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Establishment of educational module "Climate Change" in the University of Liepaja[1]

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Abstract

Increase of awareness and high knowledge base of society in the field of climate change and environment in general in global and local ranges is vital to prevent future possible increase of climate changes in the world. In order to more involve society in prevention of future climate changes, national government has come up with National Climate Policy [1], which includes possibility for educational institutions such as University of Liepaja to develop educational programs, including lifelong and distance education programs. To achieve given objective, educational module "Climate Change" is created by University of Liepaja. Goal of this activity is to increase knowledge and capacity of governmental institutions, municipalities, scientific and educational institutions, private businesses, societies and foundations as well as separate members of society. Besides overall information on greenhouse gas emissions and adaptation to climate change, University of Liepaja concentrates more on practical questions, since, in our opinion, practical knowledge on how to use renewable resources, reduce greenhouse gas emissions or even reuse them in industry will create larger impact on achieving the objective. Therefore University of Liepaja concentrates on following topics: practical use of different technical solutions in industry, technical equipment used in industry of renewable energy, technologies used to prevent greenhouse gas emissions and mathematical modeling of possible scenarios, when pollution occurs in populated areas. Developed materials will be available for society, especially for the members of the target group for educational purposes. Materials also can and will be used for distance education.

Keywords: Lifelong distance education; Natural sciences, Climate change

INTRODUCTION

Agreement was concluded between donor countries (Norway, Island and Lichtenstein) and European Committee on 18th December 2009 about implementation of European Economic Area Financial Mechanism and Norway Financial Mechanism for time period 2009 – 2014. Corresponding agreement was signed on 28th July 2010 [2]. Goal of the established financial mechanisms is to eliminate social and economic inequalities within European Economic Area and to strengthen bilateral relations between the donor and the recipient countries. Net financing

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allocated to Latvia from both financial mechanisms is 67,48 million EUR, which is about 30% increase in comparison with the previous planning period 2004 – 2009.

Within European Economic Area Financial Mechanism 2009 – 2014 program LV02 the National Climate Policy was established [3]. Goal of the program is to support development of a comprehensive Latvian national climate policy, covering areas not included in Emissions Trading System and all other areas of climate change adaptation issues. Total budget for the program LV02 National Climate Policy is 11,21 million EUR.

Within this program the support is given to previously predefined projects on establishment of national system on greenhouse gases, evaluation and reporting on policies, activities and projections, and development of national strategies, proposals on adaptation. Besides the above mentioned, the support is also given to open contests for projects in two main areas:

- Emission reduction technologies, including renewable energy and sustainable buildings, as well as new technology development;
- Small grant scheme - capacity building of educational and research areas, and measures for raising public awareness on climate change and its effects.

Goal of the second one is to expand knowledge base and capacity of the target groups – public authorities, municipalities, non-governmental organizations, educational and scientific organizations and businesses, which allows the public to participate in the climate and adaptation policies at a higher degree.

Supported activities within the small grant scheme are:

- Publicity activities related to the project activities;
- Development of informative and visual materials;
- Training seminars and conferences, development of educational programs and research activities.

University of Liepaja within the small grant scheme proposed to develop and establish an educational module on Climate Change in University of Liepaja, and the proposed project, amongst seventeen others, was accepted for implementation [4].

METHOD

Goal of the project is to increase program's "National Climate Policy" target groups' knowledge base and capacity to promote public participation in minimization of climate change and implementation of policy measures related to adaptation to climate changes. It is planned to reach this goal by implementation of the educational module and using it or parts of it in process of education, especially by increasing understanding of greenhouse gas emission reduction and adaptation to climate change.

One of the priorities of the European Union is to reduce impact on climate change, therefore EU and its member states support various activities to promote energy efficiency, use of local and renewable energy sources, as well as activities to increase environmental awareness of the society. Such measures are taken not only to ensure that the EU common objectives, such as sustainable development and economic growth, are met, but also to ensure that member states, including Latvia, develop and provide thoughtful and high quality living environment for their citizens.

University of Liepaja, by implementing the proposed project, plans to increase primary and secondary target groups' knowledge and capacity to promote public participation in minimization of climate change and implementing policy measures related to adaptation to climate change, thus increasing the overall public awareness and resulting environmental impact reduction, which, as a result, will ensure higher quality and sustainable living environment.

