Words into Action Guidelines:
National Disaster Risk Assessment
Special Topics

J. Developing Risk Assessment to Support Sovereign Risk Financing and Risk Transfer

Key words:
risk transfer schemes, sovereign risk financing, probabilistic catastrophe risk modelling, insurance pool, risk assessment

UNISDR
2017 - UNISDR

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United Nations Office for Disaster Risk Reduction

Sovereign risk financing and risk transfer schemes - a critical component of a comprehensive disaster risk management strategy

Financial losses associated with extreme events are experienced across many stakeholders, hampering socioeconomic development, particularly in the most vulnerable countries

When a disaster strikes, it can lead to significant financial burdens that can be felt either directly or indirectly by governments, businesses and individuals.[1]

A region's economic vulnerability to extreme events will depend on a range of factors, linked to (a) increasing exposure and vulnerabilities such as higher concentrations of people and property in cities in exposed coastal regions, poor development planning, complex interdependent supply chains and trade patterns, cascading failure effects of critical infrastructure, and interlinkages of natural and man-made catastrophes, and (b) increasing incidence and severity of hazards such as extreme weather events due to climate change. These factors are contributing to the rising financial impacts of disasters.

In absolute terms, the financial costs of disasters are highest for high-income countries. However, in relative terms, the financial effects of extreme events are much more devastating for middle- and low-income countries, when analysed in relation to their average gross domestic product (GDP). In those countries, recurring disasters present a significant challenge to socioeconomic development and poverty reduction efforts in those countries. As is too often the case, the poorest communities are the most vulnerable.

A comprehensive risk management strategy is required to prevent or limit the economic impacts of disasters

A comprehensive risk management strategy should consider several options to reduce and prevent economic losses. Preventive measures such as land-use planning, enforcement of appropriate building codes, retrofitting of structures, better construction practices, and investment in the natural infrastructure (e.g. wetlands) are critical for reducing and preventing economic losses associated with disasters. These can be combined with emergency preparedness and response procedures linked to early warnings to further reduce the risks.

The decision to invest in such measures should be underpinned by

[1] World Bank (2014). Financial protection against natural disasters: an operational framework for disaster risk financing and insurance.

understanding the risk, and by cost-benefit analysis of risk reduction and risk prevention measures. However, despite such efforts, some residual economic risk will always remain. Risk financing and risk transfer measures (such as insurance) provide protection cover and can distribute or pool the residual economic risk. A number of recent studies indicate that, following a major disaster, countries with lower levels of insurance penetration experience larger declines in economic output and more considerable fiscal losses than those with higher levels of insurance penetration.[2] Finally, these can be complemented by effective reconstruction plans (that may also consider re-zoning) that aim to reduce future disaster risks and build resilience after any major event.

Disasters lead to a number of direct and indirect financial impacts on governments, businesses and individuals

The direct impact on a government's budget could include:

- Emergency relief and response expenditures
- Relocation of affected or at-risk citizens
- Reconstruction or improvements of non-insured or partially insured public infrastructure and family dwellings
- Costs of social and economic programmes for rehabilitation and recovery
- Contingent liabilities for State-owned and other enterprises that are critical to economic recovery.

Indirect impacts could include:

- Decreased tax revenues associated with business interruption and decline in GDP growth
- Opportunity cost of diverting funds from intended development plans to reconstruction and recovery programmes
- Additional expenditures related to effectiveness of social recovery programmes
- Increased borrowing costs and potential negative impacts on the sovereign credit rating
- Migration of population as a result of loss of livelihoods.

Direct impacts on businesses/individuals could include:

- Cost of reconstruction of uninsured or partially insured assets

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[2] Von Peter, G., S. von Dahlen and S. Saxena (2012). Unmitigated disasters? New evidence on the macroeconomic cost of natural catastrophes. BIS Working Papers No. 394. Basel: Bank for International Settlements.

- Cost of replacement or repairs of uninsured or partially insured assets
- Health care
- Loss of sources of income
- Decline in property value owing to destruction of surrounding infrastructure.

Indirect impacts on businesses/individuals could include:

- Loss of income owing to business interruption, unemployment, death or economic decline
- Increased borrowing costs
- Additional costs such as relocation and alternative housing, and long-term disability.

At a sectoral level, the economic consequences of some disaster risks can be felt across an entire supply chain and can affect economic output by interrupting supply chain and market accessibility. For example, they can affect a country's exports or have global impacts from supply chain disruptions.

