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Adaptation planning and the use of climate change projections in Local Government in England and Germany

**Susanne Lorenz, Suraje Dessai, Piers Forster,
Jouni Paavola**

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1. Understanding green growth and climate-compatible development
2. Advancing climate finance and investment
3. Evaluating the performance of climate policies
4. Managing climate risks and uncertainties and strengthening climate services
5. Enabling rapid transitions in mitigation and adaptation

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Its five inter-linked research themes are:

Theme 1: Understanding green growth and climate-compatible development

Theme 2: Advancing climate finance and investment

Theme 3: Evaluating the performance of climate policies

Theme 4: Managing climate risks and uncertainties and strengthening climate services

Theme 5: Enabling rapid transitions in mitigation and adaptation

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ICAD Project, Informing Climate Adaptation Decision Making is funded by the ERC and began April 2012. Adaptation to climate variability and change represents an important challenge for the sustainable development of society. Informing climate - related decisions will require new kinds of information and new ways of thinking and learning to function effectively in a changing climate. Adaptation research requires integration across disciplines and across research methodologies. Currently, we lack the critical understanding of which kinds of knowledge systems can most effectively harness science and technology for long - term sustainable adaptation. This interdisciplinary research programme aims to significantly advance

knowledge systems to enable society to adapt effectively to an uncertain climate. The programme is divided into two domains:

1. Understanding climate information needs across society and
2. The social status of techno-scientific knowledge in adaptation to climate change.

The whole programme will be applied to the UK context given the sophistication of existing knowledge systems (such as probabilistic climate scenarios) and the progressive climate policy landscape (that requires public authorities to regularly report on adaptation activities).

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Abstract

Planning for adaptation to climate change is often regarded to be a local imperative and considered to be more effective if grounded on a solid evidence base and recognisant of relevant climate projections. Research has already documented some of the challenges of making climate information usable in decision-making but has not yet sufficiently reflected on the role of the wider institutional and regulatory context. This paper examines the impact of the external institutional context on the use and usability of climate projections in local government through an analysis of 44 planning and climate change (adaptation) documents and 54 semi-structured interviews with planners in England and Germany conducted between July 2013 and May 2014. We show that there is little demand for climate projections in local adaptation planning in either country due to existing policy, legal and regulatory frameworks. Local government in England has not only experienced a decline in use of climate projections, but also the waning of the climate change adaptation agenda more widely, amidst changes in the planning and regulatory framework and severe budget cuts. In Germany, spatial planning makes substantial use of past and present climate data but the strictly regulated nature of planning prevents the use of climate projections, due to their inherent uncertainties. Findings from the two countries highlight that if we are to better understand the usability of climate projections, we need to be more aware of the external institutional context within which planning decisions are made. Otherwise we run the risk of continuing to provide tools and information that are of little use within their intended context.

Keywords: *Local government, climate change adaptation, planning, climate change projections, institutions, regulation*

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1. Introduction

Climate change adaptation is considered a global challenge. At the same time it is widely recognised that it happens across multiple scales, that is local, regional, national and international scales (Adger et al. 2005). It is often argued that specific actions and adaptation planning will need to be undertaken locally. Local government is thus often considered a key deliverer of anticipatory and planned adaptation (e.g. Hurlimann and March 2012, de Oliveira 2009, Measham et al. 2011) in the form of provided public services and goods such as spatial planning, green infrastructure, flood risk management, housing and emergency planning (ASC 2012).

'Planned adaptation to climate change means the use of information about present and future climate change to review suitability of current and planned practices, policies, and infrastructure' (Fussel 2007a, emphasis added). Effective and efficient adaptation planning is considered dependent not only on climate projections at appropriate scales but also on the joint working of scientists, practitioners, decision-makers and stakeholders (Fussel 2007a). An increasing body of research has explored how both this joint working and the creation of usable science for adaptation planning can be facilitated and better understood (Dilling and Lemos 2011, Lemos et al. 2012, Kiem and Austin 2013, Kirchhoff 2013). Usability is considered to exist 'within a range in which each use is defined by a perception of usefulness and the actual capacity (e.g. human and financial resources, institutional and organizational support, political opportunity) to use different kinds of information' (Dilling and Lemos 2011: 681). The perception and capacity referred to above are influenced by both contextual factors (formal and informal institutions, competing factors in the decision-making process, organisational culture, wider cultural context of information use, availability of alternative action pathways) and intrinsic factors (understanding of the decision-context, spatial and temporal scales of information, perceived legitimacy and trust in scientific information, accessibility of information) (Dilling and Lemos 2011). Within the immediate institutional settings, for example within municipalities, rural communities, or water management companies to name but a few examples, the contextual factors are often considered too narrowly (Kirchhof, 2013, Kiem and Austin 2013, van Stigt et al. 2015) and when wider policy and legal frameworks have been considered, such as in Dilling and Berggren's (2015) analysis of user needs in US mountain states, these authors only briefly touch upon on it.

