Newsletter

May 2007, Issue 1

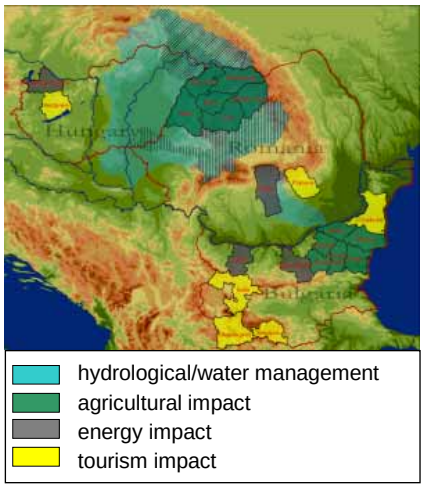
"Climate Change and Variability: Impact on Central and Eastern Europe"

Contents:

Welcome to the first issue of our newsletter. The newsletter will provide you, twice a year, with summaries of scientific work carried out within the CLAVIER Project, which started on the 1st September 2006. This project is supported by the European Commission's 6th Framework Programme and focuses on climate change and its possible consequences in Central and Eastern European countries (Hungary, Bulgaria and Romania). The CLAVIER Newsletter will address a rich set of issues ranging from the investigation of ongoing and future climate changes to their impact on four economic sectors: agriculture, tourism, energy supply and public. We hope it will be of interest not only to experts, but also to a wide range of readers.
Your comment and criticism on the newsletter contents is most welcome and will be highly appreciated. Please also feel free to submit material or topics for discussions, which we can include in the next issues.

Dr. Daniela Jacob,
Project Coordinator

Highlights



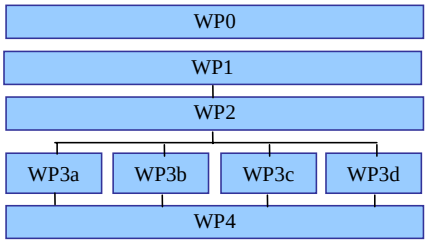
Clavier study areas

The nations in Central and Eastern Europe (CEE) face triple challenges through the ongoing economic and political transition, continuing vulnerability to environmental hazards and longer term impacts of global climate change. The overall aim of CLAVIER is to make a contribution to successfully cope with these challenges. Three representative CEE Countries are studied in detail: Hungary, Romania and Bulgaria.
In the framework of CLAVIER, ongoing and future climate changes are analysed based on existing data and on climate projections with very high detail to fulfil the need of local and regional impact assessment. Researchers from six countries and different disciplines investigate the links between climate change and its impact on weather patterns, air pollution, extreme events, and on water resources. Furthermore, an evaluation of the economic impact on agriculture, tourism, energy supply and the public sector is conducted.

Events

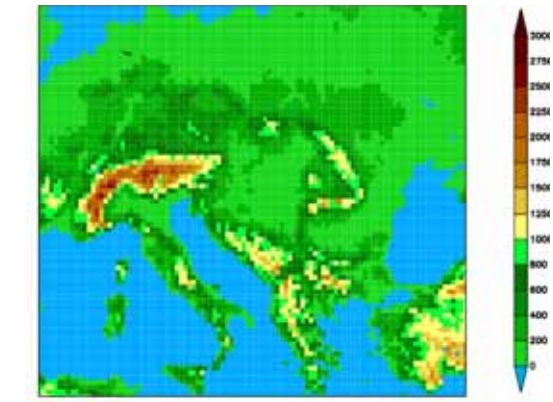
The kick-off workshop took place on the 30th of November and 1st of December, 2006 at the Budapest University of Technology and Economics. After the introduction of the partners and discussing organisational issues, the main topics of the meeting were the introduction of work packages, that is, thematic research sub-issues. Finding all the potential links and data flow options between the various issues of the project was one of the most crucial points of this first meeting.
The second official event of the project, the CLAVIER "Interfacing" Workshop was hosted by VITUKI on the 1st and 2nd of March, 2007. The main objective of the workshop was to establish interfaces and links between the climate modelling experts and the impact and vulnerability assessment research groups.
On the 23rd and 24th of March, a methodological workshop was organised in Graz, Austria for the participants of the work package on economic impact assessment (WP4).

