenges of their roles.

For this specific GP, the **following Key Performance Indicators (KPIs)** were set:

**Evaluation from Company-partner (satisfaction / desire to repeat the training):** This KPI has been already met since new contracts have been awarded to the University of Western Macedonia (UoWM) and its spinoff, INNORA, related to the replication of training sessions in Athens and Kozani and the launch of new training topics (as described in paragraph 2.1).

**Number of certified personnel in Health & Safety issues and in accidents information:** The subjects "Health & Safety" and "Accident Information" are scheduled for 2024 (see paragraph 2.1).

**Upscaling of the training (e.g. postgraduate professional course):** A postgraduate course, rated as a Level 7 course, has already received certification from the National Higher Education Authority of Greece with a Grade A. This achievement serves as a significant indicator of the success and high quality of all the training courses mentioned above. The Accreditation report of the Postgraduate study program (Figure 2) indicated that: "The establishment and operation of the new Professional Postgraduate Studies Program (PPSP), 'Modern Electricity Distribution Grids-HEDNO', falls in the main objectives of the strategy of the University of Western Macedonia (UoWM). The University's intention is to give special attention to cutting-edge scientific fields and in alignment to the local needs of the broader region of Macedonia. The UoWM completed a viability and feasibility study to support the establishment and operation of the new PPSP program. The program is designed to be operated in collaboration with HEDNO, that wishes to i) offer training to its employees, ii) preserve previously acquired knowledge of the operations in the organization related to Electricity Distribution Networks, iii) create a platform for collaboration in research with the University, and iv) take advantage of the capability to seek solutions to technical challenges related to the electricity distribution grid through student research performed for their thesis. The sustainability of the program is strengthened by the fact that HEDNO will fund the program, with 40 students out of possible 55 of each cycle being its own employees."



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**Accreditation Report  
for the New Postgraduate Study Programme of:**

**Modern Electricity Distribution Grids  
HEDNO**

**Department: Electrical and Computer Engineering**

**Institution: University of Western Macedonia**

**Date: 4 December 2023**



Ευρωπαϊκό Πρόγραμμα  
Ανάπτυξης Ανθρώπινου Δυναμικού  
Εκπαίδευσης και Διά Βίου Μάθησης



Figure 2: First page of the Accreditation Report for the new Postgraduate Course, produced by the Hellenic Authority for Higher Education

The course launched officially on the 21st of March 2024, with the students enrolled exceeding the number of 50. Figure 3 below displays images from the introductory course.



Figure 3. Photos from the launch of the MSc course "Modern Electricity Distribution Grids-HEDNO" on 21 March, 2024.



## Improvement Actions

### Aspects of the GP that need improvement

The results of the evaluation of the training seminars, as well as of the new postgraduate study program with HEDNO indicated that:

**i) A "Health & Safety Laboratory"** needs to be established in order to promote the health and safety culture change in HEDNO. Moreover, virtual reality tools are developed for specific activities of HEDNO (eg. Smart meters installation).

### ii) Constant quality monitoring and upgrade procedure

Ongoing quality control and enhancement measures are essential for both the Seminars and the Postgraduate Study program. The Program's quality assurance protocols will be supervised by the Internal Evaluation Committee in conjunction with the University's Quality Assurance Unit. The Department of Electrical and Computer Engineering intends to synchronize its monitoring activities for the Postgraduate Program with the practices employed by HEDNO. This will involve the execution of yearly internal assessments and evaluations, utilizing tools such as questionnaires, peer or external observer class observations, tracking student progress via academic advising, fostering open dialogues with students, and gathering student feedback electronically.

### iii) Extroversion

A version of the website in English will be developed, and the study guide will also be available in English, reflecting the program's objective to expand its accessibility to include the neighboring Balkan countries.

## Regional Benefit and Goals

### i) "Health & Safety Laboratory":

The region of West Macedonia (WM), that has long served as the "energy heart" of Greece, is currently in the midst of a de-carbonization phase and to transition to a new production model that is independent of fossil-fuels. This transition poses significant advantages and opportunities for development, but it also creates challenges such as high unemployment rates and low competitiveness and innovation rates. The establishment of a "Health & Safety laboratory" in the premises of UoWM in W. Macedonia, is expected to contribute to the economic growth of the region by generating new job opportunities.

The University of Western Macedonia is the only academic institute in the region. The establishment of the laboratory will improve the quality index of all training and education the University offers. Moreover, undergraduate, and postgraduate students will also benefit from the high level of provided education related to Health and Safety issues.

### ii) Constant quality monitoring and upgrade procedure

The instructors participating in the Program are highly engaged in research activities and are keen on expanding their collaborative efforts with HEDNO to foster quality research. This includes the development of joint research proposals for funding and integrating research findings into their teaching methodologies.

Moreover, the faculty has shown a strong interest in mentoring students to conduct high-quality research projects that could lead to publications through their thesis work. HEDNO, on its part, is



genuinely interested in offering many of its employees the chance to broaden their expertise and skills within the intricate field of modern electricity distribution networks, aiming to enhance its partnership with UoWM.

The collaboration with a major industry partner in conducting the seminars and the postgraduate study program naturally enhances the potential to provide high-quality education. This partnership focuses on addressing the realistic challenges and demands of the industry within an area that is currently of great interest.

### iii) Extroversion

The development of the English version of the website foresees to enhance educational access, promote regional cooperation and understanding, stimulate economic development and contribute to the overall advancement of the Balkan region through increased accessibility and communication.

## Results of the Improvement

The following KPIs will be used for validating the improvements of the current Good Practice

### i) "Health & Safety Laboratory"

- Indicator for measuring success #1: Number of trainees to be educated by the laboratory.
- Indicator for measuring success #2: Number of new clients (except HEDNO) that will ask to use the laboratory facilities.

### ii) Constant quality monitoring and upgrade procedure

- Indicator for measuring success #1: Number of approved joint research and other projects between HEDNO and UoWM.
- Indicator for measuring success #2: Number of diploma theses of the postgraduate study program that led to research papers in international journals and conferences with peer reviewers.

### iii) Extroversion

- Indicator for measuring success #1: Number of lectures sessions in the postgraduate study program that were achieved by professors-scientists from abroad.
- Indicator for measuring success #2: Number of diploma theses of the postgraduate study program that were presented in international conferences with peer reviewers.

## Evaluation Report on Adaptation to another Region

### Timeframe for implementation

To develop the GP, the following steps were undertaken:

- An agreement was established between the institutions involved, formalized through the creation of a Memorandum of Understanding (MoU).
- Laboratories were shared between the organizations, following a strategy that ensured mutual benefits.
- The partnership was enhanced by initiating significant joint research activities, which also improved collaboration in other sectors.
- Resources, data, and staff were exchanged to tackle practical issues and further research objectives, and there was a joint effort in submitting proposals for research funding.



## Funding

The program is funded by the Hellenic Electricity Distribution Network Operator S.A.

- The first type of educational program (electrotechnicians level 2 certification) had a total budget of 55.000 €.
- The second type of educational program (RES and groundings program) had a total budget of 130.000 €.
- The third type of educational program (certified health and safety technicians) had a total budget of 58.000 €.

