Evaluation report: Financials and Funds

Deliverable 4.3 Good Practices on Governance and Finance

Kozani, Utrecht, Valencia, Turku, Bochum

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SEED

sustainable energy education

Document history

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Summary sheet

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Summary	Work Package 4 is tasked with describing and implementing identified good practices, aiming to apply several regional best practices internationally by project completion. To achieve this, a thorough assessment of practices against regional requirements is crucial. Concurrently, other work packages are developing regional profiles. This comprehensive approach allows for the effective matching of best practices to compatible regions. A detailed framework for describing these practices is essential for success. Improvement strategies have been formulated to assist regions in overcoming implementation barriers, while owners of identified practices offer practical suggestions to facilitate adoption by other regions. Good Practices in Governance and Finance are essential for regional development in higher education and vocational training, particularly in energy education, ensuring efficient resource allocation, transparency, stakeholder engagement, financial sustainability, and fostering innovation. These practices drive positive outcomes for both education and regional development.

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.

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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 Governance and Finance are vital for regional development in higher education and vocational training, especially in the field of energy education. They ensure efficient resource allocation, promote transparency and accountability, support strategic planning and policy formulation, facilitate stakeholder engagement, ensure financial sustainability, and foster innovation and adaptability, ultimately driving positive outcomes for both the education sector and regional development as a whole.

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 on D4.4-1, making full use of EU financial instruments and funds. Chapter 3 discusses D4.4-2, developing sustainable financial models that combine public and private funding. Each chapter starts with a description of the 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. D4.1-1 Making full use of EU Financial Instruments and Funds

This chapter discusses two good practices. It starts with a good practice on EU financial instruments and funds to support cohesion policy and the just transition. The second paragraph will discuss the good practice Sustainable Energy Impact.

2.1 EU financial instruments and funds to support cohesion policy and the just transition (CLUBE)

The good practice titled "EU financial instruments and funds to support cohesion policies and to enable just transition in EU regions" involves leveraging EU financial instruments to promote and support green employment for engineering and technical employees within the Hydrogen Value Chain. In that direction, an innovative new Hydrogen Skills Strategy aims to facilitate the upskilling and reskilling of students and the technical local workforce and reorient them to greener practices and professions. That will be done by addressing the ever-increasing Green Skills gap and by ensuring that the European Renewable Energy sector can meet the challenging targets of the Green Transition. Subsequently, the strategy as a tool and as a good practice can assist the Region of Western Macedonia through its transition phase that contains multiple sustainability challenges at different levels such as decarbonisation/de-industrialisation, poverty, unemployment, and social exclusion, to name a few.

This practice promotes the collaboration between academia and industry. This collaboration helps to identify the needs and concerns of different industry stakeholders, and to develop solutions that are tailored to their specific circumstances. Education and training are essential components of the green transition and employment in the hydrogen sector. In the Region of Western Macedonia, education and training programmes are being developed to provide workers with the necessary skills for jobs in renewable energy, energy efficiency, and other low-carbon industries.

Guideline

Description of current situation

In addressing the critical need for green skills in the evolving energy sector, significant steps have been made towards the development of new capacities, particularly in the context of promoting and supporting green employment within the Hydrogen Value Chain. The project detailed below outlines the efforts to bridge the green skills gap, ensuring the European Renewable Energy sector is poised to meet the ambitious targets of the Green Transition. This project is particularly important for the Region of Western Macedonia, as it supports their decarbonisation efforts while addressing the socio-economic challenges associated with transitioning from lignite-based industries. In that direction, an innovative new Hydrogen Skills Strategy aims to facilitate the upskilling and reskilling of students and the technical local workforce and reorient the local workforce to greener practices and professions. That will be done by addressing the ever-increasing Green Skills gap and by ensuring that the European Renewable Energy sector can meet the challenging targets of the Green Transition. In that direction, the strategy as a tool and as a good practice can help the Region of Western Macedonia decarbonisation effort while simultaneously mitigating the consequences of this transition, including the risks of poverty, unemployment, and social exclusion, from lignite-based industries.

The practice promotes the collaboration between education and industry using EU funds. This collaboration helps to identify the needs and concerns of different industry stakeholders, and to develop solutions that are tailored to their specific circumstances. Education and training are essential components of the green transition and employment in the hydrogen sector. In Western Macedonia, education and training programmes are being developed to provide workers with the necessary skills for jobs in renewable energy, energy efficiency, and other low-carbon industries.

The "urgent trainings" conducted in Greece were specifically designed for occupational profiles impacted by the Energy Transition in the Region of Western Macedonia. These training initiatives were designed to provide upskilling and reskilling opportunities for both undergraduate and postgraduate students, as well as engineers and technicians. The main goal was to equip them with the necessary skills and knowledge to pursue careers within the hydrogen value chain.

Within this context, three urgent training programmes were organised in the Region of Western Macedonia, Greece, by the Cluster of Bioeconomy and Environment of Western Macedonia (CluBE) and Advent Technologies, collaborating with the University of Western Macedonia. These training programmes had significant interest, drawing a large audience due to the valuable opportunities they offered for upskilling, reskilling, and knowledge exchange among speakers and participants.

The first cycle consisted of three trainings:

- "One-Day Hydrogen" Masterclass
- "Hydrogen Summer ScH2ool"
- "Engineering our Future: Developing Hydrogen Skills"

Training programmes focused on upskilling and reskilling in the hydrogen sector are deeply rooted in the global transition towards sustainable energy solutions. As hydrogen's potential gains increasing recognition as a clean and versatile energy carrier, the demand for skilled professionals in this field is growing. Reskilling and upskilling training programmes aim to enhance or acquire new skills and knowledge among the workforce and young people to address the challenging goals set for the Declining Sectors and Transition Regions. The primary objective is to bridge the skills gap and ensure that the workforce is acquiring the necessary competencies and skills in designing, implementing, and maintaining hydrogen technologies.

The "urgent trainings" were directed towards specific target groups, including both undergraduate and postgraduate students, along with engineers and technicians who are impacted by the ongoing energy transition. The Masterclass: "One-Day Hydrogen" was the first training programme, providing comprehensive coverage of the entire hydrogen value chain. This included the role of hydrogen in the energy transition within the Region of Western Macedonia and the establishment of a Pan-European Hydrogen Industry Hub. The content of the Masterclass aligned with the goal of achieving a carbon-neutral economy by 2050. Participants had the opportunity to analyse various aspects, including the characteristics of hydrogen as a leading carbon-free candidate, hydrogen production, transport, storage, and end-use application. The training also delved into the technological, economic, regulatory, and safety contexts, positioning hydrogen as a critical player in the global energy transition. The Masterclass: "One-Day Hydrogen" was addressed to a diverse audience, including professionals within and beyond the energy sector. This particular training programme was well-suited for professionals seeking a deeper understanding of the hydrogen value chain and had 70 participants. The Masterclass: "One – Day Hydrogen" led to the following more specialised "urgent trainings".

