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ENHANCE

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**Policy Brief: Economic instruments for promoting disaster risk
management**



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Introduction

Economic instruments such as subsidies, taxes and insurance are at the heart of discussions regarding novel approaches for managing risk and adapting to climate change, including in the context of multi-stakeholder partnerships between the private and public sectors. Although the attractiveness of reducing and managing disaster risk is well known, there is underinvestment into disaster risk reduction (DRR). A number of factors, such as a lack of information, cognitive biases, financial constraints and moral hazard (adverse incentives provided by current arrangements for dealing with disasters) play a large role. In this line of thinking, instruments that provide a price signal for risk management and promote behavioural change can be highly appealing, yet little is known about such economic instruments, their mechanics, links to risk management, and application in the fields of disaster risk management and climate adaptation. Knowledge gaps exist with regard to conditions that create enabling environments for innovative market-based and risk financing instruments. Among these are, e.g., the attractiveness for stakeholders in the context of multi-stakeholder partnerships or institutional settings that are required to successfully and efficiently apply these instruments.

This brief presents five key insights regarding the potential of economic instruments for managing and incentivising risk management garnered in the context of the ENHANCE project.

Economic instruments for supporting the management of disaster risk

Private and public sector agents are tasked with managing disaster risks, and while significant efforts to reduce and manage risk are being carried out throughout many regions, recent evidence suggests that not enough is being done to address current hazards and future changes – e.g. through climate change – across all regions, sectors and societies. In fact, given a diverse set of risks and manifold preferences, constraints and perceptions of risk, there is no such thing as ‘optimal’ adaptation to current and future risk, but there is ample room for ‘better’ adaptation and risk management. Such risk management may happen autonomously or through policy intervention and policy instruments.

Apart from insurance-related instruments, few adaptation instruments work directly via economic principles and using markets to adapt to impacts and risks. On the other hand, a number of economic instruments (such as price signals and markets, financing schemes via Public-Private Partnerships or private finance, regulatory measures and incentives, and research and development incentives) can be used to indirectly incentivise behaviour and increase the uptake and efficiency of adaptation measures. These diverse approaches can be synthesised into two broad types of instruments:

1. **Market Based Instruments (MBI)** are instruments administered by government regulators that provide a monetary/economic incentive promoting risk management and adaptation. The definition of MBI is broad and includes natural resource pricing, taxes,



subsidies, marketable permits, payments for ecosystem services, licenses, property rights and habitat banking.

2. **Risk Financing Instruments (RFI)** are all instruments that promote the sharing and transfer of risks and losses. They generally can be classified as pre-disaster arrangements, and comprise insurance, weather derivatives and catastrophe bonds, and many of those are indeed market-based as well.

While a number of economic instruments were studied across the ten cases, detailed application focussed on the following instruments and respective case studies:

Table 1. Economic instruments and cases examined in ENHANCE

Economic Instruments	Case Study Application
Water pricing/markets	Applying scarcity-based water pricing policies (and water markets) as potential instruments to manage drought risk in the Jucar River Basin, Spain
Insurance	Forest fire insurance for wildfire risks in the district of Santarém, Portugal
Insurance	Examining a role for flood risk property insurance, which is unavailable in the Netherlands, with application to Rotterdam
Insurance	Case study on existing public-private flood insurance partnership and proposed new insurance scheme Flood Re as applied to the case of London, UK
Sovereign risk pooling	Understanding the role of the European Solidarity Fund (EUSF) generally and as applied to Eastern Europe and Romania

Assessing economic instruments

A major goal of the ENHANCE project was to assess economic instruments used in the project's case studies, and provide a synthesised analysis and conclusions with a focus on how such instruments can promote disaster risk reduction. In order to assess a number of disparate instruments with diverse goals and qualities, **a framework was established to broadly assess instruments in terms of four criteria:** *economic, social, institutional, and environmental*.

The assessment involved ENHANCE analysts providing multiple perspectives on the pros and cons of the different instruments based on quantitative and qualitative analysis, while involving stakeholder views where possible, in order to give broader insight into the instruments as they are supposed to support disaster risk management (DRM).



The synthesis assessment revealed a number of commonalities and differences between the instruments examined in ENHANCE, with five key insights relating to how such instruments can meet the criteria above as well as promote disaster risk management.

