



**OECD Conference on the
Financial Management of Flood Risk**

Building financial resilience in a changing climate

**SUMMARY OF
PROCEEDINGS**

**12-13 May 2016
Paris, France**

About this conference

Flooding is one of the most common, wide-reaching and destructive natural perils, affecting tens of millions of people around the world each year and causing, on average, more than USD 40 billion in damages. The financial management of flood risk presents a significant policy challenge in many countries, requiring careful consideration of the relative effectiveness of various tools to manage flood risk, from investments in risk prevention and public awareness, to the use of risk transfer tools to protect against significant post-disaster costs. This conference provided an opportunity to exchange knowledge and share experiences on effective approaches to the financial management of flood risk.

The organisation of this event was supported by a financial contribution from Zurich Insurance Group, which has launched a global flood resilience program to contribute with its risk expertise as a global insurer to help customers and communities to reduce the devastating impact of floods (see: www.zurich.com/en/corporate-responsibility/flood-resilience).

About the OECD

The OECD plays a leadership role in supporting the development of strategies for the financial management of natural and man-made disaster risks and has provided guidance and analysis on these issues for the G20 and APEC Finance Ministers. This work is undertaken under the guidance of the High-Level Advisory Board on the Financial Management of Large-scale Catastrophes and the Insurance and Private Pensions Committee. 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.

FOREWORD

Organisation for Economic Cooperation and Development (OECD)

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.



Rintaro Tamaki
Deputy Secretary General
OECD

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.

What is clear is that the financial impacts of flood risk cannot be effectively managed by the public sector or the insurance sector alone. Effective coordination across government – with the benefit of the expertise in risk management available in the insurance sector – is critical for establishing an integrated approach to the financial management of flood risk that considers the best-use of public resources, and takes into account the costs and benefits of different approaches, including the incentives created by different interventions. This conference – which brought together representatives from the public sector organisations responsible for managing flood risk, the insurance companies responsible for offering financial protection and the international experts responsible for improving our understanding of these risks and how to manage them – has, I hope, helped build a better understanding of these risks and how they are managed around the world.

The OECD, with the support of the members of the High-Level Advisory Board on the Financial Management of Large-Scale Catastrophes and delegates of the Insurance and Private Pensions Committee has been supporting the international efforts to improve financial resilience against disasters for close to fifteen years. We have developed a voluntary framework to facilitate the assessment of disaster risk and the development of financial strategies which resulted in the *G20/OECD methodological framework for disaster risk assessment and risk financing*. In 2013, under the auspices of the APEC Finance Ministers, the OECD prepared a survey report on *Disaster Risk Financing in APEC Economies: Practices and Challenges* outlining the approaches taken to the financial management of disaster risks across APEC and common challenges. The work for G20 and APEC has been key in refining the OECD's guidance on the financial management of disaster risk which forms the basis of a report that is being published on the financial management of flood risk. The conference also builds on a number of important discussions of these issues in recent years such as the the Insurance and Private Pension Committee round table held last December on the role of insurance in supporting climate change mitigation and adaptation.

The OECD will be pleased to contribute to enhancing the financial management of flood risk in the future as part of our mission to promote better policies for better lives of people around the world, and bring forward implementation of the OECD's policy recommendations in this area.

Zurich Insurance Group



Saad Mered

Global Chief Claims Officer
Zurich Insurance Group

There are two schools of thought around catastrophes: (i) the “Darwinian school” that perceives disasters as a natural occurrence that we should accept unimpeded; and (ii) those that perceive disasters as a man-made phenomenon caused by rapid urbanisation, population growth and economic expansion in hazard prone areas. I belong to the latter school of thought and believe it is our role as risk managers to work together to find new solutions to better manage risks related to natural hazards.