On the other hand, in countries with limited economic diversity, a single catastrophe can lead to profound economic impacts. For low-income countries, these types of economic shocks can deepen poverty levels and lead to complex emergencies, requiring significant humanitarian and relief interventions.

Post-disaster financial needs are often defined by three phases: (a) immediate relief and rescue response, (b) early recovery and (c) the reconstruction phase.

Funding needs will differ in each phase. Relief and rescue requires immediate access to funds for urgent rescue, food, medicine, clean water and shelter for those injured, affected and displaced. Early recovery requires funding, within weeks, to restore livelihoods, help communities return to some level of normality and restart their economic activities. Reconstruction requires more substantial funds to be mobilized for repairing and rebuilding damaged assets such as homes and critical infrastructure.

Funds are therefore required on different timescales. Delays in receiving funding can hamper each phase, negatively impacting the population and the economy.

Sovereign risk financing and risk transfer measures offer a variety of solutions to provide cover against financial impacts of disasters on governments, businesses and individuals as well as financing some of the post-disaster expenses

Sovereign risk transfer can take several forms, each with different trigger mechanisms, payout conditions and timescales. The suitability of this approach will differ depending on each government's budget and risk contexts. [3][4]

The first important distinction is whether public or private assets are being considered and whether these are on aggregate level (e.g. via a sovereign insurance scheme) or individual level (See boxes 1 and 2). Another important distinction is between indemnity-based and parametric insurance. With the former, claim payments are linked to the actual losses incurred by the insured. Under indemnity cover, all claims need to be individually checked, which may lead to significant transaction costs.

On the other hand, parametric trigger-based insurance contracts make a payout if a physical loss parameter (e.g. wind speed or amount of precipitation) is reached, and not on the basis of actual losses incurred by the insured.

Compared with indemnity-based insurance, loss parameters used in risk transfer schemes with parametric triggers are available immediately after the event causing losses. The most significant disadvantage of parametric triggers

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[3] Organisation for Economic Co-operation and Development (2015a). *Disaster Risk Financing: A Global Survey of Practices and Challenges*.

[4] Golnaraghi, M. and P. Khalil (2017). The stakeholder landscape in extreme events and climate risk management. The Geneva Association, Zurich.

Organisation for Economic Co-operation and Development (2015b). Financial instruments for managing disaster risks related to climate change. OECD Journal: Financial Market Trends, vol. 2015, No.1.

The Geneva Association: www.genevaassociation.org

The World Bank Global Facility for Disaster Risk Reduction (GFDRR). The GFDRR website provides a large library of research, tools and publications that relate to every aspect of resiliency and protection against natural disasters, including disaster risk financing and insurance.
Available from www.gfdrr.org/

Golnaraghi, M., ed. (2012). Institutional Partnerships in Multi-Hazard Early Warning Systems. Heidelberg/New York: Springer Verlag.

Organisation for Economic Co-operation and Development (2017). OECD Recommendation on disaster risk financing strategies.
Available from www.oecd.org/daf/fin/insurance/OECD-Recommendation-Disaster-Risk-Financing-Strategies.pdf

World Bank (2012). Disaster Risk Financing and Insurance Concept Note: Sovereign Disaster Risk Financing. Available from

http://siteresources.worldbank.org/EXTDISASTER/Resources/SDRF_Concept_Final.pdf

is basis risk, i.e. the difference between the actual loss incurred by the insured and the payout.

Since the 1990s, a number of "alternative risk transfer" (ART) capital market instruments have been developed to complement the more traditional (re)insurance solutions. These insurance-linked securities (ILS) (e.g. catastrophe bonds) provide substantially more reinsurance capital to cover catastrophe losses by transferring risks to the capital markets.

Key considerations for development of sovereign risk financing and risk transfer programmes in middle- and low-income countries

When developing sovereign risk transfer programmes in middle- and low-income countries, several factors should be taken into consideration:[5]

