Newsletter – No 1

Welcome to the first issue of the IMPACT2C newsletter

There is a serious debate whether we can limit global warming to 2°C or not. In connection with this, the work of IMPACT2C is even more important. Quantifying projected impacts under 2°C warming, is the mission of the 4-year research project IMPACT2C, which started in October 2011. The project is funded by the European Commission's 7th Framework Programme under the grant agreement no 282746, and is coordinated by the Climate Service Center in Hamburg, Germany. The projects goal is to adopt a clear and logical structure within climate- and impact-modelling, vulnerabilities, risks and economic costs, as well as potential responses within a pan-European sector based analysis. It includes case studies for some of the world's most vulnerable regions, these are Bangladesh, Nile and Niger river basins as well as the Maldives.

This newsletter serves the IMPACT2C consortium and others, providing insight on different working topics within the project. In this issue, we describe our approach for a 2°C warming definition, which is used in IMPACT2C, present some first results on climate change modelling and introduce the three non-European case studies.

Best wishes,
Dr. Daniela Jacob
(Project Coordinator)

General Assembly

After the first year of IMPACT2C the 2nd General Assembly took 14-16 November 2012 at the International Institute for Applied Systems Analysis (IIASA). IIASA is a research organization located in Laxenburg , Austria.
The overall aim of the General Assembly (GA) was to ensure a common knowledge on each workpackage status within the IMPACT2C consortium. General discussions helped to enable knowledge exchange and share experiences among climate scientists and sectoral impact specialists with both physical and social science backgrounds. Within the GA, the consortium agreed on the number and spread of mandatory simulations for all IMPACT2C participants, in order to analyze the climate patterns. The climate and impact community (with the exception of "air pollution"-model) agreed for transient simulations for the period 1971-2100. Whereby the climate community introduced the already available A1B fast track data, the provision of four RCP2.6 and one RCP4.5 scenarios is still in preparation. The provision of one RCP8.5 scenario is voluntary. The Impact community agreed on four mandatory scenarios of the Shared- Socio-Economic Pathways (SSP). Achieving a high number of ensembles is necessary for the quantification of uncertainties and robustness patterns, which is one of the major topics in IMPACT2C. Further, a conceptual discussion on the dissemination strategy and Policy-Briefs started in order to enhance the communication of IMPACT2C results in a new easy assessable manner.


IIASA ©Kotova

IMPORTANT DATES:

- **30th May 2013**: report on month 1-18 for EC
- **August 26 - September 01, 2013**: IMPACT2C summer school in Norway, near Bergen http://www.hzg.de/mw/impact2c/037306/index_0037306.html.en
- **November 2013:** The next General Assembly will be in the week of 11th to 15th November, at ENEA in Rome, Italy.

Reaching the 2°C threshold

Thomas Mendlik, UNIGRAZ
Andreas Gobiet, UNIGRAZ

Knowing when the widely discussed global warming of 2°C will be reached is crucial for IMPACT2C. The specific time of exceedance is calculated using a range of observations and simulations.

We used three different datasets to assess pre-industrial warming until recent times: GISS LOTI, HaCRUT3, NOAA NCDC. Since 1895 (30 years sliding average) until 1985 the earth heated by 0.46°C on average, as indicated in figure 1.
Using the ensemble of global climate models from the ENSEMBLES project, temperature evolution until 2100 is simulated. These models project a warming of +2°C between 2030 and 2053 compared to pre-industrial times (1895), and of 1.53°C compared to 1985.

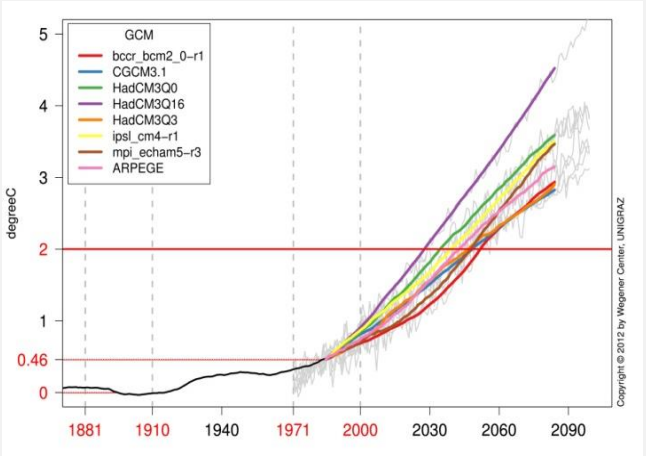

Figure 1: Evolution of global temperature. Observed historical (black line) and 8 future projections from different GCMs based on the A1B emission scenario. Time series are smoothed using a 30-year running mean. The 2 °C threshold is marked in red. Crossing this threshold indicates the +2°C central year within a 30 year time period.

