

Complex assessment of climate change impacts - preparing international R&D projects in the University of West Hungary

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Abstract

The "CLIMATE IMPACTS – Complex assessment of climate change impacts - preparing international R&D projects in the University of West Hungary" project has been launched in order to develop research, management, infrastructure and education of the Faculties.

The scientific work is concentrating on climate change and its impacts on natural and agricultural ecosystems, which has a priority also in the EU. The aim is to establish research groups who will be able to write proposals for R&D projects of the European Union, with focus on Horizon2020 projects. Beyond researchers with various disciplines from the University, involvement of young scientists, PhD students and researchers from international research centers are especially supported. These inter- and multidisciplinary research groups and new partnerships will contribute to the enhancement of the research potential as well as to the sustainable knowledge transfer in the University.

The duration of the project is 8 months, the consortium includes two partners (University of West Hungary and the Hungarian Academy of Sciences, Centre of Ecological Research).

Keywords: research and development, research group, climate change impacts

Ongoing research

The research is being carried out in the following work packages:

A) The impact of climate change on natural ecosystems

A1) Methods for analyzing climate change and its impacts on forest ecosystems

The aim is to synthesize the available databases and methods applied to analyses climate change and its impacts on forest ecosystems. Case study areas are selected where forest dieback is already visible. Complex investigation of the site conditions is being carried out applying field observations, laboratory work, modelling and GIS-methods. Documenting the main steps, a guide for impact and risk assessments is being developed in order to support adaptation in forest management.

A2) The territory change of domestic insect species – direct and indirect effect of climate change

The aim of the research is the identification of native insect species, whose area of distribution has being increased in the last decades. The possible reason of these changes and their effects on the natural ecosystems are investigated.

B) The impact of climate change on agriculture

B1) Climate change impact on crop production

GPS-based field observations were carried out: soil sampling, soil moisture content, maize plant sampling (root, stem and leaves), penetration resistance and maize root force measurements with two-armed lever equipped with a dynamometer were determined on different soil conditions. The aim is to analyze the climate impact on corn production in different soil textures with variable water holding capacity and soil moisture content.

B2) Enhancement of crop safety and pesticide free crop protection – application of microalgae in crop production and protection

The researchers of the Institute of Plant Biology are working on microalgae biotechnology for agricultural purposes.. Experimental results of the Institute approve that microalgae treatments ensure the safety of crop production by: (1) increasing crop yield, (2) improving plant water balance, (3) protecting crops against special plant fungal diseases and insects.

B3) IT system supporting clean production technologies

Over the past three months, we have started to use the SensorHUB system. The staff got to know the various aspects of the structure, the operations and the capabilities of the system.

C) Application of renewable raw materials, renewable energy resources, life cycle analysis

C1) Effect of buildings on climate

The buildings could affect the environment by the manufacturing of building materials and the energy used during operation of buildings. High ratio of energy consumption related to the heating and cooling of buildings. From this amount of energy the residential consumption is dominating against public sector. The most damaging affect is coming from the fossil energy sources. In this project period it was examined the possibility of working out projects which try to minimalize the environment damaging effect of the building.

C2) Wide-range applications of renewable raw materials

Bacterial cellulose (BC) is an environmentally-friendly polymeric material that has high purity, high crystallinity, a high degree of polymerization, high tensile strength and strong biological adaptability. Two different approaches in purifying BC are demonstrated, water and alkaline methods, and in the alkaline case followed by ultrasound treatment. The different approaches in BC purification and sonochemical processing are shown to affect drastically the morphology of the BC fibrils, as seen from films by optical methods. Rheological investigation shows that there is a difference in manifestation of particle shape/crystallinity response and that sonicated samples show a rheological behavior similar to that of liquid crystals in both linear and non-linear regimes.

C3) Dendromass production

The Bioenergy Research Group will perform a pilot project on biomass-to-energy survey. The scope of the pilot project is to develop a measurement protocol for quantity- and quality-surveys on biomass-to-energy potential on non-cultivated (natural or semi-natural) areas. Biomass potential survey protocols for such areas with wild-growing and varying mix of plants was not available so far. The new measurement protocol will be performed so that it could increase the reliability of the surveys on natural or nature-like areas with high heterogeneity of wild plants.

C4) Life cycle assessment

The members of the future LCA-research team assess the possibilities of international standards regulated procedure to apply. In the case of the scope's life cycle assessments can be drawn products, activities, production technology, operational lines and services (domains) assess inside the system boundaries (environmental and economic) inventory data (LCI - Life Cycle Inventory) range possible. With this establish the creation of the ecobalance in affected subjects.

The analyzes of software support could be designated the impact categories of the investigation's subjects, identifying groups of the environmental problems and life cycle costing (LCC) can be made also.

D) Preparing biodiversity indicators and organizing a monitoring system for Hungarian forests

The forest sub-compartments to be investigated were then classified in advance according to their type (composition, structure, extent, condition, usage) based on database information. In terms of composition, tree stands and different categorizations of tree species were our main focus. Native ones were assigned to forest association groups and forestry regions. Landscape level analysis of the biodiversity is performed in the sense of composition, structure and function.

E) Founding interdisciplinary research team for identification of biodiversity in forest

The main aim of the work package is the preparation of scientific manuscripts within two scientific working groups: (1) exploration the relationships between environmental variables and the biodiversity of different organism groups in mixed forests and (2) comparative study of Hungarian oak dominated forests.

F) Effects of climate change on ecosystems – a monitoring system in the practice

New e-learning material has been edited on climate change at the University of West Hungary. In parallel, a survey on the knowledge and attitude of students was started. Preliminary measurements and data collection has been started in different fields e.g. aerial

photography at dolinas for the effects of heavy rains and monitoring of dust pollution in the atmosphere. Examining environmental changes, we conducted botanical and zoological studies in areas exposed to varying degrees of environmental change in the Carpathian Basin. We monitored the breeding bird fauna with the standard mark-recapture method. Further aim is to develop a new methods applied to analyze environmental DNA structure in lake ecosystem. Complex investigation of the site conditions is being carried out applying field measuring, laboratory work, GIS-methods.

G) Social awareness, conflict management, challenges related to climate change

We would like to develop a range of project ideas related to the social and economic issues of climate change and general environmental conflicts. These issues are the global environmental conflicts, environmental scarcity and the knowledge controversies in society; global monetary system and sustainability issues; global climate change and the Hungarian economy; agricultural adaptation to climate change; low carbon urban strategies; and as somehow related topics green logistics and migration-based social conflicts are considered

Involved Faculties and Institutes

- Apáczai Csere János Faculty
- Benedek Elek Faculty of Pedagogy
- Faculty of Agricultural and Food Science
- Faculty of Economics
- Faculty of Forestry
- Karoly Simonyi Engineering, wood Science and Art faculty
- Faculty of Education
- Faculty of Natural Sciences
- Institute of Ecology, Hung. Academy of Sciences

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