Table 2. Criteria used in analysis of economic instruments, and motivating questions and indicators for analysis

Economic criterion: Efficiency	Social Criterion: Equity	Political and institutional applicability and criterion	Environmental criterion: biodiversity and sustainability
<ul style="list-style-type: none"> • What is the balance between costs and benefits? • What transaction costs will accrue? • How well does the instrument incentivise disaster risk management? 	<ul style="list-style-type: none"> • What distributional consequences will arise? Will they be negative, i.e. regressive? Will the instrument be affordable and cover a high percentage of those affected? • Are there any specific barriers or conditions that are not covered? 	<ul style="list-style-type: none"> • Which types of adaptive activities can be incentivised by the instruments? • Have policymakers applied similar instruments? What have the experiences been? • Are interest groups likely to oppose such instruments? 	<ul style="list-style-type: none"> • Does the measure reduce the quality or quantity of resources? • Does it incentivise more sustainable management of resources, or encourage biodiversity protection? • Do measures decrease negative externalities related to human health? Do they encourage the use of linked resources?

Key insights

1. Instruments can be structured to incentivise disaster risk management both directly and indirectly

In terms of incentivising DRM, market-based instruments did not exhibit a large direct effect, although scarcity-based water pricing policies may indirectly provide an incentive towards more efficient use of water resources by promoting high-value uses during drought periods, and providing users with a signal of the economic value of the resource and opportunity costs. Economy wide macroeconomic impacts of water pricing (e.g. effects on GDP or GVA) are difficult to account, but there are some examples in the literature using input-output tables or computable general equilibrium models.

For insurance instruments, most of the measures assessed showed a moderate ability to incentivise DRM, even though in some cases, it was not part of the initial design of the instrument, and is seen as being very context dependent. For instance, a property insurance scheme in Rotterdam shows that premium discounts could increase the share of households employing DRM by, up to, 55%. On the whole, the incentivising ability is ambiguous and context dependent, as highlighted by the UK flood insurance mechanism which emphasises that depending on its design and implementation, an insurance scheme *can* send signals to policy makers in support of flood



risk management policies which would address risk levels, e.g. via changes in the planning system and building regulations. The new Flood Re scheme does neither enhance this policy link nor the incentivisation of home resilience, which is a missed opportunity. The Portugal forest fire case provides a slight juxtaposition to the other cases, as experts asserted a high amount of incentivising DRM, since insurance application requires a Forest Management Plan and a Plan for Forest Fire Defence. The EU Solidarity Fund also found that recent reforms better linked the Fund to DRM measures, but only for flood risk, leaving more potential for strengthening the link to DRM.

2. Insurance and market-based instruments can reduce costs and promote economic activity

The expansion of insurance can promote the growth of the insurance sector or facilitate the development of economic activity; in which case it is a boon. As insurance is a transfer of resources from one economic agent to another in a mutually acceptable trade, a high premium cost is not a cost to society, as the price of the premium sends a viable signal of risk, allowing potential policy holders to make a more informed decision regarding the risk faced. However, insurance schemes tend to require (in)direct government support, which can be quite expensive, as vouchers to correct for unaffordability could cost billions of euros if offered at the national level. These burdens may be balanced out with lower overall risk faced by society.

Beyond the cost of the instrument itself, transaction costs for the provision of insurance are generally seen as moderate or low, due to the well-developed insurance markets in which most of the cases operate. However, incorporating a greater connection to risk would possibly entail higher transaction costs due to the increased costs of monitoring DRM activities that specific policyholders conduct. Private insurers commonly state transaction costs as a major reason for not strengthening the direct link between premiums and DRM. Competitive markets can help to keep transaction costs as low as possible. Moreover, in a period of increasing risk the insurers must keep increasing their reserves to meet legal solvency requirements; resulting in more resources being invested in liquid assets with higher management costs.

Non-insurance instruments, such as scarcity-based water pricing policies or water markets, promote incentives towards more efficient water use, promoting high-value uses during drought periods, reducing the total water scarcity cost (forgone benefits due to deficits in water deliveries). A perfect water market could further reduce the total scarcity cost of the system, with a transfer of resources from low to high value uses during drought conditions, although with implications on environmental conditions that should be regulated in order to prevent this.

