OECD Conference on the Financial Management of Flood Risk

In May 2016 the Conference on the financial management of flood risk was held at OECD's headquarters in Paris, with the attendance of world leading experts and actors in this field. Apart from a review of the current risk situation and of its foreseeable perspectives, in particular in sight of the challenges arisen by climate change, in the conference were presented the different options for the financial management of this risk, discussing their pros and cons.

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1. Introduction

Flooding is one of the most common, widespread and destructive natural perils, affecting approximately 250 million people and causing USD 40 billion in losses on an annual basis. More than 75% of the countries that responded to an OECD questionnaire perceive themselves as facing moderate to high levels of inland flood risk (including over 30% that perceive themselves at high risk) and just under 50% indicated that they face moderate or high-risk from coastal flooding. In many countries, floods have accounted for significant shares of disasters and losses. In the United States, for example floods accounted for almost two-thirds of all *presidential disaster declarations* during the period 1953–2010 and have been responsible for the largest number of lives lost and the most damage over the last century when compared with other natural disasters.(1) In Spain, floods have accounted for close to 70% of all losses on property insurance covered by the *Consorcio de Compensación de Seguros* (CCS) between 1987 and 2015.

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In May 2016, the OECD, with the financial support of *Zurich Insurance Group* (which has launched a global flood resilience program), organised a 1.5 day invitation-only conference on the financial management of flood risk in Paris(2). Over 160 participants from more than 40 countries and 8 international organisations registered for the event including a number of leading experts on this issue from both the public and private sectors. This article provides an overview of some of the main findings from this conference in the hopes of sharing these with a wider audience. Further information is available in a summary of the conference proceedings (http://www.oecd.org/daf/fin/insurance/2016-Flood-Risk-Conference-Summary-of-Proceedings.pdf) and in the OECD publication on the financial of flood risk (http://www.oecd-ilibrary.org/finance-and-investment/financial-management-of-flood-risk_9789264257689-en).

(1) Michel-Kerjan, E. and H. Kunreuther (2011), "Disaster Management: Redesigning Flood Insurance", Science, Vol. 333, pp. 408-409.

(2) This article is based on the recent OECD publication (OECD (2016), Financial Management of Flood Risk, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264257689-en) and the summary of proceedings of the 12-13 May 2016 OECD conference on the Financial Management of Flood Risk: Building financial resilience in a changing climate (http://www.oecd.org/daf/fin/insurance/2016-Flood-Risk-Conference-Summary-of-Proceedings.pdf).

2. Context

Among disaster risks, floods create specific challenges. Every year, floods take a heavy toll on human lives and have a devastating impact on economies and development efforts. Climate change is expected to exacerbate the impacts of flooding by increasing the frequency of heavy precipitation events, the height of the seas, and the intensity of storms – particularly in the context of the ever greater numbers of people and assets accumulating in flood prone areas. More than other disaster risks, the financial management of flood risk creates significant challenges for governments, and for the insurance companies that offer financial protection against flood risk. Flood losses are often uninsured, even compared to other disaster risks – leaving it to individuals, businesses – and more often than not governments – to absorb the costs of flood losses.

As a result, significant policy attention has been allocated in recent years to identifying effective means to manage the financial impacts of flooding. There is a wide variety of approaches across countries to addressing this challenge. Some countries invest significantly in reducing the risk – by placing tight restrictions on land-use in flood zones and/or building protective infrastructure. Some have established partnerships with the insurance sector, either by providing some form of government backstop for flood losses covered by insurance or by working with insurance companies to address the specific challenges to making affordable flood insurance coverage more broadly available.

The OECD provides a unique forum for governments to compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies. With the guidance of the High-Level Advisory Board on the Financial Management of Large-scale Catastrophes and the Insurance and Private Pensions Committee, the organisation plays a leadership role in supporting the development of strategies for the financial management of natural and man-made disaster risks. The draft *Recommendation of the OECD Council on Disaster Risk Financing Strategies* will provide a policy framework to support governments in their efforts to manage the financial impacts of natural and man-made disasters.(3)

3. Conference Discussion

he conference was organised around three main themes exploring: (i) the evolving nature of flood risk – understanding flood drivers and impacts; (ii) flood risk as a public financial management challenge; and (iii) different approaches to supporting the insurability and affordability of flood risk.