The new law framework in Greece encourages and allows professional postgraduate courses between universities and enterprises and supports enterprises with funding from the European Recovery Fund for such actions. Moreover, the HEDNO and the UoWM have signed a Memorandum of Understanding recently with main purpose to enhance such cooperations. The contract between the University and HEDNO for the professional postgraduate course is valid for 5 years, according to the new law and has a secured funding for this duration.

## Staff

The staff from the UoWM that was and is engaged in the collaboration activities is six (6) professors, two (2) laboratory staff persons, two (2) administrative staff persons and from HEDNO the engaged personnel were eight (8) high level engineers and officials, four (4) laboratory-technical staff persons and three (3) administrative staff persons.

## Timeframe of activities carried out

The training consists of three educational cycles :

- Certification Electrotechnicians class B (8 seminars, for 5 days each, 8 hours per day: 12/2021 – 07/2022)
- Training on renewable energy sources (15 seminars, for 4 days each in average, 8 hours per day: 01/2022 – 06/2023)
- Safety technicians training and certification (3 seminars, for 5 days each, 8 hours per day: 01/2023 – 06/2023)

## Collaborations

The current Good Practice involves the collaboration of the Lifelong Learning Center of the University of Western Macedonia (UoWM), its spin-off company INNORA, and the Hellenic Electricity Distribution Network Operator S.A. (HEDNO). The collaboration is necessary because it leverages UoWM's academic and technical expertise to enhance HEDNO's workforce skills, particularly in areas mandated by law, such as certifications for electrotechnicians and safety technicians.

From UoWM and its spinoff INNORA, HEDNO requires the development and delivery of targeted training programs. These programs involve participants advancing their professional certifications, engineers gaining credentials in Renewable Energy Sources (RES), and safety technicians qualifying their skills. The training covers various subjects that are all crucial for HEDNO's operational needs.

From this collaboration, UoWM and INNORA benefit by applying their academic and practical expertise to real-world industrial needs, enhancing their reputation and efficacy in vocational education. The collaboration allows for a practical application of their research and teaching,



broadens their professional and academic outreach, and potentially influences the curriculum's development and improvement based on industry needs.

HEDNO benefits from tailored training that enhances its personnel's skills and certifications, thereby improving operational efficiency, safety, and compliance with regulations. The collaboration also provides HEDNO with access to cutting-edge academic research and innovations in energy distribution, contributing to its long-term strategic objectives, such as addressing technical challenges through research.

### **Learnings**

Reflecting on the implementation, there was a notable challenge: to coordinate human resources, particularly scheduling staff for seminars, due to the unpredictable nature of electricity grid work. Many of the trainees needed to address urgent demands during severe weather conditions, which disrupted planned schedules. Nevertheless, the issue was effectively resolved through strong collaboration between HEDNO and UoWM teams and adaptable planning..

For others looking to implement this Good Practice, the experience underscores the importance of flexible planning and strong partnership. It's recommended to anticipate and plan for unforeseen challenges, particularly in environments with unpredictable work demands. Moreover, establishing clear communication and collaborative frameworks between educational institutions and industry partners from the outset can significantly aid in overcoming hurdles and achieving successful outcomes.



## 2.2 Applied innovation project "Inclusive Energy" - Spain

The Inclusive Energy is a good practice focused on VET students, that combines two different areas: technological improvements and social inclusion, in this case women inclusion in STEM.

The main points to develop this practice are:

- Developing inclusive and environmentally friendly energy production systems. Bringing renewable energies closer to VET students through multidisciplinary activities. Involving training cycles with female enrolment in this type of activities.
- Executing technical activities:
  - Assembly of solar power plants
  - Equipment maintenance
  - Calculations in relation to self-consumption needs and energy efficiency
- Developing transversal activities carried out with students of Vocational Training in the social branch (especially women):
  - Demonstrations of solar plant operation to social studies students
  - Talks on energy efficiency and the need to switch to renewable sources

As a result, we can talk about these outcomes:

- Know-How Transfer
- Teaching Materials and Procedures
- Social Visibility

The fundamental product of the technological part of the project is the facilities solar photovoltaics and instructional trainers that have been carried out in both centers teachers as materials for practical activities with students. This has also led to considerable updating and equipment of measures of both institutions.

Didactic proposals have also been developed with students of the professional teachings of Electrical and Automatic Installations and Industrial Automation and Robotics. Measurements have been made with portable instruments, and other activities such as 3D printing of a solar tracker model.

In addition, this technology has been explained to students of the social branch of VET studies, so that general knowledge about the importance of renewable energies and how they can contribute to environmental improvement has been promoted to a sector that, at first, does not have the technical knowledge to be able to the more practical part of this area.

### Guideline

#### Description of current situation

At this moment the good practice has been fully developed, with the following results:

VET students have learned how to manage solar photovoltaic self-consumption stations with the latest generation equipment in the sector, improving their technical training.

Collaboration between the different agents within the educational centres and between the different agents in the sector, teachers-students-companies, has increased.

Social studies students have received information about the advantages of using self-consumption and basic technical training on photovoltaic solar energy.





This project has made it possible to disseminate self-consumption systems in other educational centres and sectors.

The project has enabled a large part of the electricity consumed by the participating educational centres to be self-consumption.

Finally, it has increased the interest of women in this type of technology.

### Improvement Activities

The areas identified for improvement are the following ones:

- Increased outreach and participation: Increase participation rates, especially among women and under-represented groups, to ensure inclusiveness and diversity in STEM education and training. To do it, help other schools to develop similar projects.
- Expand curriculum and training opportunities: Develop a more comprehensive renewable energy curriculum. Create working groups with the administration in order to be able to expand these contents.
- Improve and increase the relationships between the different actors involved in improving sustainability and self-consumption to provide practical training and placement opportunities for participants. Develop similar projects combining the work of companies, educational centres and the administration, based on the results obtained from this work and the previous points.

In order to improve them, some of the actions to be taken could be:

- Extend the project to more educational centres, more companies, and more students. For that, specific dissemination campaigns can be carried out, taking advantage of social networks and events held by educational centres with organisations to reach potential participants.
- Improve curricula, modify curricula to introduce the latest technologies and improve training.
- Introduce sustainability as a cross-cutting subject in the different VET studies for environmental awareness, focusing on the improvements that self-consumption offers (this is already being done).
- Collaborate with industry experts and teachers to develop new modules covering additional renewable energy technologies such as wind, hydro and biomass.
- To further increase, if possible, the school-education-company relationship, and for students and teachers to enjoy training placements that allow them to improve their technical skills.

As main objectives, within the improvements, we can find:

- Increasing female participation in training cycles with a predominantly male presence, i.e. in highly technical cycles.
- Establish partnerships with renewable energy companies to improve training and therefore increase employability.
- Expand the curriculum to include modules on other renewable energy technologies.

To this end, work must be carried out involving the administration, VET centres and companies, so that in a not very long period of time the work plan can be generalised. This would achieve the two main objectives: more training in renewable energies and self-consumption, and an increase in the enrolment of women in studies where enrolment is predominantly male.

These improvements require at least two more years of project development, and would require extra funding, at least to cover the costs of staff working on the extension of the project and specific training



equipment and machinery (including virtual reality and models). The minimum budget needed for this would be €50,000.

