BARCOVE

Report on case development and implementation

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Introduction

In January 2023, eight partners kicked off their project 'Building Applied Research into Centers of Vocational Excellence', or BARCOVE in short. These partners are all involved in Centers of Vocational Excellence, the Platform of Vocational Excellence Water and the European Platform for Urban Greening, all co-funded by the European Commission. The Centers of Vocational Excellence aim to bring together all stakeholders in regional skills ecosystems across Europe to address the labor market issues we are all facing. With BARCOVE, the partners put specific focus on the role of Vocational Education and Training providers in doing applied research, together with companies and how you can organize this. In this project the partners decided to take a hands-on approach, by actually doing the applied research and describing the methodologies used. In this report we describe the process of designing and executing a hackathon, taking design thinking as the basis for our approach, and the set up of one to one cases between schools and companies in various countries to deepen the results of the hackathon. The results mentioned in this report will be used in the BARCOVE recipe book for applied research in VET, so other schools and companies can use these blueprints as a basis for their collaboration and development of a Center of Vocational Excellence.

This report in divided in the four phases the BARCOVE project went through in it's first 16 months. Per phase we describe what we did, what our lessons learned are and give an overview of some of the responses from the participants.

1. Preparation
2. The Blue Green Innovation Challenge
3. One on one cases
4. Follow up

The goal of the project was to design and execute a 2-day international hackathon, focusing on idea generation in 4 concrete key areas within urban space and water management (R3.1). In this 2-day international Hackathon we wanted to involve 40 VET students and 10 to 20 start-ups from 5 countries (R3.2). After the hackathon, we wanted to select ideas from the Hackathon and implement them as applied research projects at the national level in the Centers of Vocational Excellence of PoVE Water and the European Platform for Urban Greening. Concrete solutions will be developed, produced and tested (by data gathering) in a real-life setting of company-school cooperation (R3.3). This entire process, would be systematically evaluated among students, companies, start-ups, VET schools and other stakeholders involved (R3.4). The results of all of this will appear in 5 languages, both in audio-visual and written documentation (R.3.5).

Although some of the work is still continuing, since we extended the time period for the applied research in national settings to allow for more results and lessons learned (R3.3) until October 2024, we can already conclude that the goals of R3.1 and 3.2 were well achieved and even went beyond expectations, as you will read. In fall 2024 we will publish an updated version of this report, as well as the recipe book for applied research in VET including all blueprints and formats. That being said, we are happy to share our results so far already in this report.

Phase 1: preparation

Our objectives

- **Objective**: The application proposed the organization of a two-day international Hackathon as part of WP3, aiming to engage VET students and start-up representatives in generating innovative solutions for urban space and water management.

- **Participants**: The planned event was to host 40 VET students and 10 to 20 start-ups from 5 countries.

- **Facilitation**: Company and VET school staff were expected to assist in the Hackathon, guiding idea development and ensuring a smooth operation.

How it went

A core component of the Hackathon's design was the development of detailed templates, based on the experience of designing and organizing the BlueGreen Innovation Challenge. These templates are comprehensive guides that include all necessary information to replicate the Hackathon, ensuring consistency and effectiveness in future iterations. The templates cover various aspects such as:

1. **Event Checklist**: Detailed steps for organizing the Hackathon, including timelines, required materials, and participant guidelines.

2. **Stakeholder Roles and Responsibilities**: Information on who should be involved, from local authorities to private sector partners and academic experts, and their specific roles.

3. **Engagement Protocols**: Instructions on how to engage different stakeholders, including communication plans and collaborative strategies.

4. **Feedback Mechanisms**: Pre-designed questionnaires for participants to capture detailed feedback on the Hackathon experience, which will aid in refining future events.

These templates will be included in the Recipe book, to be published by BARCOVE in fall 2024. However, the templates have been shared with interested organizations already who used it for organizing other hackathons (see chapter follow up).

For the hackathon itself, we developed a two day program, with a mix of team building, inspirational key notes on innovations in the blue and green sector and various work sessions going through the design thinking methodology. Based on the needs of the companies, we defined four frames for the teams (max 8 persons, with a mix of students, start ups and companies, and a coach) to work on.

