Disaster risk management - An application to Austria and the EU

Key Messages

- The approach and findings organised around a climate risk management framework described here are of relevance beyond the case of Austria. Many countries and communities are feeling the impact of changes in extreme events and are looking for robust strategies to reduce and manage the risks in a changing climate. Regions are developing improved approaches for absorbing the increasing burdens, such as in the EU through reforming the European Solidarity Fund or setting up regional risk pools for buffering against the financial risks from extremes, such as in the Caribbean or Africa.
- Finally, the international community is committed to jointly tackle disaster risk based on the principle of moral responsibility via the Sendai mandate as well as through the Warsaw Loss & Damage mechanism, which is based on recognized liabilities.
- Fundamental to all these approaches is a broad-based and actionable perspective on climate risk management, which will see further attention over the years to come.

Introduction

There is a long history of managing climate-related and geophysical-driven extremes - such as heatwaves, droughts, and heavy precipitation - via disaster risk management (DRM). There is much overlap between current practice of DRM and climate change adaptation activities. Both pursue a similar goal, namely the reduction of negative impacts of climate change and disasters, respectively, on the natural environment, human society and economies by anticipating risks and uncertainties and addressing vulnerabilities.

Current DRM practice can be seen as an early adaptation measure within an iterative climate risk management approach. It can help address the existing adaptation deficit and iteratively integrate new scientific knowledge on climate change (e.g. emerging early trends and changes in variability that exacerbate existing risks or create new risks), acknowledging the uncertainties associated with climate change and paving the way for mainstreaming climate change in disaster risk management.

This case study focuses on Austria, a country that has been subject to recurrent flooding, and which was just recently hit by large-scale flooding in 2013, which led to massive losses and substantial stress to public finance. As one of the first comprehensive national assessments of climate change, the Austrian Panel on Climate Change showed that warming in Austria is stronger than the global average, leading to increasingly severe risk and the need to upgrade adaptation efforts.

Defining the adaptation problem

In 2012, Austria developed its national adaptation strategy, which was co-generated with a large set of stakeholders and identifies many options, which are now being prioritized in terms of their costs, benefits and potential to reduce impacts and risk. “Protection from natural hazards” and “DRM” are two of 14 activity categories that are covered in the climate adaptation strategy. Over the last decade there has already been a paradigm shift in the choice of policy instruments to address disasters towards a more pro-active -or planned adaptation- approach, putting a stronger emphasize on ex-ante DRM.

Comprehensive climate risk management requires joint efforts by the private and the public sector. The focus here is on the crucial role of the public sector in the provision of DRM as early action on climate change. The public sector has to step in to guarantee the local provision of DRM by

planning ahead for extreme event risk. Taking this long term view is not an easy proposition for the public sector, as disaster risk constitutes a contingent liability, i.e. costs that accrue only in case of an event. However, not considering these contingent liabilities ex-ante in the public budgeting process may eventually lead to severe fiscal stress once an extreme event occurs. Progress in public sector risk planning has been achieved based on tools available to systematically assess and manage risks in the fiscal balance sheet. Austria, with its disaster fund, already has an instrument in place to take some of the implicit climate risks out of their balance sheets and make these contingent climate related liabilities more explicit.

Identify entry points and stakeholders

The key instrument for financing public disaster risk management in Austria is the Austrian disaster fund (in German “Katastrophenfonds”). While the Federal Ministry of Finance administers the resources of the disaster fund, two other federal ministries – the Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) and the Federal Ministry for Transport, Innovation and Technology (BMVIT) – as well as the nine Austrian federal provinces are responsible for the implementation of measures regarding the protection from natural hazards. Originally truly accumulating in nature, the accumulation of reserves has been capped with the issuance of the current disaster fund law in 1996 at a level of EUR 29 million until 2012 and EUR 30 million since 2013. Surpluses from the disaster fund were redistributed to the general budget as the build-up of the reserve was capped.

Severe floods in 2002, 2005 and 2013 – with cost estimates for the 2002 and 2013 floods amounting to more than EUR 3 billion and EUR 0.9 billion respectively – led to the situation that the fund’s usual resources (including the reserve) were not sufficient to cope with the damages of these catastrophic events.

