

### WELCOME TO THE GLOBAL IQ FINAL NEWSLETTER!

The Global-IQ team announces that the three-year collaborative research project has ended the last 31 July. This last Annual newsletter will provide you with the most recent and cutting-edge research results made by the consortium and the most recent policy, networking and outreach activities done by the research and project management teams.

Global-IQ has focused on the development of solutions for a number of global challenges, arising from issues such as climate change, economic downturns and the transformation of societal structures.

The results achieved provide some data and responses about the estimation of socio-economic impact of global challenges as well as the identification of optimal adaptation strategies, their costs and optimal mix to be implemented in practice.

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### LATEST NEWS/ EVENTS

- <u>Final Partner Meeting</u>: Final Conference held in Brussels on 17<sup>th</sup> June 2014.
- <u>Partner Meeting</u>: Global-IQ Meeting in Gothenburg from 7 to 9 April 2014.

# **RESULTS ACHIEVED:**

### WP 1

Developing scenarios of global challenges is not an easy task. There are conceptual and practical difficulties and the exercise has not been attempted before on a wide range of issues, spanning environmental, social and economic issues. In this context, the **first goal has been achieved** by defining the "global challenge". The **second goal** was to build a scenario architecture tailored to fit the specific needs of the project while general enough to be easily understandable by other researchers working on global scenario exercises. After a long series of constructive discussions both goals were accomplished.

### WP2

Quantitative analyses done within WP 2 shed light on the linkage between global change and several key sectors of research (agriculture, forestry, land use, energy, EU competitiveness, labour and international trade). New advanced models have been designed to improve the estimates of the global change costs in different socio-economic areas, and several case studies have related various scenarios of global change to monetized impacts on the society. WP3 & WP4

A set of scenarios with **limited adaptation to future challenges** like climate change, energy supply and security, and environmental change are part of the results of the **socio-economic impact analysis in the global change**. This set of scenarios is contrasted to a complementary set of full adaptation scenarios (WP 5) which provide a reasonable benchmark to explore the additional impact of future challenges if the global and national actors fail in building-up the required adaptation capacities. Comparison between full and limited adaptation scenarios allows the assessment of the significance of adaptation options.

### WP5

New debates and insights have been arising upon **adaptation issues**: how would it be if Europe could supply its power demand by connecting African desert to European cities? Is it conceivable, from a geo-political point of view, that Europe will rely on MENA countries to cover a large share of its electricity demand? An analysis examines technological, economic and geo-political aspects in order to evaluate the feasibility of a likely investment.

### WP 6

New insights have widened the methods for **discounting future costs and benefits under uncertainty**. Theoretical innovations, as well as applications, have been developed for decision-making involving large-scale and long-term global changes.







### **OVERVIEW OF PARTNERS AND WORK PACKAGES:**

# WORK PACKAGE 1: Understanding global changes

http://www.isis-it.com/

Partners: ISIS (leader), TSE, FEEM, IIASA, PIK The key tasks set for this work package are: 1) Review of the state of the art in global change analysis; 2) Learning about global changes through the project achievements.

### WORK PACKAGE 2: Non-market impacts and behaviourial analysis of key sectors



Environment Center Charles University in Prague

http://www.czp.cuni.cz/czp/index.php/en/

Partners: CUNI (leader), TSE, ISIS, HEID

The key tasks set for this work package are: 1) Valuation of nonmarket goods affected by climate change and of ancillary effects; 2) Determinants of adoption of energy saving and RES installations in households; 3) Energy demand and tax incidence; 4) Trade Policy and Climate Policy.

### WORK PACKAGE 3: Models to estimate socio-economic impacts of global changes



**Applied Systems Analysis** http://www.iiasa.ac.at/ Partners: IIASA (leader), FEEM, PIK, ISIS, WIW

The key tasks set for this work package are: 1) Harmonization of model assumptions; 2) Extension of existing models and approaches and facilitation of information exchange with WP2 in order to enable the estimation of socio-economic effects of global changes; 3) Developing methods to include sectoral and partial estimates of global changes socio-economic impacts into a general equilibrium framework in order to derive total costs; 4) Testing and Sensitivity Analysis.

### WORK PACKAGE 4: Scenarios of socio-economic impacts of global changes



http://www.pik-potsdam.de/ Partners: PIK (leader), FEEM, IIASA, ISIS, WIIW

The key tasks set for this work package are: 1) The assessment of socio-economic patterns in a reference scenario; 2) The assessment of socio-economic consequences of global changes, without adaptation, under alternative scenarios describing global changes; 3) Production of macro costs of global changes - at EU, National and macro-regional level.