Design Thinking Method
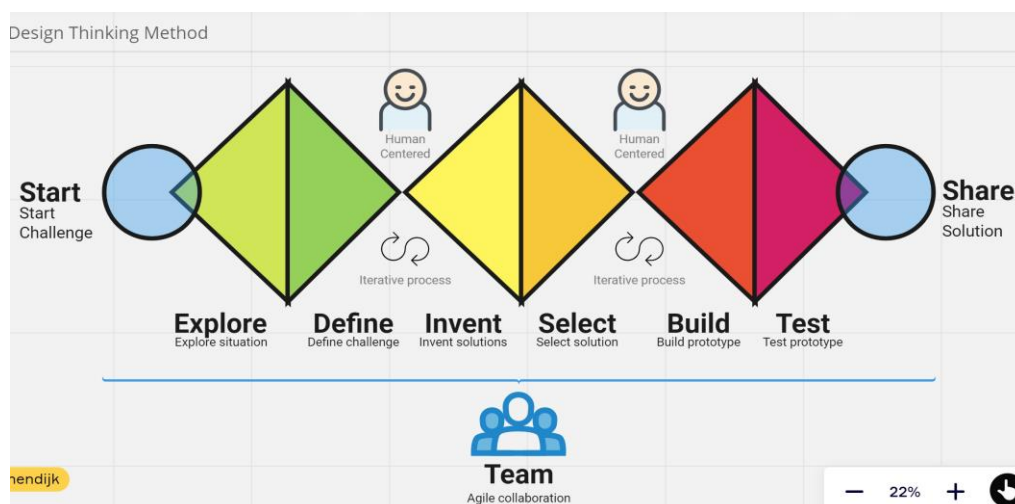
The design of the Hackathon was centered around the four specific cases outlined in the BARCOVE project application, which are:

Case 1: Green Roofs: the integration of advanced technologies in urban green infrastructures.

Case 2: Soil and plant properties in technical Sustainable Drainage Systems (SuDS): the Implementation of new models for water recycling in urban environments.

Case 3: Permeable pavements: innovations in the design and construction of permeable materials for urban surfaces.

Case 4: Pressurized rainwater systems without pumps: development of low-energy, high-efficiency water management systems that operate without mechanical aids.

Wednesday September 13th Day 1: Team building and exploration		**Thursday September 14th** Day 2: design solution and pitching	
07.15	Bus from Green Academy	7.45	Bus from Green Academy
08.00	Registration and Coffee	8.30	Walk in and coffee
8.30	Welcome and introduction	9.00	Welcome and start of day 2
9.00	Welcome by Mattias Tesfaye, Danish Minister of Children and Education	9.15	Get inspired: key note speeches
9.15	The four frames of the hackathon	10.00	Make a prototype of your idea
9.45	How does this hackathon work: the methodology	12.00	Lunch
10.00	Teambuilding	12.30	Prepare Pitch and Roadmap
10.30	Exploration of the challenge at hand	14.00	Pitches (5 minute pitch and 5 minutes question per team)
12.00	Lunch & mingle!	16.00	Jury consultation and break for the teams
		16.30	Jury verdict, wrap up & what's next
12.45	Get inspired: key note speeches	17.30	End of program and goodbye
13:15	Exploration of possible solutions: idea generating		
14.30	Coffee break		
15.00	Interviewing: checking assumptions		
16.00	Further exploration: work on main idea		
18.00	Pitches		
19.00	Dinner		

Figure 1: Program of the BlueGreen Innovation Challenge

Responses from the participants

Both within the project consortium as in the communication towards the participants (start ups and students alike), it took some effort to explain the concept of the BlueGreen Innovation challenge and the 'what's in it for me'. Based on just a description on paper, it sometimes proved a little hard to understand the concept. Therefore a personal touch was needed to explain and make sure everything was clear to the participants. This was done by approaching the students via de teachers and the start ups via the company representatives.

