



# Mainstreaming climate adaptation: taking stock about “what works” from empirical research worldwide

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Received: 9 May 2017 / Accepted: 16 November 2017 / Published online: 29 November 2017  
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## Abstract

Adaptation to a changing climate is unavoidable. Mainstreaming climate adaptation objectives into existing policies, as opposed to developing dedicated adaptation policy, is widely advocated for public action. However, knowledge on what makes mainstreaming effective is scarce and fragmented. Against this background, this paper takes stock of peer-reviewed empirical analyses of climate adaptation mainstreaming, in order to assess current achievements and identify the critical factors that render mainstreaming effective. The results show that although in most cases adaptation policy outputs are identified, only in a minority of cases this translates into policy outcomes. This “implementation gap” is most strongly seen in developing countries. However, when it comes to the effectiveness of outcomes, we found no difference across countries. We conclude that more explicit definitions and unified frameworks for adaptation mainstreaming research are required to allow for future research syntheses and well-informed policy recommendations.

**Keywords** Climate change adaptation · Mainstreaming · Climate policy integration · Systematic literature review · State-of-the-art

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Editor: Robbert Biesbroek.

**Electronic supplementary material** The online version of this article (<https://doi.org/10.1007/s10113-017-1259-5>) contains supplementary material, which is available to authorized users.

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## Introduction

Despite agreements made in December 2015 during the COP21 in Paris to reduce CO<sub>2</sub> emissions, intensified adaptation efforts are needed to deal with the impacts of a changing climate. As a consequence, adaptation to climate change is considered necessary by many policy-makers and scholars, particularly in policy sectors such as critical infrastructure, agriculture, public health and urban planning (Wamsler 2014; Albers et al. 2015; Wamsler and Pauleit 2016). In order to do so, policy-makers and planners basically have two options, which are mutually supportive: mainstreaming (integrating) climate change adaptation objectives into existing sectoral policies and practices, or the “dedicated approach”: developing stand-alone adaptation policies and programmes (Wamsler 2014; Uittenbroek 2014; Dewulf et al. 2015).

Literature suggests that mainstreaming climate adaptation objectives into existing policies and practices has several advantages for achieving sustainable change. First, mainstreaming can create synergy effects; for instance, greening urban spaces not only reduces the risk of pluvial flooding (which is expected to intensify as a consequence of climate change) but also contributes to spatial quality, biodiversity and climate change mitigation (Runhaar et al. 2012). Second, mainstreaming adaptation objectives in sectoral plans and policies may be more resource-

efficient from an administrative and budgetary point of view (Kok and De Coninck 2007). For instance, “windows of opportunity” can be used for adaptation mainstreaming, such as the construction of new roads or the restructuring of city centres. Third, mainstreaming climate adaptation in existing policies or organisational structures may result in more effective adaptation measures, e.g. if climate risks are included in urban (re)design (Wamsler 2014). Finally, such mainstreaming may promote innovation in sectoral policies and plans (Adelle and Russel 2013). However, mainstreaming as a policy strategy has also been critiqued, particularly because of the risks of diminishing issue visibility and attention (Persson et al. 2016) and policy “dilution” (Liberatore 1997), when compared with a dedicated approach that relies on highly specialised institutional responsibilities, dedicated funds and a clear legal framework.

Climate adaptation mainstreaming requires targeted strategies and action, beyond mere aspirations, to be effective and to overcome potential barriers (e.g. Uittenbroek 2016). While a recent review of the National Communications submitted under the UNFCCC reported a higher number of adaptation initiatives and mainstreaming in almost all policy sectors in 2014 compared with 2010 (Lesnikowski et al. 2016), there are considerable differences in progress across countries, sectors and policy levels (cf. Reckien et al. 2014; Dewulf et al. 2015; Wamsler 2015). Meta-analyses that have systematically assessed mainstreaming achievements, drivers, barriers and associated theory development are largely lacking (Jordan and Lenschow 2008; Runhaar et al. 2014).

Against this background, this paper takes stock of peer-reviewed empirical analyses of climate adaptation mainstreaming in order to (a) identify what mainstreaming practices have so far achieved and through what strategies; (b) identify what differences can be discerned between policy sectors and countries; and (c) identify the critical factors that render mainstreaming effective. A systematic literature review of existing empirical studies is carried out to assess the growing literature on adaptation mainstreaming.