3.1. The evolving nature of flood risk

Understanding exposure to flood risk – and how it may be evolving - is critical for effective financial management. Like other natural disasters, the low-frequency of catastrophic events and the frequent changes in the level of assets at risk (due to continued economic development) makes flood exposure particularly difficult to quantify. In the case of flood, these challenges are exacerbated by the variety of causes of flooding (which requires significant investments in modelling to assess all possible scenarios)(4) as well as the extent of the area that needs to be modelled given that almost any location is susceptible to flash

(3) The OECD is developing a *Recommendation on Disaster Risk Financing Strategies to replace the Recommendation of the OECD Council on Good Practices for Mitigating and Financing Catastrophic Risks* (2010). The draft text for the new Recommendation was made available for public comment until 15 April 2016 (see: www.oecd.org/pensions/public-consultation-drf.htm). At the time of writing, a draft Recommendation is being prepared for adoption by the OECD Council.

(4) For example, a coastal city in a river delta could face flooding damage as a result of flash flooding, riverine flooding, groundwater flooding, coastal flooding or storm surge requiring that probabilities for modelled for many different types of both meteorological and hydrological risks to estimate overall exposure to floods.

floods. There is also a need for extremely granular information on elevation in order to assess the potential for inundation as well as an accurate understanding of the impact (and reliability) of permanent and temporary flood defences.

In a session devoted to the evolving nature of flood risk, conference participants benefitted from the insights of a hydrologist at a major reinsurance company, a lead author of the Inter-Governmental Panel on Climate Change (IPCC) work on the impact of climate change on flood risk, a senior expert from the intergovernmental Group on Earth Observations (GEO) and two representatives from leading catastrophe modelling firms.

There have been clear improvements in the science and technology: the availability of hydrometry data to measure rainfall and water flow is increasing substantially (although there are significant gaps in many parts of the world, especially in low-income countries); earth observation data is also increasingly available. The modelling of flood risk is also being enhanced through the use of global circulation models that generate precipitation estimates, which can then be transformed into run-off assessments. These models can also integrate various climate change scenarios through their impact on precipitation patterns.

However, in the context of a changing climate and evolving land-use patterns, uncertainties about the level of flood risk will remain significant for the foreseeable future. The understanding of important components of climate and precipitation patterns, such a multi-decadal trends and the impact of oscillations, remains limited requiring an adaptive approach to evaluating different investments in flood risk reduction.

3.2. Flood risk as a public financial management challenge

In flood-prone countries, national governments face significant costs related to the financial management of flood risk, including both the costs of investing in ex ante risk reduction as well as ex post costs related to emergency response, reconstruction of public assets, and compensation and financial assistance to sub-national governments, businesses and individuals affected by floods. For some countries, particularly low-income countries, the impact of a large flood event could have a significant impact on public finances and even on sovereign credit ratings as a result of a reduction in economic growth, increases in public spending on reconstruction and a deterioration in export performance. Credit rating agencies are receiving increasing questions from investors on the potential impact of disasters and climate change on sovereign creditworthiness and are expanding their examination of the potential implications of disasters on ratings at the national level and increasingly at other levels of government.

Investments in prevention to lower the probability of a flood event occurring or in mitigation to reduce the losses resulting from a flood event are a critical element in the financial management of flood risk. Analyses of the potential benefits of risk reduction in terms of reducing future losses have generally shown that risk reduction measures can create substantial benefits. However, despite the potential benefits of mitigation investments, there is some evidence of general under-investment in disaster prevention and risk reduction and many countries allocate significantly more funds to disaster response than risk reduction. A review of natural disaster funding and insurance arrangements by the Productivity Commission in Australia found that the design of such arrangements could create incentives against investment in prevention.(5) Generous public compensation for losses incurred on private assets (or assets owned by sub-national governments) can also lead to under-investment in prevention by private households and businesses.