To explore the usability of climate projections in local adaptation planning we need to investigate the institutional context of adaptation in local government. Past research has found that reasons for slow progress in local adaptation include those that are internal to Local Authorities (LAs) (internal institutional context) and those that are external, filtering down from higher levels of government (external institutional context) (Measham et al. 2011). The former include lack of and unfamiliarity with technical data, human resources, lack of political will, unclear or ill-defined

responsibilities, competing priorities and lack of expertise (Amundsen et al. 2010, Baker et al. 2012, Measham et al. 2011, ASC 2012). The latter include lack of leadership, guidance and consistency from higher level governments; restrictive policies and lack of regulation and/or funding (Amundsen et al. 2010, Baker et al. 2012, Nalau et al. 2015, Naess et al. 2005, Lehmann et al. 2015, Porter et al. 2014).

Planning (for adaptation) is considered to be a key tool for progressing action on reducing vulnerability to climate impacts (Hurlimann and March 2012), and LAs have substantial power over local planning in terms of both strategic decision-making and land-use management (Measham et al. 2011). However, local planning is also considered to face several challenges (Hurlimann and March 2012) to do with the external institutional context it is impacted by (Measham et al. 2011). A key challenge is that of developing conviction, highlighting that planning is subject to political changes and ideologies (Hurlimann and March 2012) and thus continuously in flux (Carter et al. 2015). Therefore, to obtain a comprehensive understanding of these challenges it is necessary to acknowledge the key role of the broader external institutional context within which adaptation planning functions (Lehmann et al. 2015, Amundsen et al. 2010, Naess et al. 2005).

To increase our understanding of whether or not planning (for adaptation) can effectively use climate projections we need to consider the insights from both the debates on the usability of climate information and of the broader challenges local planning faces. Therefore, this paper examines the impact of the external institutional context within which planning takes place on the use and usability of climate projections in local adaptation planning. In Section 2 we outline our case studies and methodology. The differences in the use and usability of climate projections in adaptation planning in England and Germany will be described in Section 3. How these are impacted by the external institutional context will be discussed in Section 4, before we present our conclusions in Section 5.

2. Case studies and methods

2.1. Case study description and adaptation policy context

The United Kingdom (UK) and Germany are both considered leaders in climate change adaptation (Swart et al. 2009, Massey et al. 2015), even though it has been argued that the UK has shown greater advances in making adaptation a distinctive policy field than Germany (Massey and Huitema 2015). The approaches to adaptation in both countries are thus somewhat different. In the UK, the national government plays a key role in agenda setting and coordination (Massey et al. 2015). As some key national adaptation policy documents such as the National Adaptation Plan are specific to the devolved administrations, our analysis focuses on England. In Germany, the states (Länder) play key roles in setting priorities and developing regulatory frameworks while national government is the provider of scientific information and financial support (Massey et al. 2015). These differences highlight that we need to be mindful of the different scales at which the institutional

context for adaptation planning can be determined (national level in England and state level in Germany). Figure 1 provides an overview of the multi-level legal and policy context of local adaptation planning in the two countries. This external context will be explained and explored in more detail in the remainder of the paper.