## Analytical framework

In this section, we define key concepts and present the approach taken for our systematic literature review. The framework is based on literature on climate adaptation mainstreaming and environmental policy integration (EPI; see e.g. Lafferty and Hovden 2003; Jordan and Lenschow 2008; Persson et al. 2016), since mainstreaming can be seen as a specific manifestation of the EPI (Adelle and Russel 2013; Massey and Huitema 2013; Runhaar et al. 2014).

Climate adaptation mainstreaming has no agreed-upon definition (Brouwer et al. 2013). In the literature as well as in policy practice, different meanings, assumptions and objectives are associated with climate adaptation mainstreaming

(Adelle and Russel 2013). The IPCC AR5 WGII report uses the term adaptation mainstreaming for denoting increasing adaptation planning and implementation within government, regardless of whether through a sectoral integration approach or a dedicated approach (IPCC 2014, pp. 871–888). Massey and Huitema (2013) consider mainstreaming “(...) a mode or a means of implementing adaptation policies and activities” (ibid, p. 345). In other words, climate adaptation policy forms a new policy field, and mainstreaming is considered a means to *implement* that new policy at different levels and in different sectors. Authors such as Uittenbroek et al. (2014) and Dewulf et al. (2015), however, explicitly distinguish mainstreaming from dedicated adaptation policy, while Wamsler and Pauleit (2016) see dedicated adaptation policies as an integral element of adaptation mainstreaming. Different authors thus mean different things with mainstreaming.

Rather than limiting ourselves to a particular definition or perspective, in our review, we explicitly examine how in the literature mainstreaming is defined (and distinguished from a dedicated approach) and thus “measured”. In this way, we aim to contribute to more transparency about the concept and facilitating consistency of its use. Accordingly, we analyse differences in the pursued mainstreaming strategies by linking them to the mainstreaming strategies identified by Wamsler and Pauleit (2016):

- *Programmatic mainstreaming*: the modification of the implementing body’s sector work by integrating aspects related to adaptation into on-the-ground operations, projects or programmes;
- *Managerial mainstreaming*: the modification of managerial and working structures, including internal formal and informal norms and job descriptions, the configuration of sections or departments, as well as personnel and financial assets, to better address and institutionalise aspects related to adaptation;
- *Intra- and inter-organisational mainstreaming*: the promotion of collaboration and networking with other departments, individual sections or stakeholders (i.e. other governmental and non-governmental organisations, educational and research bodies and the general public) to generate shared understandings and knowledge, develop competence and steer collective issues of adaptation;
- *Regulatory mainstreaming*: the modification of formal and informal planning procedures, including planning strategies and frameworks, regulations, policies and legislation, and related instruments that lead to the integration of adaptation;
- *Directed mainstreaming*: higher level support to redirect the focus to aspects related to mainstreaming adaptation by e.g. providing topic-specific funding, promoting new projects, supporting staff education or directing responsibilities.

The authors mention a sixth strategy that refers to the dedicated approach to climate adaptation (labelled by them as “add-on mainstreaming”) and that is thus excluded from our framework.

There is no widely accepted agreement about what mainstreaming is to achieve, i.e. when it is effective, and how this could be measured, either (cf. Brouwer et al. 2013). This includes questions about the relative weight and priority adaptation objectives are given in comparison to sectoral objectives (Adelle and Russel 2013; see also Lafferty and Hovden 2003). Stated differently: to what extent should climate risk be reduced, i.e. what are acceptable risk levels? (Runhaar et al. 2016). These are problematic questions because they cannot be answered objectively. In this paper we define effectiveness of adaptation mainstreaming (i.e. the dependent variable) in terms of *policy outputs* as well as *policy outcomes* (cf. Persson 2007; Jordan and Lenschow 2008). Policy outputs here include the adoption of formal adaptation goals in sectoral policies (e.g. the goal to anticipate and reduce risk of intensified heat stress in spatial plans), procedural instruments (e.g. formal reporting requirements, cooperation), and changes in institutional structures (e.g. creation of new inter-sectoral working groups). Policy outcomes are a step further and refer to development and implementation of concrete local and national adaptation measures (including heatwave plans, early warning systems, continuity plans, embankments and other physical measures), as a response to policy outputs. Evaluating these outputs and outcomes is challenging (see e.g. Dupuis and Biesbroek 2013) although nominal measures can be used as a proxy (cf. Lesnikowski et al. 2016). In addition, our analytical framework takes a step further, including the assessment of the effectiveness of policy outputs, based on how they were described and interpreted by the authors of the articles we have reviewed (see Annex 2).