The second training programme, the "Hydrogen Summer School," was designed for undergraduate and postgraduate students from Greek institutions. 78 students, interested in hydrogen technologies, took part in the training. This programme offered a more in-depth knowledge, aiming to expand participants' knowledge and skills in the rapidly evolving hydrogen sector. Covering topics such as hydrogen technologies, electrolysers, fuel cells, safety issues, "H2-to-X" technologies, and funding opportunities, the Summer School also included practical elements like a workshop on creating a hydrogen start-up company and a round table on establishing a Hydrogen Valley in Western Macedonia. Study visits to the Laboratory of Alternative Fuels and Environmental Catalysis (LAFEC) at the University of Western Macedonia and the Centre of Research and Technologies (CERTH)/Chemical Process & Energy Resources Institute (CPERI) in Thessaloniki enriched the learning experience.

Finally, the "Engineering our Future: Developing Hydrogen Skills" training programme was implemented for the engineers of the Technical Chamber of Greece/Department of Western Macedonia (such as chemical, mechanical, civil, and electrical engineers), with the participation of 36 engineers. It was conducted in collaboration with the Technical Chamber of Greece/Department of Western Macedonia. Designed for engineers who want to upskill and reskill, this programme addressed Just Transition and expedited decarbonisation in the region of Western Macedonia. Topics covered included the current status and challenges of hydrogen technologies, utilisation properties, safety issues, and Advent Technologies' fuel cell systems. The training emphasised the innovative "HT-PEM" fuel cell technology's ability to replace polluting diesel generators, providing clean power across various sectors, including marine, automotive, and aviation.

The aforementioned trainings were very successful, as the total number of participants in these trainings was more than 150, which was the declared KPI. More specifically, the KPIs set for the trainings were: Masterclass=50 participants (70 actually participated), Summer School=70 (78 actually participated), Upskilling Seminar=30 (36 actually participated). A second training cycle is being currently prepared and will be launched in the Summer of 2024.

As the pilot trainings are now being formed, the material is not yet available. However, the presentations and the material from the "urgent trainings" that have already taken place are uploaded on the "Green Skills for Hydrogen" project website. They can be easily accessed by registering on the website: https://greenskillsforhydrogen.eu/

Improvement Actions

In the coming months, a pilot Training will be developed by Advent Technologies in collaboration with CluBE. Advent Technologies is a company that develops advanced hydrogen production and storage solutions to enable the widespread adoption of hydrogen as a clean energy source. These technologies have the potential to revolutionise industries such as transportation, industrial processes, and power generation. The pilot training is expected to build upon the "urgent trainings" that have been done so far. Trainings offered by Advent Technologies are specific to hydrogen technologies for the whole value chain and designed for engineers, scientists and technical workforce, affected by the green transition or other categories interested in the energy sector. More specifically, they focus on:

- Introduction to fuel cells (technology and market);
- HT - PEM Fuel cells (introduction, components, properties, operation, thermodynamics, electrochemistry, chemistry);

- Development of membrane-electrode assemblies for PEM fuel cells systems, electrodes with improved catalytic activity and electrochemical stability;
- Hydrogen and fuel cell applications;
- Introduction to Alkaline Electrolyser Cells (AEC);
- Hydrogen Economics.

The plans for improvement could evolve around 5 major pillars. Namely:

- Diverse Target Groups: By expanding the target audience beyond just professionals and engineers to include technicians and a wider range of individuals interested in the energy sector, the training programme could become more inclusive and relevant. This could facilitate the just transition to various professions, ensuring that a larger group of people can benefit from it.
- Lifelong Learning and Adaptability: The emphasis on lifelong learning through continuous workshops, webinars, and mentorship programmes ensures that participants remain competitive and adaptable as technology and innovation evolve. The programme will not only equip individuals with initial skills but also support their ongoing development throughout their careers.
- Curriculum Customisation: Creating a feedback loop with participants to modify the curriculum based on their experiences will lead to a more tailored and effective training programme. The content will become more aligned with the specific requirements and career goals of the participants, enhancing the learning experience and outcomes.
- Stronger Industry Connection: Involving representatives from various industries and companies in the development of training programmes will bridge the gap between academia and the labour market. This collaboration will make the training content more practical and relevant, potentially leading to internships and job placements for participants, directly contributing to their career success.
- Enhanced Accessibility: Expanding the training programmes to different locations within the Region and offering asynchronous online or hybrid options will make it easier for more people to access the training. This accessibility improvement will ensure that individuals with various constraints, such as work commitments, can participate in the programme.
- Knowledge Sharing and Community Building: The involvement of a digital platform for knowledge sharing and networking will create a strong community of practice in the hydrogen sector. People will be able to exchange ideas, share experiences, and build valuable connections, fostering continuous learning and collaboration.

Results of the Improvement

The implementation of the aforementioned plans is expected to yield significant benefits, focusing on inclusivity, adaptability, and practical relevance. By broadening the target audience, the programme becomes more inclusive, attracting a diverse range of participants from different backgrounds and expertise levels. Consequently, this diversity is expected to enrich the learning environment and foster innovative solutions. Furthermore, a new commitment to lifelong learning through continuous workshops and mentorship will ensure that the participants will remain competitive, enhancing career opportunities within the rapidly evolving energy sector. Additionally, the involvement of industry representatives in curriculum development bridges the gap between education and the labor market, making the training more relevant and increasing job placement opportunities. Moreover, expanding access through online and hybrid formats addresses various constraints, will allow wider participation. Finally, a digital platform for knowledge sharing and

networking will encourage community engagement, leading to a collaborative and innovative sector. These plans are not only anticipated to enhance the effectiveness of the current training programmes but also contribute to the development of a skilled and adaptable workforce, ready to meet the challenges and opportunities within the hydrogen energy sector, which aligns closely with the Region's development goals. Success will be reflected in the increased number of skilled professionals entering the hydrogen sector, contributing to the region's economic development using sustainable practices and leading to a fossil free economy.

