The **CLIMSAVE** Project

Climate Change Integrated Assessment Methodology for Cross-Sectoral Adaptation and Vulnerability in Europe

Newsletter N$^{o.}$ 5, July 2012

Introduction

CLIMSAVE is a European Union funded research project which is assessing climate change impacts and adaptation strategies across six key sectors in Europe: agriculture, forestry, biodiversity, urban, water and coasts. It aims to put science in the service of stakeholders and policy-makers by providing a common platform that will enable them to explore and understand the interactions between climate change impacts in different sectors. This will build the capacity of decision-makers to identify cross-sectoral vulnerability to climate change and determine how it might be reduced by various cost-effective adaptation options.

The Integrated Assessment (IA) Platform

An assessment of stakeholder needs for, and perspectives on, IA Platforms showed that stakeholders wanted to investigate climate change impacts and adaptive responses of relevance to themselves, rather than having to rely on the restricted outputs generated from a limited number of simulations chosen by researchers. However, stakeholder involvement is discouraged in most integrated assessment models by the complex software and unacceptably long runtimes. The fundamental concept underpinning the CLIMSAVE IA Platform is, therefore, to deliver rapid user-friendly interactivity through the web, allowing the User to interactively explore impacts, vulnerability, adaptation and cost-effectiveness (Figure 1).