### WORK PACKAGE 5: Autonomous and planned adaptation: total impacts of global change



Partners: FEEM (leader), IIASA, PIK, ISIS, WIIW The key tasks set for this work package are: 1) Construction of adaptation scenarios to the socio-economic transformations emerging from global changes; 2) Sensitivity analysis of adaptation scenarios to global changes to incorporate major sources of uncertainty; 3) Analysis of optimal mitigation and adaptation socioeconomic strategies to maximize welfare and estimates of total costs of global changes - at EU, National and macro-regional level.

WORK PACKAGE 6: Discounting, risk and uncertainty in modelling impacts

UNIVERSITY OF GOTHENBURG

http://www.gu.se/english Partners: UGOT (leader), TSE, FEEM, IIASA, PIK, LSE

The key tasks set for this work package are: 1) Develop theoretical innovations concerning discounting, risk and ambiguity; 2) Implement theoretical innovations concerning discounting and risk in models used within this program.





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### WORK PACKAGES 1, 3, 4 and 5 - SCENARIO ARCHITECTURE:

The *global challenges* covered by Global-IQ are: climate change, demographic changes and migration, energy, global competition and trade, environmental degradation. Although most models have a global scale, the focus of the analysis will be the European Union. The Shared Socio-Economic Pathway (SSP) scenarios have been developed through joint efforts of the Integrated Assessment Modelling and the Impacts, Adaptation and Vulnerability community to replace the SRES emission scenarios, and will be widely used in the climate change literature. By using this shared platform Global-IQ will generate scenarios that are compatible with the new standard in the literature. The main focus is placed upon the Central Scenario. Further challenges are explored through alternative pathways, which may be considered less probable today but are still possible.









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### RESEARCH HIGHLIGHT FROM WORKPACKAGE 1: UNDERSTANDING GLOBAL CHANGES

A global challenge has been defined as: "a large deviation of environmental, social or economic dynamics from the past or current conditions that has the potential to result in wide welfare impacts."

## RESEARCH HIGHLIGHTS FROM WORK PACKAGE 2: NON MARKET IMPACTS AND BEHAVIOURAL ANALYSIS OF KEY SECTORS

CUNI, IHEID and ISIS have found that ancillary health and environmental benefits from improved air quality are substantial, and the scarce evidence on these in developing countries has been enhanced within the project. Also, CUNI has conducted a meta-analysis of non-market values attributable to ecosystem services and assessed the impacts of several scenarios of global change through benefit transfer. Concerning the behavioural analysis of the firms within the production process, the elasticity of substitution of production of capital, labour and energy has been estimated by CUNI on sector level in both developed and transition EU countries. Also, the impact of climate change on land use has been investigated by TSE, resulting in estimate of the long-run cropland-price elasticity of 0.3.

**TSE** has further elaborated on **trade policy and climate policy**, where the **main results** are the following: a) trade protectionism designed to counteract competitiveness losses from carbon policies might actually protect some inefficient and highly polluting firms; b) heterogeneous sectors should face different carbon price schedules; c) learning is not a sufficient motive to trigger early development of abatement techniques, while the existence of decreasing returns to scale over abatement induces an early start of an active mitigation policy.

**New advanced models** have been designed to improve the estimate the costs of global changes in different socioeconomic areas, mainly focusing on the improvement of the state-of-the art in modelling the energy demand of households, the impact of climate change on land use, the analysis of trade and climate policy and the assessment of climate policy in a second best world.

### RESEARCH HIGHLIGHTS FROM WORK PACKAGE 5: AUTONOMOUS AND PLANNED ADAPTATION: TOTAL IMPACTS OF GLOBAL CHANGE

**FEEM** researchers have focused on the Desert Foundation's assertion that up to 20% of power demand in Europe could be obtained by connecting African desert to European cities. This research evaluates the technological, economic, and political feasibility of this idea. Although concentrated solar power is a proven technology that can work at scale, it is currently four or five times more expensive than fossil fuels. Concentrated solar power could play an important role in Europe's energy mix after 2050, but only if geo-political challenges can be overcome.

One of the main questions arising: is it economically, technologically and politically feasible to cover a large fraction of power demand in Europe from the MENA desert?

Results of this research show that there is scope for pilot projects, but large economic benefits from trans-Mediterranean CSP trade emerge only from 2050 onward. Also, in respect to the relationship between Europe and Mena countries, there are two main points: first, if the market will be dominated by a small group of large (state) operators there is a concrete risk of rent-seeking behaviour; second, and most importantly, a large trans-Mediterranean power market has the potential to increase the energy dependency of Europe. It is important to keep in mind that demand and supply must be constantly balanced in order to guarantee the correct functioning of power systems. A sudden large imbalance typically causes a blackout.







