



ENHANCE Consortium's response to
**Green paper on the insurance of natural and
man-made disasters (COM(2013) 213 final)**

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Further information available at: www.enhanceproject.eu

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About the ENHANCE project

Enhancing risk management partnerships for catastrophic natural disasters in Europe (ENHANCE) is a EC-funded FP7 research project (grant number 308438). The consortium, led by the Institute for Environmental Studies (IVM) and VU University Amsterdam, includes thirteen leading research institutes representing multiple natural and social sciences disciplines, three public bodies at different levels including the UN office for Disaster Risk Reduction (UNISDR), seven private sector specialists including five from the risk and finance sector, and an environmental NGO (see further down for the full list).

The main goal of the ENHANCE project is to develop and analyse new ways to enhance society's resilience to catastrophic natural hazard impacts, by providing new scenarios and information in selected hazard cases in close collaboration with stakeholders, and by contributing to the development of new multi-sector partnerships (MSPs) to reduce or redistribute risk. Our focus on the development of (new) partnerships for selected cases of catastrophic hazards, including multi-hazard events as well heat-waves, forest fires, floods, droughts, storm surges, and volcanic eruptions. The ENHANCE project commenced in December 2012 and will conclude after 4 years in 2016.

Within the ENHANCE methodology, insurance is one of the key economic instruments being analysed, with a particular focus on the roles of the public and private sector in providing insurance as well as the contribution of risk transfer to risk reduction. Although the ENHANCE project is at an early stage of implementation, with no research results yet available, we can share our knowledge and positions on some of the questions posed in the Green Paper. We envisage a close working relationship with the relevant EC DGs throughout the life-span of ENHANCE, in order to share our results if and when they become available. This position paper should be seen as a joint response from the ENHANCE consortium, produced by those partners engaged in the insurance related work:

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Responses to the questions posed by the Green Paper

(1) What is your view on the penetration rate of disaster insurance in the European Union? Please provide details and data to support your arguments. Is more research needed to understand any possible gaps in insurance supply and demand, insurance availability and coverage?

The application of insurance to manage the impacts of natural disasters is unevenly applied across Europe, with the extent and scope of risk transfer varying from country to country. One source of empirical evidence for these are multi-country overviews, such as the summaries of existing natural catastrophe insurance schemes provided by Insurance Europe or the Spanish Consorcio.

In ENHANCE, several case studies explore the current availability or lack of natural disaster insurance and how public and private partnerships could address this:

- Multihazard risk assessment in the Po River basin (Italy)
- Flood risk and climate change implications for multi-sector partnerships (MSPs) (United Kingdom)
- Insurance and forest fire resilience in Chamusca (Portugal)
- Flood risk management for critical infrastructure (The Netherlands)
- Testing the Solidarity Fund for Romania and Eastern Europe

Further information will be available from the ENHANCE project at a later stage.

(2) What further action could be envisaged in this area? Would mandatory product bundling be an appropriate way to increase insurance cover against disaster risks? Are there any less restrictive ways, other than mandatory product bundling, which could constitute an appropriate way to increase insurance coverage against disaster risks?

One proposition is for EU countries to develop Disaster Risk Reduction action plans at national and local level, which would raise risk awareness amongst individuals, but also help to maintain affordability of insurance by reducing the stock of extensive risks through non-structural and structural investments. Implementation and governance of these plans need to be effective and monitored.

(3) Which compulsory disaster insurance, if any, exists in Member States? Are these insurance products generally combined with compulsory product bundling or obligation for insurers to provide cover? Is compulsory disaster insurance generally accompanied by a right for the customer to opt out of some disaster risks? What are the advantages/possible drawbacks? Would EU action in this area be useful?

Response to Q2 and Q3

After the Central European flood, discussions on mandatory insurance have come to the forefront again, such as in Germany (Seifert et al., 2013) and Austria (Raschky et al., 2011). Also, in The Netherlands, mandatory flood insurance is being discussed as a way to create an affordable insurance system as well as to stimulate solidarity between households in flood prone and less vulnerable areas (Paudel et al., 2013). Moreover, less restrictive approaches than mandatory bundling for increasing flood insurance demand have been examined in the Netherlands, such as various forms of risk communication (Botzen et al., 2013). While tackling adverse selection, acceptability and legal compliance with the EU free market, decrees may be limited. The above mentioned cases in ENHANCE will look into these questions.