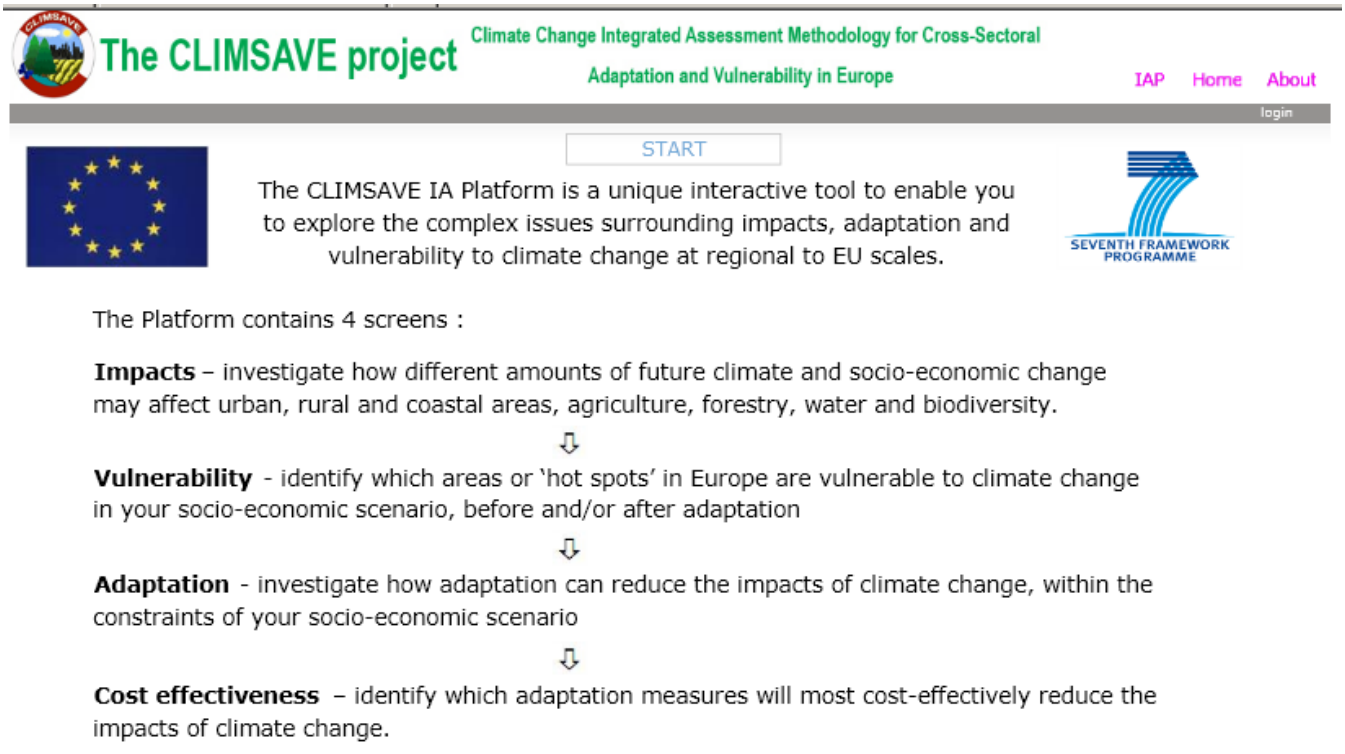

Figure 1: Introductory screen to the CLIMSAVE IA Platform

Vision of the CLIMSAVE IA Platform

The CLIMSAVE IA Platform is an interactive exploratory web-based tool to enable a wide range of professional, academic and governmental Stakeholders to improve their understanding surrounding impacts, adaptation responses and vulnerability under uncertain futures. The tool provides sectoral and cross-sectoral insights within a facilitating, rather than predictive or prescriptive, software environment to inform understanding of the complex issues surrounding adaptation to climate change. The power of the tool lies in its holistic framework (cross-sectoral, climate *and* socio-economic change), and is intended to complement, rather than replace the use of more detailed sectoral tools used by sectoral professionals and academics.

As such the CLIMSAVE IA Platform is not intended to provide detailed local predictions, but to assist stakeholders in developing their capacity to address regional, national and EU scale issues surrounding climate change. The CLIMSAVE IA Platform is also expected to be a valuable teaching tool which contributes to a better adapted Europe through assisting the intellectual development of future decision-makers.

The Platform is being initially developed for Europe, but the software is also being tailored to the Scottish context, to test regional application of the approach.

Technical design of the IA Platform

The CLIMSAVE IA Platform utilises the world wide web to provide a flexible and familiar interface to stakeholders, which should broaden accessibility and participation and increase impact in research communities. Rapid user interactivity through the web requires efficient communication between the user sitting at their computer (i.e. you) and the remote CLIMSAVE server containing the meta-models and the underlying physical (soils, land-use, etc) and scenario (climate and socio-economic) datasets.

The CLIMSAVE IA Platform uses both server-based (i.e. remote) and client-based (i.e. the user's PC) computing solutions communicating via the web. Having the meta-models and datasets located on the CLIMSAVE server avoids the need for input data to be transferred to the user's PC (and hence the requirement for data licenses) and maximises access speed. However, having the IA Platform interface, with which the User interacts, developed using a client-based computing solution allows (1) fast reply to user actions; (2) output data to be sent to the User's Interface as they become available, so that outputs from faster meta-models can be rapidly displayed by the user whilst other meta-models finish their run; and (3) the opportunity to use map services, such as Google Earth, to display spatial results.

In order to further provide this rapid interactively for the user, the run times of the models on the server should be as short as possible. Hence, a meta-modelling approach is being used to deliver these fast run times whereby computationally-efficient or reduced-form models that emulate the performance of more complex models are being developed. Ten different meta-models have been developed using a variety of approaches to abstract the leanest representation for inclusion within the IA Platform that is consistent with delivering both functionality and speed. They produce outputs on both sector-based impact indicators (covering agriculture, forests, biodiversity, coasts, water resources and urban development) and ecosystem services in order to link climate change impacts directly to human well-being.

To successfully link the meta-models, potential data transfers between the meta-models have been identified, i.e. where the simulated output from one meta-model is an input to other meta-models. Figure 2 shows a simplified flow diagram which highlights the linkages between the different sectoral models. For example, projections from the urban model on the location, area and type of urban development affects river basin hydrological responses, the population exposed to flood risk, the land available for agriculture and forestry and consequently habitat availability for biodiversity.

