PACINAS
Public Adaptation to Climate Change

Federal spending on climate change adaptation

factsheet 1 2 3 4 5 6

Aim of PACINAS

The project PACINAS (Public adaptation – Investigating the Austrian adaptation strategy) addresses the costs of adaptation to climate change for the public budget and the associated macroeconomic effects. Case studies on city, provincial and federal level made it possible to estimate the current adaptation deficit and the potential future costs of adaptation up to 2050. The project focuses on adaptation costs due to extreme events such as flooding, mass movements and heat stress as well as on activity fields of the Austrian adaptation strategy (BMLFUW, 2012) with high relevance for the public budget (agriculture, forestry, water, protection from natural hazards, catastrophe management, transport, cities and urban green). PACINAS was carried out by the Wegener Center of the University of Graz in cooperation with the Umweltbundesamt, AIT and IIASA.

International Context

At the Conference of Parties in Copenhagen in 2009, developed countries committed to the goal of mobilizing finance for mitigation and adaptation to address the needs of developing countries. The commitment to provide support was reaffirmed in the recent Paris Agreement (UNFCCC, 2015). To track progress towards these targets, a method was developed to report expenditures on climate mitigation and adaptation. This built on the Rio markers of the Organisation for Economic Co-operation and Development (OECD), with new guidance for climate change adaptation added in 2010 (OECD DAC, 2016). This method provides 'climate markers' for tracking finance by distinguishing between expenditure where adaptation is the "principal" (primary) objective, a "significant" objective, or does not target the objective.

Alongside these international initiatives, there is also an increasing mobilisation of European and national finance for mitigation and adaptation. The European Union has agreed that at least 20% of its budget for 2014-2020 – as much as €180 billion − should be spent on climate change-related action (European Council, 2013). To deliver this commitment, the Commission is increasing climate investment into the five European Structural and Investment Funds (ESIF) and mainstreaming into relevant policies. The European Commission also applies the OECD DAC markers for tracking progress against the 20% EU target and has published guidance for the application of the method to the ESIFs. This guidance applies a 100% climate marker when adaptation is the primary objective and a 40% marker when it is a significant objective (European Commission, 2016).

The climate tracking methodology and markers were used as the starting point to undertake a detailed analysis of adaptation expenditures in the national public budget of Austria.

Study outline and approach

The goal of the study was to estimate current federal spending on national level public climate change adaptation in Austria, i.e. adaptation that is funded and/or implemented by the federal government. To analyse the share of expenditure across the federal budget, the eight activity fields of the Austrian strategy for adaptation to climate change were used: agriculture, forestry, water resources and water management, protection from natural hazards, disaster risk management, health, ecosystems and biodiversity, and transportation infrastructure.

The federal spending on climate change adaptation (adaptation-relevant expenditures and adaptation costs) was estimated using two alternative methods:

1. **Top-down approach based on the federal government's budget plan and realization report 2016 (remitted funds in 2014):** This approach used federal expenditure reports, identifying areas that were adaptation-relevant and then focusing down and estimating the proportion of expenditures that were adaptation costs.
2. **Bottom-up approach based on the Austrian strategy for adaptation to climate change:** This approach assessed the costs of implementing the adaptation measures set out in the Austrian adaptation strategy, using expert interviews to estimate costs.

Federal expenditure on adaptation (top-down approach)

The first part of the project was to investigate the federal budgets to assess adaptation expenditures. Figure 1 presents the methodology used for the top-down approach.

The initial step was to identify all **adaptation-relevant expenditures**, irrespective of whether adaptation was the primary or a significant objective. To do this a series of steps were undertaken, starting with the government's budget plan and realization reports. These were first screened at the level of subdivisions (SD) to identify relevant areas of focus.