However, as soon as the concept was clear to everyone, it let to an oversubscription by the student participants by almost 50%. In order to guard the quality of the BlueGreen Innovation Challenge and limitations in terms of logistics we unfortunately had to turn down a number of applicants. Also in terms of interest from organizations, the preparations exceeded our expectations. VIA College in Aarhus offered to sponsor the event with materials and their location and promoted the hackathon among their students. The image below gives an overview of all organizations involved in the event.
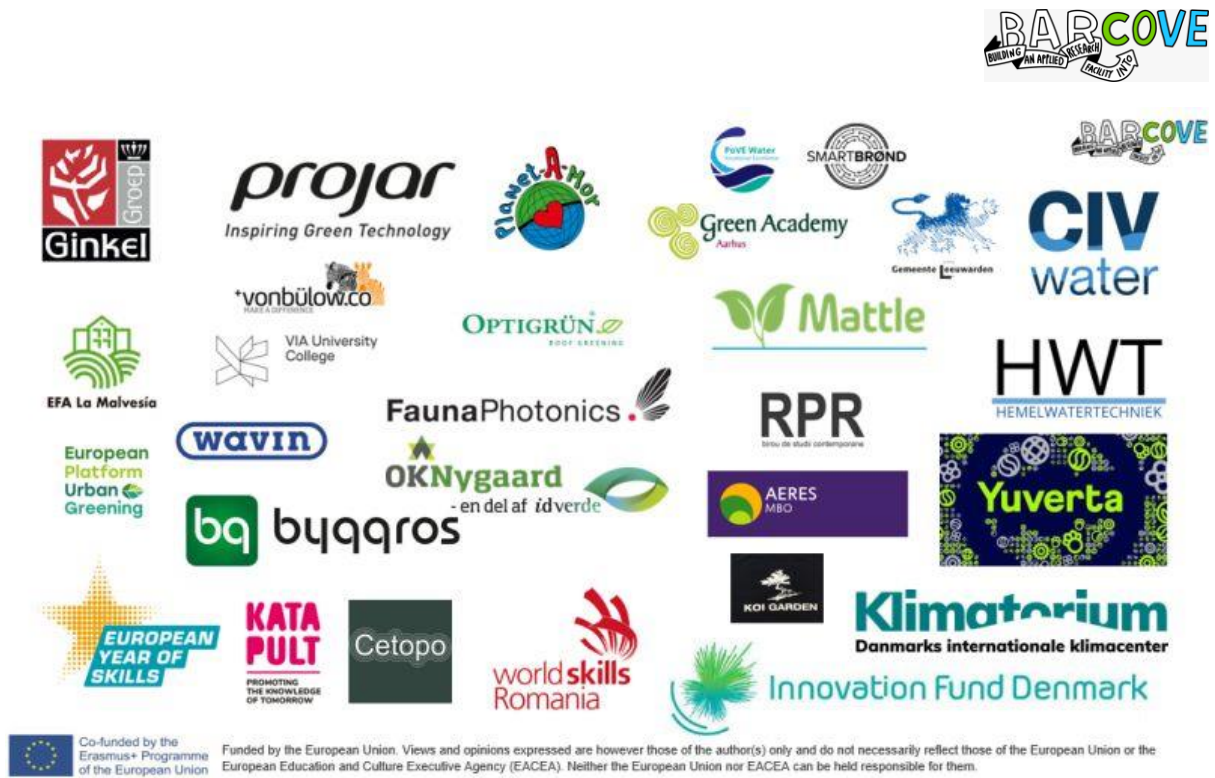
Figure 2: Overview of all organizations involved in the BlueGreen Innovation Challenge 2023

Lessons learned

- The script we developed for the hackathon, for both all preparations and the event itself was very useful and important to make sure that everyone knows what is expected. It created a plug and play concept for the event itself.
- Ensure that the chosen location provides an environment that encourages close proximity among groups, fostering collaboration and communication. Acoustics are of the essence, so everyone can work nicely in their group while feeling the energy of the other groups.
- The summer period was not ideal for the preparation of the hackathon, due to the holidays, it was sometimes hard to reach participants, companies or other stakeholders.