Transaction costs associated with water pricing vary across methods and locations, and involve a fixed component (installing measuring devices, setting up administration etc.) and a variable component that increases with water proceeds (monitoring and collection). Beyond administrative costs, others can be substantial and difficult to value, and may render pricing policies unfeasible. Markets also involve transaction costs, and can bring costs due to the economic and environmental externalities the transfer can generate. Generally, transaction costs of water markets are higher



than of pricing policies, as they might require developing new infrastructure to transfer water between sellers and buyers. When considering bargaining and information costs (also transaction costs), water markets might become more appealing.

3. Instruments have only small effects on social outcomes, but can be structured to encourage inequality reduction and affordability

Analysis found that insurance has little to no effect on social indicators such as inequality reduction, and reasonably so, as it was emphasised that it is not a role of insurance to directly reduce inequality. However, insurance may have a minor role in preventing the worsening of inequality by providing compensation payments - but this would only come into play after a disaster, limiting the role of instruments in this regard. Other examples, such as the EU Solidarity Fund, have little potential to reduce inequalities, as significantly more aid is allocated to countries most able to withstand a disaster's financial impacts. However, the Flood Re scheme to support households at the highest flood risk is shown to alleviate unaffordable premiums, which has a marginal effect on the number of instances in which mortgage payments become unaffordable and houses are repossessed (foreclosed) by the bank, thus slightly influencing inequality.

In terms of affordability, instruments again showed a potential to have a positive impact, with the correct implementation. As mentioned, the UK's Flood reinsurance mechanism is designed to combat the unaffordability of current instruments, and future estimates predict further gains in affordability into the future. Structuring an instrument similarly to the EU Solidarity Fund could also encourage affordability, as member states contribute based on economic performance. Increasing the link with risk in insurance mechanisms can result in less cross-subsidisation and potentially lower premiums for those at lower risk, but conversely higher-risk areas will see higher prices, but if the link with risk is increased as proposed then high-risk households (with risk adverse insurers) will face very high premiums

Both market-based instruments, water pricing and markets, can contribute to the reallocation of resources to high value uses during water scarcity periods. Additional revenues generated by water pricing could be used to compensate low-value users for some of the losses they might face due to the price increase during drought periods using financial compensation mechanisms. The additional financial resources generated could be also employed to develop adequate infrastructure to increase water security (for example, by financing desalination plant that reduces water scarcity).

4. Institutional and political criteria: wide variety

In terms of institutional and political indicators, cases varied widely. Water markets and pricing both approaches scored highly, as they are legally and administratively feasible in the setting of the case study, although some legal and institutional reforms are required for implementation in other contexts. Public acceptability may also provide for an impediment. Insurance can score highly on



aspects such as feasibility, and several countries have developed the required institutions for a viable insurance market with risk-based premiums. The EUSF, for example, is fully feasible and is in operation, whereas the Flood Re scheme is not yet operational, so its feasibility cannot be adequately assessed. In Portugal, a legal framework for fire insurance exists, but is not associated to any support from EU or domestic institutions to decrease premium costs.

Yet, cases diverged on how their instruments were assessed in regards to consistency. The Rotterdam case emphasised that assessing consistency is ambiguous as it is dependent with the link of DRM. The stronger the overall link with DRM, the more able insurance is to reinforce the increased resilience against natural hazards. Acceptability of instruments was seen to be mostly high and moderate among cases, with some caveats. The Flood Re instrument study highlighted that both property developers and the local government could contribute to flood risk reduction, but one aspect that warrants further investigation is how this partnership could be strengthened or expanded to contribute more significantly to flood risk reduction. The Portuguese fire insurance instrument was seen to have high acceptability among other interest groups besides the current users, contingent on the lowering of premiums. For the Solidarity Fund, acceptability was considered as only moderate, due to strong concerns from some stakeholders, namely the insurance industry. The Rotterdam property insurance instrument was more ambiguous. Possible reforms will result in certain premiums increasing (and others reducing), thus limiting (or improving) the acceptability of the reform. Cases saw a number of different barriers to introduction, as in Rotterdam where the potential hikes in insurance premiums forms a strong barrier. Moreover, insurance reforms tend to be highly political discussions between major stakeholders, which can limit stakeholder buy-in without considerable time and patience being expended. In regards to fire insurance, the absence of reliable information on risk, and limited incentives for coverage to small properties was seen as detrimental to encouraging insurance companies to provide coverage.

