

VI – Economics, financial instruments and insurance

Parallel session A – Monday 10th March 14:00-15:30

ID N°: [10]

Title: **CLIMATE-INDUCED CHANGE IN CROP YIELDS: A CGE ANALYSIS OF MACROECONOMIC IMPACTS AND COSTS & BENEFITS OF ADAPTATION**

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This paper examines the potential for adaptation to climate change in agriculture at a global level. It takes a consistent global estimate of the effects of climate change on crop yields (DSSAT-based crop modelling, 2080 climate, A1B and E1 scenarios) and applies this as a shock to the agricultural sector of a general equilibrium (CGE) model in order to observe the impacts on GDP and consumers' welfare worldwide.

The study then goes further by estimating the improvement in economic outcomes when adaptation is available and modelled as an endogenous technology choice. Adaptation is considered to be the application of additional irrigation and fertiliser compared to present-day levels. The benefits of adaptation are quantified as improvements in yield (also from DSSAT-based crop modelling), while the costs of adaptation consist of additional capital (required for irrigation) and increased chemical fertiliser purchases. Furthermore, additional irrigation is assumed to be available only where this would not create severe water stress.

The results show that under the A1B climate of 2080, lower crop yields could reduce global GDP by 0.25%, whereas adaptation (if it were free and unlimited) could increase GDP by a similar amount. However, once costs of adaptation and limits in water availability are taken into account, GDP falls by 0.1%, indicating that paid-for adaptation has the potential to halve damages. These results, while speculative, indicate the importance of considering costs, benefits and sustainability limits in assessment of adaptation policies and development of technologies.

Presenter

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ID N°: [36]

Title: **RESULTS OF A MULTIFACTORIAL PLUVIAL FLOOD DAMAGE MODEL FOR BELGIUM.**

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In Europe, floods are among the most devastating natural disasters citizens have to deal with. To minimize the damage, flood risk management is essential and therefore estimation of damage models is crucial. Typically, simple depth-damage-functions, predicting the monetary flood damage only by looking at the depth of the inundation, are used. Also, damage models almost always focus on fluvial floods caused by river overflowing.

In this paper, we construct a multifactorial damage model for residential buildings and for housing contents. As such, we do not only take into account the effect of flood depth on damage, but also the effects of flood duration, building characteristics, behavioral indicators (e.g. the use of emergency measures) and socio-economic variables. Insights on the importance of those other indicators is relevant for policy makers. The effect of building characteristics can be taken into account in regional planning, behavioral predictors are important so as to give people the right information on how to act during a flood and socio-economic variables are relevant to target the right groups for information and alarming.

We construct the model for damage caused by pluvial floods, i.e. floods caused by extreme rainfall events that cannot be processed by existing urban drainage systems. Although this flood type is less spectacular than fluvial floods, pluvial floods are much more common in urbanized areas and over the years result in at least equally severe damage figures as fluvial floods do.

Data come from a survey sent to identified victims of pluvial floods in Flanders (Belgium). The results are expected to be widely applicable for pluvial flood risk assessment in Europe or beyond.

First analyses show that damage to residential buildings is mostly driven by depth and the type of building (terraced, semi-detached or detached). Those results are to a great extent in line with the research on depth-damage-functions, which are sometimes constructed for different types of building, thereby introducing a second predictor next to depth. The first results for the damage to contents however, show also other important predictors of damage. Specifically, certain emergency measures can have a mitigating impact on damage and certain socio-economic indicators are also important. Those variables are rarely (and for pluvial floods never) taken into account in damage assessments. The analyses are repeated several times with slight modifications leading to robust results.

Our research is part of the Plurisk project on the forecasting and management of extreme rainfall induced risks. This research project is funded by the Belgian Science Policy and groups many researchers from both exact sciences and humanities. The project engages local authorities of a number of Belgian cities so as to make the research as practically useful as possible.