The structure of the project

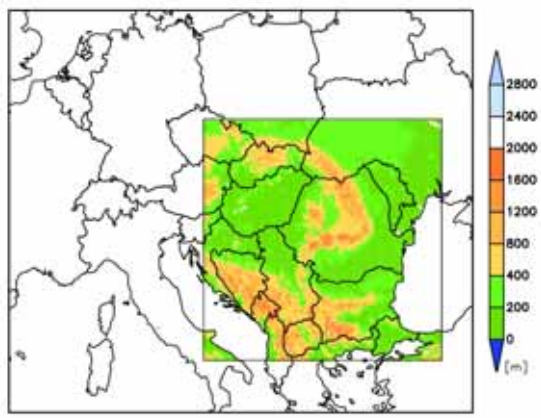


The CLAVIER project is divided into eight work packages according to the structure shown in the figure. Seven of these WPs are research topics introduced in detail below. WP0 covers a set of horizontal activities, including the internal co-ordination of the project and communication with external stakeholders.

CLIMATE SIMULATIONS – WP1



Model domain with 25 km resolution for climate change simulations



Model domain with 10 km resolution for climate change simulations

Climate change simulations and assessment of uncertainties

The first work package of CLAVIER is designed to perform climate change simulations, to assess uncertainties and to provide relevant future climate scenarios for impact communities. Three main partners are involved in this WP: IPSL in Paris, MPI-M in Hamburg and OMSZ in Budapest. Other partners, such as NIMH in Sofia, also expressed their interest in analysing numerical simulations performed in the WP1.

The mandatory experiments to be performed by the groups consist of an ensemble of 8 simulations covering the period 1951 to 2050. This ensemble is the cross product of 2 greenhouse-gas-emission scenarios (A1B and B1 from IPCC), 2 global ocean-atmosphere-coupled models (MPI-M and IPSL), and 2 regionally-oriented climate models (REMO from MPI-M and LMDZ from IPSL). Such an exhaustive combination is designed to evaluate the spread and uncertainties existing in the three distinct stages of regional climate change information production: emissions, global models and regional models.

Model validation is the second main task that WP1 is planning to deal with. Both REMO and LMDZ will be nudged into the ERA40 reanalysis dataset, in order to reproduce long sequences of climate variations during the last 40 years. The simulations results will be compared against observations, such as 2m-temperature and precipitation. Possible deviations will carefully be analysed, so that the representation of physical processes in the models can be improved if required.

In addition, a comparison of the spread of model results against observations including associated measurement uncertainties will be used for uncertainty evaluation and will help to judge carefully future climate scenarios.

WP1 is in strong coordination with other work packages of CLAVIER, especially the interfacing WP2, by performing relevant simulations to study physical processes and practical methodologies for climate information transfer across different spatio-temporal scales. MPI-M is planning to run a higher-resolution REMO simulation forced by the same REMO model but with a lower resolution. IPSL is planning to use an innovative protocol to run a large number of A2 scenarios from at least 4 global ocean-atmosphere models. This protocol tries to explore the zoom characteristics of LMDZ which can be run with the surface boundary conditions only and without any lateral boundaries.

INTERFACE – WP2

Optimized input data for climate impact studies from regional climate models

CLAVIER is conducted by an interdisciplinary team involving scientists with very different methodological backgrounds.

A crucial part of the project is the establishment of an effective interface between the project participants, particularly those from the climate modelling and the climate impact assessment communities. WP2 is designed to optimize this interface by enforcing and moderating *communication* and by providing *methodological interfaces*.

Communication: WP2 provides and moderates different communication channels (ranging from face-to-face channels like workshops to web-based non-interactive channels like a meta-database) which are used to collect and distribute information and to foster direct interaction between CLAVIER participants. Information about the requirements of climate impact studies conducted in the framework of CLAVIER are collected and the potentials and restrictions of available climate scenario data from WP1 are communicated. Available methodologies for bridging the "scale-gap" between WP1 data and the needs of particular impact studies are evaluated, and enhancement and adaptation options regarding the needs of the specific studies are elaborated.