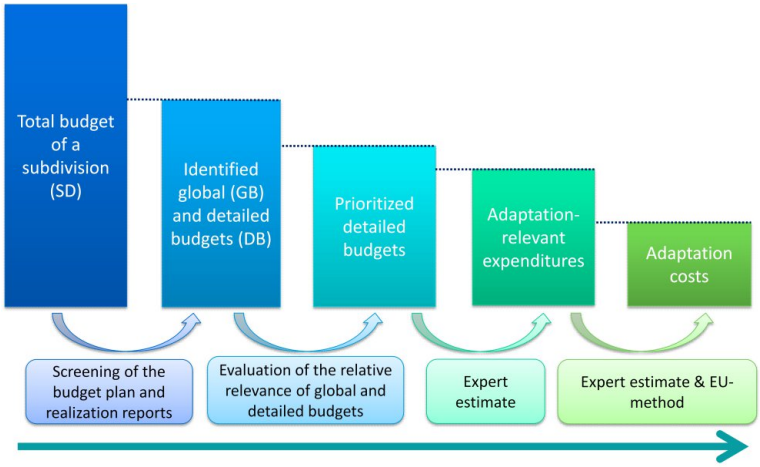

Figure 1: Methodology for the top-down approach

A subdivision (SD) consists of multiple global budgets (GB), which in turn consists of one or more detailed budgets (DB).

Source: Knittel et al. (2017)

Adaptation-relevant federal expenditures were identified for the subdivisions SD 42 (agriculture, forestry and water management), SD 43 (environment) and SD 41 (transport, innovation and technology). These subdivisions cover seven activity fields: agriculture, forestry, water resources and water management, protection from natural hazards, disaster risk management, ecosystems and biodiversity, and transportation infrastructure. SD 11 (internal affairs) and SD 24 (health and women) are potentially also relevant, but are primarily engaged in organizational and coordination tasks and as a result, personnel, rather than financial resources, dominate and costs could therefore not be estimated. These subdivisions correspond to the activity field "health" and to individual measures in the activity fields "protection from natural hazards" and "disaster risk management". Some additional adaptation-relevant expenditures are also likely in SD 44 (financial compensation), but were also not investigated in PACINAS due to time restrictions.

Next, using the subdivision's mission statement and the announced targets, the most relevant detailed budgets for adaptation were identified for closer analysis. For these areas, the analysis then collated adaptation-relevant expenditures. The final step was to allocate how much of the total relevant expenditures was directly adaptation relevant, and thus should be counted as **adaptation costs**. The analysis assigned a 100% climate marker when adaptation was the primary goal. For cases where adaptation was a significant goal, the % of the budget that was directly relevant for adaptation (1 – 99%) was estimated based on interviews ('expert estimate') with the relevant federal ministries, though in cases where it was not possible to assign an exact %, the EC climate marker (40%) was used (the 'EU method').

Table 1: Adaptation cost shares for different adaptation goals

	ILLUSTRATIVE EXAMPLES	Adaptation cost share
Adaptation as the primary goal	• Restoring natural flood areas, combined with land-use planning to reduce exposure to future floods • Education, training and public awareness related to climate change, its impacts and the role of adaptation • Sustainable climate-resilient agricultural and forestry practices	100% (using EU-method) *or* 100% (expert estimate)
Adaptation as a significant goal	• Changing to water-saving technologies to reduce the vulnerability to water shortages • Considering climate variability and climate change impacts in the planning of transport infrastructure • Improvement of water quality and quantity for existing water resources including climate variability and climate change • Health programme to adapt to heat stress and climate change related diseases	40% (using EU-method) *or* 1-99% (expert estimate)
Adaptation as the primary or significant goal*	• Forecasting, early warning and monitoring systems • Flood protection measures • Increase diversity of varieties in agriculture to enhance climate resilience	100% or 40% (using EU-method)

* For certain projects the EU method allows for both markers depending on the extent to which climate change is considered as the main the driver, i.e. a flood protection measure becomes necessary due to higher climate variability but also due to demographic changes; in the latter case the EU method would assign the 40% climate marker.

The analysis found that in 2014, annual adaptation-relevant expenditures in SD 41, SD 42 and SD 43 amounted to € 2.1 billion, i.e. the total amount of expenditure for which climate change adaptation was identified as a primary or significant goal. The relevant annual adaptation costs within this total expenditure were estimated at € 488 million. Figure 2 shows how these costs are distributed across activity fields and 'other measures'. 'Other measures' include expenditures that foster adaptation, but are not stated in the Austrian strategy for adaptation to climate change, such as flood protection measures.