As an insurance company - with over 55 000 employees serving individuals and small, medium and large corporations with insurance solutions across 170 countries - our mission is to help customers understand and protect themselves from risks. On average over the past ten years, 250 million people have been affected annually by floods and they are the single most widespread disaster risk to urban settlements of all sizes. The number of affected people is likely to increase as a result of further population growth, urbanisation and the impacts of climate change. However, when it comes to flood risk management today, we see an imbalance between pre-event risk reduction and post-event disaster relief efforts, with too little focus on the former. To support the effort to address this imbalance, we launched the Zurich Flood Resilience Program in 2013. The program brings together an alliance of partners from academia, humanitarian organisations and the private sector with complementary skills and expertise, allowing for a holistic view of the issue. At a community level, we work with the International Federation of Red Cross and Red Crescent Societies and Practical Action, in some of the most vulnerable communities in the world, to better understand what makes a community resilient to floods and how we can measure the impact of pre-event risk reduction actions. With the Wharton School and the International Institute of Applied Systems Analysis (IIASA), we are researching the drivers of flood risks and why people are not protecting themselves even when different protection mechanisms are made available to them. Zurich is not only providing funding for this work – we are also leveraging the skills and experiences of a global network of over 900 risk engineers who are key to helping our customers identify the hazards they are facing and decide what actions they should take to reduce the risks they face. With our claims function, we are also looking at large flood events to better understand what went wrong and what needs to be improved in order to be better protected when the next flood comes.

As an insurance company, we have a major role to play in increasing the insurability of flood risk. We are investing in providing tools and resources that can help increase people’s awareness of flood risk so that they feel encouraged and empowered to take flood protection measures. Together with our alliance members in the Zurich Flood Resilience Program, we have developed a flood resilience measurement tool that is already being applied in the field. It measures resilience along four properties of resilience and the five capitals from the Sustainable Livelihoods Framework (human, natural, financial, social and physical). The tool is an essential pillar to better understand the relative costs and benefits of taking action versus doing nothing. Today, we unfortunately see many repetitive flood losses of the same magnitude and we tend to reinstate to “as was” rather than “building forward” and actually increase the resilience of a building to withstand the next flood. One way to address this would be to include more explicit coverage for “betterment” in flood insurance policies.

However, if there is one thing that we have learnt from our efforts, it is that flooding is such a complex and interconnected issue, that it cannot be solved by one stakeholder alone. We therefore supported the OECD in organising this conference in order to provide a platform for the public and private sector to exchange knowledge and experience and find new ways to better manage flood risks together.

Special address



Alice Hill

Special Assistant to the
President and Senior Director
for Resilience Policy
National Security Council,
White House
(by video)

Flooding has always been a deadly peril. In the context of climate change, the story is about too much – or too little water. The United States has not been spared. In three days in April, 33 trillion litres of rain fell on one of the largest US metropolitan areas. In 2015, enough rain fell in five days on the US East coast to just about solve the worst drought in 1 200 years in California. Seas have risen by roughly 8 inches in the last 100 years – and are now rising at about double the rate of the 20th century. Along the US coast, there are thousands of miles of roads and railways, a hundred energy facilities and communities of millions that are vulnerable to sea level rise. In 2012, Hurricane Sandy caused a storm surge of over 4 meters that washed over Lower Manhattan, plunging Manhattan into utter darkness for days and leading to cascading failures across transport infrastructure

and waste-water plants, not to mention the evacuation of 6 000 patients down stairwells in powerless hospitals. With warmer oceans and higher sea levels, New York City will have to be prepared for Sandy-level flooding every 25 years. For the first time, the US federal government is paying for the relocation of a tribal community whose island home is being washed away as a result of climate change - and we have identified a dozen more that will need relocation in the future. Between 1980 and 2013, the United States faced USD 260 billion in flood-related damages. The US Government Accountability Office has identified climate change as a significant financial risk for the government, including as a result of its role as an insurer of flood risk. There is broad agreement within the government on the contribution that enhancing resilience can make to reducing risks. A concrete example is the effort to rebuild back better after Hurricane Sandy – in fact, build back higher - through the establishment of a federal flood risk management standard that requires, when federal taxpayer money is used to build in or near a flood plain, that structures be elevated to protect against future climate change. Conferences such as this are extremely important for addressing climate change risk – as no one has all the answers – and urgent – as when it comes to climate change, there is such a thing as being too late.

SESSION 1

The evolving nature of flood risk – understanding flood drivers and impacts

Moderator:

Robert Muir-Wood, Chief Research Officer, Risk Management Solutions (RMS)

Panellists:

Wolfgang Kron, Head of Research for Hydrological Hazards, Munich Re

Zbigniew Kundzewicz, Head of Climate and Water Department, Polish Academy of Sciences

Dominique Bérod, Senior Expert - Water, Disasters and Cold Regions, Group on Earth Observations (GEO)

Milan Simic, Executive Vice President, AIR Worldwide

Flooding is one of the most common, wide-reaching and destructive natural perils – causing average losses of USD 40 billion on an annual basis and increasing. Many of the largest flood events, in terms of overall losses, have occurred since 1990. Historically, reported losses from floods unrelated to cyclones are much smaller than losses from other types of natural hazards. However, losses from some major floods in recent years (such as the 2011 floods in Thailand) have reached levels more commonly associated with earthquakes and cyclones.