To measure the success of the improvement of the Good Practice, the following Indicators have been set:

- Participants Numbers: Aim for 200 or more participants annually.
- Increased Participant Diversity in Terms of Academic Backgrounds: Enhance the diversity of participants by including more varied academic backgrounds. Target: Achieve a broader academic representation by 20% within 5 years.
- Positive Feedback from Participants: Evaluate through questionnaires to assess training relevance and effectiveness. Target: Achieve an greater feedback score every year.
- Higher Engagement with Industry Partners: Number of collaborations and opportunities for participants. Target: Year-over-year increase in engagements.
- Lifelong Learning Engagement Rate: Annual engagement in workshops and webinars. Target: Year-over-year increase in participation
- Curriculum Customisation Feedback Score: Satisfaction scale (1-10) for curriculum relevance. Target: Average score of 7 or higher.
- Accessibility Improvement Measure: Enrollment increase due to more accessible options. Target: Enrollment increase by 15%.
- Qualitative Assessment of Participant Satisfaction and Engagement: Through surveys, focus groups, assessing various programme aspects.
- Curriculum Relevance and Customisation Feedback: Feedback on alignment with industry needs and career goals.
- Feedback from Industry Partners: Industry feedback on the quality and relevance of the training outcomes.

Evaluation report on adaption to another region

Timeframe for implementation

The development of this good practice comprises of two parts, namely its conceptualisation and its implementation. More specifically, in the context of the European Green Deal, given that the rapid development of the European Hydrogen Value Chain over the coming years is expected to generate a great number of new jobs, the need for the development of a skilled workforce in Europe for this new economy was emerged. This need led to the conceptualisation of a European Hydrogen Skills Alliance, comprising of partners in 15 European countries, focused on designing and implementing a highly innovative, effective, and sustainable Hydrogen Skills Strategy for Europe that will ensure the skills needs of the Hydrogen Value Chain can be met in the short, medium, and long term. Furthermore, this blueprint would address the skills need of workers in Declining Sectors and Transition Regions to provide them with upskilling and reskilling opportunities within the Hydrogen sector. The formation of the consortium was made in less than a month, and the writing of their proposal took almost three months under an Erasmus+ project call for proposals.

After the successful funding of the "Green Skills 4 Hydrogen" project, the implementation of the "urgent trainings" in the Region of Western Macedonia, followed a different timeframe for each specific training.

Masterclass: "One-Day Hydrogen"

The preparation for the Masterclass: "One-Day Hydrogen" began approximately one month prior to the event. The training being open to everyone without the need for a registration process enabled the entire planning and promotional phase to be effectively completed within that short period. This approach facilitated broader accessibility and minimised the administrative load, allowing the organisers to focus on content and logistics to ensure a successful event. The first step, about four weeks prior, involved the creation of promotional materials like teasers, posters, and social media posts. At the same time, the 8 keynote speakers from academia and industry were invited to a meeting to discuss about the Masterclass's concept and contents, which followed by bilateral meetings to finalise each speakers' presentation topic.

As the event date approached, the venue was secured through communication with the University of Western Macedonia three weeks before. Promotion through local media and CluBE's social media platforms started at the same time, to achieve a broad dissemination of the Masteclass. Furthermore, catering arrangements were confirmed two and a half weeks in advance, addressing the logistical needs for the day. With two weeks to go, speakers were engaged, focusing on the finalisation of their presentations and the event's overall content. The event's agenda took shape one and a half weeks before, marking the final stages of preparation. Graphic design work for event banners and the procurement of necessary technical equipment were finalized a week before, ensuring a professional setting for the presentations. In the final days leading up to the event, the university's public relations department helped disseminate information to students, enhancing attendance.

After the event, the organizing team conducted an evaluation to collect the total of 70 attendees' feedback, which indicated a significant enhancement in their comprehension of hydrogen energy concepts. This step is very important for refining future initiatives, ensuring that the training continues to meet educational objectives efficiently.

Hydrogen Summer School

The preparation for the Hydrogen Summer School started four months before the week of the event, reflecting the event's extensive scope. The necessity for a registration form, alongside a more extensive promotional and organizational effort, was warranted given the scope and duration of this week-long programme. This comprehensive approach also involved collaborations across academic, research, and industrial sectors to finalize speaker topics, securing sponsorships, and logistical arrangements such as catering and transportation for both the event and an educational excursion to the CERTH facilities in Thessaloniki. The preparatory phase started with the creation of promotional materials and establishing communication channels for registration, reflecting the structured approach to engage participants early on. Approximately three months prior, venue arrangements were confirmed with the University of Western Macedonia, alongside the commencement of promotion through various channels to ensure broad reach.

Two months before the event, the load of preparations increased with the engagement of speakers from the academic, research, and industrial sectors, alongside securing sponsorships and logistical planning for catering and transportation, including a bus rental for a study visit. This phase also included the preparation of presentations and the event agenda, with graphic design work for event

banners and technical equipment, enhancing the professional setting. In the final month, promotional efforts extended through university public relations departments, leading in an event that attracted 78 participants and featured 35 speakers, showcasing the international collaboration. Following the event, an evaluation form was also distributed to gather feedback, which led CluBE to establish the organization of such summer schools yearly, as a response to the great participants' feedback.

Engineering our Future: Developing Hydrogen Skills

The detailed planning and execution for "Engineering our Future: Developing Hydrogen Skills," in collaboration with the Technical Chamber of Greece/Department of Western Macedonia, initiated two months prior to the event. The process began with the creation of promotional materials and securing the venue through the Technical Chamber. Promotion on local media and CluBE's social media platforms commenced 6 weeks before the event to attract as many participants as possible. Speaker engagements from the academic and industrial sectors were confirmed 5 weeks prior, with the event agenda and presentation preparations underway. Coordination for necessary technical equipment with the Technical Chamber was confirmed 4 weeks before the event. An intensified promotion within the Technical Chamber was conducted 3 weeks prior to ensure maximum attendance by member engineers. Final preparations were reviewed 2 weeks before the event, leading to a successful day with 36 participants and 4 speakers, as demonstrated by the collection of feedback through the necessary evaluation forms.

Organisational Aspects

Organising such events involves a detailed, step-by-step approach to ensure success and achieve a great impact. Initially, it is crucial to clearly define the event's objectives, scope, and target audience, which helps tailor the content and choose suitable speakers. Early selection of the venue and date is also essential to avoid scheduling conflicts and secure desired locations. Furthermore, developing engaging promotional materials requires collaboration with creative teams to create teasers, posters, and social media content that resonate with the target audience. In addition, engaging speakers early on ensures a diverse and high-quality lineup, enriching the event's educational value.