Assessing the context and materiality

Critical elements of the assessment involve: (i) understanding historical risks and impacts, (ii) understanding current adaptation practice dealing with extreme events and natural hazards in Austria, (iii) public budget analyses, and (iv) climate risk-based fiscal and economic modelling. These multiple methods enable a comprehensive discussion of the current CRM practice, potential future climate risk and the impact on a county's fiscal position, which all can eventually be integrated to identifying robust adaptation pathways for Austria.

Climate and risk information

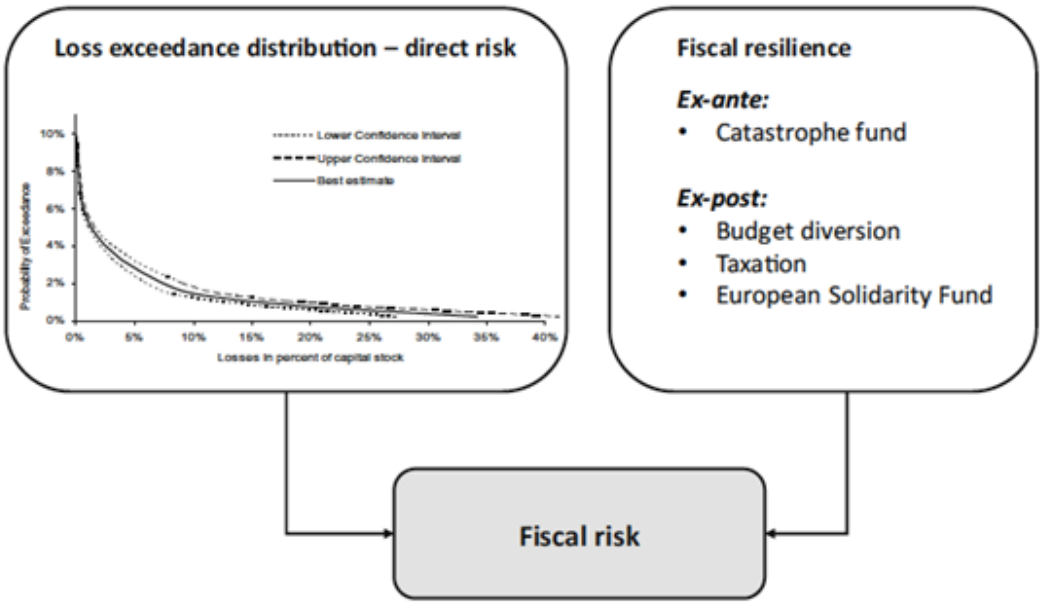
Modelling future fiscal stress from climate-related events involves linking climate risk (such as flooding) modelling and climate scenario analysis building on the IIASA CATSIM model.

CATSIM employs probabilistic modelling of disaster risk to understand the current and future stress imposed on the fiscal position. CATSIM follows the common practice in catastrophe models and evaluates monetary catastrophe loss as a function of hazard, exposure, and vulnerability modules. Losses are summarized with the help of risk metrics or loss distributions, which inform about the probability that losses do not exceed a given level. This task is complex and usually data as well as resource intensive. In Austria, for example, several flood hazard models on local scales exist, however, currently only two flood risk modelling approaches provide country-level flood loss distributions.