There are a number of causes and types of flooding, each creating different types of risks and challenges in terms of risk assessment and management. Coastal floods (or storm surge), which is usually caused by wind not precipitation, can affect large areas and create significant damages due to fast-moving water and the impact of salt water. Riverine flooding, which usually results from long-term above-average precipitation, can also affect large areas and create significant damages as floodwaters will generally remain for longer periods. The risks related to both riverine and coastal flooding can be somewhat mitigated as the locations that they are likely to affect are generally known. Flash flooding, on the other hand, can occur anywhere as a result of a short-term intense precipitation event.

While flooding is a natural phenomenon, flood risk is predominantly a man-made peril as a result of human intervention in the hydrological cycle through the construction of dams, river controls and defences as well as the development of urban areas on flood-prone land. Population growth and the accumulation of assets in flood-prone areas have led to a substantial increase in built-up areas susceptible to flooding where the capacity for rainfall absorption deteriorates and water runoff increases significantly above what would be expected to occur on natural terrain. The increased value of assets at risk, including the increasingly valuable contents of residential and commercial structures, is an important driver of the increasing value-at-risk of flood damage.

While the evidence is far from conclusive, climate change is expected to impact the nature of flood risk going forward. Climate change is affecting precipitation patterns in a number of important ways. For example, in Europe, maximum river flows are being reached more frequently than in the past (46 times between 1981-2000 relative to 24 times between 1961-1980). In most sub-regions of the world, the return period for intense precipitation will decrease (meaning more frequent intense precipitation events). However, there will be significant variation across regions and types of flooding as some flooding drivers (such as snow melt) are likely to be less important in the context of global warming while flash flooding is likely to become more frequent.

Understanding exposure to flood risk – and how it may be evolving - is critical for the effective financial management of this risk. Improvements in the science and technology for monitoring flood risk have enhanced our understanding although significant challenges remain. 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 although there are challenges in terms of the capacity to analyse all the data 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, limited availability of comprehensive terrain models that provide granular information on elevation as well as an incomplete understanding of the impact (and reliability) of permanent and temporary flood defences continue to complicate efforts to accurately assess risk at the level of individual properties. At the same time, the improvements that have been achieved have sometimes led to large premium differentials between what appear to be similar structures in similar locations – leading to a communication challenge for insurance companies.

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 as multi-decadal trends and the impact of oscillations, remains limited requiring an adaptive approach to evaluating different investments in flood risk reduction. Even so, authorities still need to make better use of what is understood about flood risk in their land-use and development decisions.



From left to right: Milan Simic (AIR Worldwide), Wolfgang Kron (Munich Re), Robert Muir-Wood (RMS), Zbigniew Kundzewicz (Polish Academy of Sciences), Dominique Bérod (GEO)

SESSION 2

Flood risk – a public financial management challenge

Moderator:

Alberto Monti, Full Professor of Comparative Law, Institute for Advanced Study IUSS Pavia

Panellists:

Inge Lardinois, Deputy Director, Ministry of Infrastructure and the Environment, Netherlands

Kenzo Hiroki, Vice President, Ministry of Land, Infrastructure, Transport and Tourism, Japan

Jonathan Coppel, Commissioner, Australia Productivity Commission

Moritz Kraemer, Global Chief Rating Officer (Sovereign Ratings), S&P Global Ratings

In flood-prone countries, governments (local, regional and national) 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.

The effective financial management of these fiscal costs requires governments to: (i) assess the potential exposures that they face, based on a range of potential flood scenarios, both normal and extreme; and (ii) evaluate the most effective way to manage these exposures, considering the potential roles of investments in risk reduction, risk transfer and *ex post* response.

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. 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.

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.