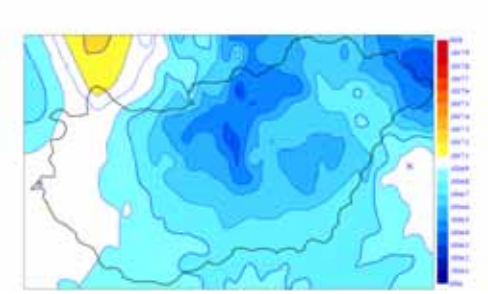
Methodological interfaces: Climate model - climate impact interfaces are realised by dynamical and statistical techniques:

Dynamic modelling and adaptation at very fine scales (3 to 1 km grid spacing) provides input for case studies in the field of hydrology and agriculture (WP3c) and multi-scale simulations are used to investigate model resolutions suited for proper representation of meteorological and climate extreme events (cooperation with WP3b).

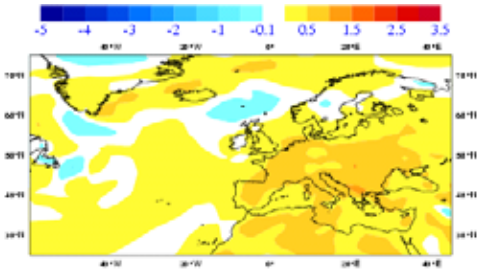
Various statistical downscaling techniques are applied to create ensembles of daily time series of key meteorological parameters on station scale using predictors from WP1 models. This ensemble approach continues the cascade started in WP1, provides probabilistic input data for climate impact studies and allows to investigate uncertainties in the projected climate impacts.

Statistical techniques are furthermore used to directly derive parameters of weather and climate extremes and various climate impact parameters in the fields of ecosystems, health, infrastructure and economics.

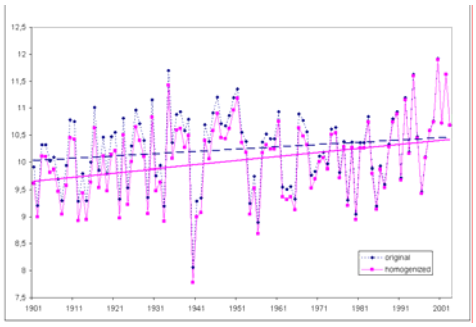
WEATHER REGIMES – W3a



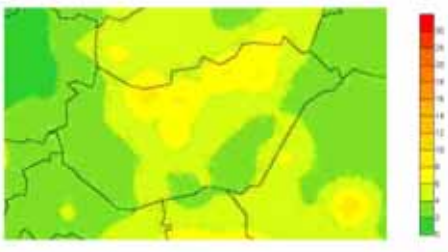
Mean sea level pressure over Hungary averaged for the period 1971-1980 based on the interpolated dataset of WP3a



Average summer temperature anomaly of the period 1991-2000 compared to 1961-2000 based on ERA40 data



Difference between the raw and homogenized temperature datasets based on 15 Hungarian SYNOP stations for the period 1901-2003



The annual mean concentration of SO2 in 2000 for Hungary based on the EMEP model

Impact on weather regimes and application to air pollution levels

The objective is to make a complete analysis of weather regimes for the region of Central and Eastern Europe for the current climate, to study the future changes of weather regimes and their implication to air pollution levels.
Weather regimes provide a dynamic paradigm for characterising the multi-modal statistics of the large-scale climate system and thus provide a natural starting point for a downscaling method to local climate (precipitation and temperature). It is well recognised that the mid-latitude atmospheric circulation is characterized by certain large-scale flow patterns that appear repeatedly at fixed geographic locations and persist beyond the life time of individual synoptic-scale events. The concept of weather regimes is particularly suitable to the geographic sector of Central and Eastern Europe. Weather regimes are believed to be a main factor in organizing the local weather and climate of this region and to be associated with significant anomalies of temperature, precipitation and wind. Four main tasks are planned:

- Characterization of the current regional climate: The main methodology of the work is based on a synoptic-climatological approach: present-day and recent-past climate data will be analysed to characterize the behaviour of the atmosphere with special diagnostics such as weather patterns and different indices.
- Main statistics of weather regimes for climate scenarios: Classification methods will be applied to the datasets provided by WP1 to obtain a complete statistic of weather regimes in the region and their future evolution.
- Composite meteorological datasets based on weather regimes: Once the weather regimes are established, we will then work in the "spectral domain" defined by these regimes and study the impact of climate change on each of the weather regimes. Composite meteorological situations will be calculated by considering both the average for a climatology and high quantiles for extreme events.
- Application to air quality modelling: Composite meteorological situations will be used in a regional-scale air pollution model (called CHIMERE) to evaluate the changes of air quality and the associated impacts on tourism when climate varies in the future.

EXTREMES – WP3b

Impact on extreme events

About 64% of all catastrophic events in Europe since 1980 can directly be attributed to weather and climate extremes. Climate change projections show even an increasing likelihood of extremes.

The following objectives will be addressed by WP3b:

- *Assessment of the impact of climate change on extreme events*

Past and future trends of extreme events in the Central and Eastern European region will be analyzed using the indices of extreme events defined in WP2. The analysis will be based on existing Regional Climate Model (RCM) Simulations and will be evaluated using the validation data obtained in the previous work packages.

- *Assessment of the impact of the summer drying problem (SDP) on the simulation of extreme events*

The SDP is a systematic bias in the simulation of today's mean climate and is a model feature that is typical for many RCMs, and to a less extent is visible in some general circulation models (GCMs). The SDP is the too dry and too warm simulation of climate over Central and Eastern Europe during the summer. The SDP is still an open issue strongly influencing the uncertainty related to climate change projections in the region.

- *Analysis of the impact of different climate model resolutions on the representation of extreme events*

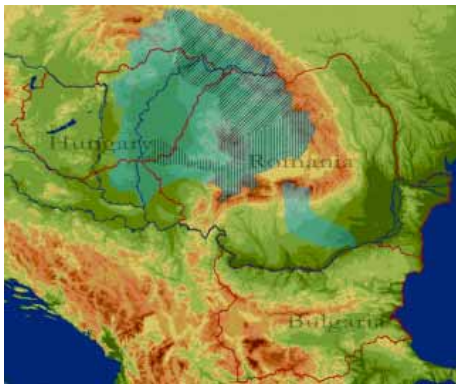
It is generally expected within the climate research community that extreme events will increase under climate change conditions, they will occur more often and will become more intense. Such events could be heavy extra-tropical storms as well as heavy precipitation events. To investigate projected future behaviour of extreme events with climate models, the corresponding models must be able to adequately simulate extreme events. Here, not only the choice of the climate model and its dynamical and physical parameterizations is important but also the resolution of the model grid. Previous climate modelling studies using model resolutions ranging from 250 km down to 18 km have shown that simulated extremes become more intense/extreme with increasing resolution.

- *Assessment of the potential impacts of climate change on forestry and water management, soil and agriculture in specific hydrological basins which could be affected by extreme events*

A new approach to different climate change scenarios and models, as well as the potential impacts of climate change on forest ecosystems, especially wetlands, and water management, soil and agriculture on specific hydrographical basins will be developed with focus on the impact of extreme events.

HYDROLOGY – WP3c

Impact on the hydrological and agricultural regime



The study areas

CLAVIER aims at the production of future hydrological and agricultural scenarios based on the output of regional climate models. Analysis of the simulation results received from hydrological models serves as direct or indirect input to water management decision support systems. Planned studies include the investigation of changes in the hydrological regime of various catchments; the estimation of changes in riverine flood characteristics; the estimation of the long-term evaporation rates from large lakes under climate change scenarios and their comparison with historical estimates; an analysis of changes in water stress for crops and changes in low water conditions.