1. There must be a clear understanding of the objectives of the sovereign risk transfer programme. For example, the programme may be: (a) primarily required to provide stimulus for domestic insurance markets, or (b) to provide cover that the government is not able or willing to provide such as for public emergency relief, or (c) used to protect public assets, or (d) required to supplement budgetary measures that can provide a portion of post-disaster financing to help expedite recovery.
2. Any risk transfer product should cover the appropriate risks, to the appropriate level of cover that aligns with the government's risk appetite and budget for covering post-disaster costs. It is necessary to understand what risks require cover, the likely frequency and size of losses that the government may have to cover, what percentage of these costs the government will pay from its own budget and what proportion it wishes to insure or finance. The estimated costs should help to determine the risk the government may wish to retain (i.e. the proportion of the post-disaster costs that it can cover from its own budget).
3. There must be adequate data and technical expertise to support the pricing, structuring and provision of the risk transfer or financing cover.
    - The data should be able to describe the magnitude, frequency and geographic distribution of potential losses in order to correctly price and structure cover.
    - These data can be generated by risk assessment methods, referred to as probabilistic catastrophe (Cat) modelling. The development, calibration and utilization of such models require multidisciplinary technical expertise and experience with interpretation of model output. Input data are often unavailable or incomplete. Incomplete knowledge of hazard events and their impact means more uncertainty for insurance pricing and penetration.
4. When developing new risk transfer mechanisms, a number of market considerations may also be considered, depending on the objectives:
    - A strong and reliable primary insurance market and access to

[5] Golnaraghi, M., S. Surminski and K. Schanz (2016). An integrated approach to managing extreme events and climate risks: towards a concerted public-private approach: with recommendations to harness potential contributions of the insurance industry. The Geneva Association, Zurich.

reinsurance are important. In the absence of mature institutions to partner with, there may be a need to provide (re)insurance capacity and expertise, and there may be higher associated costs of distribution, claims verification and settlement.

- There should be awareness of and appreciation for any regulatory issues within the market.
- Potential for adverse risk selection by the insurers, owing to scarcity of data, particularly in markets that are not yet well developed.
- Risk of limited take-up resulting in a small pool of policyholders.
- Creation of a moral hazard, unless new insurance protection incentivizes risk-reducing behaviour.

5. Understanding the linkages of insurance premiums, frequency of payments and insured limit/cover is important. Calculation of the Annual Expected Loss (AEL) is the single most important individual contributor to the final cost (premium) of an insurance product. The expected loss is a result of a calculation looking at how often (frequency) and how much (insured limit or cover) will be paid to the insured. This relationship is key, as changing one of the three elements (premiums, frequency and insured limit) will immediately impact one of the other two.

Risk Assessment: a Critical Step for Design of Sovereign Risk Financing and Risk Transfer Programmes

To determine the required scope and type of risk financing or risk transfer in a country, a government should first understand the risk context; for example, the potential impacts of disasters on the population, infrastructure and economy

Disaster risk assessment modelling provides this understanding and quantification. Results are presented not only in terms of the annual average loss that is expected to occur in any year (AAL), but also, more usefully, of the probability that losses exceed a given size in any given year (also presented as "Return Period" or "recurrence interval" or "1 in 100 year loss", for example). Losses can be broken down by geographic region, event type etc.

Disaster risk is a function of three interlinked components: hazard, exposure and vulnerability.

Probabilistic catastrophe (Cat) models provide a systematic and rigorous approach to pricing, underwriting and managing complex risk portfolios

Since the 1980s, Cat risk modelling has been developed by the insurance industry to create a systematic approach to pricing, underwriting and managing complex insured risk portfolios.

Increasingly, Cat models, or variations thereof, are being used by national authorities to design sovereign risk financing and risk transfer applications. These models include the following three modules:

Hazard module: developed by assigning spatial and temporal distributions to hazard events and their characteristics. This is typically based on the historical catalogue of events in a region. These catalogues are incomplete owing to unrecorded events, especially as we look further back in time. Therefore a probabilistic model is required, in which simulations are used to augment the historical catalogue with distribution of possible realistic events that could be expected to occur, but may not yet have been observed.

Exposure module: a representation of assets (e.g. buildings, agricultural crops) that could sustain a loss and that should describe the location, value and construction attributes of each asset.

Vulnerability module: comprises a relationship for each asset (e.g. a building) and its properties (e.g. construction type), describing how hazard intensity relates to damage sustained (generally as a proportion of asset value).

Before conducting an assessment for risk financing and risk transfer, the scope and type of financing mechanism should also be defined, as this influences the required content, fidelity and extent of modelling. In turn, this affects the level of investment and partnerships required in developing the hazard, exposure and vulnerability data.

In the risk assessment stage, it is important to define the goals of the risk assessment and identify who can and should do the assessment

A government may want to use an existing assessment, or design and implement its own risk assessment using internal scientists and experts. In considering these options, the methods and outputs should be assessed to confirm whether they may be seen as acceptable for use by the insurance market. If an assessment is deemed unacceptable for insurance market use, engagement with experienced external catastrophe (Cat) modelling

organizations may be required to develop risk models and implement assessments specifically for use by this market.