References:
LOTI: http://data.giss.nasa.gov/gistemp/
HadCRUT3: http://www.cru.uea.ac.uk/cru/data/temperature/
NCDC: http://www.ncdc.noaa.gov/cmb-faq/anomalies.php
ENSEMBLES: http://ensembles-eu.metoffice.com/

Quantifying projected European climate under 2°C warming

Robert Vautard (CNRS-IPSL), Andreas Gobiet (UNIGRAZ), Erik Kjellström (SMHI), Grigory Nikulin (SMHI), Stefan Sobolowski (Uni-Res), Annemiek Stegehuis (CNRS-IPSL), Pascal Yiou (CNRS-IPSL)

An analysis of robust patterns of climate change in Europe using the ENSEMBLES A1B regionalized scenario has been carried out for a +2°C global warming compared to pre-industrial times.

European climate changes were identified by calculating model ensemble mean differences between the +2°C periods (estimated as described above) and the reference period (1971-2000). A change much larger than 2°C relative to pre-industrial period (1.5°C relative to 1971-2000) is found in Eastern and Northern Europe in winter and Southern Europe in summer. Changes close to +2°C or slightly lower are expected in coastal areas. Winter precipitation (not shown) increases significantly in most European areas while a drying climate is expected in Mediterranean areas.

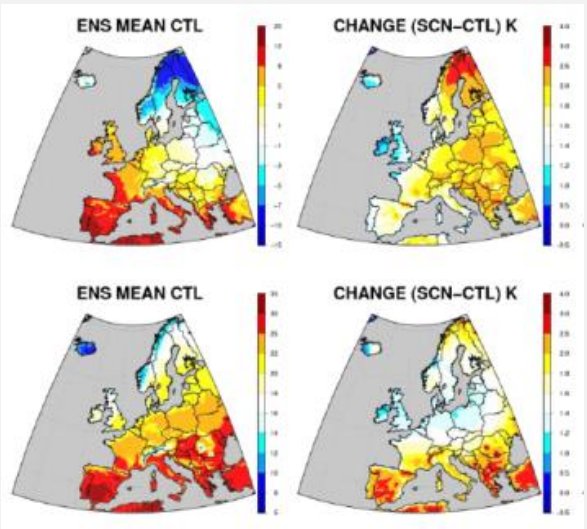

Figure 2: (left panels) Average RCM simulated temperature (°C) during the reference period (1971 – 2000); (right panels): ensemble average of changes between control and +2°C period. The white color stands for the interval 1.4 – 1.6°C, which corresponds to the global temperature difference in each simulation between the +2°C period and the reference period.

Impact, vulnerability and adaptation in Africa: the water competition.

Sandro Calmanti, ENEA
Frank van Weert, Wetlands International
Valentin Aich, PIK

Water is a key vital resource. Areas of steep climatic transition are exposed to the risk of seeing increasing competition in accessing water resources. IMPACT2C seeks to anticipate these changes using modern impact modeling capacities. We focus on vulnerability assessment in African regions due to a global averaged surface temperature change of 2 °C.

1. River economies

The Nile and the Niger rivers flow through areas of steep climatic transition: both sources are located in areas of tropical climate (e.g. more than 2000mm/yr in Guinea and Ethiopian Highlands), while they travel for long distances across the desert (less than 50 mm/yr in northern parts of Mali and Sudan).

For all riparian states of the Nile the agricultural sector is a major contributor to the GDP and food security whereas in the Inner Niger Delta the livelihoods (rice growing, fishing cattle raising) of more than 1.5 million people rely directly on the flood dynamics in the Upper Niger delta. In the irrigated area of the *Office du Niger* in Mali, about 590,000 tons of rice and 303,000 tons of sugar cane are produced per year. In the Nile basin, energy production also depends mainly on the river flow although only 26 % of the potential 20GW are currently produced by hydropower.

2. Demographic Pressure

The Niger and the Nile flow through countries with the highest population growth rate, sometimes higher than 3 %. Population will approximately double by 2050, reaching more than 225 million in the Niger basin and over 400 million in the Nile basin. This corresponds approximately to the time when a global temperature rise of 2°C above pre-industrial level is expected (see page 2).

3. Vulnerability

The vulnerability of this area is well described in the analysis conducted by WFP on the basis of humanitarian interventions conducted during the last decade (Figure 3). More than 30 % of actions are related to the effects of droughts and a similar fraction can be attributed to conflicts. Flooding represents a third important component of the vulnerability profile.