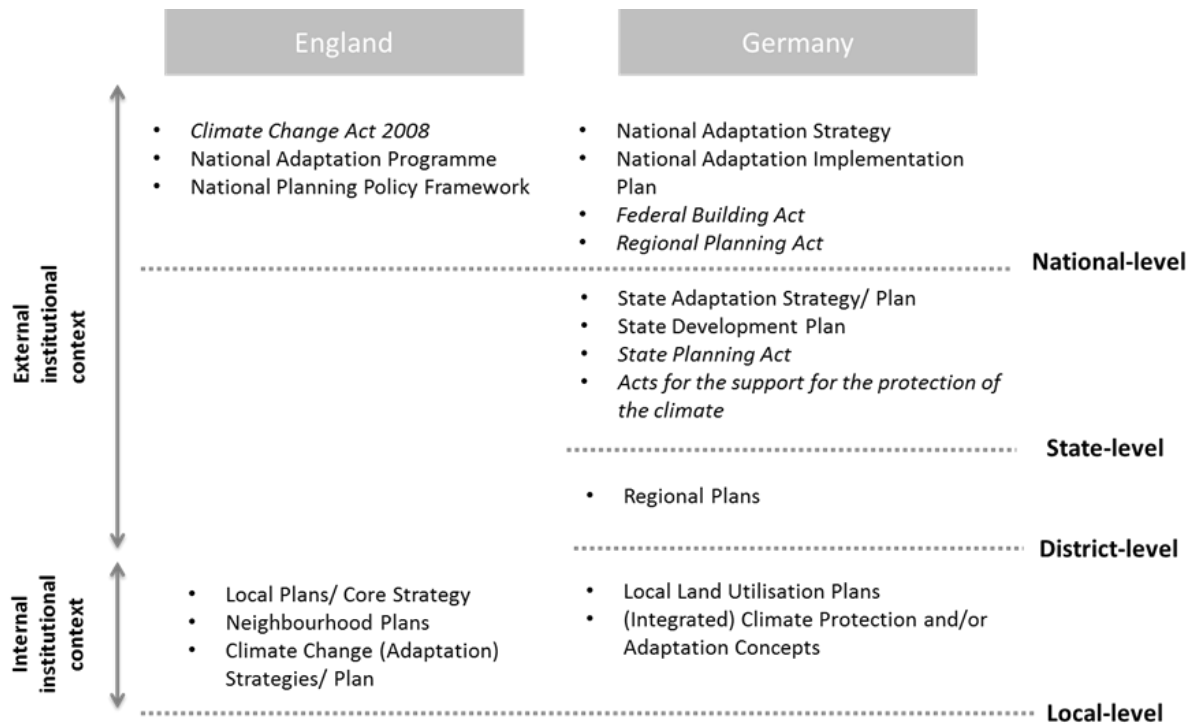


Figure 1 An overview of the legal and policy context of local adaptation planning in England and Germany (Acts are marked in italics).

In both countries, local government is a key implementer of adaptation (Massey et al. 2015) and despite some national differences in governance structures, they are largely similar in how climate protection is addressed (Bulkeley and Kern 2006). In Germany, we collected data from one of the 16 federal states, North-Rhine Westphalia, whilst our data from England comes from the South East and the East Midlands regions.

Our empirical data collection focused on the South East Region and the East Midlands Region of England, as they encompass a range of climate change impacts demanding adaptation whilst showcasing socio-economic and demographic diversity. The South East is the country's most populous region with ~8.7 million inhabitants (ONS 2014a), 75% of which live in urban areas (Causer and Park 2011). It is second only to London, in terms of economic performance, contributing almost 15% to the UK's gross value added (GVA) (ONS 2014b). The South East is impacted by flooding with 25% of properties at risk, but after London, the region is also likely to suffer the most from extreme heat events (Climate UK 2012a), especially because of its higher proportion of older people (Causer and Park 2011).

The East Midlands Region currently has 4.6 million residents (ONS 2014a), but it is expected to see the highest population growth amongst the English regions over the next two decades (Beaumont 2009). The region contributes almost 6% of UK GVA (ONS 2014b). The regional economy was originally based on the textile and coal industry and manufacturing together with agriculture are still drivers of the economy (Beaumont 2009). Flooding especially at the coast but also water shortages for agricultural production are key projected impacts from climate change (Climate UK 2012b).

In Germany, our study focuses on the state of North Rhine-Westphalia (NRW). It is the industrial heartland of the country as well as a state in which adaptation policy is being increasingly legislated. NRW is Germany's most populous state with ~17.6 million inhabitants (SB 2013). The state contributes almost 22% to German GVA (SB 2014), with the financial, insurance and business sectors dominating. The industrialised zone in the Rhine Valley is considered as one of Germany's most sensitive regions to a number of climate change impacts (Rannow et al. 2010), with flooding and heat stress projected to be causing the largest impacts (Rannow et al. 2010, Schröter et al. 2005).