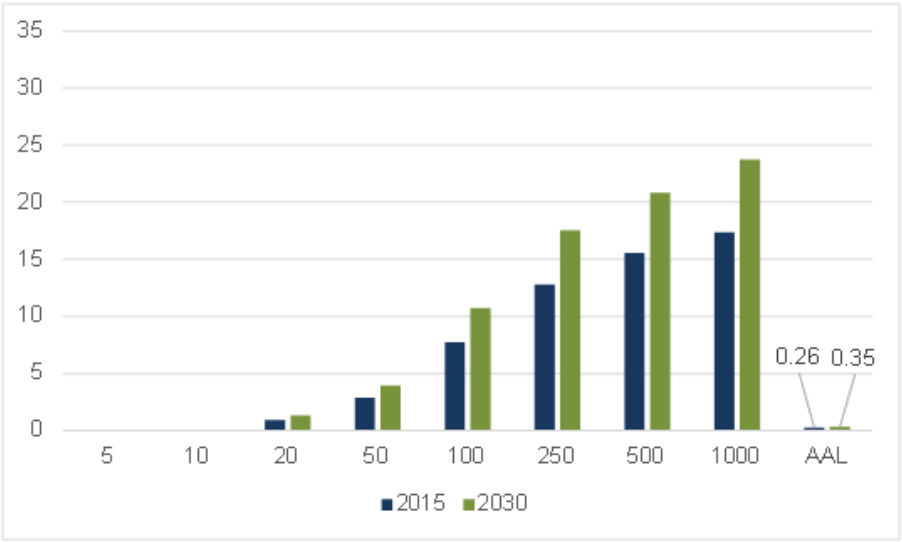
In this case study, projected GDP and demographic composition in Shared Socioeconomic Pathway

2 was used as an illustrative example for medium-levels of warming. In a next step, the flood risk is linked up with an estimate of fiscal resilience to gauge fiscal risk.

The figure shows how fiscal risk was modelled as a function of losses (direct risk) and fiscal resilience based on the CATSIM framework. By integrating potential future economic losses due to climate risks with the public resources available for absorbing these risks, the relevant layer of risk at which a specific country might experience fiscal stress in the future, and concrete options to remedy this situation, can be identified.



The figure below shows probabilistic projections of flood losses (with flood protection measures) for different return periods in Austria calculated with a copula approach (in billion 2012 EUR). The probabilistic modelling results gave not only information about the changes in average losses but also about changes of the tails, i.e. extreme risk. While average losses are expected to increase from 260 million EUR in 2015 to 350 million in 2030, policy makers should also pay attention to the full loss distribution, particularly the tails of the distribution. When talking about catastrophic events it is the low probability, high impact events that should matter most in decision making, as in case of occurrence such events could impose severe stress on federal budgets and can overburden risk instruments, such as the Austrian disaster fund, exactly at the moment when they are needed the most.



In addition to disaster risk, there are many pressures on the fiscal position. To concurrently assess