Phase 2: Blue Green Innovation Challenge

Our objectives

The project proposed the organization of a two-day international Hackathon as part of WP3, aiming to engage VET students and start-up representatives in generating innovative solutions for urban space and water management. The planned event was to host 40 VET students and 10 to 20 start-ups from 5 countries.

How it went

- The Bluegreen Innovation Challenge 2023 surpassed expectations with 22 start-up representatives from Finland, Romania, the Netherlands, Denmark, and Sweden, and 52 students from 4 countries representing 12 nationalities, highlighting a significant achievement in diversity and inclusion.
- The Hackathon was officially opened by Danish Education Minister Mattias Tesfaye, lending a notable endorsement to the event.
- Hackathon featured presentations from notable figures such as Lars Holmegaard of Klimatorium, Nico Kelderman from the Municipality of Leeuwarden, Pia Storvang from the Danish Innovation Agency, and José Anta, coordinator of the LIFE project Called SUDSlong, along with Ms. Chiara Riondino from DG Employment of the European Commission
- The coaches of the 10 teams were trained on the day before the hackathon, ensuring the proper execution of all exercises involved with the design thinking methodology used.
- The opening dinner, the night before the hackathon proved to be a great way to make sure the participants got acquainted and for group bonding
- The Bluegreen Innovation Challenge 2023 was successfully executed with commendable levels of international participation, diversity, and high-profile endorsements. The Hackathon not only met but exceeded the deliverables outlined in the BARCOVE project application, creating a dynamic and productive environment for generating solutions to real-world urban and water management challenges.
- The following after movie of the hackathon illustrates the work done, the atmosphere and some of the reactions of the participants.

Responses from the participants

Participants expressed overwhelmingly positive feedback, praising the organization, the opportunity to engage in sustainability and innovation, and the inclusivity of various fields beyond IT. Constructive suggestions were made for enhancing student leadership and teacher participation in future events. This feedback is illustrate by the following quotes:

- One of the participating start ups said: 'we were stuck on this issue for 2 years trying to develop our project, with the help of the students we solved it in 2 days'
- One of the participating companies said: 'As companies we sometimes have tunnel vision, the 'unpolluted' and fresh minds of the students really helped taking another perspective on the challenges we put to the table'
- One of the teacher present stated: 'I have never seen my students work so hard'. This shows that changing the way of delivery of content, by means of challenge based learning can be very efficient.
- 'This hackathon changed my life, it made me believe that I can do what I want' – VET student participant.

Lessons learned

- In preparation of the hackathon, some companies wanted a non-disclosure agreement. During the hackathon this proved to be a big barrier for the creation of new ideas and finding new solutions, since everyone in the team was scare of violating the agreement. The start up company decided to cancel the NDA on the spot, and immediately experienced the difference in how much extra they got from the hackathon. Therefore we learned: Non Disclosure Agreements are a no go in hackathons like these.
- Challenges from real life made a difference. Students are more motivated to solve the challenge because they can really make a difference.
- The variation in levels of knowledge and experienced should actively be addressed to make sure everyone can play to their strengths. The coaches need to be prepared for this.
- A minimum language proficiency in English is necessary to make sure everyone can really engage in the hackathon. That being said, English is a second language for almost everyone, so it does not have to be perfect.

Phase 3: One-on-one cases

Our objectives

The application outlined a process for selecting ideas from the Hackathon to be developed and tested at the national level through company-school cooperation, with an expectation of completion by the end of April 2023.

How it went

In practice, five cases from the Hackathon have been selected for implementation: two in the Netherlands, two in Denmark, and one in Spain. Recognizing the keen interest from all parties to thoroughly explore the challenges and develop optimal one-to-one case implementations, the timeline has been deliberately extended. This strategic decision allows for deeper engagement and the potential for more impactful outcomes. The new deadline to report is October 2024, so the outcomes can be included in the recipe book before the end of the project in December 2024.