The reason mandatory insurance is increasingly seen as an option, is because insurers have difficulties in offering insurance against (extreme) natural hazards at low cost. First, it is difficult to estimate uncertain extreme events, and, hence, the insurance premiums. Second, insurers often have limited capacity to cover the potentially large and correlated natural disaster losses. At the other extreme, fully public (controlled by the Government) flood insurance may be considered, which is usually provided in the form of ex post relief. The disadvantages of such a system are: that it diverts financial resources away from other important public projects, and incentives for risk prevention measures for individuals are often limited in the absence of risk-based insurance premiums. Europe displays a wide variety of insurance-systems, and some countries have a mandatory component, such as Spain, Belgium and France (Paudel et al., 2012). For example, in France natural disaster risks are insured through a public-private insurance arrangement *Catastrophes Naturelles* which bundles compulsory coverage for natural disaster risks with general homeowner insurance policies (Botzen and van den Bergh, 2008). The ENHANCE project assesses the most prevalent flood (and property) insurance arrangements in a number of EU countries according to the main characteristics of the scheme and to “who pays” or the public versus private liability continuum.

(4) How can state or state-mandated disaster (re-)insurance programmes be designed and financed to prevent the problem of moral hazard?

Fundamentally, risk transfer removes or reduces the risk of experiencing an uncertain financial loss. However, if designed and operated appropriately, it can also play a role in physical risk reduction and adaptation.

ENHANCE will examine the scope of different economic instruments for enhancing resilience and managing risk, and develop criteria for assessing them.

While there is a lot of rhetoric about the incentive-compatibility of insurance, the reality is marked by moral hazard. We will study this set of problems and look into the associated issues. For example, these criteria could be in terms of the instruments' effectiveness for incentivising risk management, distributional equity and the extent of risk reduction (Kunreuther et al., 2001; Kunreuther and Pauly, 2006). There is an increasing interest in the use of such economic instruments, which are currently at the heart of the debate on novel approaches for managing risk. The literature suggests that risk transfer could play an important role in risk reduction by incentivising the take-up of risk reduction measures (Botzen, 2013; Herweijer et al. 2009; Maynard and Ranger, 2011; Ward et al., 2008).

Economic instruments, such as risk financing instruments, private-public partnerships, taxes and others, can produce incentivising behaviour and increase the uptake and efficiency of adaptation measures. The effectiveness of these instruments in reducing risk is frequently debated in the policy and science spheres, yet the evidence base on their effectiveness remains limited (even for insurance related instruments) and there are few conceptual and numerical analyses (Aakre et al., 2010; Agrawala and Fankhauser, 2008; Fankhauser et al., 1999; Kunreuther and Michel-Kerjan, 2009).

There is a semantic challenge that one must consider when analysing the links between risk transfer and risk reduction on the one hand and adaptation on the other: stakeholders do not always speak the same language, and may use many terms in different contexts, such as loss prevention, risk engineering, risk reduction, vulnerability reduction and climate adaptation. Assessing the effectiveness of a risk transfer scheme in incentivising risk reduction goes beyond pure economic cost-benefit analysis, and needs to include the recognition of the different stakeholder objectives such as vulnerability reduction, commercial viability, affordability, and the financial sustainability of a scheme in the context of changing risk levels.

Measuring this effectiveness remains a challenge, particularly in the context of public-private partnerships, because: success or failure often only become evident after another risk event; and it requires in-depth data collection on the ground.

Efforts have been made to explore this effectiveness for particular cases, such as exploring actual risk reduction activities through surveys and on-the-ground verification activities. However, a general assessment of what works and the most effective linkages is still missing at this stage (Surminski and Oramas-Dorta, 2011). ENHANCE will also expand on the wider field of economic instruments (e.g. taxes, payments for ecosystem services, and water pricing), which are often overlooked and not well analysed. Little is known about the use and suitability of such instruments, and hence they will receive particular attention.(5) Do you see any difficulties, barriers or limitations in using information to generate parametric insurance? Which factors could scale-up the promotion and uptake of such innovative insurance solutions?

