



# GLOBAL IQ

IMPACT QUANTIFICATION OF GLOBAL CHANGES

GLOBAL IQ Annual Newsletter

August 2013 / Issue 2

## WELCOME TO THE GLOBAL IQ ANNUAL NEWSLETTER!

The Global-IQ team welcomes you to the 2<sup>nd</sup> Annual newsletter that will update you on the most recent and cutting-edge research advancements made by the consortium and the most recent policy, networking and outreach activities done by the research and project management teams.

Global-IQ focuses 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. More specifically, they entail the provision of significant advances in 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.

The Global-IQ Team has made substantial progress towards the development of the Global-IQ set of "global challenges" scenarios. More insight in these achievements is provided in this newsletter.

## OBJECTIVES ACHIEVED SO FAR:

### WP 1, 3, 4 and 5

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** of the project was to find a working definition of "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.

**A global challenge was 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."**

### WP2

The Global-IQ team has focused on a variety of research topics related to **behaviour of key players, consumers and firms, and impact assessment at micro level**. Specifically, this has included a review of non-market impacts, with a special concern paid to ancillary benefits of GHG abatement and health effects.

### WP 6

New insights have widened the methods for **discounting future costs and benefits under uncertainty**. This has in several respects generalised the literature on discounting and uncertainty in normative decision theory.

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## LATEST NEWS/ EVENTS

- **Next Partner Meeting:** Annual Global-IQ Meeting in Rome between 24 to 26 September 2013.
- **Latest Partner Meeting:** Annual Global-IQ Meeting in Prague between 10 to 13 October 2012.

## FOCUS ON: MODELLING TEAMS

Modelling teams have been active in developing new features in the research models. These new model developments will **allow a better characterization of the global challenges scenarios**, in particular by representing, with more refinements, some sector-specific issues such as water scarcity, biofuel transformation, transports, etc.; and also by improving the coupling between the different models used in the project. Modelling teams have also developed a **conceptual framework to generate and to interpret the scenarios of global challenges**. The first set of scenarios of global challenges with full adaptation is now under progress and will be presented at the second project meeting in Rome, in September 2013.



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## OVERVIEW OF PARTNERS AND WORK PACKAGE OBJECTIVES:

### 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 behavioural 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 non-market goods affected by climate change and of ancillary effects; 2) Adoption of energy and water saving installations in households; 3) Energy demand estimation; 4) Trade Policy and Climate Policy.

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



International Institute for  
Applied Systems Analysis

IIASA [www.iiasa.ac.at](http://www.iiasa.ac.at)

<http://www.iiasa.ac.at/>

*Partners: IIASA (leader), FEEM, PIK, ISIS, WIIW*

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



FONDAZIONE ENI  
ENRICO MATTEI

<http://www.feem.it/>

*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 socio-economic 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.



## 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.

### Central Case Scenario:

To be developed to provide insights from a “business-as-usual” trajectory of development. The “central case” scenario will be developed along the lines of the Shared Socio-Economic Pathway number 2 (SSP2), the “middle-of-the-road” scenario of the international SSPs scenario architecture. For more information on the SSPs, please refer to research by Moss RH, et al. (2010) and van Vuuren DP, et al. (2012).

### Alternative Scenarios

*Climate Change Impacts, Climate Mitigation Policy Scenarios, Population Dynamics, Trade Openness, Biodiversity Protection*

**Key Assumption:** the European Union – and other world economies – are able to fully adapt to the new conditions, in order to minimize (maximize) negative (positive) impact.

**Key Assumption:** by comparing the scenarios with full and limited adaptation it will be possible to estimate the value of the different adaptations.

### Current Initiative includes:

68 scenarios are under development by seven modelling teams using Integrated Assessment Models, Computable General Equilibrium Models, Partial Equilibrium of Agriculture and Forestry models and Transport models. This first set of scenarios will be presented at the project meeting in Rome in September 2013.