Some flood-prone countries have managed to achieve high-levels of flood protection:

- In the Netherlands, where 60% of the population and 70% of GDP is at-risk of flooding, flood protection structures (ranging from local dykes and wind mills to huge storm surge barriers) have been constructed for centuries. A Delta programme has been established with long-term objectives for flood management (2050), an annual budget allocation of EUR 1.2 billion until 2028, and a commissioner appointed to report to Parliament on progress. Additional funding is also available for flood protection through regional water authorities that have taxation powers and are responsible for sharing the costs of flood management. A risk-based approach is used in making investment decisions which considers the cost of the different protection approaches and the possible impact of flooding beyond the given protection standard.
- In Japan, where approximately 75% of assets and 51% of the population reside in alluvial plains at risk of flooding, there has been significant support for investing in risk reduction as a matter of survival. Investment in flood protection has kept up with GDP growth and has been successful in reducing losses (as a share of

income) through prevention investments such as extensive dam and embankment systems along major rivers, an underground flood diversion system and flood protection panels for subway entrances. Significant investments in preparedness, such as mobile phone flood warnings and street-level hazard maps, are also being made as a means of reducing the impacts of flooding when it occurs.

The design of natural disaster funding and insurance arrangements has important implications for the incentives created for investing in risk reduction relative to recovery. A review of these arrangements by the Productivity Commission in Australia found, 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. Generous public compensation for losses incurred on private assets (or assets owned by sub-national governments) can also lead to underinsurance. Higher insurance levels can significantly reduce the impact of a large flood event on sovereign credit ratings as a reduced need for public compensation and an inflow of foreign capital from reinsurance will reduce the impact on public finances and the balance of payments.

Even in countries like the Netherlands and Japan, where high-levels of protection has been achieved, the continued accumulation of assets and the risks created by a changing climate mean continued challenges in terms of effectively managing the impacts of flooding on public finances. High levels of protection will usually lead to less frequent flooding requiring particular efforts to maintain public awareness of the risk of flooding (as well as political commitment to flood prevention). Given the range of policy tools that need to be considered, overcoming the challenges to a holistic approach to the financial management of flood risk 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.



From left to right: Jonathan Coppel (Productivity Commission), Inge Lardinois (Ministry of Infrastructure and the Environment, Netherlands), Alberto Monti (IUSS Pavia)

SESSION 3

Building financial resilience against flood risk in developing countries

Moderator:

Olivier Mahul, Global Lead Disaster Risk Finance, World Bank Group

Panellists:

Andrés Ricardo Quevedo Caro, Head of Risk Management, Ministry of Finance, Colombia

Daw Ni Ni Than, Director, Treasury Department, Ministry of Finance, Myanmar

Marko Blagojevic, Director, Public Investment Management Office, Serbia

Bui Thanh Hai, Deputy Director, Non-life Insurance Supervision Division, Insurance Supervisory Authority, Ministry of Finance, Viet Nam

Developing countries face particular challenges in terms of the financial management of flood risk 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. A number of developing countries are particularly exposed to flood risk. Among the largest flood loss events since 2000 (including flooding related to tropical cyclones), many have occurred in developing countries (the 2011 floods in Thailand, the 2010 Indus river floods in Pakistan, Typhoon Haiyan in the Philippines in 2013, monsoon flooding in Mumbai in 2005 and in India, Pakistan and Nepal in 2004, and flooding in various parts of China in 2003, 2004, 2007, 2010 and 2012).

The World Bank's Disaster Risk Financing and Insurance Program, which is now involved in 50 countries around the world, is receiving increasing demand from countries for assistance in understanding risks and the relative costs and benefits of financial instruments to manage those risks. Countries face very different challenges which require specific solutions tailored to each country context. A disaster risk financing strategy, as a core element of a comprehensive approach to disaster risk management, needs to consider the costs and benefits of investments in risk reduction relative to risk transfer.

The panellists in this session represent countries from around the world with material levels of flood risk:

- In Colombia, while landslides have accounted for the largest share of lost lives from disasters since 1970, flooding has accounted for over 40% of all destroyed dwellings. The country is particularly exposed to the impacts from more frequent and intense El Niño/La Niña phenomena which have resulted in significant economic losses in recent years.
- In Myanmar, almost 2.5 million people have been affected by 7 major flood events since 1990. Flooding in 2015 alone led to the destruction of almost 40 000 dwellings, the displacement of more than 1.6 million people and 132 deaths.
- In Serbia, severe flooding in 2014 affected 22% of the population and led to a fall in GDP of 2.3% relative to projections. The flooding of an open-pit coal mine providing fuel for power generation led to a 25% reduction in electricity generation. A total of EUR 1.35 billion in funding was required for recovery and reconstruction.
- In Viet Nam, annual average losses from disasters are estimated at 1% of GDP and flooding has accounted for 38% of total losses. In 2008, flood waters reached one meter in the streets of Hanoi leading to 20 deaths and USD 177 million in losses.

