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Final report on the lessons learned from the GRIT Pilots

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ROBUST & SMART ECONOMIES

Introduction

This final report aims to identify the lessons learned from the GRIT pilots in youth engagement program and VET module that support the green industrial transition. The GRIT project, co-funded by the European Union, focuses on enhancing the capacity of regions in the North Sea area to meet the demands of the green industrial transition, starting from the development and testing of learning materials in the North Sea regions Antwerp, Groningen and Hamburg.

The transition to a greener economy is a crucial component of the European Union's **European Green Deal** (EGD) to address the pressing challenges posed by climate change. The EGD's implications are far-reaching, impacting not only environmental policy but also economic structures, labour markets, and (therefore) (vocational) education and training (VET). Energy transition has a cross-sector influence on – for instance - transportation and industry. There is a need to control total energy consumption and improve the efficiency of production, storage and distribution. This naturally has significant implications for workforce competencies.

The project started with a comprehensive **desk study and stakeholder consultation**[1], of which the latter involved 28 companies, sectoral, and educational institutions across these regions. It provided analysis of major developments affecting the labour market due to the green industrial transition, with a specific focus on the energy sector and energy-intensive industries. Furthermore, it highlighted the crucial role that VET plays in equipping both current and future workers with the competencies needed to navigate and contribute to a greener economy.

A common thread throughout the desk study and stakeholder consultation – and therefore the GRIT pilots – is the **crucial role of green hydrogen**[2] **(H2) in the industrial transition** in Belgium, the Netherlands, and Germany. Green hydrogen offers a sustainable alternative to fossil fuels, enabling significant reductions in carbon emissions, particularly for hard-to-electrify sectors like energy-intensive industry (e.g. steel and chemical sectors), as well as heavy duty transportation such as shipping and trucking. Seaports play a pivotal role in this transition as they serve as hubs for importing, producing, and distributing green hydrogen. Seaports allow for efficient integration of renewable energy resources, storage, and distribution infrastructure, facilitating cross-border collaboration across the North Sea Region.

This final report of the GRIT project brings together the key outcomes and insights gained throughout the initiative, which aimed to address skills and engagement challenges in the context of the green (hydrogen) industrial transition. It presents an analytical framework that guided **the process from stakeholder consultation to the development of pilot concepts**, along with tailored concepts for fostering youth engagement and co-creating vocational education and training (VET) modules. The report also reflects on lessons learned from the GRIT pilots and concludes with targeted policy recommendations for policymakers, industry representatives, and interest groups to help overcome skills gaps and strengthen capacity for a sustainable industrial transformation.

[1] The desk study "Identification of Skills Shortages and Opportunities for Youth Engagement Programs & VET Learning Materials" can be found here.

[2] For readability purposes other molecules storing energy are also considered when using hydrogen or the acronym H2.

Conclusions and recommendations from the desk study

The results of desk study and stakeholder consultation helped assess labour market effects of the EGD and were used to inform the GRIT project about where investments in youth engagement and (re)training should focus. To prioritise in youth engagement and (re)skilling initiatives, it was informative to look at sectors strongly affected by developments towards greener economies. Although the desk study indicated the green transition brings competency and training needs for all sectors, significant employment effects are expected in the energy-intensive industry, energy sector and port activities. This supported our choice to prioritize these sectors. In the following, we highlight the conclusions and recommendations of the desk study again and link them to the co-creation of new learning resources in the pilots. Below, we present our central strategies and more concrete building blocks. We also indicate where and how they were translated into the activities of GRIT.

Central strategies and building blocks for the GRIT project

1. **Strengthening the influx into relevant education and professions**

Educational and professional career guidance play a crucial role in preparing education and the labour market for the green transition. Sensitization campaigns can attract (young) people to promising 'green' jobs and sectors, overcoming negative stereotypes and gender imbalances in traditionally male-dominated technical professions. The GRIT youth engagement program targets to increase awareness of and access to relevant technical and transversal competencies to support the transition to a greener economy.

2. **Strengthening initial vocational education and training**

The revaluation of strong technical or STEM education plays a crucial role. Investing in initial vocational education and training (iVET) is essential from both social and economic perspectives. A future technician with competencies geared towards professions in the energy transition is more attractive to employers. Targeted investments in the involvement of secondary VET teachers and students in the development and testing of the GRIT VET module targeted to increase the job prospects of future workers, as well as the productivity and sustainability of companies.