5. Instruments can promote sustainable management of resources, if designed with this as a clear goal

For most environmental considerations, the majority of instruments were not seen to have a positive effect. Generally speaking, while insurance is not directly tied to environmental outcomes, there may be some negative implications, as insurance can facilitate economic activity that may lead to an increase in the magnitude of externalities. Conversely, incentivising DRM can encourage sustainable management; agents are made aware of the risk and only locate economic activity in risky areas if it is worth the risk or cost of insurance. Greater interaction between insurers and planning agencies can provide guidance on the land use management strategies that would alter the overall risk in an area.

While most insurance schemes did not incorporate environmental criteria to a large degree, for the Portuguese case a forest fire insurance mechanism was designed with express consideration of resources and sustainable management, with those participating in the instrument being required to submit forest management plans, which is projected to increase the quality of resources. The



instrument can also encourage the protection of biodiversity via improved protection against wildfires due to management plans and the application of the Plan for Forest Fire Defence, and has the potential to reduce human impacts due to wildfires via fire defence plans, as well as increasing most ecosystem services through the application of forest management plans.

Non-market instruments as well have a high potential to promote efficient and sustainable use of resources; scarcity-based water pricing policies work to promote more efficient water use, enhancing high-value uses during drought periods. In this way, water pricing can contribute to improve economic efficiency and social equity and, by using less of the resource more efficiently, lead to environmental enhancement. Water markets can also lead to a more sustainable use of water through water reallocation to more productive soils in more suitable locations, more efficient water users, higher-valued uses, and new developments. However, unless explicit consideration is given to non-market uses or reserves set aside for the public good, markets may not deliver on broader societal goals, requiring the inclusion of information on environmental needs, and designing an adaptive process to manage these requirements with changing conditions and circumstances.

Conclusions

ENHANCE analysis regarding the potential of economic instruments for managing and incentivising risk management identified key messages in relation to reducing costs, promoting social and environmental criteria, and incentivising DRM when instruments are structured appropriately. Economic instruments assessed in ENHANCE have been context and location specific; while the majority were insurance schemes, there exists a great variety as to how they perform against individual criteria, showing the complexity of and importance in considering the economic, social, political, and environmental conditions and effects of the instrument.

The ENHANCE work on assessing and synthesising economic instruments provides an in-depth analysis of these various instruments, and allowed the study team to highlight the diversity in results from case to case and instrument to instrument, which can be seen as a roadmap of best practices. The approach taken provides a common, structured way to assess an instrument, and emphasises the need to focus on multiple factors. Assessing multiple options in this manner enables more comparisons to be made, and more learning from others' experience. Such a framing could be used when designing a new instrument, and could be used to catalogue those currently in existence, to provide an easy way to compare options and to find new innovations for improving current instruments or when designing new ones.



This policy brief is based on research of the ENHANCE project:

Koehler, M., Mechler, R., Botzen, W., Surminski, S., Pulido-Velazquez, M., Leblois, A., Keating, A., Mochizuki, J., Manez, M., Cremades, R., Hall, J. (2014). ENHANCE Deliverable 5.1: Review of economic instruments in risk reduction.

Jenkins, K., Hall, J., Mechler, R., Lorant, A., Haer, T., Botzen, W., Aerts, J., Koehler, M., Pulido-Velazquez, M., Lopez-Nicolas, A. (2015). ENHANCE Deliverable 5.2: Key economic instruments for risk reduction and management for the case studies.

Surminski, S., Hudson, P., Aerts, J., Botzen, W., Colaco, M. C., Crick, F., Eldridge, J., Lorant, A., Macedo, A., Mechler, R., Mysiak, J., Neto, C., Nicolai, R., Perez-Blanco, D., Rego, F. (2015). ENHANCE Deliverable 5.3: Novel and improved insurance instruments for risk reduction.

Williges, K., Mechler, R., Lorant, A., Jenkins, K., Surminski, S., Botzen, W., Hudson, P., Koehler, M., Dransfeld, B., Pulido-Velazquez, M., Lopez-Nicolas, A., Cremades, R., Manez, M. (2016). ENHANCE Deliverable 5.4: Synthesis Report: The potential of existing and novel economic instruments for the enhancement of resilience.