For some countries and perils, several models exist and each is likely to provide different estimates of risk. A common question is 'which model is right?'

Different models employ different assumptions and processes in each step of the model chain, owing to available data or resources, alignment with a particular statistical or computational method, or how the model treats uncertainties. Combined, these differences contribute to (sometimes large) differences in the estimated losses. A government should look to evaluate the methods and validate input and outputs when making a judgement on which model(s) to use as a basis for designing its risk financing or risk transfer programmes. It should assess the source and scientific justification of methods, ensure that uncertainty is correctly accounted for in each component and retained throughout the model.

The input data used to develop a model should be from a reliable source, and should be as complete as possible, with any assumptions around data contents being adequately justified. Data and methodological transparency is important in being able to validate models. This is improving with the growth in availability of open source models. However, for commercial models, validation should be conducted through detailed discussions with model developers.

Parametric options may be considered when exposure and vulnerability information is lacking or unreliable, particularly for financing emergency response and early recovery, rather than financing reconstruction

In instances where hazard information for a particular region is reliable but data for exposure and vulnerability are either not available or are of low quality, mechanisms for financial payouts could be constructed based on hazard data alone. This would require analysis and design of the settlement index, triggers and associated payout. If the index is not carefully designed, it may pay out when there is little or no impact or even worse, not pay out when there has been an impact.

Key stakeholders

The development of a successful risk financing and risk transfer programme requires the collaboration of multiple stakeholders and information providers

Risk assessments and development of sovereign risk financing and risk transfer programmes should engage a variety of stakeholders from the government (relevant ministries), national technical agencies and data providers, academia and centres of excellence, (re)insurance industry, international and regional development banks, non-governmental organizations and the risk modelling community.

Multistakeholder processes should ensure (a) consideration of end users' needs and requirements, (b) development of in-country technical and operational capacities, (c) utilization of the risk assessment by all stakeholders and (d) incentives for take-up of the programme and for promoting its sustainable use.

Specifically:

1. Data and models should be developed in collaboration with national operational services and data providers to build capacity and promote the sustainable maintenance of the risk data. These may include academics, national meteorological, hydrological and geological services, as well as other government and non-governmental agencies that collect and maintain sectoral data such as the national bureau of statistics.
2. From the buy-in perspective, cooperation within and across government agencies (including national, provincial and local governments) is important to generate buy-in to the transfer programme and incentivize insurance take-up at individual level where required.
3. From sustainability and effectiveness perspective, partnership with a variety of risk transfer experts is important. Development of risk transfer solutions appropriate to the government's requirements could benefit from risk modelling, actuarial and risk transfer expertise of the domestic and international private (re)insurance industry; as well as regional or international development banks and groups such as the Insurance Development Forum. Where a risk transfer mechanism targets a specific sector, for example agriculture, it is paramount to include sector specialists in data provision and generation, and in solution design to ensure the risk transfer product can be effective for its target market and beneficiaries.
4. NGOs may have an important role to play in a number of areas, as per their expertise. For example, in the promotion and assisting with the take

up of these solutions at the local level.

5. The above may be further supplemented by bringing in other domestic and international experts.

Examples

Over the past years, a number of initiatives have been established to offer coverage for the protection of government budgets, communities and individuals in a disaster situation. Prominent examples of regional pools include the Caribbean Catastrophe Risk Insurance Facility (CCRI), the Pacific Disaster Risk Financing and Insurance Programme, which was built upon the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), and the African Risk Capacity (ARC) (box 1). Other national risk transfer programmes have also emerged (box 2). A comprehensive list is provided in Golnaraghi and Khalil (2017).

CASE STUDY

Box 1
Examples of regional pools

Caribbean Catastrophe Risk Insurance Facility (CCRIF)
www.ccrif.org
Established in 2007 as the first multi-country risk facility, CCRIF provides catastrophe insurance to 16 Caribbean governments. Initial funding came from grants – the largest being from the Governments of Canada and the United Kingdom – and sponsorship by the World Bank.
CCRIF is a mutual insurance company owned by its client country members. It is designed to provide emergency relief to governments on a parametric basis, allowing swift payment after a loss. The largest payment it has made for a single event was US$ 23.4 million to Haiti, under the country's tropical cyclone and excess rainfall policies, as a result of Hurricane Matthew in October 2016.
Initially, most members were dependent upon premium funding in order to be able to join, but now all but one, Haiti, pay their premiums.
CCRIF also provides educational and technical support across the Caribbean and has spawned several micro-insurance schemes. It buys traditional reinsurance and issued a Catastrophe bond in 2014. It is advised by a United Kingdom-based reinsurance broker on risk modelling, reinsurance design, pricing and placement.