For all these events, a registration form is very helpful to manage attendance and plan the logistics accordingly. More specifically, coordinating logistics, including catering and technical requirements, is vital for a smooth execution. This also includes ensuring the availability of necessary equipment like microphones and projectors for a professional presentation setting. Moreover, a broad promotion strategy, utilising local media, social media, and partnerships with relevant organisations, ensures maximum outreach and engagement. Finalising the event agenda and presentations well in advance allows for a structured and informative session.

Feedback collection post-event is crucial for continuous improvement, offering insights into the effectiveness of the content and organisation. This comprehensive approach, focusing on detailed planning, engagement, and evaluation, is essential for the success of educational events in the hydrogen energy sector.

Staff

To implement and sustain this Good Practice, a multidisciplinary team with specific roles is critical. The Project Manager is responsible for the whole project. This role is responsible for guiding the initiative towards its goals, managing resources effectively, and facilitating communication among team members and stakeholders to ensure the project's success. Moreover, an Education and

Training Coordinator is fundamental in crafting the educational content, aligning it with industry needs, and coordinating with speakers and trainers to deliver high-caliber training. Simultaneously, the administrative Staff is addressing the day-to-day operations, managing logistics, and maintaining communication lines. The financial oversight of the trainings is provided by the Financial Officer, responsible for tracking expenditures, acquiring sponsorships and managing financial resources.

In addition, the Marketing and Communications team is responsible for the public face of the initiative, creating engaging promotional materials, and orchestrating outreach efforts to amplify the initiative's message across media channels. During the events, the Technical Support Staff ensure that the technological aspects are faultless, managing equipment and providing immediate solutions to any technical issues that arise during events.

Last but not least, even though they can't be included in the "Staff" category, the keynote speakers are essential for each training. The speakers of the "urgent trainings" described above, were approximately fifty in total and included professors from Greek universities (University of Western Macedonia, Aristotle University of Thessaloniki, National Technical University of Athens), as well as European academic institutions (KIT - Karlsruhe Institute of Technology, University of Genoa). Furthermore, among the speakers were representatives of industrial companies related to the hydrogen and fuel cell technologies sector (Advent Technologies, Hellenic Hydrogen, Motor Oil, DESFA, DEPA, Helbio), research institutions (CERTH/CPERI, FORTH/IG), start-up hydrogen companies (B-Hydrogen) and European associations (Hydrogen Europe, Clean Hydrogen Partnership/Joint Undertaking). This collective effort ensures the initiative not only meets its educational objectives but also fosters a vibrant ecosystem for hydrogen and fuel cell technologies.

Timeframe of activities carried out

There is no regular timeframe for the good practice. The project started on July 1st 2022 and ends on 30th of June 2026. The different classes run several days. The One-Day Hydrogen Masterclass runs - as the title suggests - one day. The Hydrogens Summer School runs five days, and the Engineering course lasts two to four days. The project is funded by the European Union through the Erasmus+ program. Figures 1-3 show a roadmap of the preparations of each event, as mentioned in the 4.1 section.