There has been some discussion regarding parametric insurance for agricultural risks. For many reasons, including data, modelling and operational issues, these discussions have not lead very far. While these instruments may indeed be interesting, they may be more limited in scope than in developing countries, where they have found relatively large scale applicability, due to their potential in reducing transaction costs. Transaction costs seem not to be the major problem in the EU, but this needs more analysis, as well as the issue of basis risk that is associated with these type of contracts.

(6) Could risk-based pricing motivate consumers and insurers to take risk reduction and management measures? Would the impact of risk-based pricing be different if disaster insurance was mandatory? Do insurers in general adequately adjust premiums following the implementation of risk prevention measures?

Insurance companies with a specialised knowledge of the probability and expected damage of hazards could give a market price signal via premiums about the expected harm that individuals face. This price signal of risk may correct individual biases in judging probabilities of natural hazards and overcome the problem that people do not invest in mitigation because they have a very low perception of the risk and benefits of mitigation; or they ignore the low-probability risk altogether. In theory, insurance could stimulate the undertaking of damage mitigation measures by offering premium reductions to individuals who invest in risk mitigation. But in practice there are a range of barriers and few studies have examined the effectiveness of such incentives. For the Netherlands, a hypothetical survey has looked into this (Botzen et al., 2009).

(8) What other solutions could be offered to low-income consumers who might otherwise be excluded from disaster insurance products?

In the USA insurance vouchers or other subsidies for low-income households have been proposed to deal with equity and affordability issues of risk based natural disaster insurance premiums (see Aerts and Botzen, 2011a; Kunreuther et al., 2011).

(9) Is there a case for promoting long-term disaster contracts? What would be the advantages/drawbacks for insurers and the insured persons respectively?

In some areas there seems to be a case for long term contracts, since long term insurance may create incentives for homeowners to implement risk reducing measures. The ENHANCE project with colleagues from the Wharton Business School (Penn State University, USA) are examining how this case can be operationalized. But other colleagues in the ENHANCE consortium, such as the LSE, find important limitations to multi-year contracts (Maynard and Ranger, 2011). An assessment of long-term flood insurance contracts in the Netherlands finds that the pricing of such contracts is complicated because of the uncertain future effects of climate change on flood risks, which could result in mark ups of long-term insurance premiums (Aerts and Botzen, 2011b). However, a study of the demand for long-term insurance products has shown that consumers may have a higher willingness-to-pay for long-term flood insurance, than annual flood insurance because they prefer the price stability offered by long-term contracts (Botzen et al., 2013). This will require further analysis.

(11) Do deductibles, excesses, co-insurance and other exclusions effectively prevent moral hazard? What alternative terms and conditions could be appropriate for disaster insurance, given that the insured party may be unable to take effective risk reduction measures against a disaster?

For some time now the insurance industry has been applying these instruments under the terms and conditions of insurance contracts in order to avoid moral hazard, maintain insurability and offer affordable premiums. This is well established in some insurance classes (such as commercial insurance for large risks and motor-insurance), but the effectiveness in reducing moral hazards in the context of natural catastrophe risks remains unclear. This is one area that the ENHANCE project will investigate.

In this context it is of interest to examine how risk perceptions are formed and whether incentives can be effective in increasing individual risk awareness and

encouraging individuals to invest in cost-effective mitigation measures, for instance through public-private natural disaster insurance (Botzen and van den Bergh, 2009). Research indicates that natural disaster insurance can play an important role in promoting individual disaster preparedness by providing a price signal of risk