Presenter

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ID N°: [40]

Title: A NEW FINANCING MECHANISM FOR THE DUTCH CLIMATE ADAPTATION TOOLKIT? DIMENSIONS AND APPLICABILITY OF TAX INCREMENT FINANCING

Authors: [Liz Root](#)¹; T.J.M. Spit²; Erwin van der Krabben³

Institutions: ¹Radboud University/Climate Proof Cities; ²University of Utrecht; ³Radboud University

Scholarly and policy-oriented research often argues that new governance structures and new financial mechanisms are required to facilitate investment in adaptation to climate change. The literature often evokes the subsidiary principle by arguing that local control of funding sources will create the conditions for efficient and appropriate solutions (Heuson et al. 2012). However, there is little research on local level financing mechanisms in relation to climate adaptation. This paper seeks to shed some light upon on the technical and socio-political dimensions of operationalizing a novel financing mechanism. The research focuses on the potential of applying local property taxes as the income source in the context of tax increment financing to facilitate long term investment in new and/or retrofitted public infrastructure. The objective is to assess the technical and socio-political institutional fit of tax increment financing in the Netherlands and, secondly, its appropriateness as mechanism to facilitate investment in local level climate adaptation investments. By highlighting the role of institutional norms and values, the conceptual analysis deviates from a purely technical analysis. The assessment framework is further narrowed based on seven principles from the benefits model of municipal public finance (Musgrave and Musgrave 1989).

The investigation found evidence that while tax increment financing is technically possible in the Netherlands, limitations to operationalizing it as public financing mechanism and as a stable income stream for local adaptation investments relates to tax increment financing's dependence on real estate performance, the low property taxation rate, and the absence of a clear policy framework on climate adaptation. By exploring the norms and values that underpin Dutch public finance, the socio-political related findings suggests that tax increment financing may be perceived as being out-of-step with shifting ideas about municipal financial risk. More particularly, the structural dynamic of municipal financing results in a weak connection between the role of property taxes as an income stream to support area-specific public infrastructure expenditures. Despite these reservations, tax increment financing does have potential as it offers a range of characteristics that may enhance local long-term planning particularly in combination with other planning mechanisms. Judicious application of tax increment finance may enhance project feasibility and allow for a distribution of costs and benefits between current and future users.

The research findings were based on document analysis and interviews: 1) a nation-wide telephone questionnaire with senior tax officials; 2) interviews with officials in the national government and research organizations, including economists, financial experts in academia, and the banking sector; 3) a detailed case study of the City of Nijmegen's Waalfront redevelopment project.

Presenter

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ID N°: [49]

Title: CROSS-SECTORAL VULNERABILITY, RISK AND ECONOMIC ASSESSMENTS OF CLIMATE IMPACTS AND THEIR USEFULNESS FOR ADAPTATION STRATEGIES

Authors: [Inke Schauser](#)¹; Pamela Köllner Heck²; Martin König³; Markus Leitner³; Martina Zöllner²

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Impact-based assessments, such as vulnerability, risk and economic assessments investigate the observed and potential impacts of climate change including the socioeconomic context to assess who or what is vulnerable to what, when and where and which damages might occur. Cross-sectoral assessments are often ordered from decision makers with the objective to enable the comparison of vulnerabilities or risks and to identify spatial and thematic hot-spots for the prioritization of adaptation needs. Other objectives are the raise of awareness towards potential climate change impacts and damages, the development of adaptation options or the monitoring of effects of adaptation activities as well as scientific understanding of interactions between impacts in different sectors or of different drivers.

Vulnerability, risk or economic assessments use different methodologies. Cross-sectoral effects of climate impacts are important aspects of such assessments, which are difficult to encounter and assess. These assessments have to meet the challenge that information is coming from different sources that needs to be selected and aggregated or combined. One possibility to compare different climatic risks is by monetarisation of potential damages, others include normalised indicator values or common (measurable) values such as human live or water use. Indicators can be derived from impact models or selected by experts.

The different methodological approaches used for impact-based assessments in Europe so fare range from purely qualitative-descriptive to mainly quantitative ones. All of them have advantages and limitations; and they have to meet the challenges to deal with uncertainty and to make normative decisions. Because of the complexity of the theme, the results of such assessments as well as the expectation of the decision makers vary and often they do not fit together.

We will present experiences with developing and using these assessments in support of climate change adaptation policy in Europe, mainly for national adaptation strategies.

Presenter

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