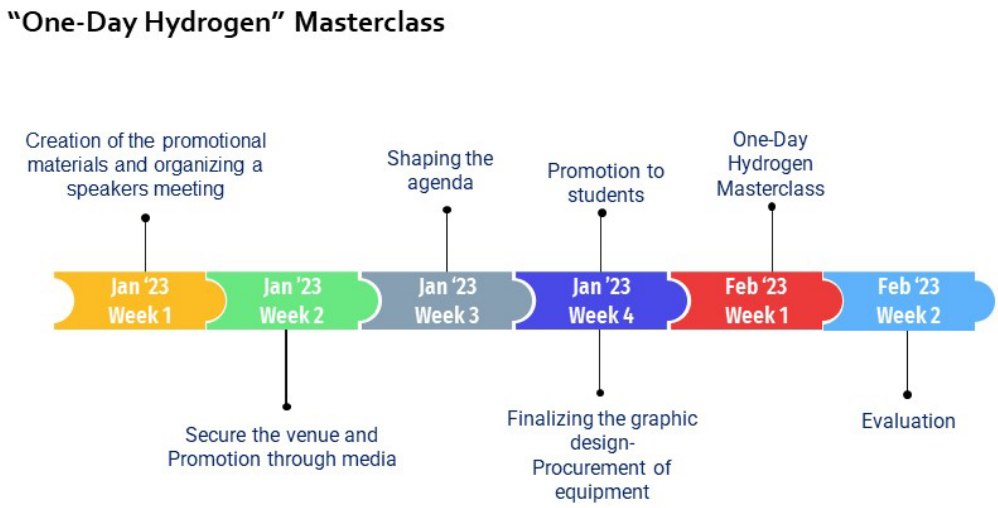


Figure -1 "One-Day Hydrogen Masterclass" preparations

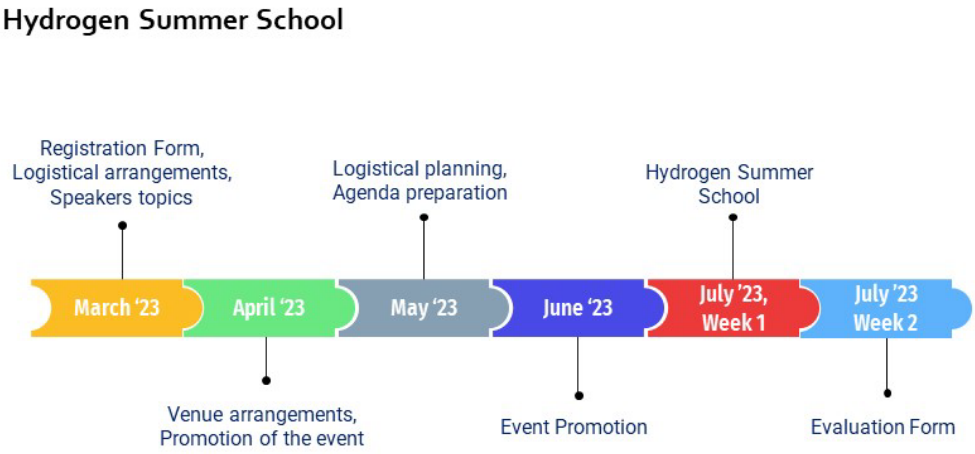


Figure 2- "Hydrogen Summer School" preparations

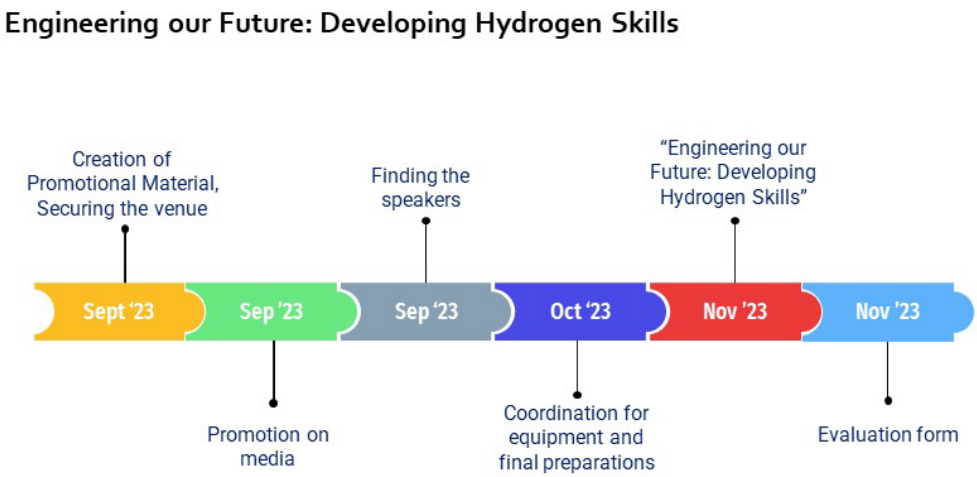


Figure -3 "Engineering our Future: Developing Hydrogen Skills" preparations

Collaborations

For the implementation of this good practice there is a collaboration between the Cluster of Bioeconomy and environment of Western Macedonia - CluBE, Advent Technologies, the University of Western Macedonia and the Region of Western Macedonia.

The previously noted key implementers feature professionals in distinct positions, with certain roles and responsibilities, where they excel in. More specifically, CluBE and Advent Technologies are responsible for the organisation and the conduction of the trainings in Greece, in Western Macedonia. The University of Western Macedonia is co-organising the trainings, while these are also conducted with the support of the Region of Western Macedonia. The collaboration between these partners is crucial and necessary for the implementation of the "urgent" and pilot trainings in Western Macedonia. CluBE, as a regional cluster, through its activities and stakeholder engagement actions, contributes significantly to the organisation of the trainings. Advent Technologies facilitates the effective implementation of the good practice in the region, since the company's personnel participate as speakers/trainers to the trainings, and they provide the industrial perspective from their experience in fuel cell manufacturing technologies. Furthermore, the University of Western Macedonia, from an academic perspective, is important to have an active collaboration with CluBE and Advent Technologies, since the target group of the trainings includes the undergraduate and postgraduate students of the engineering departments of the UoWM and the trainings take place in the premises of the university. Through their collaborations, the partners achieve the effective and successful upskilling and reskilling of the students and the regional workforce, and they have the opportunity for knowledge exchange between them.

Learnings

One main challenge was to raise public awareness. This is considered important in order to increase local enthusiasm and stimulate self-mobilisation and action. Given the transition process that the region is going through, it is crucial to develop a level of ownership to the local society, in the sense of

upskilling and reskilling are directly related to their future. Awareness is more important than persuasion. Another great challenge is related to the necessary expertise. Given that depopulation is a big issue in the region– the efficient implementation of the proposed trainings also requires skilled and trained trainers. Finally, the development of new modules and curricula will be cornerstones to upskill and reskill the workforce already involved in the hydrogen ecosystem, and to train young people to work in this increasingly expanding sector.

More emphasis should have been placed on stakeholder engagement, promoting the collaboration between education and industry. This collaboration helps to identify the needs and concerns of different industry stakeholders, and to develop solutions that are tailored to their specific circumstances.

Among the actions that could be taken by others who intend to adopt the good practice could be the promotion of European curricula for hydrogen and the development of common European certifications and standards for hydrogen training. Education on hydrogen should start by developing hydrogen textbooks for educators in lower levels of education. Designing innovative approaches for training and education along with "Train the trainers" programmes can help improving up- and reskilling opportunities in hydrogen sector. In addition, cooperation and communication between the different stakeholders involved are strongly encouraged, including local authorities, businesses, educational institutions and VET training providers. When designing the strategy, someone should also consider the need for continuous training and support, to ensure the necessary skills are developed and maintained. It is also important to develop a comprehensive strategy for the use of EU funds and financial instruments to support the upskilling and reskilling process in the different regions, considering the need for skills development and the potential for green job creation.

The practice could be replicated or scaled up in a different region. The key elements of the practice include orienting it towards sustainable economic activities. This could be tailored to the needs of different regions, such as the Region of Western Macedonia, that the green skills development could be contributed to the transition to a more sustainable society. This transition will require hydrogen at large scale, and in particular clean hydrogen. For this reason, the project will provide these regions with upskilling.

2.2 Sustainable Energy Impact (BUAS)

Sustainable Energy Impact (SEI) is a project that uses the problem-based learning (PBL) methodology. While working on real life problems, students gain knowledge in the field of sustainable energy. The focus is on sustainable energy for Sub-Saharan Africa. Currently, the concrete tasks cover the topics Life-Cycle-Analysis (LCA), as well as solar mini-grids and hydrogen technology making non-financial impact of the project tangible. The output of students' work is not meant for theoretical matters but has a real impact on ongoing research projects that are connected to SEI. The tasks in SEI are an integral part of these applied projects and the students' results will have a direct influence on the project implementation in Ghana (impact). Therefore, SEI offers participants not only the chance to work on ecologically and socially relevant business models in innovative fields of technology, but also provides them with the unique opportunity to gain experiences in working in an international research environment with real world impact. The main goal is that students should be able to gain practical experience in ongoing international research projects.

Guideline

Description of current situation

At the moment, the students in the project study are still working on their semester assignments and we are supervising them. The students' current task is to create a Life Cycle Sustainability Assessment (LCSA) of the PV modules used by us in the GH2GH (Green Hydrogen for Decentralised Energy Systems in Sub-Saharan Africa) research project at the Sustainable Technologies Laboratory. There are few difficulties at the moment, as the students have been very well prepared for their task, only need a little guidance and, judging by the current status, will achieve a very good result.

To evaluate the project studies students are given an evaluation survey at the end of each semester. Additionally, we created and sent out a survey recently to evaluate all offered problem-based learning courses at our university including SEI.

Improvement Actions

Our main goal is to provide practical experiences and problem solving competencies for students while simultanously demonstrating sustainability for impact-oriented investors. To implement this, it is important to promote empirical research in Bochum. Currently, we have limited opportunities as the workshop space is being utilized by other projects. We are working on creating space for SEI and acquiring the necessary equipment. Next semester, we plan to conduct a life cycle analysis for a fuel cell from the GH2GH project. Even though we are likely to receive a used fuel cell, we need accessories for the analysis. In addition to the hardware, we also need to develop technical competencies for the analysis. Methodological competencies, particularly in problem-oriented learning, are also targeted for improvement.