The combination of critical dependence on water available from river flows and of demographic pressure, makes adaptation to climate change in these two river basins an extraordinary challenge. On one hand, optimal strategies for the use of available water for food production is a priority. However, population growth increases the demand for new services such as energy production in urban areas. For example, about 20 large dams for hydropower are nowadays either in construction or at the project stage in the Niger basin.

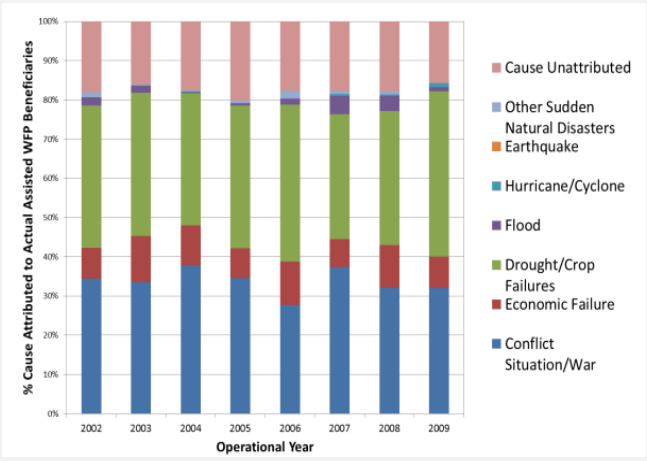

Figure 3: Assisted beneficiaries between 2002 and 2009 (Source: WFP,http://www.africanriskcapacity.org/about/background)

4. Adaptation

The EU project IMPACT2C is conducting a comparative analysis of existing adaptation plans with the aim of identifying criticalities in the light of the most recent achievements in terms of projecting future climate. In particular IMPACT2C will use climate scenarios to evaluate potential changes in the pattern of vulnerable areas, by modelling the impact of climate change on food security and how water managements strategies may affect future food and energy production.

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Adaptation to climate change for Bangladesh

Fulco Ludwig, Wageningen UR

Bangladesh is one of the most vulnerable countries to climate change in the world. Due to its low elevation, high population density and dependence on natural resources climate change can potentially have large impacts on livelihoods and economic development.

1. A vulnerable country

Bangladesh is particularly vulnerable due to the combination of different impacts. Global warming causes sea level rise and increased rainfall variability. Also the runoff patterns of the major river systems will change. Initial scenarios indicate that the peak flows will increase and that low flows will reduce. Climate change will also affect extreme events such as cyclones.

Higher river flows and sea level rise will increase future flood duration and severity. The combination of reduced dry-season flows and sea level rise can potentially cause large scale increase in salt water intrusion. This will result in reduced fresh water availability which affects drinking water quality and agricultural production.

Figure 4: The city of Khulna in South-western Bangladesh suffers from frequent inundation due to high intensity rainfall events, ©Ludwig.

2. An improved modeling framework

IMPACT2C will develop a modelling framework which integrates the impacts of sea level rise, changes in climate, and hydrology on different climate sensitive sectors in Bangladesh.

Macro-scale hydrological models will be used to generate scenarios for discharge of the Ganges-Brahmaputra river systems. These will be linked with regional models and sea level rise scenarios to assess flood risks, salinity, water availability and subsequent impacts on the different sectors such as agriculture, fisheries and water resources.

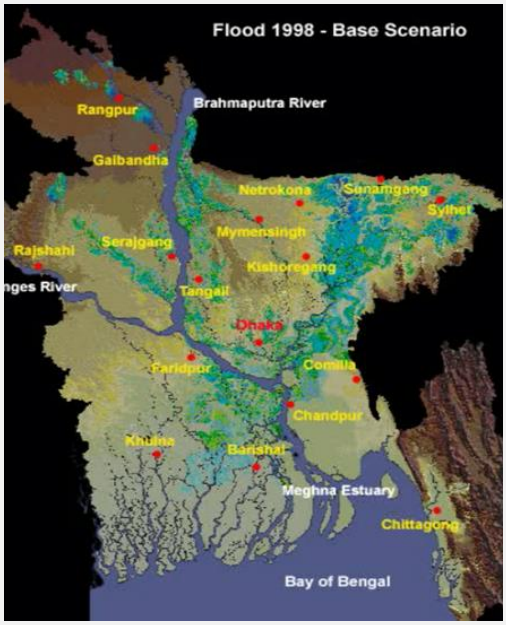

Figure 5: Interface of river models and GIS (MIKE –GIS) will simulate flooding scenarios under climate change for different flood classifications – shown here is an example for the 1998 floods.