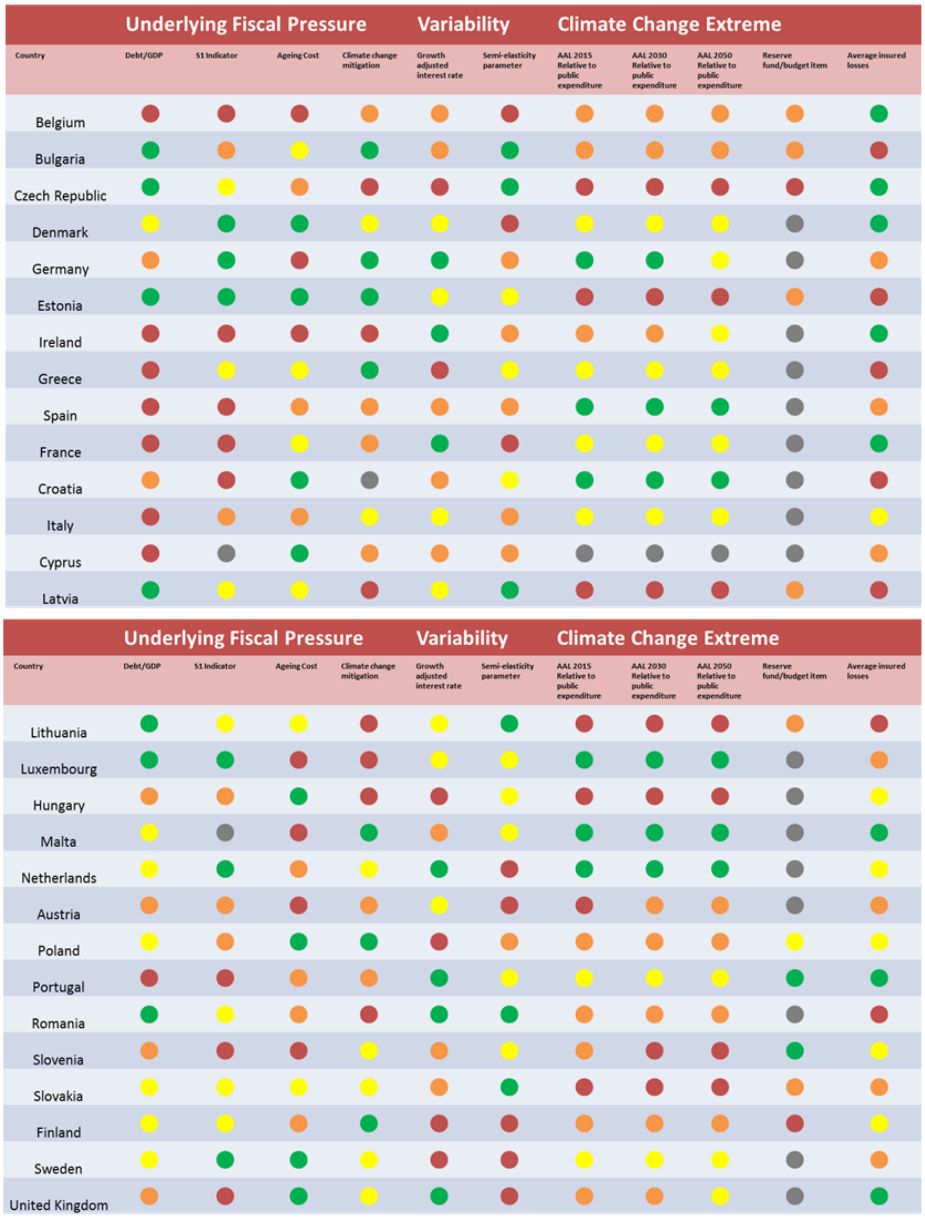
those, a scorecard approach is useful, which was applied and extended to the case of Austria and risks in the EU more broadly. A policy scorecard is a common approach used in EU wide assessments in a variety of policy domains, including, more recently, its development for use in climate change adaptation.

Using policy scorecards to assess pressures on the fiscal position

The scorecard is developed to show data from the following three domains: 1) Underlying fiscal pressure, 2) Macroeconomic & fiscal variability, 3) Climate change extreme risk (DRM Fiscal Capacity). For underlying fiscal pressure, the scorecard shows four variables: current debt-to-GDP, the primary balance needed to stabilize debt at 60% in year 2030 (also known as the S1 indicator), the projected increase in fiscal burden due to demography-related costs (ageing, health, longer-term care, education), and projected changes in the fiscal burden as a result of climate change mitigation. This set of indicators illustrate the current fiscal health and consolidation requirements of each EU member country, along with the additional longer-term challenges posed by both climate and socioeconomic changes under the SSP 2 scenario.

• For macroeconomic and fiscal variability, the scorecard shows the historical variability of three variables: growth adjusted interest rate, exchange rate and semi-budget elasticity parameters (describing how budgetary expense and revenue responded to a percentage change in the output gap). This set of indicators show how future debt burden may deviate from baseline projections (assuming past variability is indicative of the future variability of these variables). These variables are also used in the stochastic-debt assessment, described in the next section.

• For climate change extreme risk, the scorecard shows five variables: annual average loss (AAL) calculated for 2015, AAL projected for 2050 (relative to the size of projected government expenditure), current availability of reserve fund and budgetary allocation, historical observations of average insured losses, and availability of other budgetary mechanisms. This set of indicators show both direct risk posed by current and future risk of extreme weather events, together with the availability of fiscal and economic resources to cope with these kind of risks. To gather information on governments' ability to cope financially with current extreme weather events, this study sent out email surveys to relevant ministries (e.g. ministries of finance and disaster management agencies) in each EU member state.



