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FLOOD FOOTPRINT ACCOUNTINGS

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Summary

We present a new and transformative disaster accounting framework – flood footprint accountings. Flood footprint is a measure of the exclusive total economic impact that is directly and indirectly caused by a flood event to the flooding region and wider economic systems. Flooding in one location can impact the whole EU or world economy, since the effects of the disaster are transferred through the whole supply chain.

For investment in flood risk management options, it is critical to identify the ‘blind-spots’ in critical infrastructure and vulnerable sectors along with the economic supply chains and social networks. This in turn allows for sufficient adaptation to the damage that is transferred from the current event to future events. Adaption to flood risk is not limited to the area which suffers the direct damage. It also extends to entire socioeconomic networks and this must be considered in order to minimise the magnitude and probability of cascading damage to the regions not flooded.

We are developing this new tool under EU FP7 project – BASE, UK EPSRC funded projects of Sesame and Blue Green Cities.

Keywords

flood footprint, economic costs, physical damage, assets.

Issues addressed

Water resources management (water-use efficiency, integrated water resources management, transboundary cooperation, sustainable extraction and supply of freshwater)

We quantify the total economic costs for the entire economic supply chains, known as flood footprint. This would provide a new and throughout idea about the true economic cost and re-evaluate the benefit of flood adaptation. The same framework can be applied to other extreme events.

Risks (mortality, economic losses caused by natural and human-induced disasters)

The flood footprint accounting framework can be applied to all natural hazards in terms of evaluating the total economic costs. This can be captured as disaster footprint. Current work is a focus on measuring economic costs for past events. Some work has been done for future events, by integrating climate scenarios.

Tools for implementation

Financing/economic instruments:

New economic and financing mechanism can be designed to share financial burdens of flooding mitigation and extreme events adaptation. At the level of flood risk mitigation responsibility, a flood footprint accounting framework would provide an alternative way to allocate financial responsibility for flood risk mitigation interventions by incorporating the value of all stakeholders' economic capacities on the local/regional/national supply chains. This could potentially reduce the government's financial burden for flood risk management and spread the cost between major stakeholders in the supply chain, based on the 'who benefits, who pays' principle. In other words if it turns out through a proper flood footprint assessment that organisation(s) x or y benefit in a large way from flood defence then we could look at alternative flood management payment schemes.

Governance: Institutions / legal framework: Since this is a brand new approach, there is no institutional and legal frameworks at present. We have presented the research to UK Environmental Agency, and they have given high priority and will try to include indirect costs in their future estimates of flooding. We are carrying out several case studies in EU, Japan and China.

Capacity Development: We are actively engaged with local, regional, and national stakeholders. Under each project, we have stakeholder groups.

Who is involved? Under each project, we have stakeholder groups. The members include, utilities companies, city councils and national authorities for water management.

What were the objectives? This project is to produce a new flooding impact accounting tool – a flood footprint - to assess the direct and indirect socioeconomic impact of historical flooding events as case studies to demonstrate how the tool works and how this flood footprint can be useful for policy decision making.

At a communication level, the flood footprint could be an excellent concept to enhance business and public awareness of the possible damage threatening them as well as the total damage a flood can cause.

Implementation challenges: The main implementation challenge was to develop the methodology itself, to gather the relevant data, process the data and then apply it to test its validity and whether results proved relevant. We have conducted several case studies to EU regions and have hosted several stakeholders meeting, all stakeholders are interested in such framework, but also challenge the primary data (physical damage) availabilities and qualities.

Main task/activities undertaken /Tools used: We adopt the above described input-output model with a temporal dimension, to assess the economic costs as a result of the extreme weather events that have been selected as case studies, namely the 2009 Central European flood and the 2010 Xynthia winter storm.

Main outcomes / impacts (what has changed?): Flooding in 2009 causes both physical assets damage and indirect (via economic supply chains) loss to the economy. It allows the 4 countries (Germany, Austria, Czech Republic and Poland) about 18 months in average to fully recovery to the pre-disaster economic condition. The industrial capital damage to the four central EU countries is 238 million euros. Such damage is about 0.004% of total capital stock among all affected regions. The residential capital damage to the 4 countries is 118 million euros.

The direct economic loss due to industrial capital damage (in monthly term, i.e. month 0) in disaster aftermath is about 5 million euros (therefore the annual direct loss could be 56 million euros). The indirect economic loss (constraint by both industrial capital and labour loss) over 17 months is 358 million euros to gross value added. The flood footprint for this 2009 event is 362 million euros (direct loss in month 1 plus indirect loss over rest 17 months), which is equivalent to 0.02% of German annual GDP in 2009.

Lessons Learned:

Triggers: The international headlines of the past few years have been dominated by extreme flooding or flood-related events. Assessments of the flooding impacts have traditionally focused on the initial impact on people and physical assets. These initial estimates (so-called 'direct damage') are useful both in understanding the immediate implications of damage, and in marshalling the pools of capital and supplies required for re-building after an event. Since different economies as well as societies are coupled, especially under the current economic crisis, any small-scale damage may be multiplied and cascaded throughout wider economic systems and social networks. The direct and indirect damage is currently not evaluated well and could be captured by quantification of what we call the flood footprint.

Drivers: The main driver is there is no mature and robust methodology to quantify the indirect costs of climate extreme events. Current economic analysis for risk are mainly for direct and physical damages based on insurance data. Neglecting these knock-on costs (i.e. the true footprint of the flood) means we might be ignoring the economic benefits and beneficiaries of flood risk management interventions. The flood footprint analysis also identify the blind spots (where the sector are most vulnerable in terms of broken supply chains and key infrastructures and economic lifelines) hiddeing in economic supply chains. We advocate a new way to evaluate economic costs and benefits of climate change adaptation and mitigation.

Barriers: Definitions: definition of physical damage, direct cost and indirect cost are inconsistent in literature.

What has worked well?: The development of the methodology itself which is robust to capture total economic costs for extreme events. The engagements and responses with stakeholders are very well received.

What can be improved?: Methodological improvements: develop Multi-Regional Flood Footprint accounting framework; integrate climate change scenarios and flood engineering model into flood footprint accounting framework.

Engagements: Insurance companies appear to be crucial stakeholders and data providers for this type of analysis. Engagement with them has been challenging. More effective engagement with Munich Re, Swiss Re would be necessary for this type of tools.

The way forward Produce flood footprint accounting framework manual;
Apply the model to capture other types of disasters with different disaster characters.
Further develop the tool to be able to capture frequent / sequencing disasters.
Aim to produce annual disaster footprint at EU / global scale.