These countries face varying challenges in terms of managing these risks and offer various lessons for other countries in terms of establishing the necessary institutional framework and financing strategies. In Myanmar, an institutional framework for disaster risk management has been established, led by a National Disaster Preparedness Central Committee (chaired by the Vice-President) and including Ministers responsible for the various components of disaster risk prevention and response (assessment, transport, health care, etc.). In Serbia, a dedicated office has been established to support recovery and reconstruction after the 2014 floods with responsibilities for data collection, recovery programs, fundraising, implementation of works, payments and ensuring transparency in the use of

reconstruction funds. This approach has had considerable success in terms of making efficient use of the limited resources for recovery and reconstruction, and enhancing the overall credibility of the recovery process. In Viet Nam, a key focus has been increasing the levels of insurance coverage by implementing pilot projects providing insurance coverage for agricultural producers and enhancing the inclusion of disaster perils in property and casualty insurance coverage. The government is implementing a regulatory framework for insurance companies providing disaster insurance coverage and supporting the development of the risk modelling necessary for insurance companies to underwrite disaster risks. In Colombia, a main focus has been a close to USD 3 billion investment programme to protect against the impacts of El Niño/La Niña.

All of the countries are also considering ways to ensure that public finances are protected against flood risk. In Myanmar, arrangements have been established for access to undisbursed allocations of World Bank low-interest funding in the event of a significant disaster. In Serbia, the possibility of establishing a contingent credit line (CatDDO) with the World Bank and a budget protection mechanism through the Europa Reinsurance Facility are being examined. In Viet Nam, a draft law requiring that the most exposed public assets be insured has been developed. In Colombia, the potential impact of disaster risk on public finances is managed by a dedicated division within the Ministry of Finance (which is also responsible for other risks to public finances). This unit has developed a specific strategy for public financial management of disaster risk aimed at identifying and understanding fiscal risk resulting from the occurrence of disasters, implementing innovative financial instruments to manage that risk and encouraging catastrophic risk insurance for public assets.



***From left to right:** Andrés Ricardo Quevedo Caro (Ministry of Finance, Colombia), Olivier Mahul (World Bank), Daw Ni Ni Than (Ministry of Finance, Myanmar)*

This session was organised by the World Bank Disaster Risk Financing and Insurance Program



GFDRR



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SESSION 4

Managing flood risk at the city-level

Moderator:

Cristiana Fragola, Regional Director,
Rockefeller 100 Resilient Cities

Panellists:

Charles Baubion, Policy Analyst,
Public Governance Directorate,
OECD

Jeff Hebert, Chief Resilience Officer,
City of New Orleans

Mia Ebeltoft, Deputy Director (Non-
Life), Finance Norway

Ivo Menzinger, Client Executive and
Managing Director, Global
Partnerships, Swiss Re

Erwann Michel-Kerjan, Executive
Director, Wharton Risk Management
and Decision Processes Center

Cities are particularly vulnerable to flood risk given the tendency for cities to be located close to water and the reduced capacity of built-up areas to absorb flood water. Similar to national governments, municipal authorities need to assess their exposure to flood risk and evaluate the most effective way to manage that exposure, considering the potential roles of investments in risk reduction, risk transfer and *ex post* response.

The concentration of assets and economic activity in cities means that a major flood could have significant economic and social consequences. 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.

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. In New Orleans, major investments in reducing flood risk have been made since the devastating impacts of Hurricane Katrina in 2005, to address significant underlying exposure to flood risk. 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 (highest level of relative rise in the world) and subsidence has led to further losses of land (4,677 km² is projected to be lost by 2060 without actions to mitigate that loss). 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. These investments in prevention have had a significant impact on the cost of insurance in the city, leading to a decrease in premiums for 53% of residential structures, including reductions of almost 50% for those in areas no longer considered to be at high risk of flooding (“X-zones” in National Flood Insurance Rate Maps).

In New York City, at the request of the Mayor, a team of academics used advanced catastrophe modelling to evaluate potential strategies for reducing the cost of flood losses. As a large built-up area surrounded by water, New York City is highly vulnerable to flood risk, as witnessed by the USD 80 billion in flood-related losses that occurred as a result of Superstorm Sandy in 2012. 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. Interestingly, they found that these investments would not be cost-effective based on current levels of exposure although future climate change impacts could significantly change the cost-benefit calculation.