### Results of the Improvement

As a result of the implementation of these improvements we would have the following:

- Improved technical skills of future workers in the sector.
- Increased enrolment and retention rates among women
- Improved employment and thus productivity gains
- Improved development of the region

### Evaluation report on adaption to another region

#### Timeframe for implementation

Formally, the practice has been developed from January 2020 to June 2021, but other similar practices are still in progress. The GP started as a small project within the school, and then partners were sought to present it as a national VET innovation project.

#### Funding

Budget : 38.771,51 € . Funding was used for the training of students and teachers and for consumables. The funding was the money earmarked for the project under the mentioned call for proposals.

#### Staff

The staff needed is teachers, the administration and personal of the companies.

Teachers of the institutions and electrical engineers provided practical education for electrical technicians and engineers.

#### Timeframe of activities carried out

Formally, the practice has been developed from January 2020 to June 2021, but other similar practices are still in progress.

The first 6 months the participants received specific training, after which the development of the project began, with the assembly of the installations. In addition, the students started to do Dual training in the companies of the sector.

The training courses were given by the company involved in the project, the same company provided equipment to carry out the assembly of the installations and later supervised the assembly. It was also the first company to host DUAL trainees. After this step, the students went on to other companies in the sector.

#### Collaborations

Key organizational aspects concern mainly companies and educational institutions collaboration.

- Main collaborators: green energy companies and educational institutions. Companies provided training and equipment. The administration financed the project and facilitated the changes of the curriculum and the mobilities of the teaching staff and students.
- The project was supported by CIPFP Faitanar; IES Segundo Chomón; ENSOVAL Renovables



## Learnings

The main challenges lie in the curricular design of vocational education and training which seeks to integrate the practice and the results obtained, since it involves modifying or eliminating other aspects equally necessary to promote employability education and training in the economic sustainability of the productive sectors involved.

Facilitations in the process:

- The organizational structure of the project in which two schools and one company worked, which made it possible to integrate two complementary perspectives into its development.
- The methodology and timing designed for the implementation of the project combined its objectives with the curricular development of the vocational training of the students involved.
- The willingness and experience of the partner company in the field of renewable energy, its technical implementation and the training planned around it.
- The added value of the professional education generated by the development of the project, which allowed the updating and improvement of the teaching skills of the collaborating teachers.

As mentioned above, it is essential that such projects be developed collaboratively between vocational training institutions and companies, or other institutions experienced in the field of energy efficiency. In this sense it is also important that the coordination of the same is carried out from one of the vocational training centers and that it takes advantage of the experience and previous training of all the participants making a correct diagnosis of the initial situation and raising achievable objectives. In addition, it is important to contact senior departments at the hierarchical level so that the relevant authorizations are available in the technical development and curricular integration of the same.



## 3. D4.3-2 Innovation hubs, technology diffusion centres and applied research projects (Finland/BUAS)

Deliverable 4.3-2 consists of two good practices. Paragraph 3.1 will discuss the business region Turku - regional development company. The Bobby Energy Hub will be explained in paragraph 3.2.

### 3.1 Business Region Turku - regional development company - Finland

Business Turku describes itself as a dynamic business and innovation center that operates as a portal between the region's different expert, development and service organizations and their services.

The goal of this Good Practice is to produce and facilitate the best possible services to support the founding of companies, as well as their growth, development, and internationalization. The key organizational aspects of the operation are expertise, facilities, and management. A considerable number of experts are involved in the operation. The activity has appropriate and sufficient facilities and equipment at its disposal. Operations are managed and supervised by a wide-ranging management team.

As the digitalization, globalization, climate change, circular economy and artificial intelligence open new opportunities and introduce new challenges, Business Turku offers support in starting business activities in the said fields. Business advice can be related with growing your sales; refining your business idea; developing your own operations and cost structure; managing acquisitions and other changes.

Business Turku brings together companies and universities, builds clusters/ecosystems, organizes events for companies and researchers and facilitates cooperation and participate as partners in projects. These activities strengthen the region as a place to do business that attracts new talents, investments, and companies.

#### Guideline

##### Description of current situation

The increased energy costs and inflation resulting from Russian's attack on Ukraine have increased uncertainty in companies' business environments which in part affects the operation of Business Turku. Economic uncertainties slow down companies' decisions to locate in the region and bring caution to personnel increases. Material and component shortages slow down companies' growth opportunities, and the availability of skilled labor also emerges as a slowdown in companies' growth. Challenging situations emphasize the importance of renewals as a factor promoting competitiveness.

The main topics in Business Turku evolve around the development of effective management, the goal of which is a systematic and inclusive customer-oriented operating mode. In practice, this can be seen by reforming project management with the aim of refining the project portfolio to support and strengthen basic operations.

The development of Business Turku's own services and their visibility has been in the focus. Communicating about the services and increasing visibility has successfully reached an even larger



amount of the companies with growth potential in the region. As a result, the amount of external funding coming from companies in the region also increased.

### **Improvement Actions**

Improvements of the Good Practice could happen through upscaling its operations either deliberately or due to the changed world situation. For instance, Finland's NATO membership can have both direct and indirect effects on Business Turku's operations. With all the Nordic countries being members of NATO, regional cooperation is strengthened. Closer economic and trade ties with other NATO member countries opens new markets and export opportunities for businesses in Turku. This could lead to expanded trade and investment flows. Increased security may increase companies' confidence to invest in the region, leading to increased economic activity and growth opportunities. Defense and security-related regulations may also impact businesses which requires Business Turku to provide support and guidance in adapting these changes.

The upscaling of Business Turku is very strongly linked to the changing world. Globalization means that businesses are increasingly linked to global markets and competition. Rapid advancements in technology transform industries and business practices that requires continuing training, adaptation and being responsive to changes.

The improvements can also be related to the Good Practice being linked more strongly on the education by providing information and support on youth entrepreneurship at an earlier stage. Mentoring and innovation competitions increase the understanding of entrepreneurship, and early support and network may strengthen students' readiness towards starting their own companies.

### **Results of the Improvement**

Changes in industries give direction to the development of education in the region where the degrees meet the changing competence requirements of the future working life.

Collaboration with policymakers and industry stakeholders creates an enabling environment for sustainable energy education and innovation. The close cooperation between companies and the education system offers students practical learning and the opportunity to come into contact with future employers. Collaboration increases understanding of the responsibility of businesses, needs of future working life and as well as the laws and regulations concerning companies. The industry's development opportunities are easier to identify, which has a direct impact on the creation of new fields of education and the development of additional training.

### **Evaluation report on adaption to another region**

#### **Timeframe for implementation**

First, it was defined how the implementation of the projects will take place, who is responsible for its implementation and the schedules. A plan was made, which described e.g., necessary resources, trainings, and implementation steps. Then the support and commitment of financiers was ensured.

The project was piloted on a small scale before being introduced to a wider user base. This helped to detect challenging issues that were resolved before implementation. Communication played an important role in the implementation of the project. The target group, stakeholders and financiers were told about the project's benefits, goals, and its effects on their operations.



The project was evaluated after its implementation. With the help of the evaluation, it was checked whether the goals set for the project had been achieved, areas for development were identified and the necessary improvements were made. The implementation process was seen as a continuous process and that it requires constant monitoring and improvement during the project's life cycle.

### Funding

The annual budget is 7.8 million of which nearly half of the funding comes from the city of Turku. A quarter of the funding is divided between the municipalities of the Turku region. EU project funding covers a fifth of the total funding. The rest of the funding consists of other public funding, project funding from the Regional Council of Southwest Finland and various sales and rental income.