The use of different conceptual hydrological models is planned to produce long term hydrological series. Upper-Tisza, Mures/Maros and Arges catchments will be investigated comprising river systems in various climate and geo-morphological settings across the region. The simulations will be transient, covering the period 1951 – 2050. A validation for the Tisza Basin will be carried out based on the period 1984 – 2003 of observations. These partly physically based models will be used together with continuous stochastic simulation models to produce climate effect reports for the selected basins with different types of hydrological regimes and flood problems including the interaction of basins of different runoff production significance and the coincidence and superposition of flood waves .

Flood (Photo by András Csik)

The evaporation of shallow water bodies will be investigated, since it is the largest water loss term in the lakes' water budget. Any expected future change in mean air temperatures, wind conditions and humidity would greatly affect these water balances even if precipitation and its annual distribution remained the same. Evaporation calculations will be performed with the help of the lake module of Morton's WREVAP model.

Possible changes in water stress for crops in selected regions at very high horizontal resolution (< 100 m) will be studied using climate model results, a high resolution elevation model, a model for calculating potential evapotranspiration and depending on the availability of cultivation data in the specific regions, a crop-yield model. Climate change impacts will be studied by simulating one present-day period and one future scenario at the end of the general CLAVIER simulation period.

HUMANS – WP3d

Analysis of the impacts on natural ecosystems, human health and infrastructure

Typical grassland - Hortobágy

The primary aim of the analysis is to develop and apply a methodology which provides scientifically credible information for the decision makers about the various impacts of climate change on regional and local levels. Two main objectives of this WP are:

- to prepare a high-resolution vulnerability and risk assessment of the impacts of climate change and
- to determine and map the critical components of the impacts where the possible adverse effects are most severe.

In order to fulfil these objectives, various methods will be developed and integrated to reveal the spatial-dependent interrelationship between the climate and weather parameters (provided by WP2) and the impact processes.

Common ragweed

The following impact areas will be considered: impacts on ecosystems (lowland and wetland damages, migration of invasive species, pests, insects), impacts on local air quality, impacts on infrastructure (damages to roads, rails, risks in air traffic, damages to settlements and buildings, risks in industrial infrastructure, impact on energy management: electric, gas and oil pipelines safety), impact on human health (mortality due to heat waves, increase of vector-borne diseases, migration of epidemic diseases, increase of allergic syndromes, UV induced skin cancers).

The work will be divided into two major parts. In the first phase the most suitable analytical tools will be selected (or developed) to find the relations between the interface outputs and the parameters of the impact issues. During the second phase, the impacts will be quantified in the examined CLAVIER region.

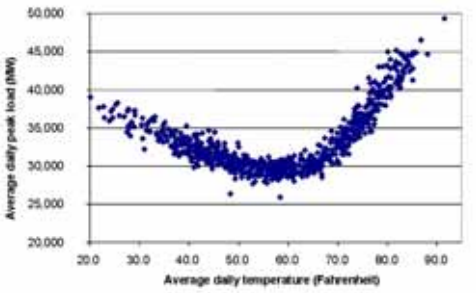
Besides providing an overview on the impacts in the examined region, WP3d will focus on some selected impacts in more detail, in five case studies:

- Ecosystems – Grasslands
- Infrastructure – Roads, Buildings
- Human health – Allergy (ragweed), Heat waves

ECONOMIC VULNERABILITY - WP 4

Climate change: causes, impacts and solutions

Floods affecting business infrastructure and private property



Search for correlations: peak load and temperature Summer 1998 - summer 2000

Economic Vulnerability of CEE societies and economic impact assessment

The main objective of WP4 is to evaluate the economic impacts of Climate Change in Hungary, Romania and Bulgaria.

The knowledge gained through the achievement of the scientific goals within the prior work packages builds the basis for the work in WP4. This WP connects the findings of Work Packages 1, 2 and 3a, b and c by "translating" the possible effects of climate change on e.g. weather patterns and extremes, agriculture, water resources and infrastructure into economic and social impacts.