3. Adapting to climate change

Due to its high vulnerability, Bangladesh will have to adapt to climate change even under a 2 degree scenario. Based on the impact assessments a selection of the most vulnerable sectors will be done. For these sectors and regions the main adaptation options will be identified and evaluated. The evaluation of adaptation options will specifically focus on cross-sectoral analyses. The different adaptation options will be discussed with stakeholders and experts during a final workshop in Bangladesh.

Impacts, vulnerability and adaptation to sea-level rise in the Maldives

Sally Brown, University of Southampton, UK

Sea levels are rising, and remote low-lying islands are vulnerable and need to adapt in different ways.

The Maldives are already adapting to coastal threats

Small low-lying islands are vulnerable to climate change, and unless they can successfully adapt to sea-level rise, it could at worst, lead to the forced migration of whole nations.

The Maldives are a collection of 1,192 low-lying coral atolls in the Indian Ocean and are home to 300,000 people. One third of the population live in the capital city, Malé, which is one of the most densely populated cities in the world. They largely rely on tourism and fisheries for income.

Figure 6: The low-lying islands of the Maldives are vulnerable to the effects of sea-level rise. Malé, capital city of Maldives, © Wikimedia Commons.

The islands have elevations typically within 1m of high tide, and with potential 21st century sea-level rise in excess of 1m, the islands are extremely vulnerable to flooding and erosion. To better protect and adapt to those risks, assessments are required to determine what is at risk, who is at risk and when this may occur. However, adaptation for small islands is challenging due to their limited resource base and remote location.

Figure 7: © Ahmed Shan, EPA, Maldives.

Working with the Maldives Ministry of Environment and Engineering, the University of Southampton, Global Climate Forum and HZG are trying to better understand the impacts of climate change, especially sea-level rise, and strategically plan and investigate potential adaptation options.

Using a number of case study islands with distinct land uses (such as tourism, agriculture, housing and development), data is being collected by the Maldivian engineers, including land elevation and location of key assets to determine what would be affected under a range of sea-level rise scenarios. Some islands have high population growth, so the collection of population data and projections of population change are also important.

One case study is the artificial island of Hulhumalé. Constructed in the late 1990s to a height of around 2m above sea level, the island was created to relieve population pressure on the neighbouring island of Malé. It also houses Malé International Airport. People have relocated to the island from the capital, and industry is also developing there. As the island is raised above natural island levels, it is presently protected from most flooding and erosion. As part of IMPACT2C, we will investigate the impact of sea-level rise, and determine possible adaptation measures which could better protect the island.

Initial results from other case study islands indicate that the Maldivians are highly innovative and adaptive to living so close to the sea, and other nations may learn from them. Reclaiming land is one way of dealing with coastal change, but further assessment of impacts and of innovative methods of adaptation are required to better manage land which is being lost to the sea.

Stakeholder Workshop

An information exchange between an international group of Stakeholders and IMPACT2C representatives was arranged at IIASA on 13 November 2012.

Eight experts from all over Europe and one from Niger accepted the invitation of the IMPACT2C consortium to join the first Stakeholder Workshop. The main topic of the first meeting was to identify hot spots which may affect the stakeholders' business. The discussion was focused on possible strategies for bilateral information exchange. Both sides agreed on the necessity for establishing a research network to exchange information and stimulate the research community. However, the complexity of establishing such a network became clear. Specifications of single topics have different demands on climate change information e.g. flood risk assessment versus policies for agriculture. Nevertheless, the relevance of uncertainties is of high interest for all different purposes, as well as the role of cross sectoral influences, which confirms the relevance of IMPACT2C goals. The projects' dissemination strategy was discussed, and major outcomes were the involvement of communication-experts and the development of aggregated indicators as a useful way of communicating project results.

IMPACT2C Stakeholder Workshop ©Kotova

IMPACT2C participating institutes:

Helmholtz-Zentrum Geesthacht – Zentrum für Material- und Küstenforschung; PIK; uni Research; Meteorologisk institutt met.no; SMHI; ENEA; CNRS – dépasser les frontières; METEO FRANCE – Toujours un temps d'avance; JRC – EUROPEAN COMMISSION; Wegener Center – UNI GRAZ; JOANNEUM RESEARCH; IIASA; DMI; Koninklijk Nederlands Meteorologisch Instituut – Ministerie van Infrastructuur en Milieu; WAGENINGEN UR – For quality of life; Technical University of Crete; Paul Watkiss Associates; UNIL | Université de Lausanne; University of Southampton; SEI – Stockholm Environment Institute; Met Office; Ministry of Environment and Energy – Republic of Maldives; BCAS; IWMI – International Water Management Institute; ACMAD; Global Climate Forum

http://www.hzg.de/mw/impact2c/