2.1.1. England

In England, the Climate Change Act 2008 contains the key provisions on action on both climate change mitigation and adaptation (UK Parliament 2008). The national government has responsibility to undertake a comprehensive climate change risk assessment (CCRA) every five years, with the first one published in 2012. The CCRA makes use of the UK Climate Projections 2009 (UKCP09), which are the nationally funded central source and go to place of climate information (both climate projections and observed past climate data) for the country. In 2013, a National Adaptation Programme (NAP) requiring a progress report every two years was created for England. The NAP considers local government to 'play(s) a central role in leading and supporting local places to become more resilient to a range of future risks and to be prepared for the opportunities from a changing climate' (DEFRA 2013: 96). Prior to the change of government in 2010, local authority performance was measured and compared by the Audit Commission by using a set of 198 National Indicators (NIs) (DCLG 2007a). LAs could prioritise 35 of these indicators in their Local Area Agreement according to specific local needs and visions. The process-based indicator NI188 – Planning to adapt to climate change provided guidance on how to progress on adaptation and helped measure progress on the ground.

The regulatory and planning framework has undergone substantial changes between 2010-2015 because of the decentralisation and localism agenda of the conservative-liberal coalition government. Local Authorities are no longer required to report to the central government on their performance and the indicator set has been scrapped. The new National Planning Policy Framework (NPPF), which sets out planning

guidance for England, still requires Local Planning Authorities to ‘adopt proactive strategies to mitigate and adapt to climate change’ in their Local Plans (DCLG 2012: 22), but the earlier more detailed Planning Policy Statements, including specific guidance on climate change (DCLG 2007b), have been withdrawn. Local Government has also experienced a 28% budget cut (Hastings et al. 2015) and has been amongst the hardest hit by the centrally imposed austerity measures (Lowndes and Pratchett 2011, Hastings et al. 2015).

2.1.2. Germany

The German political system and administrative structure is decentralised and polycentric (Beck et al. 2009). The Federal Ministry for the Environment, the most important national level player (Hustedt 2013, Beck et al. 2009), has together with the federal states (Länder) developed a national adaptation strategy (NAS) published in 2008. It sets the overarching framework and guidance for adaptation at the national level (Beck et al. 2009). The implementation plan of the NAS was published in 2011 and is to be evaluated by the Federal Environment Agency (Hustedt 2013).

The details of delivery and implementation of adaptation are determined by the policies and goals of the individual Länder. Baden-Wurtemberg and North-Rhine Westphalia (NRW) have even enshrined action on adaptation within their ‘Act for the support for the protection of the climate’. The NRW Act states that ‘the negative impacts of climate change are to be limited through the development and implementation of sector specific adaptation measures that are attuned to the respective regions’ (MIKNRW 2013). Furthermore, states such as Bavaria, Hesse and NRW have published or are developing state adaptation strategies and plans.

At the national level, climate adaptation is specifically mentioned in the Federal Building Act (BJV 2014: Art. 1.5) and the Regional Planning Act (ROG): the latter stipulates that ‘the spatial requirements of climate protection are to be taken into account, through measures that mitigate climate change as well as through those that serve adaptation’ (BJV 2008: Art. 2.6). The latter provision is also reflected in the NRW State Planning Act (MIKNRW 2005). As planning is very hierarchically regulated in Germany, local planning is supposed to fit in and be compatible with higher-level plans. Therefore, a broad overarching framework for local adaptation planning does exist.

2.2. Methods

2.2.1. Interviews

We conducted 54 semi-structured interviews with 67 adaptation practitioners at the local, regional and national level in Germany and England between July 2013 and May 2014. As we focus on planned adaptation, we follow Lehmann et al. (2015) by defining adaptation practitioners as ‘decision-makers in the field of planned climate adaptation’. The majority of the interviewees (n = 52) came from the three focus regions mentioned above (England: South East and East Midlands, Germany: NRW). The remaining ones (n = 15) were based outside of the three regions to

ensure that our findings resonate with the German and English experience outside of our focus regions. Our interviewees included a) local government officials mostly from environment departments (n= 51), officials from regional organisations (n=5), district governments (n=1), regional ministries (n=3), regional authorities (n=3), federal authorities (n=2) and the national weather service (n=2). For a more detailed characterisation of interviewees, see Annex 1.