Four economic sectors are of particular interest - agriculture, tourism, energy supply and the public sector. In order to estimate the economic vulnerability and the impacts on the national economies based on the findings of WP1-3, representative case studies of selected regions within the analyzed countries will be conducted for each sector. In addition, the risk transfer mechanisms and institutional settings in place that can deal with economic risks, e.g. from flood events or droughts, are analysed.

In order to fulfil the objectives of WP4, it is essential:

- to conduct a study of vulnerabilities of the study region (in a socio-economic vulnerability approach), that exist prior to and independently of hazards related to Climate Change and that put socio-economic structures at centre stage.

This is an important prerequisite for and starting point of the survey, and allows the selection of the case study areas, i.e. "the most vulnerable regions" with respect to the analyzed economic sectors.

- to link the scientific results of work packages 1, 2 (climate data and simulations) and the results of the impact studies carried out in WP 3a,b,c (climate change impacts on weather regimes, extreme events, the hydrological and agricultural regimes as well as on infrastructure) to the selected case study areas.

Based on the findings of the case studies, the influence of climate change scenarios on the national economies is estimated and conclusions on the overall macroeconomic relevance of the studied phenomena are drawn.

The analysis of economic impacts will be jointly carried out by all partners in WP4.

Introduction of project partners

Max Planck Institute for Meteorology (MPI-M), Hamburg, Germany (coordinator)

The overall mission of the Max Planck Institute for Meteorology is to understand how physical, chemical, and biological processes, as well as human behaviour contribute to the dynamics of the Earth system, and specifically how they relate to global and regional climate changes.
With roughly 200 employees from around the world, we carry out research into the dynamics of climate and of the Earth system. We develop models and measurement methods in order to study processes in the Earth's atmosphere, in the ocean and in the biosphere. We want to understand the variability of these processes, and to simulate the interactions between these Earth system components. We want to detect why climate changes and which of the numerous natural and man-made causes influence the climatic events. The regional effects of climate change and the consequences for the water cycle and air quality are of particular interest here.
Our computer models allow us to describe past climates and to estimate potential climate changes in the future. We develop the models together with meteorologists, oceanographers,physicists, chemists, biologists, information scientists and satellite experts in partner institutes in Germany and worldwide.
The Max Planck Institute for Meteorology is developing its research strategy around five major foci: (1) the understanding of atmospheric processes; (2) the investigation of key interactions between biogeochemical and physical processes at different scales; (3) the simulations of past, present and future climate; (4) the assessment of the impact of global and regional changes; (5) the integration of knowledge into comprehensive earth system models.
The International Max Planck Research School on Earth System Modelling (IMPRS-ESM) was established in 2002 to provide an integrative, interdisciplinary framework of PhD education on Earth system modelling.
Together with 6 institutes and facilities at the University of Hamburg and the Institute for Coastal Research at the GKSS Research Centre Geesthacht as associated partner, the Max Planck Institute for Meteorology makes up the Centre for Marine and Atmospheric Sciences (ZMAW).

Hungarian Meteorological Service (OMSZ), Budapest, Hungary (co-coordinator)

The Hungarian Meteorological Service (OMSZ) is the national meteorological service of Hungary, which is the largest meteorological, climate and environmental information provider in Hungary. The principle investigator of the CLAVIER project inside OMSZ is the Division for Numerical Modelling and Climate Dynamics. This group is in charge with various topics linked to numerical weather prediction with special emphasis on the entire spatial and temporal scale of numerical modelling. Basically all the activities of the division are realised through tight international co-operations. The ultra-short and short range numerical modelling is based on the ALADIN modelling system. The medium and seasonal range weather prediction products are received and processed on the basis of our cooperating membership of the European Centre for Medium-Range Weather Forecasting (ECMWF). The climate dynamics activities have been started rather recently at OMSZ. Regarding the regional climate models the REMO and ALADIN/Climate models are considered. The modelling contribution of OMSZ to the CLAVIER project will be based on the results of the REMO model.