### Staff

Business Turku employs a wide range of people with backgrounds in different fields of expertise. To support the establishment of a company, Business Turku's personnel includes business advisors, growth coaches and sector-specific specialists. Considering the Good Practices own operations, it includes its own marketing team and personnel administration.

### Timeframe of activities carried out

The project is already established, the operation is regular and daily. Consolidation and expansion of operations have been done systematically for several years.

### Collaborations

At the end of 2023, Turku Business Region and regional development company Turku Science Park experienced a brand renewal and have since operated under the common name Business Turku. Although the name of the regional development company changed, the operation and cooperation are still remarkably important.

The neutral and non-profit regional development company acts as a partner and a builder of cooperation between universities and colleges as well as the public sector and companies. The participating universities include the university of Turku, Åbo Akademi and the Turku University of Applied Sciences. In addition to the city of Turku, the other participating municipalities are Kaarina, Lieto, Masku, Mynämäki, Naantali, Nousiainen, Paimio, Raisio, Rusko and Sauvo.

More and more companies have come into operation, and their operations are organized into sector-specific forums. Business Turku operates Smart Chemistry Park, located in Raisio that focuses on companies in the chemical industry, and Spark Up, which is a community for new business activity and growth. The business advisory service Potkuri and the Western Finland Film Commission WFFC are also part of the company's services.

Particularly strong and internationally operating leading industries in the Turku region are HealthTurku, MaritimeTurku, TechTurku, ExperienceTurku and CleanTurku. Business Turku is actively building and accelerating the growth and renewal of these clusters in the Turku region.

### Learnings

In practice, there are no big risks. The economy has been thought through, the operation is politically approved and there are enough personnel. The greatest risk could be that the biggest financier, the city of Turku, would withdraw. At this point the challenges of securing funding and finding motivated



parties have already been largely answered. The right people have been found to carry out the activities so the funding has been secured.

Things that helped to succeed: good design; the commitment of all parties; targeting development activities and trainings based on the needs of the companies (and their personnel) and not in a way that there would have been a pre-prepared training program.

The practice has already been scaled up on the regional level. The operational model can be transferred to another region easily. But the implementation of the operating model requires the commitment of various stakeholders in the long-term development and financing of the operation. Implementation of the practice can be done as described earlier and it requires committed personnel.



### 3.2 BOBby EnergyHub: solar charging station for sustainability in micro mobility - BUAS

The EnergyHub is an off-grid photovoltaic charging station for light electric vehicles (LEVs). It is located on the campus of Bochum University of Applied Sciences and was built by students as part of the project study BOBby, which aims to find more sustainable solutions for sharing LEVs in urban areas. The EnergyHub is used to charge e-mopeds, e-scooters, e-bikes, and e-cargo bikes with renewable electricity. The PV charging system was provided by the company SunCrafter.

Especially in dense areas like the Ruhr area there is a great need for alternative mobility concepts with respect to the climate crisis and lack of space in the cities. The EnergyHub has been designed with these factors in mind, additionally its design is modular, the internal components are easily accessible and it's easy to work on and learn about scientific projects.

On sunny days is easily possible to use refurbished solar panels in a mini grid scenario with batteries our size to charge around 10 scooters (depending on usage scenarios), however in seasons where there is a lack of sunshine there could be difficulties to get sufficient energy. Also, the system is pretty vulnerable to low temperatures (below 0°C, batteries cannot be charged depending on the type of battery).

Apart from the practical experience the students got from building the EnergyHub, it was also used in the BOBby project study for research and educational purposes on topics such as grid independent charging solutions for LEVs, pros and cons of decentralized energy systems, feasibility of different solutions under different conditions and life cycle assessments.

#### Guideline

##### Description of the Current Situation

Currently the EnergyHub it is mainly used by the members of the Sustainable Technologies Laboratory at BUAS.

The EnergyHub used to be integrated in the BOBby Sharing project study for students, where it was used to charge shared e-mopeds. In the current semester, the focus of the BOBby project study shifted. Integration into a new or different project study is needed.

In order to carry out further research and optimization on the photovoltaic modules and the charging cabinets, a separate control unit was installed so that the data received could be stored on a separate server. In this way, it is possible to check and query the required data and create comprehensive evaluations in the form of dashboards, which in turn can be used in teaching and research. Live transmission is also made possible, which sends out messages when problems occur so that they can be resolved quickly. This enables us to improve the service life and quality of the individual parts.

Another key aspect of the in-house data collection and evaluation is the efficient use of load management, which actively controls electricity consumption. For example, load management can be used to control when electricity may and may not be supplied for charging. This ensures additional safety and a long service life for the batteries. Concrete examples of this are that the power is automatically switched off when a battery is fully charged or that charging is not allowed if the outside temperature is too hot or too cold for safe use. In addition to the advantages for current use described above, the collection of data also forms the basis for future research. The long-term goal of the data collection is to work with the available battery and charging capacity with foresight.





To make the experience even more vivid and attractive, an interactive tablet to provide visitors with information was installed. Dashboards based on current data from the control unit were made available for this purpose. Unfortunately, the tablet had to be taken down, due to vandalism.

Another issue is a staff shortage of skilled employees who can work with the EnergyHub and its data and are available to monitor, manage and maintain the EnergyHub consistently. Therefore, there are currently no measurements on the energy consumption rate and the maintenance frequency.

### Improvement Actions

To improve the status of the EnergyHub, trainings for the members of the Sustainable Technologies Laboratory are planned. This way the trainers will be skilled to present the EnergyHub to visitors of the Lab or BUAS in general, to generate more traffic and interest to eventually improve the education. A new employee will be trained to manage and maintain the EnergyHub, so that measurements on performance indicators can be collected regularly.

A big change that is aimed to improve the usage of the EnergyHub, is a relocation. A different area on campus has opened up, which is close to parking facilities and bus stops. Integrating the EnergyHub near a transportation hub can increase the overall usage, which benefits the performance indicators and the people in the region as well.

The main goal is to permanently include the EnergyHub in educational and research projects again. To do this it will be integrated in an existing student project study, or a new project study will be designed for this purpose. The project study will use the problem-based learning approach, which in our experience produces good learning progress and results. This new project study will be established in cooperation with the company Green Power Brains. In this way, we can ensure that the maintenance of the EnergyHub is guaranteed regardless of staff changes. This can also help to improve the expertise of hardware and software functionalities of the EnergyHub for students and employees of the laboratory as well.

Topics of the project study should include management of batteries, Raspberry Pis and other hardware components like relays and inverters, data acquisition, analysis and processing, data visualization, user interface design and control logic. Students should be enabled to learn the fundamentals of solar technologies, such as efficiency levels, orientation of solar modules, energy output, off-grid technology, storage, and management. These are topics that can be provided by Green Power Brains, whereas the part from the Sustainable Technology Laboratory will focus on sustainability assessments, supply chain, procurement and sustainability issues, life cycle assessments, economic efficiency assessments and use cases. This way we establish a cooperation which provides students with a comprehensive educational offer, that prepares them for requirements of the labor market.