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RESEARCH HIGHLIGHT FROM WORK PACKAGE 3 and 4: MODELS TO ESTIOMATE SOCIO-ECONOMIC IMPACTS OF GLOBAL CHANGES and SCENARIOS OF SOCIO-ECONOMIC IMPACTS OF GLOBAL CHANGES

PIK has selected the major insights and policy conclusions from the different scenarios can be summarized as follows:

• Increasing food demand of world population challenges the global agricultural system due to climate change impacts; however, several adaptation measures are available and can substitute each other in the presence of partial limits to adaptation

• While at the global level trade is a quite important measure of adaptation in the global agricultural sector, for Europe irrigation and yield increasing technologies are more important

• Limited adaptation in terms of factor substitution, labour mobility and trade is likely to increase climate change impacts by 30% until 2050 at the global level

• Limited adaptation to mitigate climate change due to a biomass potential reduced from 300EJ to 100EJ may almost double the mitigation costs and will in Europe also result in a reduced level of gas consumption

Limitation of oil and gas imports in Europe will heavily increase fossil resource prices and the use and import of coal in Europe

• Limitations in providing advanced transport technologies and in improving the modal shift of passenger transport result in environmental (air pollution) and health impacts that amount to social costs of 7 billion Euro in 2050 in Europe

### RESEARCH HIGHLIGHTS FROM WORK PACKAGE 6: DISCOUNTING, RISK AND UNCERTAINTY IN MODELLING IMPACTS

University of Gothenburg has extended international pollution models to study the benefits of international cooperation under climate uncertainty. The research attempts to answer how uncertainty about global warming affects the net welfare of individual countries in non-cooperative and cooperative situations, and how climate uncertainty affects the benefits from international cooperation

**IIASA** has investigated the **implications of discounting on catastrophic risk management** during for instance extreme climatic events. Standard discount rates obtained from capital markets may significantly underestimate the net benefits of long-term decisions. Research has shown that an alternative approach is to focus on arrival times of catastrophic events rather than horizons of market interests. Another result shows that enforcing rigid levels of bio-energy targets might come at a severe cost in terms of enhancing food price volatility, which is already under pressure from food security.

London School of Economics research on the use of welfare weights and spatial discounting has been extended to include risk. The analyses include effects of inter-generational equity, intra-generational equity, and risk on the value of climate policies. Moreover, the moral hazard problem has been analysed in the context of financing adaptation to climate changes. **FEEM** has been working on a theoretical framework to establish a relationship between climate change impacts and global greenhouse gas (GHG) concentrations that take into account the ambiguity - i.e. **the structural uncertainty of climate change**. As an example they use a case study and estimate the sensitivity of agricultural land values and climate distinguishing between cropland and non-cropland regions.

FEEM has also studied the optimal use of Solar Radiation Management (SRM) in climate mitigation policy. Using standard economic models of dynamic decision theory under uncertainty researchers have estimated that SRM would play an important part in a mitigation portfolio, but should not be considered the only mitigation option. A stochastic version of the integrated assessment model WITCH confirms the theoretical results for a wide range of parameter specification.







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## NEWS/EVENTS:

Global-IQ Final Conference in Brussels (17th June 2014)

The final Conference of Global-IQ was held in Brussels at the Renaissance Brussels Hotel. The meeting focused on the discussion regarding the findings of the three-year collaborative research project involving eleven partners located in eight EU member state, led by the Toulouse School of Economics. The agenda of the meeting is available here

Global-IQ 3rd Annual Meeting in Gothenburg (7-9 April 2014)

Global-IQ 2ND Annual Meeting held in Rome (24-26 September 2013)

Global-IQ 1st Annual Meeting in Prague (10-12 October 2012)

Kick-off meeting at TSE in Toulouse (18th-19th October 2011)

### **PUBLICATIONS**

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Emmerling, J. and M. Tavoni (2013), "Geoengineering and abatement: a "flat" relationship under uncertainty", FEEM Note di Lavoro 31.2013., available at: <u>http://www.feem.it/userfiles/attach/2013726944434NDL2013-031.pdf</u>

Urban, J., & Máca, V. (2013). "Linking traffic noise, noise annoyance and life satisfaction: A case study" International Journal of Environmental Research and Public Health, 10(5), 1895-1915.

Athanassoglou, S. and E. Massetti (2012). "Climate Change Impacts and Ambiguity." Mimeo, FEEM and Yale.

Fuss S., Havlik P., Szolgayova J., Obersteiner M and Schmid E (2012). "Agricultural price volatility under climate change: the impact of multiple objectives on commodity prices". Paper prepared for the 123rd EAAE Seminar, Dublin, February 23-24, 2012.