Wegener Center for Climate and Global Change (WegCenter), University of Graz, Austria

As an interdisciplinary, internationally oriented research center the WegCenter combines the competences in the research areas "Climate, Environmental and Global Change".
It brings together scientists from fields such as geo- and climate physics, meteorology, economics, geography, and regional sciences. At the same time, close links exist with many international and national cooperation partners.
The research interests extend from monitoring, analysis, and modelling of climate and environmental change via climate impact research to the analysis of the human dimensions of these changes.

Laboratoire de Meteorologie Dynamique (LMD), Institut Pierre Simon Laplace (IPSL), Centre National de la Recherche Scientifique (CNRS), Paris, France

The Institut Pierre-Simon Laplace (IPSL) is a federation of five research laboratories in the Paris area, all of them working in the field of terrestrial and planetary environments: CETP (Centre d'Etude des Environnements Terrestre et Planétaires), LMD (Laboratoire de Météorologie Dynamique), LOCEAN (former LODYC: Laboratoires d'Océanographie Dynamique et de Climatologie), LSCE (Laboratoire des Sciences du Climat et de l'Environnement), SA (Service d'Aéronomie). It gathers 650 scientists, post doctorates, graduate students, engineers, technicians and administrative staff. It is affiliated to the Centre National de la Recherche Scientifique (CNRS), the Université Pierre et Marie Curie, the Université Versailles Saint-Quentin, the Commissariat à l'Energie Atomique (CEA), the Institut de Recherche pour le Développement (IRD), the Ecole Polytechnique and the Ecole Normale Supérieure. The activities of IPSL are in the field of research, observation networks and teaching. Besides the researches being conducted in each laboratory, the main activities conducted by the Institut Pierre-Simon Laplace address the field of multi-disciplinary environmental research. They are concerned with the study of the coupled environmental system of the Earth at various temporal and spatial scales from global environment to local and regional studies.

Department of Hydraulic and Water Resources Engineering, Budapest University of Technology and Economics (BUTE), Budapest, Hungary

The legal predecessor of BUTE was founded in 1782 under the name of “Institutum Geometrico-Hydrotechnicum”. At that time engineers specializing in surveying, flood protection and stream regulation were trained.
Nowadays BUTE, a public university, has about 16,000 students and 1024 faculty members. It has eight faculties: Civil Engineering, Mechanical Engineering, Architecture, Chemical Engineering, Electrical Engineering and Informatics, Transportation Engineering, Natural Sciences and Economic and Social Sciences.
The faculty of the University holds posts in more than 200 international organizations and BUTE has educational and scientific links with more than 100 universities worldwide. The University has produced three Nobel-Laurates who were educated at BUTE.

Institute of Technology and Regional Policy (InTeReg), JOANNEUM RESEARCH Forschungsgesellschaft mbH, Graz, Austria

The Institute's experts operate at the interface between economy, science and politics. The focal points of their work are in the areas of technology, regional and labour market policy as well as environmental economics and in the development of quantitative methods of analysis and evaluation. The projects in the area of environmental economics focus on 3 main themes:

- economics of water resources ;
- economic impacts of climate change;
- institutional questions of environmental and climate policy as well as risk management (mitigation and adaptation).

VITUKI Environmental Protection and Water Management Research Institute (VITUKI), Budapest, Hungary

The institution was founded in 1952 on the basis of the Hydrologic Institute to perform for the Hungarian Water Management both basic and applied research, as well as studies related to the development, conservation and sound management of water resources of the country. Recently a number of environmental laboratories were added to VITUKI basic infrastructure. At present, there are about 80 highly qualified specialists on the staff, out of the total 230 employees, including civil, chemical, electrical, mechanical engineers, geologists, biologists, mathematicians, and geophysicists. Implementation of the CLAVIER project is the task of a team formed out of the National Hydrological Forecasting and Flood Risk units.