3. **Strengthening opportunities for re- and upskilling for current professionals**

The green transition can change work processes and thus the demand for skills and professions, creating displaced workers. By providing targeted opportunities for re- and upskilling to affected workers, this increases retention in their existing profession or enables them to transition more smoothly into a greener economy. The GRIT VET module targets to help minimise potential social and economic costs of the energy transition by tackling skills mismatches among technicians. The introductory GRIT VET module on hydrogen technology is therefore well-equipped to support up- and reskilling purposes.

The desk study and stakeholder consultation report pointed to several concrete building blocks that can help make the green industrial transition a success by investing in youth engagement programs and modular (re-)skilling VET supply. We discuss these **building blocks** and link them with the GRIT pilots in youth engagement and VET module:

- **Engaging companies and sectoral partners in updating learning contents** ensures that learned competencies meet current and future labour market demands. Cross-sectoral dialogue can significantly contribute to effectively steering the relevance and practicality of competency development in education and training. In GRIT, we strongly focus on this alignment by starting our work from a stakeholder consultation and included stakeholder feedback loops throughout the pilot phase.
- The energy transition requires an **increased influx of technicians**, and so there should be broader efforts from a younger age to excite young people for STEM education. Without a foundation in STEM, they may find it more difficult to specialize in relevant technical disciplines later on. We worked on this within the development of the GRIT youth engagement program that targeted specific STEM learning goals that are also connected to sustainability.
- By **highlighting the importance of VET for the energy transition**, the attractiveness of VET itself can increase. The energy transition can thus be a stimulus and an opportunity to reposition VET. Defining competencies for the energy transition and identifying shortages of professionals can become an integral part of the economic and societal revaluation of VET. Collaboration with businesses, including through the development and implementation of the GRIT youth engagement program and VET module offered opportunities to develop green STEM competencies and make VET attractive for young people, both young men and women.
- The energy transition requires the development and programming of new VET modules. **Existing programs need to be evaluated** for emerging competency needs. While procedures for revising qualifications are inflexible and time-consuming, it is essential to update curricula – and the qualifications underlying them – in a timely manner. In GRIT, existing curricula were evaluated by project partners CVO Vitant and Alfa-college, new content is added via a new VET module on the introduction to hydrogen technology in an industrial and/or port environment.
- **A modular approach** to integrating new learning content into existing curricula and qualifications is better suited to a rapidly changing labour market. Short, targeted courses and learning experiences enhance familiarity with relevant concepts and practices for the energy transition in their respective fields. This approach in the VET module paves the way for comprehensive adjustments to curricula in the (medium to) long term. The GRIT VET module on an introduction to hydrogen technology was acknowledged by the final stakeholder feedback loop as a valuable first step.
- Another important aspect is strengthening **participation in lifelong learning** and, more specifically, developing targeted modules for re- and upskilling. Development of re- and upskilling modules for current employees is worked on by project partners CVO Vitant and Alfa College that have current professionals as part of their target group. by. Also, Ma-Co is further developing the VET module for the Hamburg port context.

- **Ensuring that teachers are up to date** with new learning contents is crucial. By providing time and training, teachers can be motivated and enabled to focus on the energy transition in their schools. Professional development opportunities through formal training and learning/practice communities will be part of the implementation of the GRIT VET module. VET teachers themselves were strongly involved in the development of the VET module. Other teachers – both from secondary as adult VET - were engaged in the testing and provided feedback to further strengthen the module.
- **Encouraging businesses to engage in competency development** through VET, including offering workplace learning or sharing up-to-date equipment. Close collaboration between learning environments – companies and VET providers – was sought after in GRIT. Leading companies in the hydrogen transition in both Antwerp and Groningen region provided existing learning materials, opportunities for site visits and feedback on the VET module.
- New green competencies often require **new learning methods and environments**. The combination of practical and theoretical learning forms the basis of VET and means VET can provide a fertile ground for new learning methods. It is important, however, to recognize that pedagogical change is not a simple process. A non-threatening approach to teachers is important to effect change, rather than imposing changes. Within GRIT, we worked with education managers, teachers, and pedagogical advisors to find suitable learning methods and environments. Examples that were included:
    - **Gamification** is perhaps one of the most prominent areas of innovation found in inspiring educational practices and has the potential to expand the range of authentic learning opportunities. The GRIT youth engagement program is fully game based.
    - **Workplace and hybrid learning** provide students with more access to innovative practices and technology. By purposefully and systematically intertwining school and workplace learning, students gain more realistic learning opportunities. As the introductory GRIT VET module is rather short and targeted, it takes only a couple of training days. Workplace learning was therefore not favourable. However, the module did include site visits to leading companies to showcase hydrogen technology and installations.