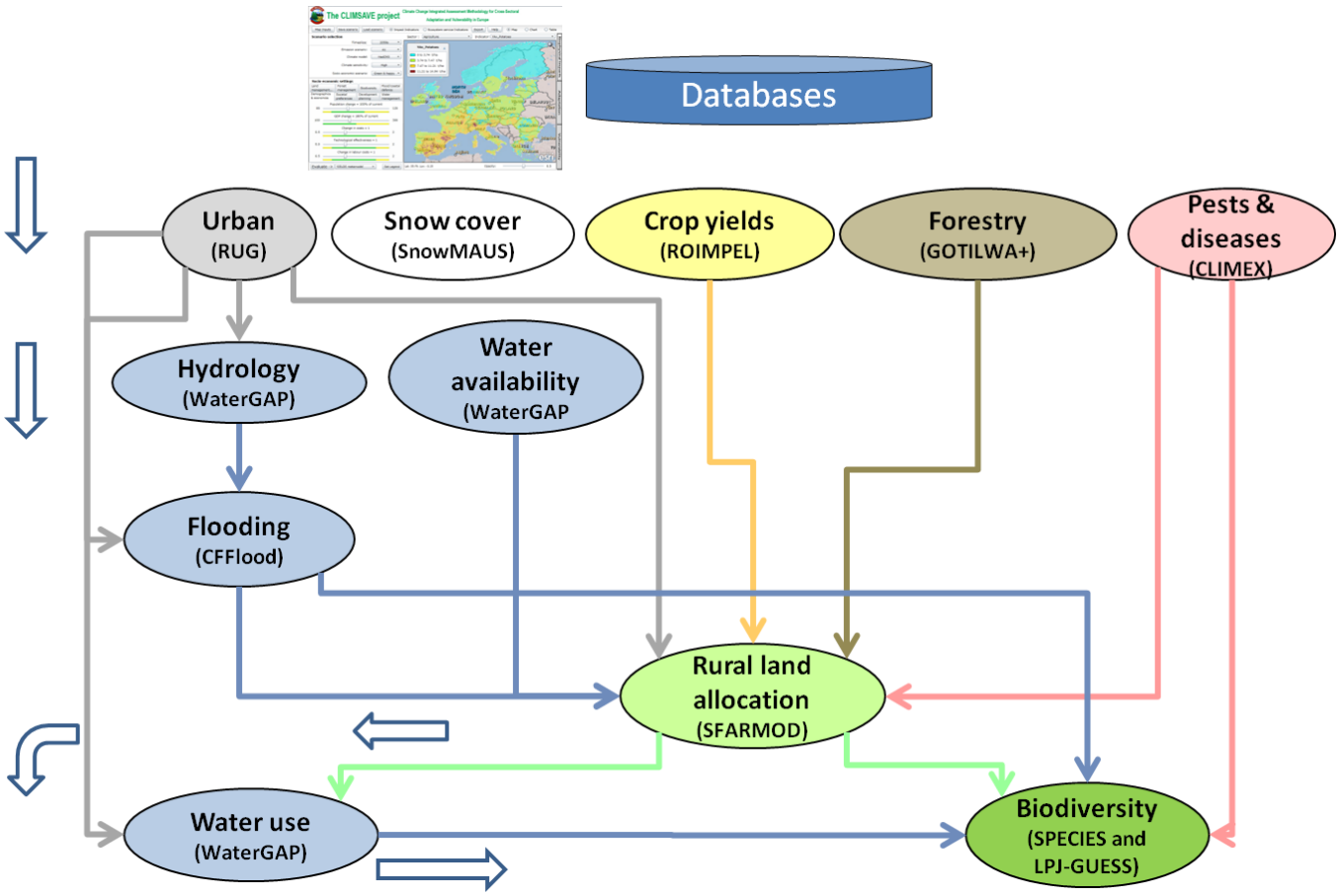

Figure 2: Simplified schematic of meta-model linkages within the CLIMSAVE IA Platform

The spatial scale of the Platform represents a compromise between the scale of available harmonised datasets, model runtime and spatial detail of the outputs. The higher the resolution at which it operates, the greater is the number of times that the meta-models have to run and hence the greater the overall runtime of the Platform. The European and Scottish IA Platforms therefore operate at resolutions of 10 arcmin x 10 arcmin (approximately 16km x 16km in Europe) and 5km x 5km, respectively, consistent with the available baseline climatologies.

The IA Platform User Interface screens

The CLIMSAVE IA Platform is designed to facilitate a two-way iterative process of dialogue and exploration of "what if's" through the development of an intuitive interface that should enable an interested individual to use the Platform with minimal recourse to help files and, importantly, without need for training. This what-if process can be carried out by progressing between the different screens of the IAP:

Impacts screen – investigate how different amounts of future climate and socio-economic change may affect urban, rural and coastal areas, agriculture, forestry, water and biodiversity by:

- *Baseline sensitivity analysis* – modifying baseline parameters to understand the sensitivity of the modelled system to changes;
- *Climate and socio-economic scenario analysis* – select from a choice of pre-defined timeslices (2020s and 2050s), SRES emissions scenarios, climate models, climate sensitivity, and CLIMSAVE socio-economic scenarios;
- *Uncertainty analysis for socio-economic change* – the User can modify the socio-economic scenario settings to examine uncertainty ranges that are consistent with the underlying story (green part of the slider) and wider uncertainty (yellow part of the slider) (Figure 3). NB climate uncertainty is addressed through the choice of climate models and climate sensitivity.