Explaining the extent to which climate adaptation mainstreaming is successful in terms of producing outputs and outcomes that can be considered as effective requires insight into mainstreaming drivers and barriers. Previous studies have identified these factors from various perspectives. The following categories are typically identified:

- *Political factors*: interests that align or conflict with adaptation goals, level of political commitment to adaptation, level of public awareness of or support for adaptation, policy (in)consistency across policy levels, flexibility of legislative and policy context, and level of political stability (e.g. Stead and Meijers 2009; Runhaar et al. 2012; Dupon and Oberthür 2012; Uittenbroek et al. 2014; Wamsler and Pauleit 2016);
- *Organisational factors*: factors within particular organisations as well as inter-organisational factors. Examples include formal requirements or incentives to develop

sectoral adaptation plans, presence or absence of a supportive regulative framework (i.e. supportive legislation, regulation), (expanded) mandates and statutes, (a lack of) coordination and cooperation between government departments (within or across policy sectors), coordination among policy levels, cooperation with private actors, clarity about responsibilities for adaptation (problem ownership), level of institutional fragmentation, organisational structures, routines and practices, and administrative leadership (e.g. Persson 2007; Stead and Meijers 2009; IPCC 2014; Wamsler 2014; Uittenbroek 2016);

- *Cognitive factors*: level of awareness, level of uncertainty, sense of urgency, and degree of social learning (Persson 2007; Runhaar et al. 2012; Biesbroek et al. 2013; Wamsler and Pauleit 2016);
- *Resources*: available staff, financial resources, subsidies from higher levels of government, information and guidance, and availability of and access to knowledge and expertise (e.g. Stead and Meijers 2009; Runhaar et al. 2012; Ekstrom and Moser 2014; Uittenbroek et al. 2014; Wamsler and Pauleit 2016);
- *Characteristics of the adaptation problem at issue*: the way in which the adaptation objective is framed and linked to sectoral objectives, level of detail in which adaptation objectives are defined and compatibility of time scales (Persson 2007; Runhaar et al. 2012; Biesbroek et al. 2013; Ekstrom and Moser 2014);
- *Timing*: waiting and sustaining momentum for climate adaptation, focussing events, and windows of opportunity such as urban renewal (e.g. Runhaar et al. 2012; Wamsler 2015; Uittenbroek 2016).

## Methods

Methods used for applying our analytical framework are described in detail in Annexes 1 and 2. In brief, a systematic, in-depth literature review was conducted of peer-reviewed papers ( $n = 87$ ) that reported on empirical analysis of climate adaptation mainstreaming practices. Figure 1 visualises the stepwise approach taken for the selection of papers. The papers, selected from the Scopus database (end 2016), reported on 140 cases of mainstreaming practices. A “case” represents here a mainstreaming practice in a single country (at national, regional or local level; no cases referred to mainstreaming in a transboundary or supranational context). In various papers that reported on international comparisons of mainstreaming practices or multiple cases, it was not possible to differentiate distinctive mainstreaming practices in terms of our analytical framework to a specific country because the evidence was presented at a too abstract level. Therefore, not all 140 cases are included in all analyses. The majority of cases are



Fig. 1 Selection procedure for identifying papers reporting on empirical analyses of climate adaptation mainstreaming

European ( $n = 71$ , as opposed to 51 cases in non-European developing countries and 18 in non-European developed countries). Europe is thus over-represented in adaptation mainstreaming research. For the analyses we used qualitative coding and descriptive statistics. Annex 2 describes in detail how we have operationalised our analytical framework through a coding scheme.

