Training Concept for Raising Awareness and Building Skills for the low Carbon Economy

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ABSTRACT

Decarbonization and achieving a low carbon economy and lifestyle are important goals for the next generations of young people. The concept proposed in this paper aims to introduce the Romanian students, on a voluntary bases, to the field of climate change mitigation through decarbonization, by organizing a series of workshops and trainings. We will address topics like renewable energy, circular economy, zero waste systems, cleaner production, new resources, innovation management and smart solutions. The participants to the events of the project are intended to become "message bearers" and to act as change agents in their future work places. A community will be formed in the virtual environment (Facebook page, email group, Twitter account, YouTube channel) with all the persons involved in the activities of the project, that will permit the continuation of information and good practices exchange.

Keywords: decarbonization, training, low carbon economy.

INTRODUCTION

Decarbonization and achieving a low carbon economy and lifestyle are important goals for the next generations of young people. This is a very big challenge as our entire way of life is built around using fossil fuels. The challenge not only applies to energy and transportation, but also to construction materials, plastic industry, agriculture and even synthetic fibers for clothing. In this effort, a significant role should be played by engineers and economist that help design new products and new technologies. Once they have a mindset adequate to diminishing the carbon footprint on a large scale, which is achievable through higher education, the currently developing contributions of researchers
in this area will enter mainstream circulation and will be applied globally, thus truly lowering the amount of carbon dioxide that is released into the atmosphere and limiting the consequences of climate change.

THE CONCEPT’S VISION, AIM AND GOALS

According to the available 2018 data (European Environment Agency, 2018), the EU will meet the 2020 reduction target but will miss the one set for 2030, with the energy sector and manufacturing having the largest footprints. This, however, is considered a minor setback in a very ambitious plan for a “climate-neutral Europe by 2050” assumed in November 2018 (European Commision, 2018). While the technical dimension is very well discussed in studies and publications, and the framework conditions are starting to be addressed from a scientific perspective, in (Busch, Foxon, & Taylor, 2018) or (Rogge & Dütschke, 2018), we have found that the human dimension and especially training approaches in this are rather underrepresented.

The concept proposed in this paper aims to introduce the Romanian students, on a voluntary bases, to the field of climate change mitigation through decarbonization, by organizing a series of workshops and trainings. The goal of this approach is aligned with the need to help speed up changes in attitudes, know-how and practices in universities and academic communities with respect to the ongoing challenges the world economy faces in relation with climate change. By organizing dissemination events and free training programs in universities, we aim to help new generations of students become aware of and understand the impact their decisions in manufacturing or service companies will have on the environment.

The workshops will help in raising awareness regarding this topic and will contribute to revealing the link between engineering, product development, marketing and changes taking place within the global climate system. We will invite experts and public figures that have a good public track record in this area to deliver presentations and answer the questions of the students from the bachelor and master programs.

The training will focus on developing the proper skills to address these challenges and will constitute a complementary and additional specialization to the one given by their home universities. We will address topics like renewable energy, circular economy, zero waste systems, cleaner production, new resources, innovation management and smart solutions.

By basing the presentations on scientific knowledge and good economic and engineering practices, as well as on international policy recommendations in this area (such as those from UN's IPCC or the EU), we will ensure that future professionals will gain an accountability related dimension to their higher education experience. Also, we believe that a multiplying effect will be generated and once a group of participants will be trained, they will pass on their know-how to their peers and co-workers, thus helping further extend the impact of this proposal. At the same time, we hope to generate interest and emulation on the topic in such a way that similar or larger scale initiatives could be implemented with the same goals or that the universities in Romania will pick-up this good practice and integrate in into the regular curricula for some of their study programs.

Due to their involvement in the local communities, the host universities could act as conduit for the topics on which this course is focused to become more mainstream in Romania. University cities have vibrant communities of engaged and socially active young people that can push further the ideas of low carbon economy in the companies they work and groups they belong to.

The main beneficiaries of the proposal will be university students. The background of these students will be in engineering (mechanical, electric, civil etc.) and economic sciences. They will be in a good position to enter the workforce in positions that will handle new product development, material choice and technology selection, thus having the potential to impact the transformation towards the low carbon approach of the Romanian economy.

Students represent a very powerful instrument to help change the way Romanian society approaches these issues. Because of their youth and enthusiasm, the know-how they will accumulate regarding climate change threats and way to mitigate them by reducing the carbon footprint, has an increased chance of being disseminated into the society and then accepted over the long run. Each of the students
targeted by the concept could become an agent of change and inspiration to other people from their peer groups, families and communities.

**EMPIRICAL RESEARCH FOR FOUNDATION DEVELOPMENT**

In order to develop a concrete form of the proposed approach, the authors conducted an analysis of the requirements of the target group based on the current trends in decarbonization science and educational good practices. A focus group of 14 students in engineering sciences has been assembled and questioned about three categories of requirements related to the foreseen program: content, delivery and administrative issues. They have been presented with sets of requirements proposed by the researchers in each direction and, after discussion and clarification, asked to rank them using the Analytical Hierarchy Process as implemented by the software Qualica QFD. First, the three categories were ranked, then the requirements inside each of them and then, the final results were generated by compounding the intermediary values and normalizing the outputs (Figure 1). Care has been taken that the consistency index, which measures internal coherence of the pairwise comparisons, to be below the quality threshold of 10%, with the actual values ranging between 3.00% and 9.95%.