A further study project for students is planned and can be implemented if funding is approved. This project will combine knowledge of Integrated Energy Systems, Mobility and Hydrogen, by adding a hydrogen fuel cell, hydrogen tank and Electrolyzer to the EnergyHub. The students' tasks will include:

- Initial Assessment: This includes the theoretical study on the fuel cell, different types of Electrolyzer, sizing, cost etc.
- Project Development: This includes the site assessment, procurement, commissioning of the project.



- Real Time Data Evaluation and Demonstration: This should include the inclusion of the real time data to our server.
- Optimization and Future Concept: The theoretical optimization of the project and possibility of adding the other energy system.

In addition to that a digital twin of the EnergyHub is being developed. This will be used to expand and support the teaching further. This helps to create a new creative pathway in the educational structure of the project studies and the problem-based learning.

### Results of the Improvement

After the implementation of all enhancements, students at Bochum University of Applied Sciences will gain access to a solar-powered charging station for light electric vehicles. This not only provides an alternative transportation option but also serves as a valuable source of educational materials. As popularity grows and a user-friendly system for students is established, the number of daily active users is expected to increase. Subsequently, the integration of a user satisfaction survey and its regular evaluation can be realized, aiming to improve all success criteria.

On the one hand, the EnergyHub will function as a dependable energy source and a showcase for sustainable, fossil-free micro-mobility. On the other hand, it will be utilized as an effective method to educate students and foster skills necessary for their future careers, further promoting and encouraging their development.

### Evaluation report on adaption to another region

#### Timeframe for implementation

The initial project started in October 2018. The hub was installed two years later. The aim was to provide an innovative tool for teaching about the potential of the energy transition in the transport sector. To this end, we developed the EnergyHub and implemented it in our teaching programme. The question of location and the final concept took a particularly long time. The development and installation phase were during the Covid pandemic. This led to delays in the implementation of the hub. The planning phase with site selection and installation took around 24 months. Teaching modules for exercises have been developed. A paper on the topic LCA and Energy Hub was produced. Acceptance studies and surveys on the use of the station were conducted and various light electric vehicles to the Energy Hub were connected. Efficiency measures implemented to improve the hub.

Ongoing improvements:

- Incorporation with local companies (reused solar panels, construction, internal design of the system).
- Negotiations about requirements of space, position and feasibility
- Setting up of external devices.
- Establishing social media and marketing activities of the project (fares...).

### Funding

Staff are needed to plan the hub and numerous hardware components are also required for implementation. Depending on the choice of concept, the costs can vary greatly. There are also maintenance and service costs if components fail or are damaged. At least around €25,000 should be budgeted for the hardware alone. In addition, vehicles (e-mopeds, e-cargo bikes, e-scooters) are required, which can also incur high costs depending on the number and design. We have partly applied



for university funding and partly for third-party funding. Numerous measures were also built up successively over several years. Supporting teaching with the Energy Hub requires additional costs.

### Staff

The Good Practice could be implemented by one person, that gets in contact with a company that provides the PV modules and the facility where the EnergyHub will be located. This person can manage the student project study where the students will build the hub in cooperation with the company. The integration of a provider for sharing LEVs can also be part of the project and the student's task. Students should be integrated in the development process as much as possible, as they gain a lot of knowledge and skills. There should be one person, that is continuously in charge of the hub, since student projects happen only during the semester.

For long term use, it would be better to split the responsibility between multiple people. The number of staff that is needed, depends on the desired outcome. You need to know if you want to focus on a sustainable sharing model for LEVs or if you want to focus on education and research, or both.

### Timeframe of activities carried out

When the EnergyHub is up and running, it is a constant activity. Student projects that work on and with the hub meet once a week and last for one semester.

### Collaborations

The central partner was the company Suncrafter, with whom we planned and set up the station. Further cooperation in the area of the Energy Hub was very important. We worked together with numerous corporate partners to implement the hub. These included EVO in Oberhausen, for example, which has incorporated solar charging stations into its own e-moped sharing business. This enabled us to investigate the real-life use of the solutions and offer students an attractive teaching programme. We have also involved further partners. These include vehicle manufacturers, charging solution companies, component manufacturers and transport companies.

### Learnings

Since we work with batteries appropriate handling is required to ensure safe operations. There is the possibility of disagreement by other people working on the campus (especially when it comes to visual elements). Social acceptance was also a factor because of the need to replace existing parking spaces for cars.

Most challenges are technical, for example dealing with (cold) temperatures, high usage scenarios and the establishment of different charging solutions. Another challenge was the lack of capacities when it comes to technical skilled people who keep this project running and do maintenance.

We recommend a thorough planning in advance and establishing bigger teams right at the beginning. Projects like this need people who are willing to participate reliably for a long period of time.



## 4. D4.4-3 Skills competitions, raising attractiveness and excellence in VET (HU/UPV)

### 4.1 Challenge based education in Hoefkwartier (Celsiushuis) - HU

Innovation workshops are facilities outside our educational buildings where we practice project-based experimentation. At these locations, students, researchers and teachers, together with partners, develop innovative solutions for healthy and sustainable cities. This form of education and practice-based research is in line with the overarching vision of our educational institute, but nevertheless is still new: Here we learn how to innovate -and- innovate how to learn.

The main focus of the Celsius House is to develop technical and social interventions for making a sustainable and healthy new urban district. This all within the constantly changing opportunities and restrictions of the local system.

Through our projects, we aim to answer location-specific issues. The requests usually originate from residents or the municipality. Precondition for follow-up is that the issue corresponds to UAS own Knowledge and Innovation Agenda.

Currently, there are two collaborating innovation workshops operated from the CoE Smart Sustainable Cities:

Table 1: Overview of the Celsius House project

| <b>Celsius House (launched in June 2022) in the Hoefkwartier city district of Amersfoort.</b> |                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Task                                                                                          | Developing innovative interventions that fit the needs of (future) residents and help to make this new urban district both healthy and sustainable.                                                                                                                                                                                                             |
| Location                                                                                      | A modular and circular house (60 m <sup>2</sup> ), designed and built by students from various studies as a submission to the global Solar Decathlon competition in 2021.                                                                                                                                                                                       |
| Partners                                                                                      | Municipality of Amersfoort, Province of Utrecht, Residents, Placemakers, ROC Midden Nederland (MBO), Welfare organisations, Housing corporations.                                                                                                                                                                                                               |
| Programmatic themes                                                                           | The neighbourhood as an ecosystem / New Energy Systems / Well-being in the Public Space A Voice for Nature and Future generations / Social cohesion and participation / Shared mobility and hubs                                                                                                                                                                |
| Skills                                                                                        | By working on on-site on real-world issues, students develop different skills than they would in regular education. We particularly observed the following ESCO generic skills: T2.1 - processing information, ideas and concepts. T3.2 - taking a proactive approach. T4.3 - collaborating in teams and networks. T2.4 - thinking creatively and innovatively. |



## Guideline

### Description of current situation

The Celcius House was installed as living lab in the Hoefkwartier district almost two years ago in 2022. A large number of student projects were started and finished in those two years. During this period, we have seen that the issues in this area are more complicated and challenging than our students and field partners can handle in the time given for a project. We therefore learned to break down large issues into feasible and incremental stepping stones that can be finalised within the duration of a student project. The goal of a student project has therefore shifted from "solve a problem" or "develop a product or service" to "overcome the next obstacle to get one step closer to a final solution" or "clarify and clearly define an issue".