## Reviewing the evidence: what works?

Our results reveal that there has been a rapidly growing interest in studying adaptation mainstreaming over the past decade (see Annex 3), which also might indicate an increase in actual cases of mainstreaming practices.

## Mainstreaming definitions and interpretations

Regarding the different definitions and interpretations of mainstreaming used, we find that 70% of the reviewed papers provide an explicit definition of adaptation mainstreaming (see Annex 4 for an overview of definitions). However, in only 40% of the papers an explicit framework for analysing or operationalising mainstreaming is applied. Some papers have adopted the use of key criteria for integrated policies proposed by Mickwitz et al. (2009). In other papers, mainstreaming is analysed in terms of different mainstreaming strategies similar to those proposed by Wamsler and Pauleit (2016). The fact that 60% of the papers did not employ an explicit framework for analysing or operationalising mainstreaming suggests that there is ample scope for more specific definitions and explicit operationalisations as well as more unified operationalisation in order to facilitate comparative analysis, policy recommendations and learning.

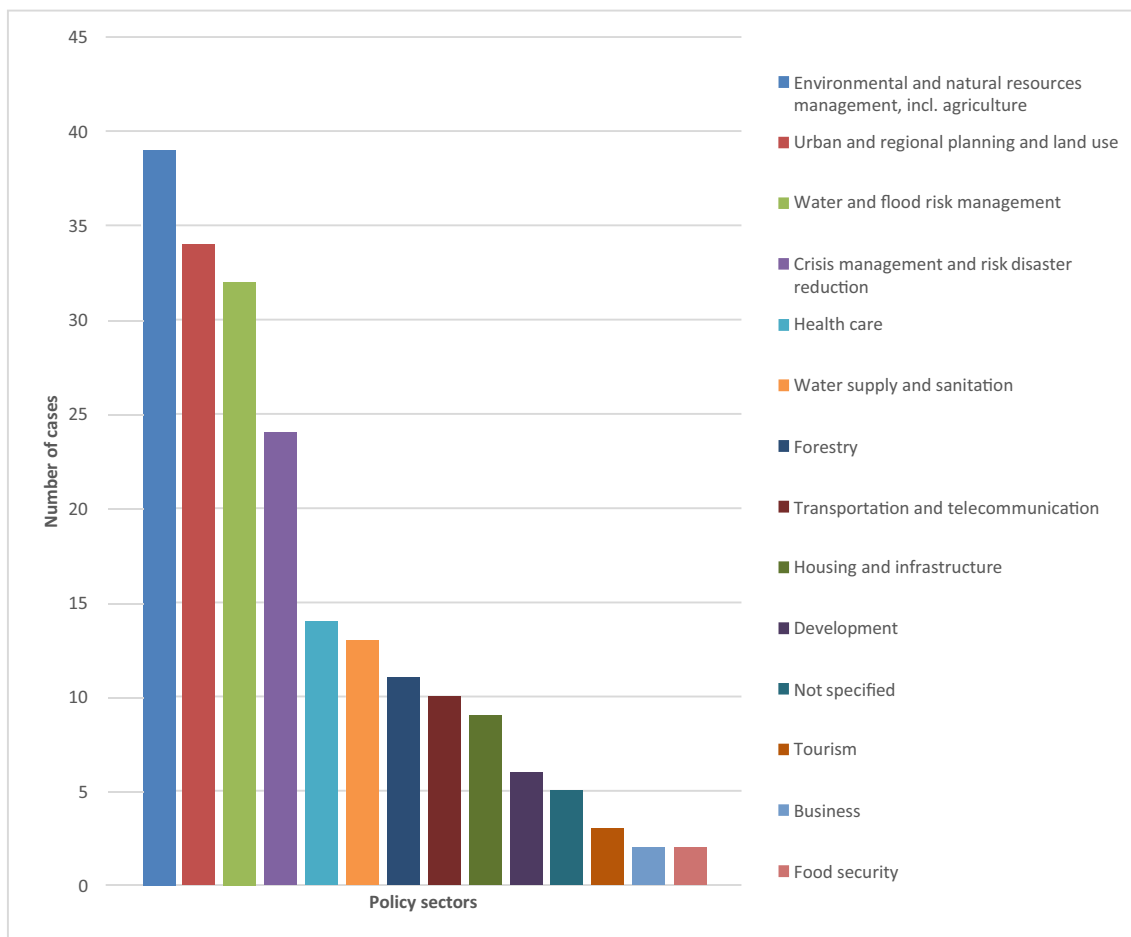
In just more than half of the papers, mainstreaming is explicitly distinguished from a dedicated adaptation approach. Twelve papers that made such explicit distinction (14% of all papers) report on experiences with both approaches to climate adaptation. For instance, Stiller and Meijerink (2016) and Wamsler (2015) describe the employment of climate adaptation officers via climate-related funding (dedicated approach) to facilitate the integration of climate adaptation as a central theme in sector development planning and work streams of sub-regional, local administrations (mainstreaming) in Germany. Another example of such a mixed, or nested, approach are national or municipal adaptation plans (representing a dedicated approach) that include provisions to mainstream climate adaptation objectives into sectoral policies and plans, as outlined by Biesbroek et al. (2010), Saito (2013) and Wamsler (2015). Again, these results show the importance of more precise and consistent terminology to facilitate comparative analysis, policy recommendations and learning.