Conference participants heard from two flood-prone countries that have managed to achieve high-levels of flood protection - the Netherlands, where 60% of the population and 70% of GDP is at-risk of flooding and Japan, where approximately 75% of assets and 51% of the population reside in alluvial plains at risk of flooding. In both cases, the allocation of sufficient funding for investment in flood protection has been critical to maintaining high-levels of flood protection - although the resulting decline in the frequency of flooding requires particular efforts to maintain public

(5) For example, that a lack of provisioning for disaster-related contingent liabilities (i.e. likely response and reconstruction costs of future disasters) in government budgets and/or higher cost-share rates for national financing for reconstruction relative to mitigation can create a systemic bias towards recovery over prevention. See: http://www.pc.gov.au/inquiries/completed/disaster-funding/report

awareness of the risk of flooding (as well as political commitment to flood prevention). In a session organised in collaboration with the World Bank's Disaster Risk Financing and Insurance Program,(6) conference participants also benefitted from the experience of representatives of Colombia, Myanmar, Serbia and Viet Nam which face a very different set of challenges as a result of more limited resources for investing in ex ante risk reduction and ex post response, lower levels of insurance market development, and more restricted access to international insurance and capital markets.

Another session was devoted to the specific challenges faced by cities. The concentration of assets and economic activity in cities means that a major flood could have significant economic and social consequences.(7) In most countries, cities have jurisdiction over many of the measures that can improve flood resilience, such as land-use planning, protective structures and the flood resilience of local public infrastructure – although in large cities like Paris, the effective implementation of these tools will often require strong leadership and effective coordination among many local, regional and national authorities.

The Chief Resilience Officer of the City of New Orleans provided an overview of the major investments in reducing flood risk that have been made since the devastating impacts of Hurricane Katrina in 2005. Due to limited land availability, over one-third of the city has been developed in wetland areas (populated disproportionately by low-income residents) and sea-level rise and subsidence has led to further losses of land. Since 2005, major structural mitigation investments have been made, including the construction of storm surge barriers, pumping stations and urban drainage improvements. Municipal authorities are also examining options for safely retaining water within the city in the event of a flood, through the use of rain gardens and other natural retention options.

Given the range of policy tools that need to be considered in managing the financial impacts of flood risk, overcoming the challenges to a holistic approach requires effective coordination across government ministries and levels of government, supported by strong leadership aimed at addressing the financial vulnerabilities created by exposure to flood risk. A robust framework for identifying and evaluating different approaches to mitigating flood losses is critical for making the most effective use of public resources for flood risk management. In New York City, a team of academics used advanced catastrophe modelling to evaluate potential strategies for reducing the cost of flood losses. Using different discount rates and climate change scenarios, the team measured the potential costs and benefits of a number of approaches to reducing future losses, including flood-proofing individual structures by elevating or wet or dry-proofing the structures; building major storm surge barriers in different locations; and a hybrid approach involving building code improvements, critical infrastructure protection and more moderate structural protection measures.

The insurance sector can make an important contribution to helping governments understand their exposure to flood risk. In Norway, the insurance sector has responded to the challenge of increasing urban flooding due to ageing infrastructure and higher precipitation by sharing its data on losses with municipal governments. Through a public-private collaboration between insurance companies, the insurance association, a university and ten pilot cities, address-level data on damage to residences, companies and public buildings have been harmonised, anonymised and shared with municipalities with the aim of strengthening municipalities' knowledge-base for preventing water-related natural hazards – providing a very different picture of risk from that developed by municipalities without the benefit of insurance data. The (re)insurance sector is also increasingly working with governments at all levels on ways to manage the financial impacts of flood losses. Some innovative approaches are being developed, including the use of parametric triggers for insurance coverage (e.g. water level (storm surge or river), tropical cyclone severity or flood footprint).