The insurance sector can make an important contribution to helping cities 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 municipalities involved in the project, along with the Norwegian Water Resources Directorate (which has access to similar loss data), have used the local insurance loss data – which provides them with information on building exposures and insurance costs per event - to calibrate the flood models that they use to prioritise their investments in preventive measures. The pilot project on loss data sharing has inspired several other research projects aimed at incorporating information on exposure and vulnerable areas into public decision making, including a new initiative among the National Metrological Institute, municipalities and the insurance sector to combine local weather data with the local loss data for the purposes of improving early warning for inhabitants and identifying priority areas for emergency response (i.e. "first-at-risk").

The (re)insurance sector is also increasingly working with cities on ways to manage the financial impacts of flood losses. Cities will face a number of costs in the aftermath of a major flood, including costs related to relief and clean-up, costs for rebuilding damaged public buildings and infrastructure as well as costs of foregone tax revenue where flooding leads to significant economic disruption. 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). A number of innovative approaches might also be available to finance investments in prevention, such as the use of resilience bonds or specific taxes or levies targeting specific beneficiaries of improved resilience (such as tourists).

Cities also have a role in encouraging resilience among its residents and particularly the businesses and critical infrastructure providers that can make an important contribution to reducing economic disruption from flooding. While large global corporations are increasingly focused on managing the risks they face from flooding and other disasters, SMEs are generally not as well-prepared and have faced closure rates of close to 25% in past disasters. In New York, for example, 90% of SMEs did not have flood insurance when Superstorm Sandy struck.



From left to right (foreground): Charles Baubion (OECD), Jeff Hebert (City of New Orleans), Erwann Michel-Kerjan (Wharton Risk Management and Decision Processes Center)

SESSION 5

Protecting households against flood risk – comparing the different approaches across OECD countries

Moderator:

Swenja Surminski, Grantham Research Institute on Climate Change and the Environment

Panellists:

Roy Wright, Federal Emergency Management Agency, United States

Alfonso Nájera Ibáñez, Consorcio de Compensacion de Seguros, Spain

Laurent Montador, Caisse centrale de réassurance, France

Aidan Kerr, Flood Re, United Kingdom

Robert Whelan, Insurance Council of Australia

Anton Matzinger, Federal Ministry of Finance, Austria

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. 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 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.

Beyond differences in the level of government involvement in providing flood insurance, flood insurance arrangements in different countries also differ in terms of the extent that premiums reflect the underlying level of risk. 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. In the United States, for example, a legislative change to transition to full risk-based pricing for all publicly-provided insurance led many communities to examine investments in prevention.

In countries without government intervention, prices charged by insurers are risk-based. In the United Kingdom, private insurers price flood coverage that they retain at risk-based rates. For policies reinsured by Flood Re (which charges insurers a fixed rate), the savings relative to full risk-rates may be passed on to policyholders (although Flood Re cannot obligate insurers to pass on those benefits due to competition-related restrictions). In the United States, most premiums are risk-based although approximately 20% of policyholders benefit from a premium subsidy or discount (mandated in legislation). In France and Spain, premiums are flat at the level of individual properties (i.e. don't vary based on underlying risk) although, in Spain, premiums are risk-based in aggregate (i.e. the premium applied for "Extraordinary Risks" protection is calculated based on an assessment of the overall level of exposure faced by the public insurer).

There were differing views among panellists on the importance of the risk signal provided by risk-based premiums. Risk-based pricing may have little impact on risk reduction if the cost of effectively reducing risk is significant. Households may also 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. 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. There are also other ways to encourage risk reduction. For example, in France, residents in communities that do not prepare and implement risk prevention plans will face higher deductibles for losses covered by the public reinsurer, creating incentives for local administrations to invest in risk reduction.

The form of insurance coverage also differs across countries. 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. 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. However, despite these requirements, penetration rates remain relatively low in many flood hazard areas (approximately 20%). Extended flood insurance coverage is optional in Austria and penetration levels are very low. Any form of mandatory insurance requirement would likely be perceived as a tax (and the tax level is already high in Austria (tax revenues account for 43.9% of GDP). In Australia, flood insurance for riverine flooding is optional and penetration rates were very low in the early part of the 21st century. However, since the 2011 Queensland flooding, flood insurance penetration has increased to 86% of households 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). Broader levels of coverage provide a larger pool of risks and lead to a reduction in the overall cost for covering flood risk.