The internationalization of teaching is also being advanced. SEI will be integrated into the curriculum of our partner university, Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi, Ghana, next semester. Previous issues with the lack of motivation among students from partner universities are being addressed by offering credits. A concept for better structuring of collaboration has been discussed and needs to be documented. In addition to digital collaboration, we aim to facilitate in-person exchanges. A funding application has been submitted to support travel for students and mentors. Thanks to our membership in the NRW-Ghana Alliance, two students from partner universities in Ghana were able to participate in a two-week "Winter School" in Germany.

To sum up, we would like to enhance the empirical research in Bochum, which means that we want to facilitate the access to the workshop for SEI students and for the project study in general, and additionally we would like to acquire the necessary equipment. Further, we would like to reinforce the internationalization of SEI, through the integration of the project study into the curricula of our partner universities, supported by the written documentation of an improved collaboration concept.

Results of the Improvement

The potential outcome of our improvement ideas results in maintaining a high number of applications for SEI, allowing us to form teams in an interdisciplinary manner as desired in the PBL concept. Our goal for the further development of SEI is to establish a dedicated and well-equipped space for empirical research in our workshop. This will enable students to work not only digitally but also analogously. We view this as crucial didactic improvement that will significantly enhance students' experiential learning.

The concept for cooperation with partner universities in Ghana should be documented and actively implemented. The collaboration should function smoothly, providing students from both countries with the opportunity to gain valuable experiences through international collaboration, both digitally and in-person.

Lastly, we aim to elevate the professional and methodological competence of instructors to a very high level. This is intended to maximize student learning outcomes and increase the number of publications and theses.

Evaluation report on adaption to another region

Timeframe for implementation

In the first step, subject areas with problems are presented and described (task description). In the second step, gaps in the students' knowledge for solving the problems are identified. During the semester, these knowledge gaps are filled with content-related contributions by lecturers from academia and practice. This also includes visits to companies and trade fairs. The necessary methodological knowledge is taught in parallel to the work on the problem. This can be the application of LCA software, methods and tools for scientific work, scenario technology or technical expertise.

During the semester, students must pass two interim meetings and a final meeting in which they summarise the results in a milestone report. They receive feedback at these meetings.

In our view, the SEI course can be quickly adapted to a university or educational institution within a period of one year. However, funding is required for implementation. Most of the costs are for the teaching staff who organise the course and the lecturer who brings the experience. In some cases, funding is required for prototypes, publications or travelling, which may be necessary on a case-by-case basis. Depending on the complexity, implementation can take place within a year and be adapted over time. If several external and international partners are involved, the preparation and implementation phase can also take longer. The course should be anchored in the curriculum or issued as a certificate for company employees.

Funding

The funding is an internal university funding pot for quality improvement measures. This funds a staff position that SEI manages each semester. Additionally, depending on topic funds e.g. for material or travel cost could occur.

Staff

The position is currently filled by a research assistant who works 20 hours per week. If there was more staff, additional tasks, such as public relations and communications, technical matters, etc., could be realized. An additional experienced lecturer is required.

Timeframe of activities carried out

The project study runs - content wise - for one semester. Since the PBL approach is applied in the project study, the focus changes every semester with a new group of students. The focal point for the students' tasks for each semester is found within the projects at our laboratory. Problems for the PBL course are usually designed around real-world problems arising from the scientific projects.

Collaborations

There are collaborations with Kwame Nkrumah University of Science and Technology (KNUST) and University of Energy and Natural Resources (UENR) in Ghana. SEI is currently collaborating with the research project GH2GH and is supported by the partner companies Green Power Brains, SFC Energy and Don Bosco Solar and Renewable Energy Centre.

Collaborations are not necessary; however, it is an advantage to make use of collaborations. This way the students receive a realistic task with actual impact. It is also useful to collaborate with partners, that can provide us with technical tools and workshops, where our students can conduct empirical research.

In the case of internationalization, it also makes sense to collaborate with companies or universities abroad, in order to start comparative studies or to build long term partnerships and an international network.

Learnings

A few recommendations would be to keep the size of the learners' groups at a moderate level. A scale that has been proven beneficial for us was one "moderator" (teacher) per group of six students. In the previous semester, the demand for SEI was higher, which is why we decided to split the funding on two teachers, but therefore accept 12 students.

Another recommendation would be to start on a small scale: if you already run bigger projects, see if there is a certain issue within those projects, that needs a more intense solving. Dedicate this issue to a group of students, who will have the chance to solve this issue within one semester. It makes sense to start with an introduction to the concept of project studies and the problem-based learning approach, so that students understand what is expected from them. And then present the problem, that needs solving. The rest of the task is to guide the students while working on the project rather independently. Also a lot of work needs to be put in the design of the problem, that the students are working on. When problems are directly adopted from the research projects, they might be too complex, unstructured, or abstract, which leads to excessive demands and frustrations among students.

Implementing a project study is an efficient way to combine practical learning methods with solution-oriented work.

A challenge could be to implement this into the university's curriculum. At Bochum University of Applied Sciences, we have a module dedicated to project studies, which means that students from the sustainability study programs must partake a project study anyway. SEI is offered within the scope of this module.