Interviewees were selected from a pool of respondents to a survey on the visual communication of climate projections conducted in the two countries who had indicated willingness to participate in further research. Details of the surveys are reported in a previous study (Lorenz et al. 2015). Additional interviewees were approached upon recommendation of initial interview participants (snowball sampling). The 45-90 minute interviews took place with 1-3 participants and were conducted by the lead author in the interviewees' native language (German or English).

The core themes the interview protocol covered included progress on adaptation within the organisation; regulatory and statutory framework for action on adaptation; communication and inclusion of climate projections in strategic documents, and participants' use of climate projections and communication preferences of projections. The interviews were semi-structured to allow for conversations to progress flexibly to the issues and concerns raised by the interviewee. They were conducted either face-to-face or over the phone, were audio recorded and later transcribed.

Transcribed interviews were analysed by using software for qualitative analysis (Bazeley and Jackson 2013). Based on existing literature we developed an initial coding system which was allowed to evolve throughout the data analysis process (Harding 2013).

2.2.2. Document analysis

We searched and gathered publicly available strategic planning and climate change documents for the LAs we conducted interviews with in the regions we focused on to triangulate our findings from the interview material. In particular, we analysed whether the documents referred to or used climate projections. We reviewed 14 documents for England and 30 documents for Germany. For an overview of the material reviewed for each of the LAs in the three focus regions see Annex 2.

We analysed climate change (n = 6) and climate change adaptation strategies and plans (n = 4) for 8 out of 14 LAs we conducted interviews in, in the two regions we focused on in England. Only two LAs had both types of strategies, and six LAs did not have either publicly available. As 10 of the 14 LAs are local planning authorities, we also reviewed their core strategies, which determine the overarching guidance for local planning. But as only three of these 10 LAs have adopted strategies and one more has a draft plan available online, we could only review four core strategies. In light of the Planning Inspectorate's latest progress review (2015), this is symptomatic

for all English Local Planning Authorities – 38% of them do not have an adopted Local Plan.

In Germany, we reviewed the NRW state development plan (Landesentwicklungsplan), the regional plans for the districts in NRW (Regionalplan) (n = 14) and the publicly available local land utilisation plans (Flächennutzungsplan) (n = 6) for those LAs in NRW we conducted interviews in. In addition, we examined the climate protection (and adaptation) concepts and plans, which were publicly available for 10 out of the 15 LAs in NRW we interviewed in (n = 9, as two of the LAs commissioned a joint concept). The concepts mainly focused on mitigation and were funded either nationally or by the state environment ministry. However, 'special concepts' that focus on adaptation and integrated concepts looking at both mitigation and adaptation are also supported.

3. Results

3.1. England

The headline result from our analysis is that local progress on adaptation has largely been driven by government regulation. Without the 'Planning to adapt to climate change' indicator NI188, many LAs would not have taken action on adaptation. Despite some of its recognised shortcomings, it gave LAs much-needed direction of travel and five stages to pass through on the way to a regularly reviewed risk-based action plan (LRPB 2010). The risk-based approach to adaptation in England is particularly evident in the indicator level 2, which asks for services to be comprehensively assessed against climate (change) impacts. This led the Department for Environment, Food and Rural Affairs (Defra) and the UK Climate Impacts Programme (UKCIP) to advocate and stress the use of climate projections in LAs. Training on the use of the UK Climate Projections 2009 (UKCP09) was provided to some LA officers, to enable assessors to consider possible future states, likelihoods and consequences of potential impacts. However, many LAs failed to generate sufficient information on current and past vulnerabilities and exposure to impacts to be able to effectively use climate projections to deduce potential future vulnerabilities.

'I think what you ended up with was a lot of councils who really thought that it was very important that they used this thing [UKCP09] but had no idea why...Unless you have already done a bit of understanding about what your vulnerabilities have already been, your current risks and the ways you have already been impacted, then you don't know how to interrogate that properly necessarily. So many of our councils hadn't done any of that work yet and... I think were not helped by the fact that Defra and the government office were coming over and going, "You need to know about this, you are going to use this, it's going to solve your problems around adaptation".'
(REG03)

Due to the novelty of the adaptation agenda and lack of awareness of vulnerabilities and exposures, it is thus questionable whether the LAs would have used climate projections to the same extent as they did had it not been for the top-down push.

