The **CLIMSAVE** Project

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

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Introduction

CLIMSAVE is a pan-European research project funded by the EU to assess climate change impacts and adaptation strategies across six key sectors in Europe: agriculture, forestry, biodiversity, urban, water and coasts. Linkages between these sectors are being represented within a series of integrated models, whose output will be translated into ecosystem services in order to link climate change impacts directly to human well-being. The project aims to put science in the service of stakeholders and policy-makers by providing an Integrated Assessment 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.

This second edition of the CLIMSAVE newsletter focuses on the development of a conceptual framework for vulnerability assessment. The framework will be implemented within the Integrated Assessment Platform to enable stakeholders to identify hotspots of climate change vulnerability across Europe.

CLIMSAVE Vulnerability Framework

There is a huge amount of literature on vulnerability with countless definitions. Thus, in order to develop a vulnerability framework for the CLIMSAVE project, a comprehensive literature review was undertaken. More than 70 papers, journal articles and book chapters were reviewed to deepen our knowledge concerning terms such as adaptation, adaptive capacity, vulnerability and resilience, and to select definitions that can be operationalised within the CLIMSAVE project. The findings of the literature review were used to elaborate a vulnerability framework which clearly identifies the relationships between the key terms.

The vulnerability framework was developed explicitly for the CLIMSAVE project and, hence, focuses on ecosystem services. It is not a framework that deals with the concept of vulnerability from a general point of view. In fact the word “vulnerability” does not appear in the framework. Vulnerability is an outcome of the interactions illustrated within the Framework (shown in Figure 1).

The Framework assumes that the current vulnerability to pressures, such as climate change, depends on the capacity to cope and that this is determined by the amount of capital that can be used to deal with the pressures. Five types of capital are defined: natural, manufactured, social, human and financial, which are connected to each other. If coping capacity is low due to lack of capital then the quality or quantity of ecosystem services change and the beneficiaries of those services become vulnerable to the pressures. Faced with a change in ecosystem services, the ecosystem service beneficiaries (or decision-makers within the system) can adapt by improving their coping capacity in order to be more resilient to the pressures, or they can mitigate by reducing the pressures and/or drivers of change.

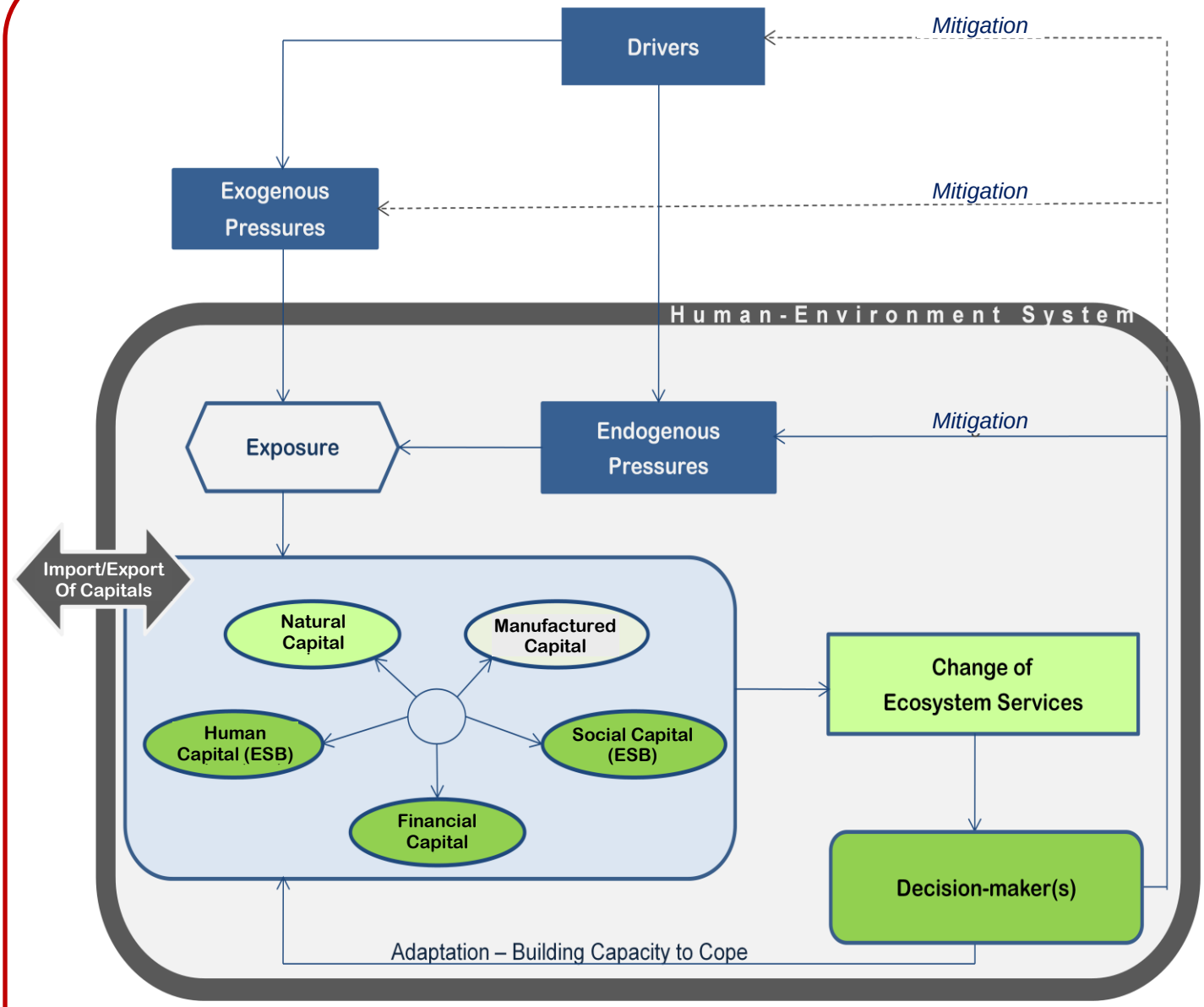

Figure 1: The CLIMSAVE Vulnerability Framework.