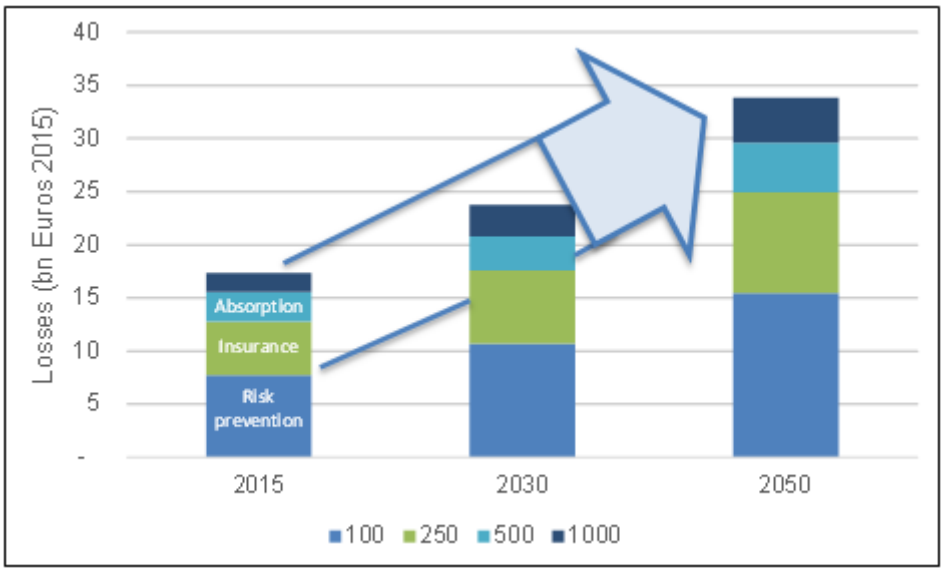
Results of applying the scorecard approach to EU 28 are shown below.

For more information see: *Mochizuki, J., Mechler, R., Hochrainer-Stigler, S., Schinko, T. (2016). Pan-European Assessment of Fiscal Consequence of Climate Extremes. Deliverable 5.2. EconAdapt Project.*

Option identification, sequencing and prioritisation

A mix of policy measures, carefully selected under a risk layering lens, is needed to fully implement the CRM conceptualization generally and in Austria: risk reduction measures for low layers of risk, potentially financed by a reformed disaster fund, risk financing, e.g. via insurance, for medium layers of risk, and national and internationally coordinated disaster relief in combination with alternative risk transfer mechanisms for high risk layers. Proactively engaging with all three layers of risk and fostering explicit budgeting for contingent disaster risk liabilities is needed to reduce climate stress on public budgets and to ensure fiscal stability in the future.