(6) The World Bank's Disaster Risk Financing and Insurance Program, which is now involved in 50 countries around the world, provides assistance to governments in understanding the disaster risks they face and the relative costs and benefits of financial instruments to manage those risks. See: http://www.worldbank.org/en/programs/disaster-risk-financing-and-insurance-program

(7) For example, the OECD undertook an innovative review of the potential economic implications of a major flood in the Paris/Île-de-France region, in line with flooding that occurred in 1910. The Île-de-France region is home to a number of major French companies and government institutions and accounts for approximately 30% of the GDP of France. The study found that a major flood, and the resulting disruptions to critical infrastructure, could have direct and indirect impacts on 5 million residents, result in EUR 3 to 30 billion in direct damages and a cumulative GDP loss of 0.1%-3.0% over five years, depending on the flood scenario used.
See: http://www.oecd-ilibrary.org/governance/seine-basin-ile-de-france-2014-resilience-to-major-floods_9789264208728-en

3.3. Different approaches to supporting insurability and affordability

Insurance and other risk transfer tools can make an important contribution to the financial management of flood risk by spreading the risk across domestic and international (re)insurance and capital markets and reducing the share of losses absorbed by households, businesses and governments. There is a wide variety of approaches across countries to protecting households against flood risk. In many countries, private insurance companies offer coverage for flood-related damages and losses, either as part of standard property and business interruption policies or as an optional add-on to such policies. In some countries, coverage for flood damage may only be available from a public insurer, especially for properties deemed to be at high-risk of flooding. In other countries, government assistance may be the only source of compensation available for losses from flood events.

The conference included interventions by representatives of countries with very different systems. In the United States, United Kingdom, Spain and France, the public sector provides coverage for flood risk, either as a direct insurer (Spain and United States) or reinsurer (France, United Kingdom). In France and Spain, public involvement extends to all (or most) disaster risks. In the United States, coverage is only provided for flood risk. In the United Kingdom, coverage is only provided for flood for residential properties at high-risk of flooding – although on a transitory basis with the objective of shifting to a full market-based system by 2039. In Australia and Austria, flood insurance is provided by private insurers only.

These different approaches to financial protection have been designed with the aim of achieving different policy objectives, such as broad availability and affordability of coverage, solidarity in terms of loss-sharing across regions, establishment of clear incentives for risk reduction and/or significant transfer of risk to private markets. In theory, risk-based pricing of insurance can provide an important signal to households on the level of risk they face and provides incentives to reduce that risk and benefit from lower premiums. However, there were differing views among conference participants on the importance of the risk signal provided by risk-based premiums as risk-based pricing may have little impact on risk reduction if the cost of effectively reducing risk is significant and households may be motivated to undertake risk reduction measures by factors other than premium pricing, such as the wish to avoid disruptions caused by floods or loss of items with sentimental value.(8)

The different approaches to offering flood insurance coverage also leads to very different outcomes in terms of the level of flood insurance penetration. Flood insurance coverage in Spain, France and the United Kingdom is automatically extended to residential property insurance policies (and sometimes other policies) which has led to very high-levels of flood insurance penetration. By contrast, in the United States, flood insurance coverage is optional (although mortgage lenders are required to ensure that borrowers in high flood risk zones ("Special Flood Hazard Areas") have insurance coverage for floods) and penetration rates remain relatively low in many flood hazard areas (approximately 20%). For example, it has been estimated that more than 80% of the houses damaged by flooding in Louisiana in August 2016 were not insured.(9)

Where flood insurance is optional, governments may need to support the insurability and/or affordability of flood insurance. There are a number of factors that affect the price at which insurance companies are willing to offer coverage for flood risk, including the scale of potential losses, the lack of diversity in the pool of risks covered (where flood insurance is optional) as well as the level of uncertainty in estimating expected losses (due to modelling challenges and/or a changing climate). While these insurability challenges generally lead to higher prices for flood insurance, a number of factors tend to reduce the demand/willingness-to-pay for flood insurance, including the tendency towards underestimation of risk, misunderstandings about coverage and expectations of post-disaster public compensation or financial assistance – leading to a failure in the flood insurance market.

(8) In Spain for example, the amount paid by the public insurer per claim has declined substantially over time suggesting that risk reduction has occurred – even without the incentives created through risk-based pricing.

(9) AON Benfield (2016), Global Catastrophe Recap (August), http://thoughtleadership.aonbenfield.com/Documents/20160908-ab-analytics-if-august-global-recap.pdf

Some participants provided examples of successful government interventions to support insurability and affordability. In Australia, for example, flood insurance penetration has increased from low-levels to 86% of households since the 2011 Queensland floods as a result of significant investments in improving the quality of flood maps and raising consumer awareness of flood risk (including by requiring insurers to provide a "fact sheet" on the level of flood insurance coverage of each policy).