![Figure 1. Ranking of (clockwise): general, content, delivery, administrative requirements and final results](image)
As it can be seen, the first four resulting elements are content related aspects, defining the first four topics to be addressed in the study program, and the two next ones are related to delivery, which should approach both policies and technical solutions in a practical and hands-on manner.

**PRACTICAL DEPLOYMENT OF THE CONCEPT**

The concept is designed to be deployed through 3 main steps: Scouting and communication, Organizing workshops for raising awareness and Organizing training sessions for developing skills, completed hopefully by a follow-up and systematization / institutionalization phase (Figure 2).

![Figure 2. Proposed training concept phases.](image)

The **Scouting and communication activity** will have the goal to attract the participants to the workshops and trainings organized in subsequent activities. Since decarbonization of the economic / industrial activities is not well known in Romania, this task aims to transform the "cold" market into a "warm" one, by presenting to possible participant niches the importance and opportunity of the topic. The actions to be performed will be divided into two main areas: Preparing the communication message and materials, based on scientific studies and marketing best practices, and Distributing the materials and message in printed and electronic form, as well as giving live presentations in universities. Participants lists will be drawn up and continued communication will ensue to help the attendees make the decision to participate in the project activities.

**Organizing workshops for raising awareness** will be a task focused on organizing 1-day events in the universities contacted in phase 1 that agree to collaborate on this subject. The workshops will include presentations and discussion sessions, as well as coffee breaks and lunches for professional networking. Each workshop will have 1-2 speakers which are experts in one or more areas related to decarbonization, which will be joined also by a local team from the host institutions. General and broad-view topics on climate change mitigation and low carbon strategies in various fields, as well as in everyday life will be presented and discussed. The participants will also be encouraged to make a longer time commitment and join the training sessions proposed later. As components sub-activities, this activity will be divided into Preparation of the workshops, including agenda development, speaker invitation and contracting of services (based on sponsorships) and Delivery of the workshops, which contains the actual events.

In the last phase, **Organizing training sessions for developing skills**, several students at each institution will be enrolled in a longer training program aimed at delivering skills related to decarbonization and low carbon economy, using face to face and web-based training sessions held by specialists in the field. In total, there will be 3 full days of training spread over 3 months and the participants will receive certificates of attendance at the end.

The effectiveness of the envisioned activities will be measured directly and indirectly. The promotion actions included in first activity will be measured during and after implementation, using web-related metrics (web page hits, social media post engagement) and feedback questionnaires. During the events to be organized within the scope of the second and third stages, the participants will receive detailed feedback questionnaires to check their understanding of the topics and quality of the events, including organization issues, the delivered content and the discussions with the speakers and trainers. The data collected in this way will be processed and analyzed to improve activities as they go along and to tailor the sustainability strategy focusing on the long-term impact of the initiative.
Since the main goal of the program is to determine a change in the public and specialized knowledge related to the topic of low carbon economy and the way in which product and process redesign can lead to a reduced carbon footprint, we consider that effective communication is as important as the content of the workshop and training activities. Also, after the conclusion of the events, the participants will be contacted via email to gauge their continued involvement with the topic of decarbonization through surveys and email interviews. The social media pages to be developed will also serve as indirect means to assess the success and impact of the project activities on the participants by determining the way in which they apply the learned skills in their day to day careers. Statistical determinations will be performed on the aggregated data and the conclusions will form part of a sustainability plan a list of recommendations to be sent to the leadership of the host universities.

CONCLUSIONS AND OUTLOOK

The participants to the events included in the concept are intended to become "message bearers" and to act as change agents in their future work places. A community will be formed in the virtual environment (Facebook page, email group, Twitter account, YouTube channel) with all the persons involved in the activities of the project, that will permit the continuation of information and good practices exchange. As they are expected to progress along their career paths, they will gain more expertise and know-how and will be able to also share it with their colleagues for peer-based learning. The goal of this sustainability mechanism is to create over time a community of specialists capable of producing change in their organizations and capable to assist other organizations in their community in a voluntary manner.

Institutionally, the host universities will gain the possibility to transform this experience into an example and pilot test for developing new teaching approaches in their fields (technical or economic sciences) that could reach future students either through entire study programs integrated in the topic of decarbonization or through specific courses that can be included in other, more traditional programs. In the first category, possible programs that should be investigated included Renewable energy, The circular economy, Electric vehicles, Carbon recapture technologies or Decarbonization of manufacturing. In the second category, the courses that will be targeted include Solar energy systems (civil engineering), Biofuels (automotive engineering), Smart materials (mechanical engineering), Industry 4.0 solutions (industrial engineering), Sustainable agriculture and Sustainable tourism (economic sciences), etc. We are hoping to determine the leadership of the host institutions to acknowledge this need and take bold action in committing the educational development of future generations of students on this path, as well in advancing scientific research in the field. It is our belief that continued attention to the topic of decarbonization from all members of the academic community is necessary at this time in history.

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