In order to properly manage this programmatic approach, it is necessary to develop a good relay system of individual projects and to generate an overview of the interconnections of those projects. The latter both for navigation and redirection of the route to an end solution but also for communication and to create insight for field partners, students, researchers and teachers.

We are enthusiastic about what we have already achieved and clearly see the potential that innovation workshops and living labs offer for the link between education, research and practice in rich learning environments. This has been extensively mentioned in the HU Vision "Together for the Future; education and research as a basis for talent development and innovation".

Still, working in innovation workshops on site-specific issues, at a considerable distance from our educational buildings is relatively new in our organisation. It offers a lot of possibilities to operate as an odd duck within the educational system, but is sometimes cumbersome. In common practice, we experience that linking multidisciplinary student projects to the regular courses is often tailor-made and requires the involvement of colleagues who know their way around the broad spectrum of our organization well. Also, relying on support from facilities services, procurement and business operations, which primarily serve the regular educational system, is time-consuming and often very hard. Therefore we will work on the following improvements.

### Improvement of the Good Practice

#### Preconditional and overarching objectives

- Creating a digital project catalogue (2023 - mid-2024).

The large number of projects without much uniformity makes it difficult to generate overview and provide insight into how our projects contribute to the city. As a result, we lose not only momentum and therefore stakeholder trust, but also accumulated knowledge. A dynamic digital catalogue of all student projects is desirable. As there is often little time available for this, we aim for a high degree of automation in the process from gathering information with the student groups to publishing a catalogue in a uniform format.

#### Global timeline and milestones

Q2 2023 - Develop MVP as pilot

Q3 2023 - Allocate budget and time for a project leader and assistant

Q4 2023 - Develop digital survey to obtain information on each project.

Q1 2024 - Develop automated layout of information to project page



Q1 2024 - Test process and catalogue quality

Q2 2024 - Processing modifications

Q2 2024 - Allocate budget and time for management and editing after implementation

Q2 2024 - Delivery of automated Project catalogue

Q2 2024 - Ensuring accessibility and findability on website and libraries

- Creating a clear picture of projects and interconnections (2023-2024)

As the issues in the innovation workshops are location-specific, the (changing) contextual factors have a great impact on the projects in their content. This is one of the reasons why managing and planning these projects is challenging. It is therefore necessary to have a clear overview of the unifying principles of the projects to be able to channel them. To make this possible we will use a programmatic tool to document the connections between the different projects and visualise the bigger picture. Gain for the region: All energy can be deployed on projects that contribute to the end goal. In addition to this, stakeholders also get an easy overview of all projects and the connection to the themes in the district. Besides the reasons mentioned above, there is also the possibility of documenting the skills students have been working on in their project. (See the list of skills, Appendix 2.)

#### Global timeline and milestones

Q4 2023 - Exploration of different program management tools and selection

Q4 2023 - Prototyping: testing the application with a selection of projects

Q1 2024 - Testing whether the application matches the needs of HU and their partners

Q2 2024 - If successful: allocate budget for Lab Assistant (0.3 fte for this task)

Q2 2024 - Identify which data is needed for program management and knowledge sharing

Q2 2024 - Launch application and input data

Q3 2024 - Stakeholder sessions for sharing new insights

- Form learning network of Labs (2024-2025)

Besides these innovation workshops, there are other Labs within Utrecht University of Applied Sciences (Tech-Labs, StadsLabs. In an exploratory interview, it is concluded that each of these Labs deviates from regular education to a greater or lesser extent and many common obstacles are being experienced. Also, there is little to no exchange between the labs and each one is reinventing the wheel by itself. The impact of the individual labs and their projects for the region can be significantly increased by working together more closely, exchanging knowledge and researching the impact of project outcomes in varying situations.

#### Global timeline and milestones

Q1 2024 - Exploratory meeting on connecting to HU Rich Learning Environments

Q1 2024 - Identify and showcase the various Labs, Innovation Workshops etc HU-wide

Q2 2024 - Obtain a mandate from the Executive Board

Q3 2024 - Organising a large-scale meeting of Lab leaders to explore needs

Q3 2024 - If justified: appoint project leader from HU Teaching and Learning Network (TLN)



Q4 2024 - Investigate need for structural support for Labs by TLN / HU Services etc.

Q4 2024 - Examine means for digital and physical knowledge sharing

Q2 2025 - Develop and implement digital platform

Q2 2025 - Develop and implement physical meetings

Q3 2025 - Share knowledge also outside own organisation

### **Improvements specific for Innovation workshop Celcius House and surrounding area Hoefkwartier**

Focus on practice-based research and innovation challenges involving residents and SMEs.

The strength of the Celcius House is its location in the middle of the future urban district Het Hoefkwartier. Because of this, the house is immersed in the real-world issues affecting this neighbourhood. It also makes the connection with the educational courses and the Tech-Labs complicated, because of the physical distance (commuting time: 45 min)

- Coping with shifting partner issues (2024)

Because of changes in the economy, the overarching issue of our main partner, the municipality of Amersfoort, has unofficially shifted. Sustainability and wellbeing ambitions are now a lower priority. Ensuring that any construction at all will occur in the area is now the number one priority. Commitment from all partners for several years is required to justify the investment of an on-site innovation workshop. To avoid becoming a pawn in a shifting system, we as CoE need to develop a well-defined vision to address the issue. Profit for the region: a proper Vision allows us to refocus attention on the quality of interventions for the neighbourhood, i.e. sustainability and well-being.

#### Global timeline and milestones

Q1 2024 - Develop internal vision on this topic by means of strategy sessions

Q2 2024 - Understanding our interests in the area and the Municipality as a partner.

Q2 2024 - Develop a sound alternative (BATNA)

Q3 2024 - Obtain a mandate from the Executive Board

Q3 2024 - Initiate dialogue with partner based on interests and core values

- Involve more local residents (collaboration with 20 people, 2024-2026).

Until now, there were very few inhabitants of the area. Those living here are often on short-term contracts and feel less ownership for the neighbourhood. We represent a trans-disciplinary approach in the area, this requires connecting with the residents. Therefore, a lot of effort has been put into engaging residents in the past year, with little result. In Q2 of 2024, the first homeowners will move into the area. These future residents already expressed interest in working with the Celcius House on the quality of the neighbourhood. We will spend more time partnering with placemakers and neighbourhood welfare organisations to actively strengthen and expand this contact with the residents. Our goal is to collaborate with at least 20 residents on projects around their sustainability and wellbeing needs in the area before the end of 2026.

- Involve more companies (cooperation with 5 companies, 2024-2026).



Our focus in recent years has been on engaging residents (see previous item). By now, we are ready to also start involving local companies. To do so, we will first conduct some interviews with the neighbouring companies. Each of them we will ask for a reference for another company. Our goal is to have partnered with at least 5 local businesses on projects around wellbeing and sustainability needs by the end of 2026.