Within the GRIT project – and more specifically the Antwerp, Groningen and Hamburg region – we built regional learning communities that connect education (VET and higher education) with industry and developed a tailored youth engagement program and educational programs on green industrial transition and, more in particular, hydrogen technologies. The mission was to help share a sector-wide narrative, accessible to both professionals and future professionals still in education. As an overall achievement we strengthened the (inter-)regional human capital agenda with regard to skills for the green industrial transition.

Below, we formulate more specific lessons learned from the development and testing of new learning materials for the purpose of youth engagement and VET (up-/re-) skilling on hydrogen and related technologies. These resources mainly tailored to the competence and training needs linked to the energy transition in the energy sector and energy-intensive industry.

Lessons learned from the GRIT youth engagement program

Seaports play a central role in the transition to green industrial transition and more specifically the green hydrogen value chain. Availability of human capital is crucial for ports as well. Shortages of labour at various qualification levels are expected (and already experienced). Working in a port – and the heavy industry in the immediate vicinity of a port – is still often considered unattractive for young people. Since the sustainability impact of a company increasingly influences employees when searching for a job, sharing ambitions related to the energy transition can be a factor in attracting youth. Therefore**,** the ambition of **greening ports was chosen as the baseline** for the GRIT youth engagement program "Pimp My Port".

Stakeholder consultations in Antwerp highlighted **strong company engagement** across the Antwerp port area and the green hydrogen value chain to support youth-oriented programs that showcase the role of technicians in the port's green industrial transition. Partners emphasized the importance of making the green industrial transition and specifically the hydrogen value chain tangible for young people while underlining the port's central role in the green transition. Key Antwerp stakeholders included H2 producers (CMB Tech Namibia, DEME offshore projects, Air Liquide local production), shipping companies (CMB Tech and Exmar), storage and distribution actors (Port of Antwerp-Bruges terminals, Bilfinger piping), and end users such as industrial players (BASF, Equans, Air Liquide). CMB Tech also presented applications in mobility and logistics, including Van Moer's hydrogen trucks and inland vessels, as well as hydrogen-powered CMB Tech H2 tank station and Port of Antwerp-Bruges' tugboat.

Stakeholders recommended that youth engagement programs focus on making the **green industrial transition both attractive and accessible across educational levels**. Some companies stressed the need to attract more higher-educated technicians and more women by linking careers to building a sustainable port and industry. Also, the importance of framing the industrial transition broadly, strengthening STEM pathways, and ensuring regular touchpoints with practical experiences and workplace learning. Showcasing companies' efforts to reduce the sectors' CO_2 footprint can also inspire future technicians. Next to industrial and energy enterprises, also maritime and logistical companies were open to demonstrate the greening of their activities and increase visibility to young people, e.g. with regard to the role of trucking and inland shipping. Finally, a higher VET institution emphasized the urgency of increasing student enrolment in energy-related study tracks, noting that energy is often not a distinct subject in secondary education and thus not a popular choice in higher education.

The gamified GRIT youth engagement program **"Pimp my port"** was developed in cooperation with these and other educational professionals and representatives from the blue economy. The main developed was led by educators from the provincial Port Centre in Antwerp, building on the expertise of existing educational programs. The game was further developed focussing on greening port activities. To test the influence on the enthusiasm of potential future employees, test panels were operated among the target group of 12–14-year-olds in both the Antwerp and Hamburg region. Below we report on the lessons learned from both test panels.

Testing the GRIT Youth Engagement Program – Pimp My Port

The GRIT youth engagement initiative **Pimp My Port** uses a game-based learning approach to introduce students to the port environment, sustainability, and the energy transition. The Pimp My Port educational game allows students to build their own sustainable port. In the game, they earn credits by answering questions and completing port-related tasks, competed against other teams for upgrades, and invested in sustainable initiatives such as solar panels, wind turbines, biomass plants, combined heat and power, or hydrogen facilities.

Students **start from a basic port setup**, which includes industrial companies, a city, lock, terminal, distribution centre and natural conservation areas. As the game progresses, teams can "pimp their port" by earning money and buying upgrades. Money is earned by answering questions and performing tasks scattered around the playing field, which cover various port-related themes. Teams collect their rewards at the bank and then spend them at the market to buy installations and hire specialized professionals:

- Beyond basic upgrades, teams earn special **green upgrades** such as shore power systems, electrified vehicles and cranes, hydrogen or methanol tugboats, carbon capture on industrial installations, and biodiversity solutions such as bat boxes or swallow nests. These special upgrades are won through battles between teams, where the winners receive more rewards.
- They also had to **recruit the right workforce**, including engineers, technicians, and environmental coordinators. The goal was not only to learn how ports function but also to understand the energy transition and experience the consequences of decision-making in a playful and interactive way.