## What is mainstreamed into what?

Looking at the policy level of mainstreaming practices studied, our results show that adaptation mainstreaming has mainly taken place at national government level (39%) and local government level (35%). The national level thus gets the most attention, despite the fact that municipalities or cities are increasingly seen as the key stakeholders in adaptation planning (Bulkeley and Betsill 2013). In terms of substantive focus, in the reviewed cases the climate risks in focus are flooding, changing temperatures, and extreme heat and cold. However, there is quite an even spread among these three and other categories (e.g. extreme weather events in general, drought and water scarcity, sea level rise and erosion), meaning that there is no clear pattern. Finally, in terms of policy sectors in which adaptation objectives are mainstreamed, the most dominant ones are environmental and natural resources management (including agriculture, coastal zone management, environmental management, nature and biodiversity conservation and green infrastructure), followed by urban/regional (land use) planning, water/flood risk management, and crisis management and risk reduction planning (Fig. 2). In contrast, there are fewer reports of climate adaptation mainstreaming in critical infrastructures such as water supply and sanitation, housing, transportation and telecommunications, despite their widely-recognised importance (Runhaar et al. 2016; IPCC 2014). Surprisingly, housing, transport and telecommunications are relatively less subject to mainstreaming than other policy sectors. Yet, with their typically long planning and investment horizons (meaning that climate proofing is particularly critical), housing, transport and telecommunications are sectors that merit more attention for adaptation mainstreaming.

## Mainstreaming strategies

During the coding of the papers it appeared that the strategy of “programmatically mainstreaming” posed problems because it was difficult to distinguish this strategy from its achievements in terms of policy outputs and outcomes. Therefore it was ignored in the analysis. Considering the remaining strategies, our results show that regulatory mainstreaming (which ranges from including climate adaptation as an objective in sectoral policy documents to changes in strategic planning and legislative tools), is the most frequently reported strategy (86% of cases). The relatively lower frequency of managerial (73%) and intra- and inter-organisational (54%) mainstreaming suggests that more practical approaches are still lacking, i.e. how to achieve a stated policy aspiration or requirement in practice. In addition, directed mainstreaming (that is, higher level support to redirect the focus to aspects related to mainstreaming adaptation by e.g., providing topic-specific funding, promoting new projects, supporting staff education, or directing responsibilities) is least reported (37%). This suggests that mainstreaming is often a rather informal activity that is pushed



**Fig. 2** Policy sectors subject to mainstreaming research. Note: the number of cases is larger than the number of mainstreaming practices ( $n = 140$ ), because a case may involve mainstreaming into multiple policy sectors