As mentioned in the previous paragraph, five cases have been selected from the hackathon to be implemented and tested in the national contexts between companies and schools. Below a brief overview of each case is given

Spain

The Spanish case involves the measuring biodiversity on rooftop gardens, using a biodiversity sensor developed by one of the start ups. Together with students from the local VET school, Projar developed a rooftop garden with two sides, one with extensive green and one with intensive green.

The Spanish case has evolved into an international collaboration with additional funding for the Danish startup involved, extending beyond initial expectations. Additional funding in Spain has enabled a comparative study between digital and physical measurements, enriching the project's data analysis capabilities.

Netherlands case 1

The start-up and van Ginkel Groep developed a dashboard for a smart Green Roof. They involved IT students from a university of applied science in the Netherlands in this process. The solution will be implemented in a training roof of the Dutch CoVE Urban Greening, at the Green Hotspot of Yuverta in the Netherlands. This roof will be available by the end of April 2024 and offers a multifunctional solution for applied research, training of students and life long learning activities.

Netherlands case 2

The second case in the Netherlands involves the irrigation of movable planters in the city of Leeuwarden. Through the Milieu Advies Bureau (Environmental Consultancy run by students) of MBO Life Sciences and CIV Water, students are working on this case for the municipality of Leeuwarden.

Denmark case 1

In Denmark, collaboration between the school's experimental facilities, a startup company, and the University of Copenhagen has been focusing on how materials can best manage gravity-fed water without compromising aesthetics or functionality.

Denmark case 2

Implementing the smartbrond solution to measure waterflow in a pressurized rain water system without pumps from a distance by building a dashboard that students can use to monitor the data of the solution

Apart from the cases mentioned above, the BARCOVE project has stimulated the partners of the European Platform for Urban Greening to apply for another project involving applied research (see the chapter Follow up).

Responses from the participants

- The companies find the one on one cases really useful: for instance, the Projar Group indicated they even were able to collect more data than originally was planned
- An interesting insight from the Danish one on one case, was the realization by the participants from the research institutions how valuable the collaboration between higher education and VET is, due to the complementarity of the skills of the students.
- The case of irrigation of movable planters for the municipality was embedded in the curriculum of MBO life sciences through the student-led Environment Consultancy Bureau, which is part of the curriculum. This showed that it is possible to embed applied research activities in the curriculum of VET schools.

Lessons learned

- More time is needed for the one-on-one cases than we initially expected. Not so much to start to doing the applied research, but in order to maximize the results of the activities. In a number of the one on one cases, it is highly valuable to collect data in different seasons for instance and to see how the applied research set up is performing over time.
- Structurally embedding applied research in a Center of Vocational Excellence or in the collaboration between schools and companies takes time and a tailor made

Figure 3: Whole School Approach model

approach. The Whole School Model is a helpful tool to provide a common language on all elements that need to be organized to do so.

- It is important to realize the differences between the worlds, speed and interests of schools and companies and to actively address these differences when doing applied research in a Center of Vocational Excellence.

- Therefore, it is important to train all staff involved in working together and being able to make the cross over between education and the work field. With this lesson in mind, the Green Academy in Denmark, part of the CoVE European Platform for Urban Greening, decided to train all their staff in design thinking and the use of hackathons as an education methodology and a way of shaping the collaboration with the companies in their regional skills ecosystem

Phase 4: Follow up

Our objectives

The objective of the project was to collect all formats, blueprints and experiences in BARCOVE in a recipe book, allowing others to use them to develop applied research and hackathons as well. The publication of the Recipe book is foreseen for fall 2024.

A second objective is to disseminate the outcomes of the BARCOVE project so other Centers of Vocational Excellence can build applied research into their activities between companies, VET providers and regional governments.