Premium subsidies may be one means of supporting the affordability of insurance - especially for some high-risk households - although subsidies are generally expensive, difficult to remove - and importantly – do not usually lead to a reduction in risk. In the United States, one proposal put forward has been to attach subsidies to investments in risk reduction as a means to lower the cost of subsidies over time. A more sustainable approach for addressing insurability and affordability among high-risk properties may be to focus on resilience. Governments have a critical role to play in ensuring sufficient focus on prevention at both the level of communities and individual households. In Switzerland, a strong legislative and regulatory framework on land-use and significant investment in mitigation have been key to managing risk. In other countries, various financial incentives are provided to households for mitigation activities.

Insurance companies have an important role to play in encouraging resilience among policyholders: before a flood by informing customers of both the level of hazard they face (and could face in the context of a changing climate) and possible approaches to mitigating their risk – and post-flood by supporting policyholders in rebuilding better and mitigating future exposure. In Swiss cantons with public insurers, these insurers offer policyholders advice on how to reduce risk to their property and invest approximately 25% of premiums collected in emergency preparedness and prevention, including financial assistance for improving the resilience of individual buildings. In Germany, insurance companies increasingly provide tailored mitigation advice to insured households (and for high-risk households, require mitigation measures as a condition for providing insurance). A system has also been established to provide a standardised assessment of the flood risk for individual households and the mitigation measures that could be implemented to reduce that risk ("Hochwasser Pass"). In Canada, a pilot program to undertake household-level risk audits is being developed. The risk reduction benefits of mitigation investments also need to be recognised by insurance companies and rewarded with reductions in premiums and/or deductibles – which is increasingly occurring in Germany.

Private insurers can also play a role in encouraging sufficient levels of government investment in prevention. In the United Kingdom, prior to the establishment of Flood Re, a formal agreement was put in place ("Statement of Principles") between government and the insurance sector whereby the government agreed to make investments in mapping and prevention and the insurance sector agreed to offer broad coverage of flood risk. In Australia, the insurance industry has responded to underinvestment by government by refusing to provide coverage in certain cases (and in at least one community, leading to government investment to provide greater protection). In the United States, where local and state governments have important responsibilities for flood risk management (while the federal insurance program incurs the costs of losses), the public (federal) insurance coverage is only offered where land ordinances are applied for future construction.

4. Outcomes

The interest expressed in this conference is a testament to the importance of the issue and the complexities that countries face in terms of addressing the challenges related to the financial management of flood risk. Many common challenges were identified by the speakers and participants – leading to a number of key policy messages for governments to consider when developing a strategy to manage the financial impacts of floods:

- The ability to assess risk and quantify flood exposure is the critical first step to properly managing its impacts – and a prerequisite for the development of a viable private insurance market. While this may seem obvious – there remains a lot to be done in this area in most developed and developing countries. It is through effective collaboration between governments and the insurance sector that this can be best addressed.

- The level of flood risk is likely to increase as a result of a changing climate and this needs to be taken into account when assessing exposure, implementing risk reduction measures, and developing a strategy for the financial management of flood risk.

- Even where private flood insurance markets are well-developed, governments have an important role to play in supporting the insurability of flood risk. Land-use policies that allow for development in flood-prone areas, under-investment in flood prevention and generous government compensation schemes can all impede the viability of a flood insurance market.

- Households consistently underestimate their exposure to flooding (and/or the financial consequences of that exposure) and this needs to be addressed by increasing their awareness and making it as easy as possible to insure against flood risk. The form of insurance can have important implications – both for take-up rates and in terms of the incentives created for risk reduction.

- There is a clear need for effective coordination across government agencies and levels of government. Given the range of policy tools to manage flood risk and the potential for the interventions of one agency or level of government to have implications for the interventions of another, this coordination is probably more important for flood risk than for any other disaster risk.

The OECD will continue to support countries in their efforts to manage this complex policy issue through further analysis of specific issues and by convening relevant parties/stakeholders to share experience and best practices.