The level of government compensation offered for flood losses may be a factor in discouraging the take-up of insurance. In the United States, the expectation of government assistance discourages flood take-up even though the support actually available after flooding is very limited. Similarly, in Austria, the existence of a dedicated Natural Catastrophes Fund to finance prevention and recovery/reconstruction could discourage households from purchasing insurance although only a small portion is actually provided as compensation for private losses (and only for about one-third of the damage incurred).

In countries where private insurers provide most flood coverage, a key challenge has been ensuring sufficient levels of investment in prevention by governments (since losses will be mainly absorbed by private insurers). In the United Kingdom, prior to the establishment of Flood Re, this was addressed through a formal agreement (“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.



Roy Wright (FEMA)

SESSION 6

Supporting insurability and affordability – challenges and innovations

Moderator:

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Ensuring the broad availability of affordable flood insurance is a key challenge in many countries – often leading to significant government intervention in providing (re)insurance coverage for all or high-risk properties and/or subsidising premiums (explicitly or implicitly) to support affordability.

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.

The development of quality flood maps has been key to improving the insurability of flood risk. In Germany, improvements in mapping (and confidence in those maps) has allowed insurers to transition to maps (away from a dependence on past claim experience) as the basis for underwriting insurance coverage. In Canada, significant investment (CAD 2 million) in mapping has enabled the underwriting of some flood risk by private insurers for the first time.

High-risk areas, often developed before the true level of flood risk was known, require particular attention given the difficulty of providing a viable insurance offering to households in those areas. In most countries, the proportion of properties facing high levels of flood risk is relatively small although these properties often account for a material share of overall losses. For example, in Canada, at least 20% of households (1.7 million properties) have been identified by the industry as subject to flooding, and about half of them (800 000 to 1 million properties) are thought to be located in moderate- to high-risk areas where flood insurance is unlikely to be available or affordable in the absence of government support.

While premium subsidies may be one means of supporting the affordability of insurance for some high-risk households, 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 is 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. The potential role of tax incentives to encourage risk reduction might also be worth examining.

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.

Significant levels of government compensation for losses can be an impediment to the demand for private insurance coverage. This has been a challenge in Germany where large amounts of public compensation has been provided after major floods in 2002 and 2013 (EUR 7-8 billion after each event despite lower levels of damage and higher insurance penetration in 2013) although efforts are being made to ensure that there is no bias against insured households in the allocation of public assistance. In Canada, federal public compensation and assistance for disaster losses (most of which is for flood losses) is now averaging over CAD 600 million per year and could reach CAD 900 million per year by 2020 based on the expected growth in exposure.

In the United States, where most flood insurance is provided by the public sector, the private property and casualty insurance industry has achieved historically high-levels of financial strength and has an appetite to underwrite flood risk. A number of reforms could support a gradual transition to a private insurance market, including the acceptance of private flood insurance as meeting requirements for flood coverage on properties with mortgages from federally-backed lenders, eliminating a non-compete clause in contracts between the National Flood Insurance Program (NFIP) and the “Write-Your-Own” insurers that distribute NFIP policies and the sharing of NFIP’s underwriting data with private insurers. A political decision would also be required on eliminating premium subsidies for high-risk households in NFIP policies if private insurance were to become a viable alternative.



From left to right: Annegret Thieken (University of Potsdam), Howard Kunreuther (Wharton Risk Management and Decision Processes Center), Sean Kevelighan (Zurich Insurance Company), Don Forgeron (Insurance Bureau of Canada)

FORWARD AGENDA



Erwann Michel-Kerjan
Executive Director
Wharton Decision Processes
Center; and
Chair, OECD High-Level Advisory
Board on the Financial
Management of Large-Scale
Catastrophes



Timothy Bishop
Directorate for Financial and
Enterprise Affairs
OECD

The interest that has been expressed in this conference – with participants from more than 30 countries around the world - 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, with the support of the High-Level Advisory Board on the financial management of large-scale catastrophes, stands ready 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. An OECD report dedicated to the financial management of flood risk, and aimed at sharing experience and best-practices, will hopefully help governments in their effort to manage this complex policy issue. The Wharton Decision Processes Center is also developing an e-platform on “Flood Insurance Around the World” which will provide access to a comparable overview of different approaches to flood insurance arrangements across countries based on criteria such as the role of the public and private sectors and the form of flood insurance offered.

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