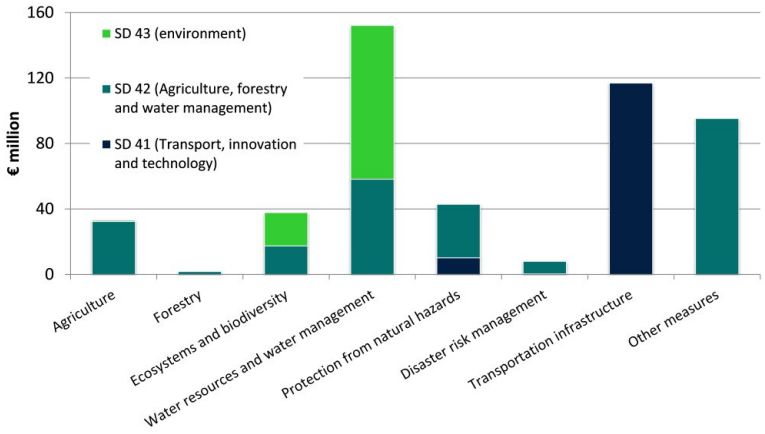

Figure 2: Annual adaptation costs in SD 41 (transport, innovation and technology), SD 42 (agriculture, forestry and water management) and SD 43 (environment) split by activity fields in € million (2014), top-down approach.

Source: Knittel et al. (2017).

Cost estimates of the Austrian strategy for adaptation to climate change for the federal budget (bottom-up approach)

The aim of the bottom-up approach was to estimate and aggregate the current costs of adaptation measures that are listed in the Austrian strategy for adaptation to climate change, focusing on those funded by the federal government (Figure 3).

Expert interviews with federal ministry staff were used to identify adaptation costs for each of the 67 measures, and to map these measures to the expenditures in the current budget. Costs were attributed by assigning different numbers of a scale ranging from 0 to larger than € 60 million per measure. Expert review was used to revise the estimates, with a final group of experts and authors meeting to jointly agree assigned costs.

Using this approach, the average annual adaptation costs currently amount to € 385 million (with a range from € 286 million to € 485 million). It is important to note that several measures are not yet fully implemented, which means that increasing effort in the future will lead to higher costs.

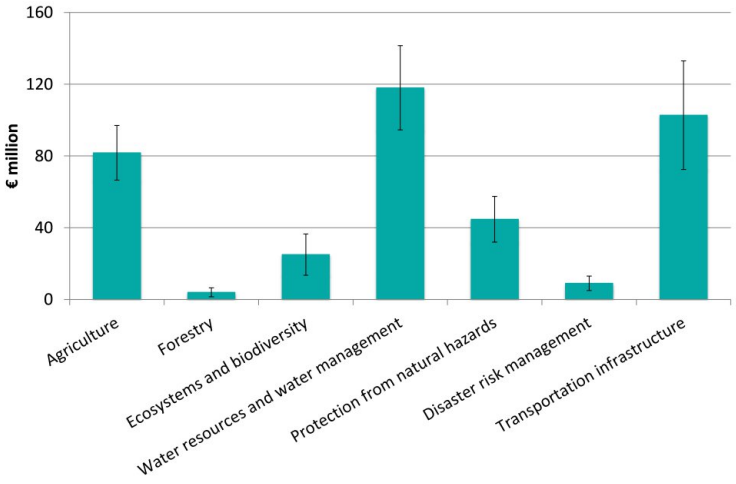

Figure 3: Annual adaptation costs for activity fields in € million (current), bottom-up approach

Bandwidth shows minimal und maximal values.
Source: Expert interviews; Knittel et al. (2017).

Comparing the cost estimates

Table 2 summarizes the differences in the coverage of the top-down and bottom-up approaches. It is stressed that these costs only include federal level spending on public adaptation: they do not include expenditures at the state or municipal level, or in the private sector, and thus represent a sub-total of total adaptation costs. The results are presented relative to other government spending in Figure 4, including a comparison with the Austrian disaster fund payments: a national reserve fund, which provides annually investment in disaster risk management as well as payments to compensate for major natural disasters such as floods.