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Within the project an educational module "Climate Change" is developed and approbated, and it will be used to achieve project's goal and therefore solve abovementioned problems.

Advantage of this educational module in relation to other educational activities is that the target audience not only acquires knowledge of the regulatory framework and theoretical knowledge about climate change, but also has practical access to real life working renewable energy systems, such as solar panel systems, natural gas reactors etc. through practical activities. This educational module also includes a mathematical modeling part, where the audience has an opportunity to use simulation tools, which allow to predict environmental consequences and impact on climate change of practical use of one or other energy source.

Project's target group, during the implementation of this educational module, is students of University of Liepaja and invited members of the program's "National Climate Policy" target group.

The educational module, developed within the project, will cover following topics:

- Nature of climate change and evidence to its existence in Latvia and also on global scale, as well as the need to adapt to climate change and possibilities for adaptation in Latvia and in the world (normative base review included).
- Diversity of greenhouse gas emission in Latvia both in a sense of technologies and activities, as well as practical activities within the project, including work with mathematical models.
- Climate change, its minimization and adaptation to climate change's socio-economic aspects.

The project is both important and relevant, since it helps to address the issues that are associated with one of the EU's priority – to reduce the impact on climate change, and draws attention to the different types of renewable energy options. The project is also significant, since its primary and secondary target groups have the largest potential impact on society and therefore on the achievement of common objectives – sustainable development and increasing quality of life. Establishment of this educational module is also important with respect to EU common goal to decrease CO2 emissions by 20% in 2020 against 1990, to increase energy efficiency by 20% and increase renewable energy's share in total final energy consumption by 20%. Establishment of the educational module "Climate Change" in University of Liepaja also corresponds to the Sustainable Energy Action Plan for Liepaja City for the time period 2014 – 2020.

By evaluating project's coverage, it can be concluded that the project's target group (about 50 people), that consists of students of University of Liepaja and the invited representatives from the program "National Climate Policy" target group, is 100% covered. Simultaneously, the materials, which are generated within the project, will be published in an Internet website, so the project will cover a much wider audience, including the general set of "National Climate Policy" program's target groups. By taking into account that the educational module "Climate Change" will be used by University of Liepaja at least the next five years, audience covered by this project can be evaluated at least five times larger than described.

All educational materials generated within the project will be approbated by University of Liepaja, which will increase usefulness and clarity of created set of educational materials by taking into account the opinion of target groups.

It is planned to use the educational materials of the established educational module "Climate Change" in the future educational process, including distance education, constantly improving educational materials by adding new information on latest discoveries in climate change and newest technologies. The educational materials can be used as one set of materials for an autonomous lecture course, or an integrated section in other educational programs related to climate change or engineering sciences.

Within this project the principles of good governance are ensured:

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- Participation – participation of all parties involved is promoted both directly and by publicity measures;
- Responsibility – organizations and institutions involved in the project operate in the public interest;
- Transparency – decision-making process during project implementation is both transparent and well understood; decision implementation is carried out in accordance with legal norms and information about it is freely available.
- Efficiency – results of the project ensure the needs of the target audience by effective use of project funds;
- Compliance with the law, justice – within the framework of the project, principles of legality and human rights are respected. Possibilities of corruption are prevented.

During the project implementation the target group will be informed about the impact of climate change, which is an important environmental problem. By informing the target group about the relevance of climate change and greenhouse gas reduction potential in households, a change in consumers' behavior will be promoted, that will reduce their negative impact on the environment, as well as increase more efficient use of resources.

Implementation of this educational module to the target audience, including local government employees, will indirectly contribute to climate change reduction, thus reducing the impact of climate change on economic sustainability.

By focusing attention to climate change, attention is focused on one of the most important environmental problems. Reduction of climate change also reduces its negative impact on human welfare, public health and safety.

In implementation of this educational module in University of Liepaja, national laws and regulations that determine state standards for first and second level professional higher education will be taken into account.

METHODS OF IMPLEMENTATION

Within the educational module "Climate Change" a number of courses designed to teach students to analyze environmental factors, make educated forecasts and gain practical knowledge with latest technological solutions and modern laboratory equipment are developed.