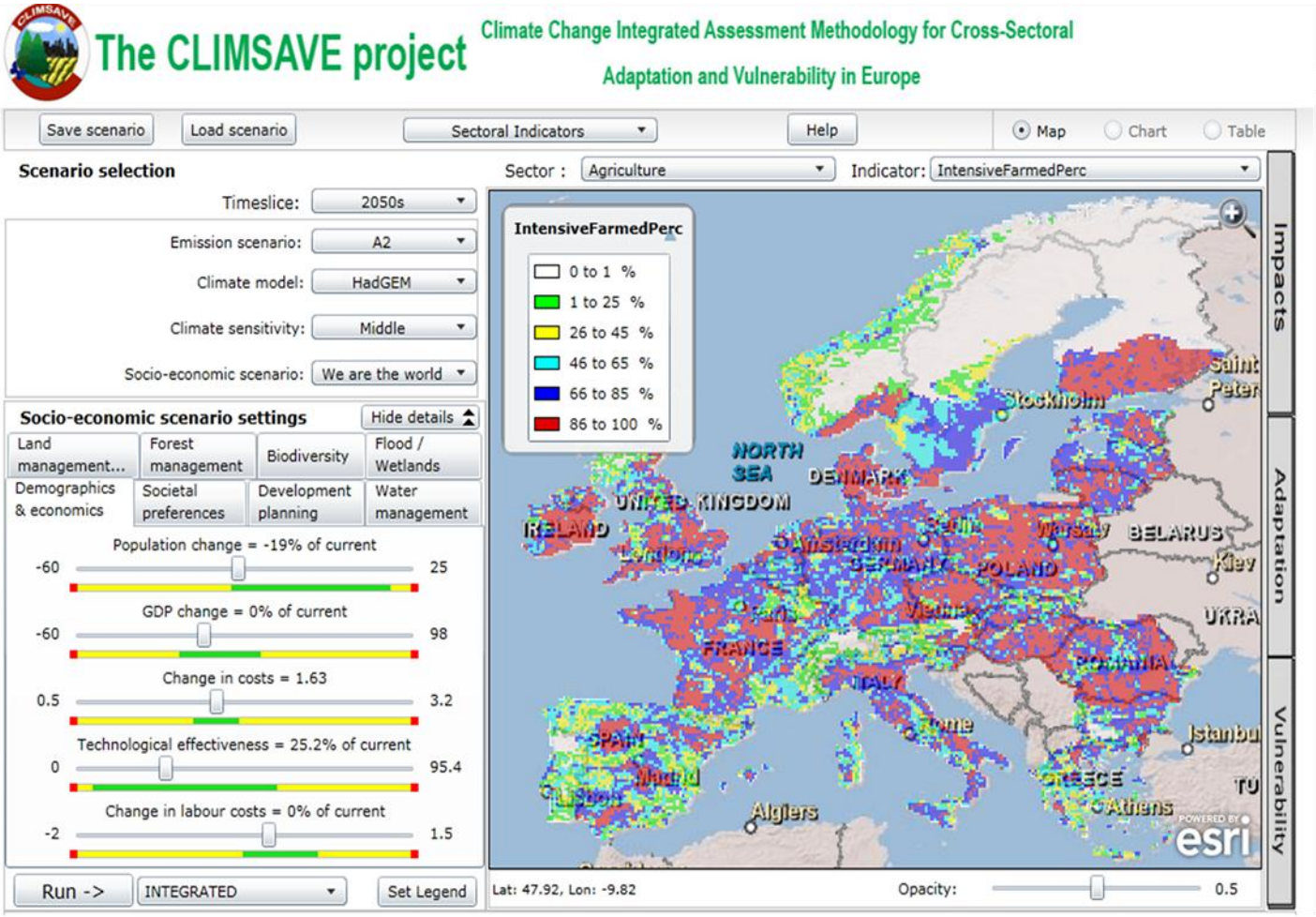

Figure 3: Latest version of the Impacts screen of the CLIMSAVE IA Platform User Interface

Vulnerability screen – identify which areas or 'hot spots' in Europe or Scotland are vulnerable to climate change in your selected climate and socio-economic scenario, before and/or after adaptation:

- Vulnerable regions are those in which impacts before or after adaptation are high and the coping capacity (which is a function of the scenario capitals – financial, manufactured, social, human and environmental) is low. The vulnerability screen will allow assessment of the vulnerability of individual or multiple CLIMSAVE sectors to climate change.