Pacific Disaster Risk Financing and Insurance Program
www.pacificdisaster.net/pdnadmin/data/original/WB_2011August_PDRFIS.pdf
Launched in 2013, the Pacific Disaster Risk Financing and Insurance Program provides parametric disaster insurance for tropical cyclones and earthquakes. Currently there are five participating countries: Marshall Islands, Samoa, Tonga, Vanuatu and Cook Islands
The overall aim is to provide short-term liquidity to participating governments in the event of disaster. The first payout was made to Tonga in January 2014 (US$ 1.27 million).
The pool is part of the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), a joint initiative of the World Bank, the Secretariat of the Pacific Community (SPC/SOPAC) and the Asian Development Bank, with financial support from the Government of Japan, the Global Facility for Disaster Reduction and Recovery (GFDRR) and the Africa, Caribbean, Pacific-European Union Natural Disaster Risk Reduction Program.
PCRAFI was launched in 2007 to provide the Pacific island countries with disaster risk assessment and financing tools for enhanced disaster risk management and climate change adaptation.

African Risk Capacity (ARC) **http://www.africanriskcapacity.org/**

ARC was formed in 2014, initially to provide cover against drought to African countries. Its creation was sponsored by the World Food Programme, operating under the African Union. Like the Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company (CCRIF), ARC is a mutual insurance company, although countries that provided loans to capitalize the company (Germany and United Kingdom) are also members. Cover is on a parametric index basis offering drought and windstorm policies.
ARC Insurance Company Limited has a sister organisation, ARC Agency, which provides African governments with advice on why insurance is required, how its insurance contract should be structured and how to create contingency plans.
ARC has 32 member countries, with 8 currently buying insurance. In January 2015, Senegal, Niger and Mauritania received an insurance payout of more than US$ 26 million, triggered by the drought in the Sahel, before an international humanitarian aid appeal was made. Twenty-four reinsurers participate in reinsurance cover, including Lloyd's syndicates.
Note: When engaging in regional facilities, the availability of premium financing among governments can strongly influence take-up of sovereign risk transfer. As of May 2017, only eight of 32 member countries in the ARC purchase cover, with the most significant barrier to growth being a lack of a premium financing facility.
CCRIF overcame such issues by providing such a facility, which allowed members to join and phase in premium payment over several years. With such a facility, it is estimated that by 2020, ARC could cover 20 countries, meeting a significant proportion of the G7's InsuResilience target – 400 million people in developing countries to be brought under the coverage of catastrophe insurance by 2020.

CASE STUDY

Box 2
Examples of national risk transfer programmes

Turkey: Turkish Catastrophe Insurance Pool (TCIP) **www.tcip.gov.tr**

The ever-present threat from widespread earthquake damage led to the creation of TCIP in 1999. TCIP provides earthquake and fire insurance coverage at affordable yet actuarially sound rates for registered urban dwellings, limits the Government's financial exposure to loss, builds long-term catastrophe reserves and encourages risk reduction and mitigation practices in residential construction.

During the first five years, the World Bank provided a contingent credit layer that would have provided capital relief should there be a shortfall as a result of claims activity.

Reinsurance cover per event is purchased through various layers. Current market penetration is around 34 per cent (approximately 5.6 million policies), with an average premium per policy of €59.

India: Telenor Suraksha Micro-insurance **https://microensure.com/telenors-free-life-insurance-scheme-suraksha-recognised-efma-accenture-innovation-insurance-awards-2016/**

In September 2015, Telenor India launched Telenor Suraksha, India's first mass-market life insurance product, in partnership with MicroEnsure, a leading United Kingdom-based micro-insurance specialist, and Shriram Life Insurance.

Cover is offered via Telenor's network of 48 million customers, who can sign up when topping up their phones. The electronic registration process is simple and no paper policy document is required. Cover is offered without exclusions and is offered for free for a certain amount of airtime usage as a reward to loyal subscribers.