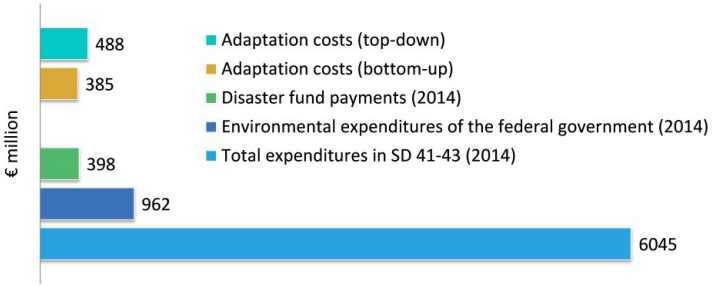

Figure 4: Annual Federal adaptation costs compared to other public expenditures

Source: Knittel et al. (2017).

Table 2: Differences between top-down and bottom-up estimates

	Top-down approach	Bottom-up approach
Coverage of adaptation measures of the Austrian strategy for adaptation to climate change	partial *	complete
Further adaptation-relevant spending**	yes	no
Annual adaptation-relevant expenditures (today)	€ 2.1 billion	
Annual adaptation costs (current)	€ 488 million	€ 385 million

* 67 out of 132 adaptation measures in the activity fields agriculture, forestry, water resources and water management, protection from natural hazards, disaster risk management, ecosystems and biodiversity and transportation infrastructure were analysed in detail.

** Current expenditures cover additional measures that foster adaptation, but are not stated in the Austrian strategy for adaptation to climate change, such as flood protection measures.

Future trajectories of federal spending on public adaptation

Initial work in PACINAS has indicated that future adaptation needs are likely to rise rapidly in the next three decades due to climate change, with a possible 2 to 3 fold increase in adaptation costs. This will have important implications on the federal budget and the public finances (find more information on the macroeconomic effects of public adaptation to climate change in Factsheet #5). There is expected to be higher expenditures on reactive adaptation to extreme events (forecasting, early warning and monitoring) and also increasing expenditures to scale-up anticipatory (pro-active) adaptation to address new and future risks. This is likely to increase pressure on the federal budget.

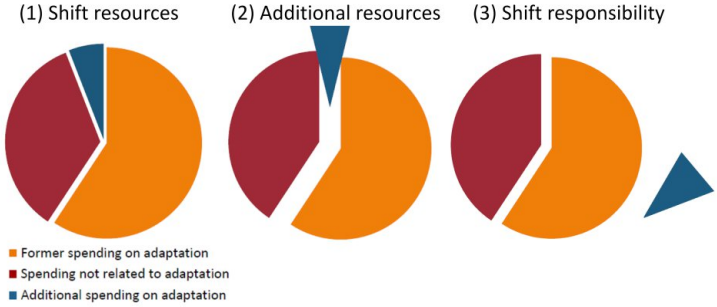

Figure 5: Options for Federal Ministries to meet additional public adaptation expenditures

Source: Expert interviews; Knittel et al. (2017).

Based on interviews with the relevant ministries, Figure 5 presents three alternative ways that federal ministries (with increasing adaptation needs) could cope with the additional expenditures: they could shift resources within the department; they could seek additional resources from outside; or they could shift responsibility to other public authorities or private actors.

Key findings

The top-down analysis of the federal budget finds that the estimated annual adaptation-relevant expenditures amount to at least € 2.1 billion currently. The share that can be explicitly attributed as adaptation is estimated at € 488 million. It is stressed that this only considers federal costs and is therefore a sub-total of all relevant expenditures: it excludes state and municipal expenditures and all costs in the private and household sectors.

These adaptation costs are 8% of the investigated budget positions (the three SDs) and 0.65% of the total federal budget in 2014. When the annual costs of the Austrian disaster fund are added (some expenditures thereof are already covered in the top-down approach), the adaptation and damage costs rise to € 886 million, which is 1.2% of the total federal budget.

The alternative bottom-up approach using expert elicitation has estimated that the current cost of the Austrian strategy for adaptation – for the areas relevant for the federal government - is € 358 million annually.

The difference between the top-down and bottom-up approaches results from the varying coverage: while the top-down approach covers all adaptation activities that are currently implemented by the federal budget, the bottom-up approach only accounts for those activities that are part of the Austrian strategy for adaptation to climate change.

Finally, initial work in PACINAS has indicated that future adaptation expenditures are likely to rise rapidly in the next two decades due to climate change. This will have important implications on the federal budget and public finances. It would be useful to start developing more detailed forward projections on likely adaptation expenditures under climate change and to consider the implications on the federal budget.

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