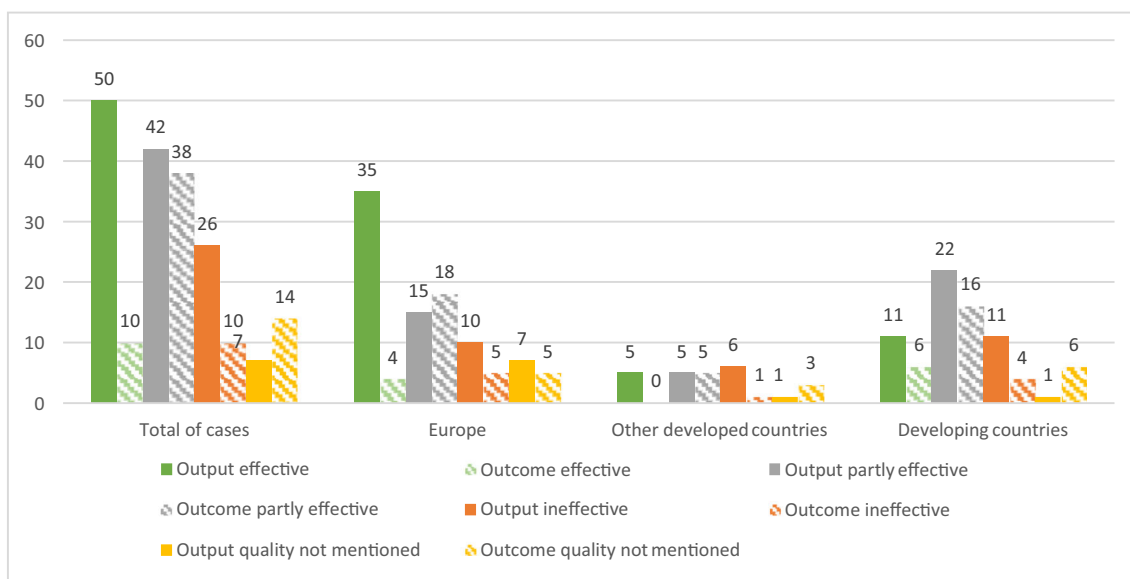
by local needs and bottom-up processes rather than pushed by higher level authorities (cf. Wamsler 2015). Looking at the adoption of mainstreaming strategies over time, they follow a similar curve (peaking in 2010, but likely due to the time period selected for inclusion of papers) which suggests that relative preferences have not changed over time.

### Mainstreaming effectiveness—outputs and outcomes

In most of the cases (98%), it was reported that mainstreaming had led to policy outputs, whereas policy outcomes were reported in only half of the cases (51%). Scoring the outputs and outcomes in terms of whether they were seen by the authors to represent effective, partly effective or ineffective mainstreaming, the results clearly show that mainstreaming has been more successful in producing effective policy outputs than effective outcomes (Fig. 3). This means that the literature finds adaptation mainstreaming more effectively addressed in sector policy documents and plans, than in concrete projects and activities. In other words, there seems to be an implementation gap in translating mainstreamed sectoral policies into concrete adaptation on the ground.

Further, qualitative assessment of the identified outputs and outcomes suggests that effective outputs were mainly reported when several mainstreaming strategies were employed simultaneously and when higher-level changes were operationalised at local level, for instance, into the set-up of functional, supportive municipal structures, enshrining climate adaptation in local programming, enhanced coordination and collaboration of stakeholders, or the renegotiation of responsibilities (Stiller and Meijerink 2016). Unfortunately, the number of papers in which single strategies were reported was too small for an analysis of relative effectiveness of mainstreaming strategies.

Zooming in on the most prominent policy sectors ( $n > 20$ ) we found that not only the number of strategies employed but also their composition are decisive factors for effective mainstreaming (measured in terms of policy outputs), irrespective of the sector (see Annex 5). The majority of success cases across all four sectors exhibits a combination of managerial, intra- and inter-organisational, and regulatory mainstreaming (90% in environmental and natural resources management, 82% in crisis management, 74% in urban planning, and 65% in water and flood risk management). Directed mainstreaming would seem a powerful strategy to promote



**Fig. 3** Comparison of mainstreaming outputs ( $n = 125$ ) and outcomes ( $n = 72$ ) across regions. Note: numbers for regions to not sum up to the exact total because papers can report on multiple regions

climate adaptation mainstreaming, but is less prevalent in cases with effective policy outputs, which can be explained by our finding that it is the least observed strategy. Possibly absence of directed mainstreaming can be compensated by employing multiple other strategies.