How it went

- The Recipe book is still being written and expected by fall 2024. Many of the formats and lessons learned have been used by others already to organize hackathons and stimulate the cooperation between VET schools and companies.
- PoVE Water already used the BARCOVE formats for a hackathon in the Czech Republic, January 2024
- Project partner, Van Ginkel Group already used the BARCOVE formats for a hackathon with an university of applied science in the Netherlands on the use of IT in the green sector, March 2024
- The regional Center of Vocational Excellence in Denmark from the European Platform for Urban Greening had all their teachers trained in the use of design thinking methodology and hackathons, April 2024
- The partners of the European Platform for Urban Greening used the experience and lessons learned in the BARCOVE project so far in an Erasmus Cooperation Partnership application to build TecRoc Green façade systems in six European countries to do applied research on the proof of concept of this originally Spanish solution in other European countries. Furthermore, it will provide the VET schools with state of the art training facilities on vertical green while developing the applied research skills of VET teachers and students as well.
- BARCOVE will provide a hands on workshop on Applied Research in VET and the outcomes of the BARCOVE project during the 2024 edition of the Forum on Vocational Excellence. By doing so, we offer all EU funded Centers of Vocational Excellence (53) the opportunity to learn about the project outcomes and use our methodology and formats in their own Center of Vocational Excellence. Furthermore, their will be many national CoVE like initiatives present, like the French Campus de Metiers et Qualifications, the Dutch Public-Private-Partnerships in VET and many more. In total there will be ca 700 participants from all over Europe present during this event.
- The Danish Klimatorium will organize the blue green innovation challenge in 2024 again, funding the entire event.

Responses from the participants

The abovementioned interest in the results of BARCOVE clearly indicates a positive response from stakeholders working in VET and in Centers of Vocational Excellence. We will continue to follow and evaluate all responses through the impact measurement work package in BARCOVE and update this report in fall 2024.

Lessons learned

Even though BARCOVE is co funded by the Erasmus program of the European Commission and we have a clear work program outlined in the application, it is important to focus on the impact beyond the project from the beginning. By taking the hands on approach and sharing our plans for the BlueGreen Innovation Challenge, we managed to involve more people than expected. Furthermore, other stakeholders are already starting to use our approach, long before we expected it. And finally, by actively sharing the project, the results and the impact, we were directed towards additional funding opportunities to support the Centers of Vocational Excellence in developing their applied research activities (for example funding for specific one on one cases, but also the offer to repeat the BlueGreen Innovation Challenge in 2024 funded by Klimatorium Denmark).

Conclusion

The overall conclusion so far is that the BARCOVE project seems to create an even bigger impact than expected. The reaction to the hackathon from students, start-ups, schools and companies exceeded the expectations, both in number of people that wanted to join and their reactions before, during and after the hackathon. Also the interest in the format and working models from BARCOVE from stakeholders outside the project consortium, even though the work on the recipe book in WP4 is still in progress, was more than we could have hoped for.

We also learned that sometimes it helps to stick to a tight deadline, to make things happen. The hackathon in September is a clear example of this. However, in case of implementing the one on one cases, deviating slightly and allowing for more time to let the cases complete was more appropriate. The decision to extend the project's timeline reflects a commitment to quality and depth of research and implementation. By adjusting the schedule, BARCOVE is positioned to deliver more nuanced, thoroughly tested, and potentially groundbreaking solutions in urban space and water management, exceeding the initial promises made in the application.

Furthermore, we would like to highlight the hands on approach of BARCOVE in organizing its hackathon and the follow up cases. We noticed based on the work in WP2 that there are many different definitions and approaches to do applied research in VET. This leads to the risk of having extensive theoretical discussions about the topic, whereas we believe that by starting to do applied research, you create clarity about what works and what does not in the context of the participating schools and companies. Furthermore, we noticed that by doing, the participants recognized the value and impact of applied research in VET, whereas during the preparation of the hackathon, it was sometimes difficult to explain the concepts based on just the theoretical explanation. Therefore, we strongly recommend anyone who would like to do applied research in VET to focus on impact and take a hands on approach.

Finally, we would like to conclude that we are looking very much forward to delivering results 3.4 and 3.5 later this year, in fall, including the recipe book. By doing so we hope we can provide more VET schools and companies to engage in applied research together and by doing so making an impact for society, both in their regions as well as across Europe.