The use of climate projections also remained confined to awareness raising in the early stages of adaptation planning, rather than becoming integrated into the overall planning process. Often the projections were not consulted again after local impacts had been identified, 'largely because they don't change very much, the implications for us as a district, there's no new information for us' (SE06). Although the projections could have been of use in planning e.g. as an additional layer on the Geographical Information System (GIS), this has rarely been done. When and where it has been done, climate projections have been used predominantly by the climate change team or the flood risk management team.

The limited capacity of LAs for adaptation planning is also reflected in how comprehensive risk assessments required under NI188 were conducted. The comprehensive risk assessment was intended to cut across all council services to build capacity. However in most instances risk assessments were led and conducted by climate change officers. Climate change adaptation thus remained firmly rooted in the environment / climate change teams rather than being integrated more broadly into local planning and service management processes across the council. Even in environment and climate change teams the uptake of UKCP09 varied: some teams made regular use of them whilst others hardly used them at all. The use of climate projections thus appears not only to have been confined to certain (initial) stages of the adaptation planning progress but also mostly to the respective officer or team tasked with the climate change agenda.

'In terms of having something that is quite detailed and information heavy, I don't think we've got an outlet for it...I would love to see it and look at the analysis of it and play around with it and see what happens, but in terms of usefulness outside of our team I just can't see it because we have to be so simplified to people.' (EM03)

When the capacity to use climate projections is confined to very few people, competing pressures on said staff create a real risk of side-lining engagement with the projections. Local council budget cuts after the 2010 general election and the dismantling of NI188, have led LAs to redefine their priorities away from adaptation. At the same time, expertise with the use of climate projections has often been lost when staff have been made redundant, or rendered useless when staff are transferred to other roles.

'And so we were progressing quite well, 'til 2011, when all the indicators...went out the window with the new government, really. So it was all change again, and adaptation, at that point in particular, really dropped completely off the radar.' (SE01)

The abolition of the indicator NI188 and the extreme cuts to LA budgets happened at the same time, thus making it difficult to distinguish the exact cause for staffing losses. However, the interviewees considered that by making tasks related to

adaptation voluntary, the abolition of the indicator NI188 put people focusing on those tasks at risk. Many, despite the varied criticisms of NI188, were thus sad to see it go.

The lack of integration of climate projections into strategic and spatial planning in LAs is also supported by documentary analysis. UKCP09 is not mentioned in any of the core strategies, and the two that refer to climate projections at all not only focus on headlines such as ‘summers are likely to be drier and hotter’ but in fact refer to climate predictions instead of climate projections. UKCP09 provides an array of possible future climate outcomes and their associated probabilities: mistaking them as certain predictions highlights lack of understanding of the nature and intended use of UKCP09. Although climate (adaptation) plans and strategies refer to UKCP09 and climate projections more frequently, they again remain focused on headlines or highlight the temperature and precipitation changes without reflecting on how they might impact strategic and spatial planning.

In summary, our results highlight that the demand for and use of climate projections in LAs emerged to respond to the requirements of NI188 and the push for UKCP09 by national departments and programmes. With the start of austerity and shift in priorities after 2010, the policy-created demand for the use of climate projections was dismantled. This quickly led to loss of capacity and expertise in local authorities on climate adaptation generally and the use of climate projections more specifically.

3.2. Germany

In Germany adaptation is considered a local matter and local authorities have planning sovereignty, despite having to conform to higher level plans. Adaptation has been a voluntary task at Local Government level and doubts have been voiced whether any local action will be taken before adaptation becomes a mandatory task, especially in financially strained municipalities.

‘It is naturally always the case with voluntary tasks, that they always get put to the back of the queue. That is naturally the case with municipalities, and that is the majority in NRW, for example have financial problems, and then people like to or it is not otherwise possible, concentrate on things, that are legally mandated and as long as there is no legal mandate, to deal with the topic, many just simply ignore it.’ (NRW19)

Although the climate protection act in NRW sets out a roadmap for action on climate change, it only sets clear targets for mitigation. The article on adaptation is vague and leaves the extent of expected action on adaptation unclear. Thus there is not the kind of top-down guidance for progression stages in local adaptation planning as there was in England under NI188.