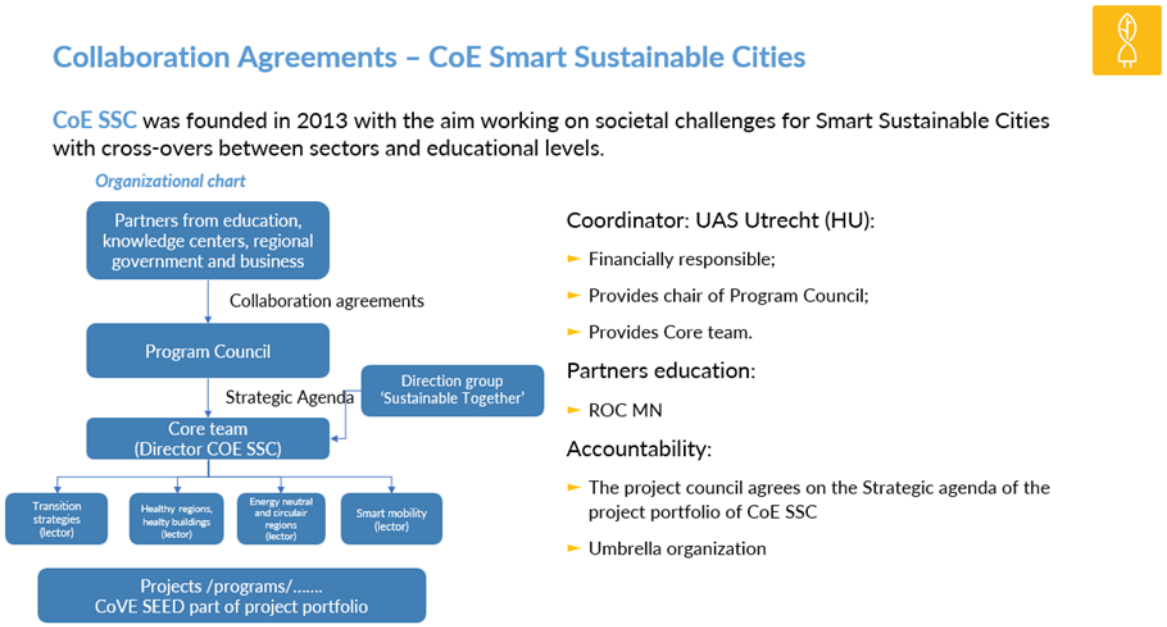
3. D4.4-2 Developing sustainable financial models that combine public and private funding

This chapter describes two good practices concerning sustainable financial models combining public and private funding. The first good practice explains the public private partnership model of CoE, whereas the second good practice is about the Machine technology centre in Turku.

3.1 Public Private Partnership model CoE (HU)

The Centre of Expertise Smart Sustainable Cities (CoE SSC) is a platform for business, knowledge institutions and Utrecht University of Applied Sciences. This team, drives and directs activities in which professionals, researchers, lecturers, and students with different areas of expertise work together to achieve a sustainable, smart and healthy city. The Centre creates a network of companies and organizations in the region. They conduct innovative research, develop new business through innovations and ensure that (future) professionals are better trained for the labor market. Students are involved in the several activities of the Center of Expertise, like student challenges, project-based learning, internships and thesis projects. For more information about the organisation of CoE SSC, please consult figure 4.

Figure 4: Collaboration Agreements and Organizational Chart of CoE Smart Sustainable Cities



Explanation of the roles:

- The CoE is a network organization with HU (UAS Utrecht) as lead partner.
- The CoE is a public-private partnership in which the partners help set the strategic agenda through a Program Council.
- The activities are developed and executed by a small and decisive team. The director of the CoE is ultimately responsible.

- There are four focus areas defined including an transition approach to determine focus, setting out research agenda and initiating activities. The responsible leader for these areas is a professor in collaboration with partners.
- Per activity (project, program) governance arrangements are made in the usual way.
- Support on activities within focus areas: core team CoE (in cooperation with leading professors).
- The direction group 'Sustainable Together' approves the 4-annual ambition plan and annual monitoring. Two representatives of this group are members of the program council

Guideline

Description of current situation

There are many public-private partnerships in the region Utrecht. The good practice is about the governance and the financing models of the Centre of Expertise Smart Sustainable cities (CoE SSC).

There is a long-term commitment between the public and private partners in the CoE SSC based on cooperation agreements. All partners are represented in programme council of the CoE.

We have developed governance models for deliverable D3.2 and we have added the governance structure of the CoE SSC. The objective is to share the expertise with the other regions of SEED and in the conference in Valencia.

CoVE SEED in the Utrecht region will be part of the governance structure that is already existing in the region.

Improvement of the Good Practice

We have been describing the governance structure of the CoE SSC. The next step is to strengthen the network of companies, to find the synergy between the public-private partners in the region. To develop a CoVE or PPP governance and financing model that can be applied to different sectors and regions.

The MoU for the regional CoVE in Utrecht will be aligned with existing governance structure of CoE SSC for securing activities and securing the network. This will be proposed in the next programme council meeting in June 2024. RHDHV will be invited to join the programme council. In that way, the educational and business partners of the regional CoVE SEED in Utrecht are represented.

The regional network will be strengthened by organising events for regional partners and connecting to events that are organised by regional platforms. Examples for 2024 are the network event of Earth Valley and Utrecht ROM and the celebration of 10 years CoE SSC. Every year, two regional events will be selected to present the results of the SEED-project and for companies to join the activities.

Results of the Improvement

We expect the experience will be used in the MOU's in the other regions next to the Utrecht region.

Evaluation report on adaption to another region

Timeframe for implementation

The CoE SSC has started almost 10 years ago. It started from a mission and a vision.

Mission: We believe it is important that people can live together healthily and safely in a sustainable, smart and healthy city. We work on solutions to the complex issues involved.

Vision: We do this by connecting and enabling organisations, research and education to learn together from issues in their complex reality. In doing so, the boundaries of disciplines and sectors are challenged to arrive at useful solutions, with the route to them being part of the solution.

A long-term public - private partnership was formed between education and business partners. This network is extended and more partners are involved by community management.

Funding

The CoE SSC is funded by the HU in cycles of 4 years. Yearly public funding by the University is co-funded by projects together with partners in the network with regional or European funding. The main business model next to the public funding, is developing projects with partners and regional or European funding.

Staff

The CoE SSC is operated by a small project team comprised of:

- director of CoE
- Project managers
- Business development
- Community management
- Teaching and research staff
- Marketing
- Administration / support

Timeframe of activities carried out

The CoE is funded in 4-year periods (Jan. 1, 2023 next block began). The portfolio of projects has various timeframes.

Collaborations

Collaborations are essential in public - private partnerships:

- Educational organizations
- Municipalities
- Enterprises

For educational organizations, public-private partnerships are an excellent opportunity to better shape their core mission. Together with partners (companies and organisations), they can develop education and innovation programs that better meet the needs of professional practice than existing educational offerings.

For companies there are broadly two reasons to participate: human capital (more and excellent trained professionals) and innovation of products and processes.

For municipalities and provinces, public private partnerships strengthen the innovation ecosystem in the region and support the strategic themes.

The collaborations are formed in Centres of expertise such as CoE SSC or other forms of public private partnerships.

Learnings

Some of the learning of public -private partnerships (Centres of expertise) in the Netherlands:

- There is long-term commitment of public and private partners.
- A Center is a public-private, or public-public partnership. This is reflected in the governance structure of the Centre.
- In a Centre, all four 'blood groups' of the quadruple helix are represented as partners, or actively involved as stakeholders in projects and activities. Partners make a long-term commitment to a Centre and are obliged to make a substantial effort (in cash and in kind).
- A Centre operates value based and is an excellent connector from 'outside' to 'inside'. It will always work towards a result that does justice to the issue at hand and meets the needs of all stakeholders.
- There is an impact on education and teacher professionalism.