A comparison of whether mainstreaming has been effective or partly effective at the policy output level across our three country groupings shows that Europe has the largest share in effective outputs (70%, compared with 52% of all outputs observations) (Fig. 3). Developing countries show the largest share of partly effective mainstreaming outputs, which suggests that robust mainstreaming strategies are yet to mature and that developing countries have comparatively greater difficulties to sustain adaptation practices.

The situation is quite different, and the picture more unified, when we compare policy outcomes across country groups. In fact, effective outcomes are low in numbers across all country groups. The relatively high frequency of partly effective outcomes across all country groups (developed or developing) suggests that crossing the threshold between pilot projects and institutionalisation of practices is difficult, no matter what region or context.

### Mainstreaming drivers and barriers

What explains these mainstreaming achievements and ‘what works’? Our literature review looked at drivers and barriers mentioned in the analysed cases that report on both outputs and outcomes, in a similar way as Biesbroek et al. (2013) did for adaptation in general. Our analytical framework (see “Analytical framework” section) includes 32 factors that can

promote or inhibit mainstreaming, grouped in six categories (see “Analytical framework” section).

Our results show that the most often mentioned drivers are, in order: political commitment; cooperation with private actors; the presence of policy entrepreneurs; focusing events; and lastly subsidies from higher levels of government which is on par with framing and linking to sectoral objectives (see Table 1). While the importance of political commitment and external cooperation is thus recognised, it is not reflected in practice (with directed and inter-organisational mainstreaming being the least reported strategies). While the mentioned drivers are also found in much literature on general EPI, the role of (a) cooperation with private actors and (b) focusing events appears to be more crucial in this specific context of climate adaptation mainstreaming. The importance of the latter stems from the perceived urgency and enhanced public and stakeholder support for adaptation action after climate events (“focusing event”), although we expect this so-called window of opportunity to be generally very short-lived.

The most frequently reported barriers are lack of: financial resources, information, guidance, coordination and cooperation between departments, staff resources and access to adaptation knowledge and expertise as well as conflicting interests. Note that some factors (e.g. coordination/cooperation between government departments, and information and guidance) are almost as often reported to be drivers as barriers, which suggests they are particularly important to get right. The importance of good coordination and cooperation between government departments contrasts with the identified mainstreaming strategies, in that intra-organisational mainstreaming was not reported as a common strategy while forming an integrative part of success cases (see above). Also for the cases scored as

**Table 1** Frequency of drivers and barriers reported in cases with outputs and outcomes

Category	Factors	# of reports as enabling factor	# of reports as inhibiting factor
Timing	Windows of opportunity	7	0
	Focussing events	22	1
	Waiting and sustaining momentum for adaptation	4	0
Characterisation of problem at hand	Narrowly defined adaptation objectives	0	1
	Timescales (conflicting or compatible)	1	4
	Framing and linking to sectoral objectives	21	5
Resources	Information or guidance	14	18
	Availability of and access to knowledge and expertise	11	16
	Subsidies from higher levels of government	21	12
	Financial resources	5	27
Cognitive factors	Staff	4	16
	Learning	19	6
	Sense of urgency	6	7
	Uncertainty	1	12
Organisational factors	Awareness	15	8
	Leadership/policy entrepreneurs	23	1
	Organisational structures, routines, and practices	3	14
	Institutional fragmentation	1	8
	Clarity about responsibilities for adaptation	4	12
	Cooperation with private actors	25	11
	Coordination among policy levels	3	12
	Coordination/cooperation between departments	17	18
	Expanded mandates or statutes	5	11
	Supportive regulative framework	8	8
Political factors	Formal requirements to develop adaptation plans	15	6
	Political (in)stability, political patronage, or short-termism	2	1
	(In)flexible legislative or policy contexts	0	2
	Policy (in)consistency across levels	2	3
	Public awareness or support	6	2
	Political commitment	31	12
	Conflicting interests	0	16

Note: drivers and barriers that are explicitly related to policy outputs and policy outcomes

yielding effective policy outputs ( $n = 50$ ) a pattern emerges, which is similar to this picture. In sum, while the identified drivers and barriers match the key attributes of the different mainstreaming strategies (see “Analytical framework” section), and in turn support the identified importance of employing multiple strategies for effective outputs (see above), current practice is lagging behind.