Env-in-Cent Ltd. (EiC), Budapest, Hungary

The mission of Env-in-Cent Consulting Ltd. is to provide strategic, professional support for our clients to solve environmental related problems as well as to contribute to national and EU-wide environmental research projects. The main profile of Env-in-Cent is environmental oriented decision support of companies, governmental organisations and municipalities. Our experts have significant experience of climate research on national and international level. In the CLAVIER project we would like to utilise our professional background and experience as well as organisational and communication expertise.

National Institute of Meteorology and Hydrology (NIMH), Sofia, Bulgaria

NIMH at the Bulgarian Academy of Science is the main provider of scientific research and operational activities in the field of meteorology in the country. Among the present research staff of NIMH there are 41 Professors, Associated Professors and Senior Research Associates. Current research priorities are: Optimization of basic observation networks, improvement of methods of observation, processing, interpretation and dissemination of information; Assessment of hydrometeorological resources – climatic, agroclimatic and water resources, their variability over the country and their use in the various sectors of the national economy; Research on the content of the atmosphere and hydrosphere, and regional and global scale variations of natural and anthropogenic origin. The Institute takes part in a lot of European projects.

University of National and World Economy (UNWE), Sofia, Bulgaria

University of National and World Economy (UNWE) is one of the biggest and oldest higher educational institutions of economics in the Republic of Bulgaria and South Eastern Europe with a history of over 80 years.
UNWE is a leading educational and research institution in the field of economics, management, politics and law in Bulgaria.
The research activity of the University is directed toward the demands of the public practice during the transformation of the national economy and the accession of the country to the European socio-economic dimension. Concurrently UNWE works on extensive scientific research projects in the sphere of economy and management in line with the scientific and educational policy of the country and the requirements for advanced training of highly qualified personnel for the newly developing areas of science and social practice.
UNWE has the adequate amount of professional and linguistically well prepared academic staff to face the new realities. The staff is from high qualified experts in the fields of economics, management and law. Currently, more than 500 member of academic staff are employed at the university.
The University of National and World Economy confirms its name and prestige among the academic and scientific community in Europe and the world.

National Institute of Hydrology and Water Management (INHGA), Bucharest, Romania

The National Institute of Hydrology and Water Management (INHGA), as an agency of the “Romanian Waters” National Administration, is the national authority in hydrology and water management. INHGA develops research activities and provides operational services of national and international public interest for the protection and socio-economic well-being of people. INHGA’s activities help improve peoples’ quality of life and help protect the environment. NIHWM was established under its current name in December 2002, but, as different organizations, its activities are over 50 years old.

Babes-Bolyai University (UBB), Cluj, Romania

The Babes-Bolyai University of Cluj-Napoca is the oldest, largest and the most comprehensive institution of higher education in Romania (21 faculties with 44,000 students). It’s trademark is multiculturalism: there are three basic lines of study in Romanian, Hungarian and German. The university is well integrated in the international educational and research system. At the Faculty of Economics and Business Administration students are taught in the most attractive and demanded economic specializations at BSC, MBA and PhD levels, in a competitive learning environment.

Institute of Geography (IG), Romanian Academy, Bucharest, Romania

The Institute of Geography (IG), is a leading institution of fundamental and applied geographical research in Romania. It carries out research and documentation work, also coordinating PhD activities. Its researches focus on the relationships between the components of the physical and the biotic environments and of the social and economic milieu, as well as their spatial distribution in connection with global environmental change. IG is engaged in the following activities: the elaboration and publication of synthesis works on Romania; the development of research into Physical Geography and Environmental Geography, closely connected with the interests of global international programmes, such as the International Geosphere-Biosphere Programme, International Human Dimensions Programme on Global Environmental Change and International Strategy for Disaster Reduction; integrated geographical research and participation in the interdisciplinary studies targeting the elaboration of regional development policies; integrated geographical research of natural and technological risks.
The Institute has 3 laboratories (Laboratory of Physical Geography, Human Geography and Cartography and GIS) staffed with 10 senior researchers, and 20 young researchers and PhD students.

Project partners:

Coordinator: Max Planck Institute for Meteorology (MPI-M), Hamburg, Germany
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