To win, teams must strategically combine installations, workforce, and upgrades, and then present their final ports. Presentations require them to justify why their port is future-proof, while a facilitator challenges their arguments.

In 2024, an analysis of Flemish minimum **educational goals** was carried out by an expert, with teachers consulted on its classroom applicability. The concept also ties closely to the Port Centre's experiential and authentic learning approach. The game was carefully aligned with key educational competencies for secondary students in Flanders. It helps learners understand the interaction between STEM and society through real-world challenges. It encourages spatial awareness by analysing the impact of landscape changes, fosters citizenship by debating social themes, supports entrepreneurship by guiding career choices and idea development, and strengthens social and relational skills through teamwork.

Test sessions were conducted in Antwerp and Hamburg in April and May 2024 with four classes, 88 students, and 8 teachers. These are the main **lessons learned**:

- Students overall rated the game positively (average score 8/10). Feedback on the youth program showed that students particularly **enjoyed** the entertaining and creative aspects of the game. The combination of teamwork, competition, and practical problem-solving was especially well received. Most students particularly appreciated the mini-games and the strategic puzzle of fitting upgrades into the port.
- Many reported **learning** about energy solutions in ports and gaining new insights into the roles of workers who install and maintain these systems. Some even indicated greater interest in pursuing port-related technical jobs in the future. A number of students said their perception of the port as a workplace had changed positively.
- Teachers observed that the game **successfully connected energy transition and STEM professions** to students' everyday concerns, such as sustainability and energy saving. This made the port—a context usually unfamiliar to them—more relatable.
- Teachers also stated they would consider **booking the workshop** for their classes, especially as a follow-up to a port excursion or as a synthesis activity at the end of a school year. Teachers also considered the game effective in building knowledge about the port and energy/environmental topics, and supportive of career guidance.
- **Class 8 (14-year-olds)** was deemed the right age group, as younger students lack the necessary background.
- At the same time, <u>some challenges were identified:</u> larger groups required additional staff for certain parts of the game, time management needed improvement to avoid long waiting times, and the rules had to be refined to prevent cheating. Nevertheless, the overall impact was very positive, and many students stated that the experience made the idea of working in the port sector more attractive.

Lessons Learned from the GRIT VET module

The desk study revealed that sustainability themes are increasingly included in educational objectives and curricula, but there is a **lack of concrete teaching materials**. Furthermore, there is also a lack of coordination on the subject, and the emphasis on sustainability relies too heavily on individual actions and initiatives by teachers or school managers. Additionally, teachers indicated that they are insufficiently trained to teach (STEM) competencies for the green transition and are not well informed about what is happening in companies regarding this matter. Resources to invest in teaching materials and train-the-trainer programs are scarce and are not always a priority for schools. The GRIT project targeted to provide such resources to invest in teaching materials, where possible within a learning community that provides an ecosystem to develop learning materials in cocreation between VET, the industry and research in higher education.

To ensure consistency across regions, the **project partners jointly developed** a common questionnaire and defined shared target groups. The results of the interviews were then analysed and evaluated. In addition, each region contributed input from existing skills gap analyses and previous studies on competence needs. These findings were brought together in the above-mentioned desk study thus consisting of a comparative analysis that highlighted common challenges and shared skills requirements.

During the stakeholder consultations, several opportunities for developing an introductory vocational education and training (VET) module on hydrogen were identified. Input for curriculum goals and course structures were drawn from existing initiatives such as Green Hydrogen for Europe[3] and GroenVermogenNL[4]. In addition, existing course materials was made available by Dutch GRIT partner and VET institution Alfa-college. A number of educational, industrial, maritime and logistics **stakeholders contributed to the module** by providing input, such as course materials, visuals, videos, and site visits, as well as feedback. These included CMB Tech, Port of Antwerp-Bruges, Waterstofnet.eu, Equans Academy, ACTA (training centre for the chemical sector), VET school PITO Stabroek, AP University of Applied Sciences and Arts and Flemish spearhead cluster for energy transition Flux50.

The introductory GRIT VET Module on hydrogen technology was thus developed through the interaction with regional and European stakeholders and **informed by existing expert course materials**. By including a feedback loop during the development of the introductory module, the development process allowed for the co-creation with regional companies and training institutions that are active in the regional green industrial transition, often already implementing hydrogen solutions.

The development of the VET module also took into account **national/regional educational contexts**, such as standard curriculum frameworks for Flemish adult education and Dutch VET system. German GRIT partner and Maritime Competence Centre (Ma-co) is also exploring how to fit the introductory VET module on hydrogen in their accredited up- a reskilling offering.