- Collaboration between MBO and HBO: Escaperoom as a teaching method in Energy Education (2024-2025)

We are actively exploring the possibility of playfully teaching students and professionals about modern technologies that will soon be implemented on a large scale as part of the energy transition. This playful teaching approach perfectly complements the emerging trend of "serious gaming" in education. Within the Escaperoom project, we can collaborate on various VET levels with VET provider ROCMN, who are currently developing this initiative as well. Using an escaperoom as a learning tool seems logical, especially considering the conclusions from the Skills analysis conducted as part of COVE SEED. From this analysis, it was apparent that practice-based knowledge is essential, according to employers, next to working together, critical thinking and creative problem solving. Furthermore, it was also emphasised that a good balance and interaction between theory and practice are very important. An escaperoom provides a suitable solution to these needs, thus aligning with the educational vision we want to embrace and the wish for involving more companies in research and education.

#### Global timeline and milestones

Q1 2024 - Develop a joint vision on this topic with ROC Midden Nederland

Q1 2024 - Student team Quest is commissioned to develop a concept escaperoom

Q1 2024 - Introductory talks with practising partners on investments and interests

Q3 2024 - Design first prototype (contribution required, approx. 10,000)

Q4 2024 - Implementation first prototype

#### **Results of the Improvement**

With the improvements identified above, challenge based education in Hoefkwartier will be reinforced. Due to better cooperation between existing innovation labs, insights on challenge based education will be shared which will contribute to new practices and projects in Hoefkwartier. Furthermore, with the involvement of more residents and companies based in the area, new challenges will be completed by students, researches etc. This will contribute to the sustainability of challenge based education in the area and enable more students to take part in challenge based education. With the collaboration with VET level 2-4 (ROCMN), students and teachers will also experience multilevel cooperation as well as facilitate group work for students from various study backgrounds. This will contribute to their generic skill development. On a more practical note, the organisation of challenge based education in Hoefkwartier will be improved, enabling an effective selection of projects, more insight in taught skills and a clear overview of project results.

#### **Evaluation report on adaption to another region**

##### **Timeframe for implementation**

1. Setting a clear intent to place a local innovation workshop in relevant grant applications.





2. Reaching an intentional agreement with the main stakeholder: usually a Municipality
3. Obtain permits and contracts for temporary placement of the innovation workshop. Also arrange electricity, water, sewerage, etc.
4. Develop vision and strategy for this specific innovation workshop
5. Make an inventory among the different types of end-users (residents, businesses, commuters, students) what issues are of concern to them in this area. Then determine whether these issues can be linked to any of our research.
6. Building up relationships with local residents and other stakeholders (ongoing process)
7. Building relationships and providing insight into this form of education with teachers and managers of the most relevant studies, in order to increase the likelihood of student participation (ongoing process)
8. From the first projects and inventories, select and validate the most urgent and appropriate themes. For now, these are:
  - a. Comfortable survival; a house without a safety net (micro)
  - b. The city as a closed ecosystem; working on closed circles (macro)
  - c. The creative neighbourhood living room; building a community (mesa)
9. For each theme, break down the larger and wicked issues into manageable and incremental sub-projects from Horizon 3 to horizon 2 or -1 (ongoing process)
10. Based on these sub-projects, start with student projects on each of these 3 themes to achieve the first results and create momentum
11. Generate a steady stream of projects and suitable communications on the outcomes and follow-up paths (next step)

## Funding

Funding is mostly project based by national or European funds, such as Erasmus+, National Grow Fund, SIA, KIA. To make sure all the different projects and outcomes are well managed and interconnected to each other, there is some overall funding available from the CoE.

For maintenance and upgrading of the building and its installations we focus on sponsorship of our business partners. Without falling back on sponsorships we would need €30,000 per year for maintenance, cleaning and upgrading of the facilities.

## Staff

Momentarily we have one programme leader (30 hrs/week), one project leader (10 hrs/week) and a Lab assistant will soon start for 8 hrs/week This is however a understaffed situation, for a well functioning innovation workshop we would also need two student coaches (16 hrs/week) and a communication and media member (16 hrs/week)

## Timeframe of activities carried out

This relies completely on the situation and thus varies from week to week. However: Every student project will have at least one hour of coaching at the start of every week, where the team of Celcius house will act as delegated question owner.



## Collaborations

- HU internal
- HU research groups Lectorates
- Other Educational institutions (Bouw- en Mediacollege, Campus Connect Center, College van Bestuur, Smart Buildings, MBO Amersfoort)
- Municipality
- Placemakers / Quartermasters/ others

## Learnings

Plans how to scale up:

- More collaborations with regional businesses, in long chains regarding one issue.
- Structural exchange and cooperation with VETs.
- Transition from successive projects, to overlapping approach; creating parallel project lanes.
- Expand communication, tailored to each part of quintuple helix.
- Secure overhead funding, in addition to project-based funding streams.
- The practice is partly replicable. The key to success is connecting to hyper-local issues and cultures and allowing them to shape the program, while ensuring our own knowledge and innovation agenda remains the guiding principle.

Criteria for success:

- Student success: Having students learning collaboration and innovation skills (such as analytical thinking, critical thinking, systems thinking, creativity and originality, converging and consolidating, resilience, ability to create or draw, complex problem solving, leadership and initiative).
- Company involvement: Building trusted relationships with regional organizations desiring long-term collaboration on innovative and sustainable solutions.



## 4.2 Schools competition of Shell Eco Marathon Europe - UPV

Participating by teams in the Eco-Marathon competition consists of traveling the maximum number of kilometers and consuming the least fuel. The teams are multidisciplinary and composed of students tutored by academics from their institutions. Initially, the competition was launched in Europe, but later it moved overseas. Shell's oil company organizes competitions and brings together the best universities and vocational training centers. The Universitat Politècnica de València (UPV) has participated in each Eco-Marathon Europe that Shell has managed since 2006.

Students from different backgrounds (computer sciences engineering, mechanical engineering, electrical engineering, business and administration management, chemist engineering) apply their knowledge to design, prototype, and compete in the Eco-Marathon Shell competition. The overall goal is to engage students in multidisciplinary teamwork to better understand/apply the contents of their studies from a practical perspective. The practice allows us to fill the content gaps in class (the content of the courses has been reduced), and now it is done with this practice. This competition encourages the training of highly competent future engineers due to the fieldwork carried out by being part of a real project like this. In addition, the evaluation of soft skills (transversal competencies) is made possible through this practice: Teamwork, Project management, sustainable development, and communication skills.

Regionally speaking, the Valencian region is the community that has the most Eco-marathon teams from Spain. A historical tradition of vocational training education in engines explains the sustained high number of teams participating in the competition annually. The teams come from Universitat Politècnica de València, (UPV), Miguel Hernández University (UMH) and vocational training centers.

There's an ecosystem of connected teams; the tutors share knowledge and have met and celebrated workshops (at the proposal of the vocational center of Marxadena) where they share experiences.

Also, it is a practice that is carried out locally but with an international dimension. The teams participate in an international competition that entails going to the place where the competition is held (not just the team members but also to deliver the car to the competition) and joining in a competition in which more than 3000 people participate, coming from all parts of the world. This practice generates a before and after in the life of the student. It also creates know-how: students are part of the team while they are UPV students, but when they graduate, they can continue to be part of it as alumni, which generates collaboration between people with different levels of training.

### Guideline

#### Description of current situation

At the present time (January 2024), the team is working on the next competition that will take place in France in May 2024. The team is planning the tasks pending from February (once the exam period of the first quarter is finished) until May. December 2023 was a month full of training for the team. It was essential to learn the basics of mechanics, electrical, electronics, and other key sectors for their car and competition. Senior students and guest lecturers provide the lectures. The importance of balancing knowledge among team members and increasing their technical, tech, and digital skills are of paramount relevance for solving any problem later during the countdown to the competition when time becomes a constraint.