Causal relations of the framework

The Framework shows a number of causal relations between the different elements (Figure 1). Although the diagram suggests some linearity of the processes, in reality this is, of course, not the case. There will be feedbacks and the processes are dynamic. The amounts of the different capitals will change over time, thus changing the capacity to cope.

The blue boxes in Figure 1 indicate drivers and pressures. The pressures act on the human-environment system but their effect on that system is moderated by exposure, which is thus included in a hexagonal box with no shading.

Within the large box in the human-environment system are the five types of capital, which determine both the capacity of the system to cope with the pressures and the capacity of the system to adapt (increase coping capacity) over the longer term. Social and human capital exists within the ecosystem service beneficiaries (ESB).

Changes in the amount of capital (in particular natural capital) lead to changes in ecosystem services. As a result of these changes, responses by decision-makers may be to decide to mitigate (by reducing drivers of change or pressures on the system) or adapt (by using various forms of capital). The focus of the CLIMSAVE project is on adaptation.

Explanation of the framework components

Drivers and pressures

Drivers are the social, demographic and economic developments in societies and the corresponding changes in lifestyles, overall levels of consumption and production patterns. Examples of drivers include population growth and demand for food, water, energy or other goods.

Pressures can appear from the inside of a human-environment system (endogenous, e.g. land-cover change within the exposure unit) as well as from outside the system (exogenous, e.g. sea-level rise).

Both types of pressure (which can be environmental changes or socio-economic changes) affect the exposure unit, which is a coupled human-environment system.

Exposure

Exposure refers to the amount of exposure of the system to the pressures and is characterised by the *degree, duration, nature and/or extent* to which the system is in contact with, or subject to, the pressure. If the human-environment system or exposure unit being studied is, for example, a river watershed in an upland area, it would have no exposure to sea-level rise but could be exposed to many other pressures such as short periods of flooding.

Five types of capital

Natural capital is any stock or flow of energy and matter that yields valuable goods and services. This includes resources, some of which are renewable (e.g. timber, grain) and others that are not (the most well-known these days being fossil fuels). Natural capital also includes sinks that absorb, neutralise or recycle waste.

Human capital includes the health, knowledge, skills and motivation of an ecosystem service beneficiary, as well as their individual emotional and spiritual capacities.

Social capital consists of the structures, institutions, networks and relationships of ecosystem service beneficiaries that enable individuals to maintain and develop their human capital in partnership with others, and to be more productive when working together than in isolation. It includes families, communities, businesses, trade unions, voluntary organisations, legal/political systems and educational and health institutions.

Manufactured capital consists of material goods – tools, machines, buildings and other forms of infrastructure – that contribute to the production process but do not become embodied in its output.

Financial capital reflects the productive power of the other forms of capital and enables them to be owned and traded. However, its value is mainly representative of natural, human, social or manufactured capital.

For the CLIMSAVE project, it will also be important to take into account the possible *import/export* of the capitals from the exposure unit. In particular, it is clearly possible to import manufactured capital to deal with pressures such as climate change (e.g. importing materials for dam-building). Natural capital from outside the region of study could also be used to cope with pressures (e.g. water storage upstream). Social as well as human capital is lost, if people move away from the area.

Responses

Faced with a change in ecosystem services, the humans in the exposure unit can adapt by improving their coping capacity in order to be more resilient to the pressures, or they can mitigate by reducing the pressures and/or drivers of change. In the case of a particular human-environment system, for example a rural village exposed to the pressure of climate change in the form of increased flood events, humans could cope with floods by investing in manufactured capital and building a reservoir upstream of the village. Human capital in the form of skills could be used to provide better early warning systems and social capital could be used in

the form of voluntary organisations that help people most exposed to move when a flood is forecast. Natural capital could be used by planting forests upstream to prevent mudslides and landslides. Thus, the capacity to cope depends on the amount of capital that can be mobilised to respond to pressures.

Other project activities

The project held its first Steering Committee Meeting on 13-15 September 2010 in Barcelona. Progress was reported on all aspects of the project and workplans were updated in order to deliver the outcomes of the project. Discussions focused on the vulnerability framework, the specification for the Integrated Assessment Platform, the development of the participatory scenarios and arrangements for the stakeholder workshops.

The first set of stakeholder workshops have been scheduled for 10-12 May 2011 in Bruges (European scale) and 27-28 June 2011 in Edinburgh (Scottish regional case study). These workshops will focus on the development of storylines for defining a set of plausible futures, including discussion of the main drivers and changes in contextual social, economic and institutional factors. Stakeholders will also have the opportunity to provide feedback on a mock-up of the Integrated Assessment Platform.

CLIMSAVE was represented at a set of two EC workshops organised by the project's EC officer, Wolfram Schrimpf. In the first workshop the project had the opportunity of presenting CLIMSAVE's approach to representatives of the different policy Directorate-Generals to identify and gain feedback on potentially policy-relevant output. In the second workshop, the project met with representatives from other EC research projects working on climate change adaptation to discuss potential synergies and topics for collaboration.

Further information on the project, including a 2-page project flyer can be obtained from the CLIMSAVE website (www.climsave.eu) or the Project Co-ordinator: Paula Harrison (paharriso@aol.com). A full report on the vulnerability framework can be downloaded from the CLIMSAVE website. Further information on the vulnerability framework can also be obtained from the WP5 co-leader: Ines Omann (ines.omann@seri.at).

Figure 2: The CLIMSAVE consortium

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