Adaptation screen – investigate how adaptation can reduce the impacts of climate change, within the constraints of your socio-economic scenario:

- The potential to adapt to climate change is not infinite but is constrained by scenario-independent limits (technical, physical, etc), by scenario-specific values (derived from the CLIMSAVE stakeholder workshops) and by scenario-specific resource availability (represented by the scenario capitals). These constraints are indicated by the green slider range which represents the estimated adaptation range that is consistent with the assumptions and settings within the scenario. The yellow range removes the scenario constraints.

Cost-effectiveness screen – investigate the relative cost-effectiveness of different adaptation measures:

- The adaptation options and their magnitude selected within the adaptation screen form the adaptation target in the cost-effectiveness screen which then lists specific adaptation measures for achieving the target ranked in the order of their cost-effectiveness ratio. It also includes options for altering the implementation time for the measure, the discount rate or unit cost as well as the method used for quantifying uncertainties in the cost estimates.

Concluding remarks

Decision-makers and other interested citizens need to be able to access reliable science-based information to help them respond to the risks of climate change impacts and assess opportunities for adaptation. The unique user-friendly, interactive web-based CLIMSAVE IA Platform described in this newsletter will allow European and Scottish stakeholders to assess climate change impacts and vulnerabilities for a range of sectors for themselves. The linking of models for the different sectors will enable stakeholders to see how their interactions could affect European landscape change.

The tool will also enable stakeholders to explore adaptation strategies for reducing climate change vulnerability, discovering where, when and under what circumstances such actions may help. It will highlight the cost-effectiveness and cross-sectoral benefits and conflicts of different adaptation options and enable uncertainties to be investigated to better inform the development of robust policy responses.

Other project activities

The project held its second set of stakeholder workshops in early 2012: European case study: 6-8 February 2012 in Prague; Scottish case study: 27-28 February 2012 in Edinburgh. These workshops focused on enriching and expanding the socio-economic scenarios drafted during the first set of workshops in spring/summer 2012 as well as defining adaptation options that would be important for each of the scenario storylines. Stakeholders also refined the quantification of a number of socio-economic variables that are important inputs to the meta-models within the IA Platform. Following the workshops, the other socio-economic variables were quantified by the CLIMSAVE team to be consistent with the socio-economic scenarios developed by the stakeholders. The third European and Scottish stakeholder workshops will be held in parallel in December 2012 with some common sessions to enable the stakeholders to compare their resulting scenarios and their social learning experiences. At these workshops, stakeholder will also have the opportunity to use the platform to explore cross-sectoral impacts and evaluate different adaptation options under the socio-economic scenarios they have created.

The project held its third General Assembly meeting on 19-21 March 2012 in Prague. Progress was reported on all aspects of the project and workplans were updated in order to deliver the outcomes of the project. Results from the project have also been presented at the Planet under Pressure conference in London (March 2012) and the Adaptation Futures conference in Tucson, Arizona (May 2012). Further, a short movie introducing the functionality of the CLIMSAVE IA Platform was prepared for the launch of CLIMATE-ADAPT, the European knowledge base on climate change adaptation (visit http://climate-adapt.eea.europa.eu/climsave-tool).

A number of new CLIMSAVE outputs are now available on the project website (www.climsave.eu). These include reports on the second set of stakeholder workshops and the prototype of the IA Platform. These join existing reports on scenario development, adaptive capacity, vulnerability, adaptation policy and governance, and the specification of the Integrated Assessment Platform and the sectoral meta-models within it which can be downloaded from the “Outputs” page of the website.

Further information on the IA Platform or the project in general can be obtained from the website or the Project Co-ordinator: Paula Harrison (paharriso@aol.com).

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