that steers individual behaviour and rewards policyholders who invest in risk reduction with benefits on insurance policies, such as increased coverage and premium discounts (Botzen and van den Bergh, 2008; Kunreuther, 1996). However, commercial reality and consumer behaviour show a different picture, with some authors indicating a failure of the market to incentivise risk reduction measures and shows that insurers should be more pro-active in linking insurance with risk reduction (Thieken et al., 2006; Warner et al., 2009). For example, a survey of 400 homeowners in the UK by Lamond et al. (2009) shows that insurers have been ineffective in encouraging their policyholders to adopt flood mitigation measures. More research on the effectiveness of different kinds of incentives provided by (public-private) insurance to stimulate individuals to mitigate natural disaster risks is required (Botzen et al., 2009). For example, recent research in Germany has shown that “soft” incentives such as information provision about flood damage mitigation measures may be effective for improving household flood preparedness (Bubeck et al., 2013). ENHANCE will examine methods that can be used for assessing the regional culturally embedded perception of natural hazards. Moreover, online surveys will be conducted with the objectives of: (a) assessing individual risk perceptions; and (b) examining the effectiveness of different kinds of incentives provided by insurance in stimulating individuals to invest in cost effective measures that mitigate natural disaster risks.

(12) How could data on the impacts of past disasters be improved (e.g. by using standard formats; improved access to and comparability of data from insurers and other organisations)?

See response to Q14.

(13) How could the mapping of current and projected/future disaster risks be improved (e.g., through current EU approaches in flood risk mapping under the Floods Directive 2007/60/EC, civil protection cooperation and promotion of EU risk guidelines)?

See response to Q14.

(14) How could better sharing of data, risk analysis and risk modelling methods be encouraged? Should the available data be made public? Should the EU take

action in this area? How can further dialogue between insurance industry and policymakers be encouraged in this area?

Joint Response to Q12, Q13 and Q14:

This is a very important issue and one of the key objectives of ENHANCE is to further develop systematic and harmonized risk mapping and risk projections. To progress beyond the current state of play ENHANCE will provide a pan-European harmonised risk assessment scheme, addressing the knowledge gaps described above and will:

(a) Provide consistent spatial-dynamic scenarios of hazard, vulnerability, and exposure for all case studies. Most past European studies (e.g. Floodsite, emBRACE, PESETA, ClimateCost, ENSEMBLES) have used static scenarios for vulnerability and exposure to natural disasters at several future time-periods (Feyen et al., 2009, 2011; Meyer et al., 2009). Recent studies (e.g. Barredo, 2009; Barthel and Neumayer, 2012) have shown, however, that the observed upward trend of flood damage in recent decades can be attributed largely to socioeconomic factors, such as the increase in population and wealth in flood-prone areas, and to land-use changes, such as urbanisation, deforestation, and the loss of wetlands and natural floodplain storage. We will therefore explore dynamic future 'vulnerability exposure-hazard' from three angles, namely socioeconomic drivers (including land use, population dynamics, and water consumption), policy drivers (e.g. EU Floods Directive, EU Agricultural and Regional Policy), as well as climate variability and change drivers (e.g. Bouwer, 2011; Feyen et al., 2011; Hall et al., 2005; Hölpe and Pielke Jr., 2006).

(b) Develop scenarios of multi-hazard risk. Most risk studies focus on single hazard risk (e.g. wind storms, floods, or earthquakes), whereby hazards are considered as individual events rather than components within systems. Therefore, dangerous threats and cascading effects that are hidden within a system with interacting elements (e.g. heat-waves and droughts) are neglected. We will derive copula-functions linking the univariate fitted hazard models to construct multi-risk joint probability distributions that express the interdependency between the multiple hazards, including hydro-metrological and volcanic hazards (e.g. Shiau et al., 2010; Zhang et al., 2011).

(c) Develop and apply probabilistic methods to generate coherent probabilistic risk scenarios. Disasters caused by natural hazards are rare by nature and future scenarios of their occurrence (e.g. Dankers and Feyen, 2009; Feyen and Dankers, 2009) and loss potential (Feyen et al., 2011) are plagued by uncertainty. Therefore, we will build on novel research in the newly emerging field of probabilistic risk assessment (e.g. Apel et al., 2006; Gaslikova et al., 2011; Manning et al., 2009; New et al., 2007; Ward et al., 2012) through the use of multi-scenario ensemble approaches that probe the respective uncertainty spaces. State of the art quantitative

(probabilistic) risk assessments of natural hazard risk are done via catastrophe models (Grossi and Kunreuther, 2005; Woo, 2011).

