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Uncertainty assessment tool for climate change impact indicators

Introduction

A major challenge in the study of climate change impact indicators is dealing with the numerous sources of uncertainties of climate and non-climate data.

The communication of uncertainty is an important component of the FP7 project **“Climate Information Portal for Copernicus**” (**CLIPC**). CLIPC is developing a portal to provide a central point of access for authoritative scientific information on climate change. In this project the **Climate Service Center 2.0** is in charge of the development of a **tool to assess the uncertainty** of climate change impact indicators.

There is a **lack of a systematic classification of uncertainties** arising from the whole range of climate change impact indicators. We develop a framework that intends to clarify the potential sources of uncertainty of a given indicator and provides - if possible - solutions how to quantify the uncertainties.

CLIPC meta-classification of impact indicators

Tier-1 indicators give information on the past and future evolution of the climate system (i.e. **heavy rain days**)

Tier-2 indicators attempt to quantify the impacts of climate change in bio-physical systems (i.e. **flood risks**)

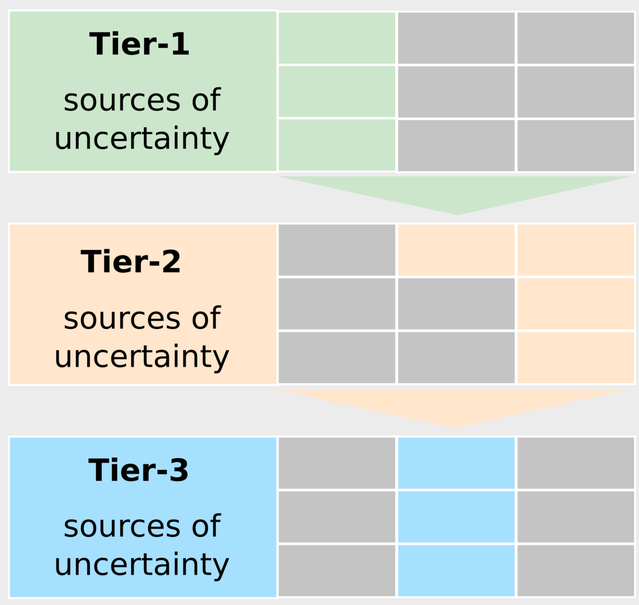
Tier-3 indicators providing information on the socio-economic systems affected by climate change (i.e. **flood damage cost**)

Concept

The concept of the uncertainty assessment tool is inspired by the graphical representation of data in a **heat map**. A heat map represents individual values contained in a matrix by colours.

Here, the matrix consists of the different sources of uncertainty arising from the climate and non-climate data. The **colours** stand for the **sources of uncertainty**: a field gets a colour assigned, if this source of uncertainty is relevant for a certain indicator. The field is grey if this source of uncertainty is not relevant for a certain indicator.

The matrix consists of three main **rows** which correspond to the CLIPC **meta-classification** (left figure).



Exemplary application to a **dummy** climate change impact **indicator**

Tier-1 indicators comprise only uncertainties of **climate data** from observed data records to modelled data

Tier-2 indicators combine the sources of uncertainties arising from **climate data**, i.e. Tier-1 indicators, and **non-climate data**

Tier-3 indicators embody much of the a priori **climate-driven** uncertainty and **non-climatic-driven** uncertainty, i.e. bio-physical and socio-economic

Application

Example indicator: ‘**summer days**’

Definition: the number of summer days is the annual count of days with **maximum air temperatures ≥ 25° C**

Calculation: ‘summer days’ are derived from **climate projections** and from **observed climate data**

Uncertainties of 'summer days' calculated by projected climate data

Tier-1 sources of uncertainty	scenarios		
	model		
	variablity		
	structural		

scenarios: all sources of uncertainty related to ‘unknown future’
model: limitations in the ability to perfectly model the climate
variablity: natural internal and external variation of the climate system
structural: covers any processing of raw data

Uncertainties of 'summer days' calculated by observed climate data

Tier-1 sources of uncertainty		precision	
		inhomogeneity	
		sampling	
		structural	

precision: variability in measurement when repeatedly measuring the same quantity
inhomogeneity: any non-stationary component of a time series that is not of climate origin
sampling: measurements are discrete in time and vary in spatial resolution
structural: covers any processing of raw data

Proceeding

- to list all possible **sources of uncertainties** for all indicators
- to **classify** the sources of uncertainties (making use of existing classifications like e.g. Warmink et al., 2010*, Identification and classification of uncertainties in the application of environmental models. Environmental Modelling and Software*)
- to find methods to **quantify** or **reduce** uncertainty

Poster will be available on http://www.clipc.eu/.

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