Education on the benefits of insurance is made through marketing materials, text messages (SMS) and a phone menu that provides all the information required. Claims are paid using mobile money. Within 148 days, more than 22 million customers had opted for the programme, with most of thesepeople living in rural areas. Over 95 per cent of customers had never had any form of insurance previously.

France: Caisse Centrale de Réassurance (CCR) **www.ccr.fr**

CCR was created in 1946 as a pool to cover all perils not traditionally insured through the private market, including flood, mudslide, earthquake, landslide, subsidence and tidal waves. Losses are only covered when an event is declared a natural disaster by government decree and results in property damage. Cover is compulsorily included (to avoid adverse selection) in fire and property damage policies covering homes, commercial and industrial properties, farms and motor vehicles, including any business interruption cover where provided in original policy.

A flat premium rate is applied, which is set by the State, to each eligible policy which varies by class. Gross written premium is above €1 billion. CCR has an unlimited State guarantee and purchases its own reinsurance programme in the open market to manage volatility.

Checklist for conducting risk assessment for design of sovereign risk financing and risk transfer programmes

For protection of government budget	For protection of individuals
Define geographical coverage of programme, e.g. national, subnational, city [1,2]	Define geographical or unit of coverage of programme, e.g. national, subnational, city, community, household [1,2]
Define hazard(s) or peril(s) to be covered by the programme, e.g. windstorm, drought, cyclone, excess rainfall, earthquake, epidemic [1,2]	Define hazard(s) or peril(s) to be covered by the programme, e.g. windstorm, drought, cyclone, excess rainfall, earthquake, epidemic [1,2]
Define what risk(s) are to be covered, e.g. budgetary risks post disaster, property, critical infrastructure agriculture, infrastructure [1,3]	Define what risk(s) are to be covered, e.g. residential property, agriculture, infrastructure, livelihoods. [1,3]
Identify existing government protection arrangements (includes risk transfer programmes, credit lines, or budget allocation) to be used to disburse funds in the event of disaster. Define objectives and assess how a new programme will efficiently enhance or add to existing schemes [1,3]	Identify existing insurance arrangements to protect individuals (includes risk pools, government-backed insurers) to be used to pay individuals' claims in the event of disaster. Assess how a new programme will efficiently enhance or add to existing schemes [1,3]
Define the type of trigger that will be used to signify payout, e.g. indemnity (loss) or parametric (hazard) NB: possible to migrate over time or have both components in a scheme [1,3] Collect, assess and quality assure data for the hazard, exposure and vulnerability modules of the models [2,3]	Define the type of trigger that will be used to signify payout, e.g. indemnity (loss of an asset) or parametric (based on characteristics of hazard) NB: possible to migrate over time or have both components in a scheme [1,3] Collect, assess and quality assure data for the hazard, exposure and vulnerability modules of the models [2,3]
Determine level of international sponsorship of the programme from e.g., international development banks, global insurance and reinsurance companies [1]	Define cover types compulsory (possibly politically unpopular) or optional (possible adverse selection and low take-up) [1]
Determine who will guarantee the programme, e.g. reinsurance purchase, or capital markets [1,4]	Determine who will guarantee the programme, e.g. government as insurer of last resort, reinsurance purchase, or capital markets [1,4]
Determine premium rate conditions: flat-rate (increases social solidarity) or risk-adjusted (influencing behaviour and often required by international schemes). Determine whether premium financing scheme is required to encourage take-up [1,4]	Determine premium rate conditions: flat-rate (increases social solidarity) or risk-adjusted (influencing behaviour and often required by international schemes) [1,4] Identify potential hurdles to take-up
Identify internal and external experts to support the development, interpretation and guide the utilization of the risk model(s) [1,2, 3, 4]	Identify internal and external experts to support the development, interpretation and guide the utilization of the risk model(s) [1,2, 3, 4]
Conduct risk modelling of appropriate fidelity and scope to support the design of risk transfer programme, based on outcomes of above steps. [1,3]	Conduct risk modelling of appropriate fidelity and scope to support the design of risk transfer programme, based on outcomes of above steps. [1,3]

Note: [ ] indicates the stakeholders who should be involved in each step:

[1] Government authorities at all the relevant levels, ministries of finance and other relevant ministries; insurance experts and insurance industry representatives (domestic and international) to define needs of programme.

[2] Academics, domestic technical experts, technical operational centres that collect and maintain hazard (national meteorological, hydrological, geological services) and sectoral data (and when required regional and international experts).

[3] Risk analysis experts / risk modellers.

[4] International sponsors (e.g. development banks, NGOs).

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