(d) Integrate disaster risk management and climate change adaptation. The information from harmonised risk scenarios (outlined above) can be used in risk assessment approaches. Here, ENHANCE draws from the scientific fields of disaster risk management (DRM) and climate change adaptation. Thus far, these two fields have evolved separately, and only recently has some merging occurred (e.g. IPCC, 2011). Lately, however, the climate change modelling community has embraced a more risk-based approach (Carter et al., 2007; IPCC, 2011; Jones and Preston, 2011). This combined research on risk-based assessment of adaptation is an important basis for ENHANCE, as it is targeted to managing risk for fat-tailed (i.e., non-normally distributed) catastrophic impacts that are potentially very large, uncertain, unevenly distributed, and may occur in a distant future. The merging of these fields has led to the increasing use of an iterative risk management process, which combines an initial step of risk identification with subsequent analysis, evaluation, management, and implementation of projects. In the EU Flood Directive, an update of hazard and risk maps as well as flood management plans is foreseen every six years in order to account for climate change. Similar ideas have also been developed in the CONHAZ project (Meyer et al., 2012).

(e) Develop a framework for assessing and communicating uncertainty within MSPs. For this, we propose using an agent-based approach that explicitly quantifies the risk exposure of the various parties in an MSP to a risk sharing transaction (e.g. insurers, re-insurers, bond holders, governments, householders and businesses), alongside some representation of the motivations that drive their decision making behaviour. In addition, it is important to understand the role of uncertainty in these situations. Moreover, the ENHANCE project will develop a general agent-based simulation methodology to explore the implications of different risk management instruments in order to develop metrics to quantify and communicate uncertainty in the scenarios (exposure, hazard, and vulnerability) to partners in MSPs. Improvement of mapping and risk communication was investigated in the framework of the second CRUE funding initiative "Flood resilient communities". (<http://www.crue-eranet.net/>)

The ENHANCE partner UNISDR is closely involved in disaster data collection and risk awareness raising across the globe, for example through the "Making City Resilient" campaign, joined already by over 400 cities in Europe and over 1,465 worldwide. This could be developed into a tool for advising on disaster insurance aspects to a broad population. The UNISDR Global Assessment report 2013 provides information on how several countries have used database on disaster losses

(collected through standardized methodologies proposed by the UN system, ISDR and the World Bank) to inform local and national policy makers on the most relevant disaster risk financing strategies (how much risk to retain, how much to be transferred through insurance and reinsurance). Besides the work initiated by climate-ADAPT it is important that EC (under the guidance of relevant DGs such as ECHO) mainstream guidelines on the establishment of database on disaster losses to EU member countries.

(21) This paper addresses specific aspects related to the prevention and insurance of natural and man-made disasters. Have any important issues been omitted or underrepresented? If so, which?

More attention should be paid to the roles and responsibilities of public and private sector players in this debate and how new partnerships, beyond insurance and government, could lead to innovation.

Providing disaster insurance is challenging – there is ample evidence for this around the world, where governments are struggling with effective solutions. One common response to this is ‘partnership’. When the challenge is deemed too big to be dealt with by one type of actor alone the solution is seen in close collaboration between public and private stakeholders. This term is very broadly used, but has its roots in efforts to increase efficiency of public service by engaging the private sector. From an economic perspective, partnerships delivering a service or a public good have a long history. Economic theory provides a framework for assessing the effectiveness and economic value of a partnership (de Bettignies and Ross, 2010) by calculating impacts on economic efficiency and aggregate social welfare, applying cost-benefit analysis as well as market centred and social valuations (Scott, 2009). What is less clear are the rules of these partnerships and how they can deal with changing risk levels. The current flood insurance arrangement in the UK can be seen as such as ‘partnership’, a joint approach with roles and responsibilities divided between government and insurance. But as the current discussion shows, this partnership has come under heavy stress.

Public and private insurance is operating under very different conditions, which has implications on how issues, such as moral hazard and risk reduction, can be addressed.

The ENHANCE project is assessing the characteristics of (un-) successful partnerships in improving resilience, and aims at identify processes for fostering novel multi-sector partnerships (MSPs).

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