In the educational process University of Liepaja uses equipment from the environmental chemistry laboratory and physics laboratory, including biogas reactor, latest software for modeling of environmental processes and real life processes simulation.

Laboratory equipment used in course of this educational module is mainly dedicated to renewable energy, starting from implementation of solar, wind and hydro energy and finishing with state of the art thin layer sputtering systems.

It has been decided to focus more on practical aspects of environmental processes and climate change, so after a research on existing educational programs, the decision has been made to create four following courses within educational module "Climate Change":

- Climate Technologies;
- Use of Renewable Energy Sources;
- Environmental Processes Modeling;
- Practical Solutions for Environmental Engineering.

The course "Practical Solutions for Environmental Engineering" is devoted to exploring various engineering solutions, such as pressure switches, temperature sensors, level transmitters, etc. and

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their use in various applications. Skills will be gained to choose the right solutions in specific cases. It is important that people, who practically use different industrial equipment, including ones related to renewable energy sources, have knowledge on different parts of systems, which ensures successful use of equipment and its long life.

The course "Environmental Processes Modeling" is dedicated to developing skills in modeling of environmental processes, both in global and local scales. Skills will be gained by training students to work with the latest numerical modeling programs. Main objectives of this particular course are to:

- Educate students on relations between environmental parameters and possibilities to use discovered relations in computer modeling;
- Educate students on how to add more parameters to the environmental mathematical model, and therefore make the model more precise and universal.

Goal of this course is to educate students up to the level where they can independently define environmental problems, including relevant processes which define the problem and its parameters, create a proper mathematical model and use it to simulate the problem, and afterwards make educated decisions on how to act to solve the particular problem, based on the gained results,.

The remaining two courses – "Climate Technologies" and "Use of Renewable Energy Sources" together cover all the industrial equipment used to create energy from renewable energy sources and reduce CO2 pollution, as well as the latest technologies for creating new equipment related to climate change.

The course "Use of Renewable Energy Sources" includes theoretical part for the technologies of using renewable energy sources – starting from solar, wind and hydro energy and finishing by graphene solar panels, energy harvesting concept etc. Besides theoretical knowledge, students will be available to gain practical skills by using real life renewable energy equipment – biogas reactor, solar panels, solar collector, etc. In our opinion it is important, that after finishing educational module "Climate Change" students have "hands on" experience with industrial technologies used at the moment in district heating companies, factories, households etc.

The course "Climate Technologies" is dedicated to engineering solutions used in two fields – reduction of CO2 emissions and new technologies. First one includes solutions not only to reduce CO2 pollution by reducing actual pollution, but also technologies which allow collecting CO2 and using it in industry. Second part includes theoretical education process on thin layer sputtering processes and also practical part by using state of the art sputtering equipment owned by University of Liepaja and available in its laboratory. There are two types of vapor sputtering processes - physical and chemical, both of which are usable to create thin layers. Thin layers technology is the latest tool to create new technologies and innovative materials, which allows scientists to create new more powerful solar panels, different types of sensors etc.

Both courses "Climate Technologies" and "Practical Solutions for Environmental Engineering" are complemented with educational tours to manufacturing or processing plants to enrich the gained knowledge with some practical real life experience, thus consolidating the acquired knowledge.

FINDINGS

It is established that there is a lack of practical approach, when questions of climate change and environmental processes are addressed. To fill this gap, University of Liepaja is implementing a new educational module "Climate Change", which besides legislation and theoretical part mainly focuses on practical aspects of climate change, namely technical solutions for use of renewable energy sources, technologies for reduction of CO2 pollution and new technologies to create new innovative equipment for use with renewable energy etc.

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At the moment a set of educational courses covering theoretical and practical aspects of climate change is created. Content of the courses are established and now it is in the process of approbation.

Latest responses from target group of the project shows, that the created educational module is very useful and needed in practical life. It helps not only to more deeply understand previously gained theoretical knowledge, but also to find a job after the studies, since students have practical "hands on" experience with industrial equipment.

Results of the project will be used in future to study possibilities of learning natural sciences in distance education process.

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