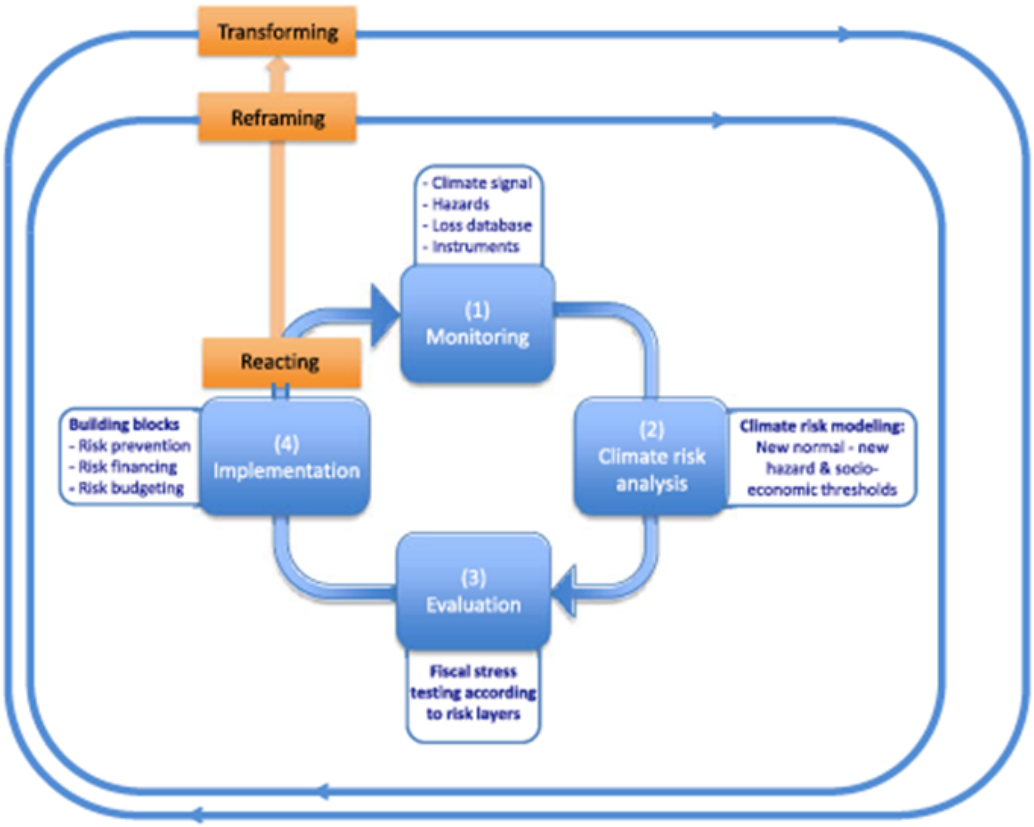
Instead of relying on a single risk management measure, a more comprehensive and integrative approach to climate risk management was employed. As there are different kinds of climate related risks, some occurring frequently with only minor impacts while others rather infrequently but devastating, it is recommendable that countries employ a varied portfolio of instruments, each carefully chosen to be applicable for a certain layer of climate related risk and iteratively adjusted over time with evidence. The figure presents a risk layering approach to deal with probabilistic projections of flood losses for different return periods in Austria. For low layers of climate risk – characterized by high probability of occurrence but comparably low impacts –, risk reduction is often the most effective and cost efficient way forward. Ex-ante preventive measures, such as constructing flood barriers, could be financed, e.g. through a disaster fund as in Austria.



Financing, programming and implementation

The figure presents a generic operationalizable climate risk management framework closely aligned to the policy-led framework. At its core, this framework consists of four steps and is embedded in a comprehensive participatory process, which at every stage requires thorough stakeholder involvement (e.g., DRM practitioners, the research community, affected communities, and representatives of ministries of finance, ministries of the interior and environmental ministries). Step (1) of the approach includes monitoring existing instruments, new scientific knowledge on climate change (e.g., emerging early trends and changes in variability that exacerbate existing risks or create new risks), natural hazard data (e.g., hydrological data), loss databases, and the climate signal. This is the basis for step (2): a model-based analysis of climate risks acknowledging the uncertainties associated with climate change in order to identify the *new*

normal, which is characterized by new hazard-based and socioeconomic thresholds. This is followed by step (3): testing and evaluating the new normal according to different layers of climate risk, and potentially by an update of the measures already in place or the implementation of new instruments framed around the building blocks risk prevention, risk financing, and risk budgeting: step (4).



Authors and References

The disaster risk management section of the ECONADAPT Toolbox was authored by Thomas Schinko, Reinhard Mechler and Junko Mochizuki (all IIASA).

The research has been jointly conducted with the Austrian funded project PACINAS (Public Costs of Adaptation). As key publication see: Schinko, T., Mechler, R. and S. Hochrainer-Stigler (2016). A methodological framework to operationalize climate risk management: managing sovereign climate-related extreme event risk in Austria. *Mitigation and Adaptation Strategies for Global Change* DOI 10.1007/s11027-016-9713-0. See also: Schinko, T., Mechler, R. (2016). Iterative climate risk management as early adaptation in Austria – Policy case study "Public adaptation at the federal level. "PACINAS Working Paper #01. February 2016. http://anpassung.ccca.at/pacinas.

Econadapt insights
Assessing flood risk management: Austria
Assessing flood risk management: Czech Republic
Assessing flood risk management: the Netherlands
Assessing flood risk management: United Kingdom
Fiscal consequences of extreme weather risks in Europe
Uncertainties and causes of uncertainties in climate change adaptation
Uncertainties and risk analysis in climate change adaption
Sourcing and using climate information for economic assessments of adaptation