### Learning from mainstreaming failure

An analysis of “what works” is incomplete without learning from the cases where mainstreaming has failed. Therefore, we

take a closer look at prominent barriers reported in those cases where outputs did not translate into implementation of adaptation measures. These may provide explanations why ensuring outcomes from mainstreaming strategies are experienced as a challenge, which applies across all country groups. We decided against further comparing these cases with the ones that reported on ineffective outcomes, since the sample was too small to be conclusive.

As could be expected from their relative importance in the successful cases, the most frequently mentioned barriers for cases where outputs did not translate into implementation are: a lack of coordination and cooperation between departments



within and across policy domains, closely followed by a lack of financial resources (see Annex 6). These further support above-mentioned explanations for directed and inter-organisational mainstreaming being the least reported strategies and underline their importance for both outputs and outcomes. Additional factors scoring high as barriers are: the absence of clear mandates, conflicting political interests, and organisational structures, routines, and practices. Overall, most of the dominant barriers to implementation are found in organisational factors (linked to managerial and inter-organisational mainstreaming) and, to a lesser extent, in the resources and cognitive categories. In contrast, factors that we classified within the timing and political categories (except for conflicting interests) seem to play a subordinate role as these were least often mentioned. Furthermore, access to expertise and information and guidance are not among the prominent barriers. This suggests that the implementation gap is not primarily an issue of lack of knowledge or financial resources, but first of all needs to be addressed by reviewing inner-organisational structures, practices and ways of collaboration both internally and externally. In other words, practitioners do seem to have the knowledge about potential adaptation measures but are experiencing trouble putting them into practice within existing structures.

## Discussion and conclusions: advancing adaptation mainstreaming

Because progress in climate adaptation is commonly considered to be slow, past research has strongly focused on identifying adaptation barriers. However, this “barrier-focused” type of research has been increasingly criticised since it oversimplifies adaptation planning and decision-making processes (Biesbroek et al. 2015). In view of the need for “opening up the black box of adaptation decision-making” (Biesbroek et al. 2015), our meta-analysis offers a more nuanced study by analysing mainstreaming as a specific approach to adaptation planning, including distinctive strategies as well as achievements in terms of policy outputs and outcomes.

Our results show, first, that the analysis and operationalisation of mainstreaming is diverse, often limited and inconsistent. This limits learning from others and with that, effective mainstreaming. Hence, we call for more explicit and systematic conceptualisation of adaptation mainstreaming in practice and research. We suggest to measure climate mainstreaming in terms of policy outputs and outcomes, in other words, the extent of “climate proofing” of a policy sector, because this is ultimately the aim. The often-employed definition (or better: description) of mainstreaming in terms of the incorporation of climate adaptation objectives into sectoral policies is too vague and does not make clear what the focus is: on the process of mainstreaming or on its results. In order to learn from mainstreaming practices it is

important to identify strategies that have been employed as well as barriers and enablers. For that purpose our study offers a replicable framework for systematically assessing and supporting future progress in adaptation mainstreaming.

Second, our results show that the identified implementation gap of adaptation mainstreaming relates mainly to a lack of a sustained political commitment for adaptation mainstreaming from higher levels, and the lack of effective cooperation and coordination between key stakeholders. A focusing event may temporarily increase momentum, but it fails to secure institutionalised routines and practices for mainstreaming. We found that so-called directed mainstreaming, that is higher-level support for mainstreaming and/or higher-level mainstreaming requirements, are among the least reported strategies for promoting mainstreaming, rendering mainstreaming a rather voluntary activity that is faced with numerous implementation barriers. Based on our findings we expect that more strict requirements for mainstreaming, set at the national or international level, will provide an important impetus for policy-makers and planners in non-climate policy sectors and at lower tiers of government to climate proof the sectors they bear responsibility for. These requirements should be combined with the provision of sufficient resources in order to overcome implementation barriers. A more active involvement of civil society and private sector could help maintain climate adaptation on the policy agenda and increase political stakes.

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