## Improvement Actions

At the present time, the major risk of the good practice and something that requires improvement is its sustainability in the long run. This concept is explained as follows:

1. The high degree of interventionism from the tutor. Thus, dependence on only one person: the faculty advisor. If the tutor discontinues participating, the trained students continue for 2/3 years, but the sharing of know-how is not sustained.

### Improvement action:

Embedding the good practice in an institutional program of the UPV. This way, the continuity of the good practice will be guaranteed if and only if students are interested in participating. Currently, there is an institutional program, "Generación Espontanea" which allows students interested in working on any kind of project to receive funding in the form of facilities, equipment, and materials. This activity is extracurricular and tries to boost innovation and creativity. By participating in the program, the teams have access to funding twice per year, active participation in UPV fairs, and official recognition (certificate of participation in the program), which has been recently assessed as highly relevant by employers.

2. Financial risk: the raw materials and components are expensive. In addition, the team members must also travel to the competition and bring their own vehicles.

### Improvement action:

Embedding the good practice in an institutional program guarantees access to funding and official recognition; it creates an identity that can be used to introduce the good practice to third parties (external entities). At this time, UPV just launched (January 29 2024) the UPV Patronage program (<https://mecenazgo.upv.es>) to capture additional funding for projects started by students and academic staff at the UPV. There are multiple ways to generate additional revenue streams: crowdfunding platform, partnership agreements with companies, donations and more.

## Results of the Improvement

- The main indicator of success or improvement is the continuity in participating in the competition. Participating in the competition means that the "previous" work/efforts (organizing the team, planning, leading, controlling) have been done, and the team is ready to compete, so enough funding and proper work has been done.
- Technical improvement, which means being classified in the competition, means being able to run over 1000 km/l (which has not been achieved since 2015). At the present time, the score is around 800km/l. The more financial stability, the better the working conditions in the prototype. At the present time, the budget is highly limited, which has an impact on the results of the competition.
- Competition results improvement: If the previous 2 elements improve, the third one will be reached.

## Evaluation report on adaption to another region

### Timeframe for implementation

The practice (competition) is held once per year, but the teams work all academic year.



The easier way to implement the good practice would consist of calling for participation for students and other lecturers at the start of the scholar year to team up and start the planning & organization of the workload and responsibilities during the scholar year. Conveniently, the group is composed of students from the first to last year of the education programs to combine different levels of skill competencies.

Once the team is set, they will be able to register for the competition and understand the different stages & milestones to be able to make it to the competition. The competition is so well regulated/organized that the teams must work consistently throughout the year to be classified into the competition (usually in May or July).

Apart from the Eco-Shell Marathon competition in Europe, competitions are hosted on other continents. Still, those will require additional funding to make the team and the car travel to those locations.

The practice has been held in the region of Valencia since 2006 (22nd edition). There, the practice coincides with the Scholar academic since the registration for the competition starts in September, and traditionally, the competition takes place in June/July. Thus, the team building, starting with recruiting 1st-year students, takes place in September, coinciding with the start of classes.

### Funding

The success of the good practice relies on two pillars: the students' access to guidance from lecturers and the access to funding the materials, travel, etc., assuming facilities and equipment are already available for them. If those are not available, they would be the first financial need.

Also, raising funding is an activity students need to learn, and this practice allows them to learn how to finance a project, communicate effectively, and persuade others to donate funds for their project-based learning.

In the case of the UPV, when the practice was established, the search for sponsors was a task performed by the faculty advisor (tutor); also, the tutor taught students to elaborate a sponsorship brochure, and the senior team members currently are responsible for its update and donor campaign.

Later on, the practice was embedded in the institutional program Generación Espontanea (GE program). Then, the practice started being funded by the UPV. Thus, UPV finances the practice twice yearly throughout the GE program (January and September). Teams are asked to fill in a report defining their financial needs in accordance with their activities. The team's budget is split according to the projects presented (activities to be done). The GE program's financial resources vary each period. The budget is split into three elements:

- Budget for participating in events/competitions
- Budget for materials/ design and prototyping
- Other costs budgeted

Apart from this, Alcoy Campus provides additional funding. In addition to the UPV funds, the team has sponsors and keeps looking for more.

### Staff

This practice requires guidance. Mostly, the training students receive comes from the academic tutor and other peers. Since the academic tutor does not have a team and resources are limited, he has



implemented a strategy based on training the trainers model; senior students help first and second-year students as part of the team. The academic tutor supervises all of them.

It is advisable to have teams that cover the following activities:

- Logistics supervision: responsible for taking the vehicle to the place of the competition.
- Lab supervision: responsible for the equipment and materials of the lab.
- Threads & risks supervision: dangerous materials & activities require supervision to guarantee students' safety.

### Timeframe of activities carried out

As it was explained in section 4.1. the practice (based on the international Eco Shell competition) is held once per year, but the teams work all academic year. The practice has been held since 2006 (22nd edition). The practice coincides with the scholar academic since the registration for the competition starts in September and takes place in June/July. Thus, the team building, starting with recruiting 1st-year students, should occur in September, coinciding with the start of classes. Once the team is built, the responsibilities, work, and duties are split among the team members. Traditionally, due to the scholar year organization, the team works from September until December. After the Christmas holidays, there is a break due to exams, and from February, students are back to work on the project until May or July.

### Collaborations

It is interesting to implement this practice at different universities and VETs. The inter-center collaboration will enhance the development of the regional ecosystem. Also, the university students can train the VET students, who will be potential future student participants in the team when they join the UPV. This takes place in the Valencian region even when the collaboration has been unplanned and responds to a bottom-up strategy resulting from the personal interaction between the academic staff from UPV and local VETs.

Also, the team is creating its own stable portfolio of sponsors (companies that provide materials and/or financial funding to the team). Apart from Shell, who is acting as the most relevant sponsor there are other companies such as Textrem (firm), Loctite (firm), Gurit (firm), Cadena Moblat (firm), Mecanizados XYZ (firm), Xuquer/Copitermo (firm).

### Learnings

In the particular case of Valencia, the practice is characterized by a high degree of interventionism from the tutor, which means the practice's success depends on only one person: the faculty advisor. If the tutor discontinues participating, the trained students continue for 2/3 years, but the sharing of know-how is not sustained.

Secondly, paying attention to workplace hazards, such as occupational risk in vehicle body care, is important. Students must always be accompanied; there is dangerous machinery.

Thirdly, paying notice to the financial risk is important: the raw materials and components are expensive. In addition, the team members must also travel to the competition and bring a vehicle.

Apart from that competition in Europe, there are other competitions to be hosted in other continents, but those will require additional funding to make the team and the car travel to those locations.



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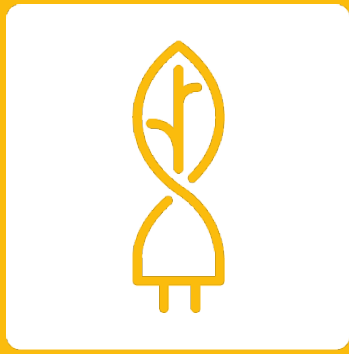
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