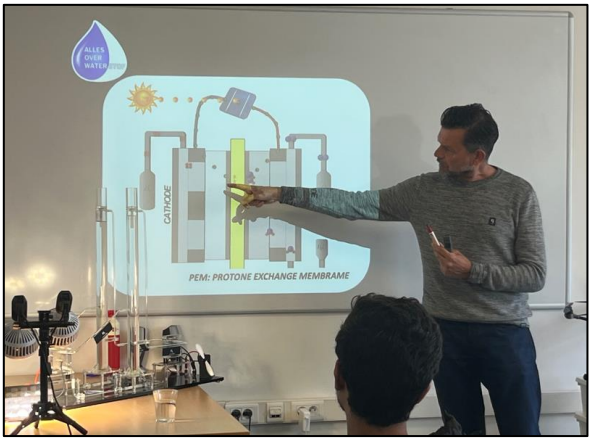
[3] Green Skills for Hydrogen: Hydrogen Skills Core VET Curriculum.
[4] SBB-approved in the Netherlands: Waterstof in de industrie.

Testing the GRIT VET Module – an introduction to H2 Technology

CVO Vitant – GRT partner and adult education centre in Antwerp with a technical VET focus – developed the **introductory VET module in hydrogen technology**. This initiative is part of its broader commitment to innovation and industry-oriented learning, complementing existing programs such as SIRA, ACTA PRO, and ACTA META.[5] The goal of the GRIT VET module is to introduce learners to the fundamentals of hydrogen, its production and applications, and its growing relevance to industry and energy transition.

The testing of the introductory VET module on H2 technology was conducted within project partner CVO Vitant's own educational setting, involving **participants** from both the adult education centre and partner companies. The testing was supported by external collaborators who contributed as guest lecturers, by hosting sessions, and by facilitating on-site visits.

The **broader target group** includes final-year secondary students in both the VET and academic tracks, current CVO Vitant learners in fields like electromechanics and STEMtechnics, employees from industry partner industries, and members of the local community with a technical interest. No prior knowledge of hydrogen is expected, but curiosity and enthusiasm for technology are considered essential.



The pilot of the VET module was launched in May 2025 in **four concentrated sessions**. The content was designed with reference to European hydrogen skills curricula, ensuring both relevance and accessibility. A deliberate balance was struck between theory, hands-on practice, and real-world industry visits, making the material suitable for beginners yet practical enough to inspire further learning. Participant numbers varied between 9 and 17 per session, including Vitant students and staff as well as a few external participants.

The sessions covered a **range of topics**: an introduction to electricity and hydrogen production through electrolysis, an exploration of hydrogen in small-scale projects, an in-depth look at industrial applications such as storage, transport, and safety in collaboration with CMB.TECH, and finally a site visit to CMB.TECH's H2 fuelling station and a H2 tug boat, a collaboration between CMB.TECH and Port of Antwerp-Bruges.

[5] For more info on the technical VET courses: SIRA, ACTA Pro and ACTA META.

Evaluation results were very positive. Participants, most of whom had no prior background in hydrogen technology, gained a strong initial understanding of the subject, particularly in relation to the energy transition, industrial applications, and future employment opportunities. The combination of theory, practical engagement, and site visits was highlighted as the ideal structure, ensuring both knowledge transfer and motivation.

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The pilot demonstrated clear **potential for further development**. Recommendations include communicating earlier and more widely about the module through newsletters, tech and training fairs, and online platforms, and offering a condensed version over one or two days at an introductory level (EQF level 4). The integration of the module into Vitant's regular offer for electromechanics and STEMtechnics is already planned for the next school year, with additional opportunities to extend the programme to teachers and students from secondary (VET) schools and companies. External collaborations were found to be highly valuable, and further investment in didactic material will ensure that all learners can start from the same baseline, in line with best practices from partner institutions such as Alfa-college.

Based on the development and testing of the VET training module on the introduction to green hydrogen technology, the following **policy lessons** can be drawn:

- Raising awareness and investing in skills forecasts and a roadmap for adapted trainings is an important first step;
- Relying on hybrid/dual learning-work environments are most ideal to teach future-oriented (green) competencies. Although the short GRIT VET module the workplace learning was limited to site visits, these proved to be very meaningful;
- Strong collaboration between VET providers, companies and sectoral organisations mutually reinforces innovation and the human capital of all stakeholders involved.
- An important consideration in training on hydrogen technologies is safety. Hydrogen introduces new hazards that require special attention.

In conclusion, the hydrogen module has proven to be a timely and promising initiative. It not only equips learners with essential knowledge of a rapidly growing field but also strengthens connections between education and industry, opening pathways for innovation, employment, and sustainable energy transition in North Sea regions.