Criteria for success as described by the director of the CoE SSC: Commitment of partners (business/practice and education), demand-driven approach, decisive team, contact point for businesses.

3.2 Machine technology center Turku (TUAS)

The Turku Machine Technology Center is a cutting-edge facility designed to cater to the needs of enterprises, educational institutes, and researchers in the metal industries. It serves as a vibrant environment for research and development activities, promoting collaboration between industry, education, and research sectors while offering practical training opportunities for students. Developed to address the skills gap in the metal sector, the center provides shared practical training facilities for educational institutions in the region, alongside rapid prototyping and development services for companies.

Its core activities include organizing teaching and training as part of degree programs, offering lifelong learning opportunities, providing development and prototyping services to regional companies, and participating in externally funded projects. Practical training is integral to the educational approach of the center, enhancing learning outcomes for students and fulfilling organizational objectives for shareholders and participating institutions.

The outcomes of the center's efforts are evident in the cost-efficient organization of practical training and teaching for educational institutions, ensuring high-quality education and increasing the skills and competence of workers in the region. Acting as a one-stop shop for industrial partners, it facilitates training, development, and collaboration opportunities with universities, fostering new partnerships and projects between educational institutions and companies. By combining public and private funding, the center sustains its mission of driving innovation and excellence in the metal sector, contributing to its competitiveness and growth.

Guideline

Description of current situation

Presently, the Turku Machine Technology Center stands as a pivotal institution supporting the metal industry and fostering collaborative research endeavors in Turku region and whole Finland. Despite its significant contributions, the center grapples with persistent challenges related to funding. While not the primary focus, these funding constraints play a role in hindering the center's ability to fully modernize its machinery and infrastructure to keep pace with rapid technological advancements. Consequently, this limitation poses obstacles to the center's overarching mission of driving innovation

and excellence within the metal sector. Despite these challenges, the center remains steadfast in its commitment to facilitating industry-academia partnerships and providing valuable practical training opportunities for students, albeit within the confines of its financial constraints.

Improvement Actions

The Machine Technology Center is committed to ongoing development to align with the latest industry advancements and the evolving demands of academia. Over the coming years, our focus will be on enhancing both infrastructure and teaching environments to better serve universities and their research endeavors.

It's essential to acknowledge that sustaining the Center's machinery and infrastructure at the forefront of technology requires continuous funding. However, securing private funding has proven to be more challenging than initially anticipated. Additionally, navigating the complexities of public funding poses further hurdles, given the Center's limited liability status and stringent public funding regulations.

In response to these challenges, a strategic decision has been made for public owners to acquire the shares held by private stakeholders. Consequently, the Machine Technology Center will transition into a co-owned affiliated unit under the stewardship of the public owners. This move aims to streamline funding processes and ensure the Center's sustained growth and relevance in the field.

In addition to streamlining funding processes, this transition will pave the way for a more systematic approach to development, particularly in catering to the universities' research and training needs. By aligning with public ownership, the Machine Technology Center can better leverage resources and expertise to tailor its offerings to meet the evolving demands of academic research. This strategic shift will foster closer collaboration between the Center and universities, enhancing the quality of education and advancing research initiatives in the field of machine technology.

Results of the Improvement

The transition to public ownership for the Machine Technology Center is expected to enhance its focus on university research, thereby attracting increased external funding for both research activities and infrastructure improvements. By aligning resources with the needs of academic research, the Center anticipates a greater appeal to funding bodies interested in supporting collaborative projects between academia and industry. This strategic alignment not only ensures sustained financial stability but also fosters a culture of innovation and knowledge exchange, driving advancements in machine technology and solidifying the Center's position as a prominent research institution.

Evaluation report on adaption to another region

Timeframe for implementation

Turku Machine Technology Center was founded as Ltd in 2004. Permanent facilities at Lemminkäisenkatu in Turku were opened in 2005. The center and collaboration have been continuously developed since then. Some milestones include:

- Turku Machine Technology Center was founded as Ltd in 2004
- Permanent facilities at Lemminkäisenkatu in Turku were opened in 2005
- Turku UAS became the main shareholder 2016
- Digital Factory -investments 2018-2021
- University of Turku became shareholder 2019

- Changing the ownership to fully private 2024

Funding

Running the Machine Technology Center requires steady funding, which is allocated for equipment maintenance, materials, and new equipment investments to keep the equipment pool up-to-date and relevant for education and research purposes. The funding is primarily obtained from shareholders and supplemented by external financing through projects and service business operations. In 2022 the revenue was 1,1 million euros.

Staff

The educators are either vocational school/university educators or the machine operators from the Machine technology center. Education is provided in the machine technology center, where theory can be studied in a classroom, practical skills are practiced with educational lab setups and the actual machinery. The Machine Technology Center has 9 own employees working full time.

Timeframe of activities carried out

The practice is continuous since 2005 and continuous developments are done.

Collaborations

The key implementers and collaborators are the educators from educational institutions. The Center has also its own staff who contribute to the teaching and training activities, provide development services to the companies and maintain the machinery. Collaborations are at the heart of this good practice and the value is created by sharing the expensive equipment and facilities and cooperation in RDI and teaching & training activities.

Main shareholders (in 2023): Turku University of Applied Sciences 32,0 %; University of Turku 31,9 %; City of Turku 18,8 %; Vocational Adult Education Foundation of Turku 7,3 %; Åbo Akademi University 5,4 %; The Federation of Finnish Technology Industries 3,3 %; Technology Industries Enterprises 1,3 %

Learnings

As mentioned above, securing the funding has been the main challenge. This challenge has been addressed by diversifying the funding base by seeking for external funding from different sources. Also, the main stakeholder's faith in the practice (and funding) has been priceless.

Cooperation between different stakeholders before and during the practice has been the key to success. Active key persons from different organizations are also important. Constant development is needed to address anticipated needs and to keep the Center relevant.

It is possible to replicate this practice to other sectors (such as energy) as well. However, the process is long and several factors are needed in place: seed funding + continuous funding, good cooperation, active key persons, shared needs and objectives. However, the end result can be very fruitful and rewarding.

The practice can be replicated anywhere in theory, but suitable circumstances are needed such as several stakeholders with joint needs, previous relationship/cooperation, open-minded and active people, funding (investment & continuous).

4. References

- Public Private Partnership: https://smartsustainablecities.nl/default.aspx

SEED

sustainable energy education

www.coveseed.eu

Co-funded by
the European Union