### Questions considered include:

- What are the most effective adaptations in the European Union to a new round of trade negotiations that increase market openness?
- What are the most important adaptations in the energy sector to respond to a large availability of natural gas?
- What are the optimal adaptations in agriculture to cope with a new climate, for example, a new set of trade rules or an increasing energy demand?



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## RESEARCH HIGHLIGHTS FROM WORK PACKAGE 2:

**IHEID** - in collaboration with Peking University - **collected primary data on the cost of airborne diseases for Beijing residents and on their willingness to pay for cleaner air.** This study is important for designing climate change policy in developing countries, since it links global emission targets with local health and pollution problems. In particular, should China adopt more climate friendly industrialization patterns, it could at the same time reduce domestic pollution, benefiting its urban population. In this study, we find that the average yearly cost of airborne diseases ranges around 3000 yuan per year (circa 500 US\$), equivalent to one month of average wage. This can be combined with information about the willingness to pay for reduced morbidity, which was 55 RMB (less than 10 US\$) for reducing one case of getting cold symptom and 770,000 RMB (120,000 US\$) for reducing one case of respiratory or cardiovascular illness. The value of a statistical life found was about 490'000 US\$ (at PPP). Overall, we argue that these results indicate that the local benefits that China could reap from reducing emission simultaneously at home and internationally can be sizable and are worthy of great consideration.

**IHEID** researchers also **estimate the elasticity of substitution for capital, labour and energy in nine CEE countries.** We apply non-linear estimation techniques to estimates substitution elasticities direct from the CES production function and estimate the elasticity of substitution for several types of the production function nesting structures, while finding that (EL)K nesting structure fits our data best. In ongoing work, country specific estimates are appraised, adding materials as the fourth production factor.

## RESEARCH HIGHLIGHTS FROM WORK PACKAGE 6:

**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.

**University of Gothenburg** has analysed **how to discount when consumers value not only income but income relative to that of their peers.** This has in several respects generalized the literature on optimal public expenditure when relative consumption matters. If consumers value not only income but income relative to that of their peers, this will have important implications for how to discount future costs and benefits of, for example, climate change.

**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 1<sup>st</sup> Annual Meeting in Prague (10-12 October 2012)



The Global-IQ Annual Meeting was held at the Charles University in Prague in October 2012. The participants included representatives from the partner institutions and the European Commission. The discussion agenda focused on a number of issues:

- The objectives of the project from the viewpoint of the European Commission;
- Discussion of various Global Change Scenarios as part of the specific Work Packages. The discussion focused on 4 main research areas: Ancillary Effects and Externalities, Tax incidence, Health Benefit Valuations, and Trade Policy and Climate Change. The specific examples included topics such as health effect of climate change, external costs of transportation modes, optimal taxation models, new trade models that account for the marginal productivity of labour.
- Various methods and methodology devised and employed by the research team to reach the main project objectives;
- Necessary inputs and potential outputs of the research agenda – need to acquire specific datasets and the possibility to combine existing ones.
- Administrative issues such as the preparations for the 1<sup>st</sup> Period Reporting to the European Commission.
- Outline of the main objectives for the second half of the project: renewable and non-renewable energies, water from the viewpoint of environmental threats, and trade barriers and trade regulation.

The minutes of the meeting are available [here](#):

The next Annual Global-IQ meeting is **scheduled to take place in Rome from 24-26 September 2013**. For more details, please visit the [project website](#).

## PUBLICATIONS

Ščasný, M. and Alberini, A., "Valuation of Mortality Risk Attributable to Climate Change: Investigating the Effect of Survey Administration Modes on a VSL", *International Journal of Environmental Research and Public Health*, 9, 2012, pp. 4760 – 4781.

Massetti, E. and Ricci, E. C., "As Assessment of the Optimal Timing and Size of Investments in Concentrated Solar Power", *Energy Economics*, 38, 2013, pp. 186 – 203.

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

Both publications are also publicly available on the [Global-IQ website](#).

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