Despite progress on adaptation at national level, at the local level adaptation still seems to be in the early stages and climate projections are thus unlikely to play an important role in local decision-making processes in Germany. Our document review corroborates this: climate projections are referred to in the climate change

(adaptation) plans of three LAs and in the state adaptation plan. However, they are not mentioned at all in any of the local, regional or state-level planning documents in NRW. These findings indicate that like in England, climate projections have not been integrated into local strategic and spatial planning in Germany.

On the other hand, we find that climate data in the form of climate function maps and planning recommendation maps has been widely used in the planning process for several decades in larger LAs. These maps are based on measured data of a variety of climate variables. Some LAs have even conducted consecutive analyses to establish the change in these climate variables. Planning maps indicate the present state of local climate, subdivided into geographical areas with different microclimatic conditions and land-use characteristics (Heaphy 2014). This practice is guided by technical rules established by the Society of German Engineers (Matzarakis et al. 2008). The rules describe how the urban climate is to be represented and evaluated in maps that underpin urban and regional planning recommendations (Heaphy 2014). These maps often highlight potential heat islands and cold air paths and guide where additional development can or cannot take place.

Thus, whilst climate projections are not used in local planning, past and present climate data is. The use of these climate function and recommendation maps is strictly regulated and an integral part of planning across LAs. 'In that sense, as an evaluation tool, it is a very important instrument here in the municipality. It is taken seriously' (NRW12). Small-scale simulations are sometimes created with tools such as Envimet, a micro-climate simulation tool, to establish how planning options would affect local micro-climate and influence future climate locally. That is, these tools are used to assess planning options and help with decision-making and resource allocation. These findings highlight that there is capacity, tools and a regulatory framework enabling the use of past and present climate data – but not projections of future climate — in local planning.

The current state of climate is by many LAs considered sufficient for planning purposes: it helps to identify and highlight existing vulnerabilities and exposure to impacts, as well as to discuss alternative adaptation measures. 'Yes well, I mean, in the present state of the climate, I can obviously already see a lot of mistakes, which will probably be the same with climate change' (DEU07). Climate change (adaptation) documents of a few of the LAs consider analyses of current local climate a sufficient foundation for the development of an adaptation strategy.

Some LAs have used climate projections to complement current climate maps to explore the future state of local climate, effectively linking climate projections to a tool that has been used in planning for a while. This demonstrates that climate projections can be used with established planning tools and highlights the potential capacity of the local planning system to extend its use of past and present climate data to include future climate projections. However, maps based on projections have often been used only internally, not for communication with elected council members or the public. This is because they are not considered to be certain enough to be

able to inform planning processes and because they are difficult to communicate. That is, lack of use of climate projections is less of an issue of insufficient technical capacity or lack of tools but more an issue of lack of fit with regulatory and institutional requirements and perceived communication and engagement challenges.

Finally, climate projections are not used simply because it is not required by the rules of federal and regional funding (mentioned in Section 2.2.2) available to LAs. As many LAs have very constrained budgets, activities that are not mandatory are extremely unlikely to be undertaken.

'The funding programme stipulates certain things, that one has to do and tick off the list, as otherwise one doesn't get all of the funding. These climate projections were not specifically asked for...Only during the creation [of the climate protection concept] one becomes wiser, but then there simply wasn't any time or budget left.' (NRW18)

Our findings demonstrate that in Germany top-down drivers have created a planning system that could potentially accommodate the use of climate projections, as the use of past and present climate data is already well integrated into current planning. However, the planning system makes it difficult to expand the current system to climate projections due to their inherent uncertainty (BMVBS 2013). Additionally, the lack of top-down regulation and guidance on adaptation leaves adaptation voluntary which makes it difficult to justify the allocation of resources for increased use of climate projections.

4. Discussion

Our findings highlight that to better understand the usability of climate projections at the local scale, it is important to ground the use of climate projections within a wider context determined by differing planning frameworks, statutory duties, regulations and approaches to adaptation.

In England, there was initially a very ambitious approach to adaptation both nationally and locally on the basis of the regulatory framework around NI188 put in place by the Labour Government. NI188 was prioritised in about 30% of LAs (Cooper & Pearce 2011) and it has been considered a strong steering mechanism and driver of action (Boyd et al. 2011, ASC 2012). Its risk-based approach to adaptation planning and the push for the use of UKCP09 created a momentary demand for climate projections in LAs.

From 2010, the Conservative-Liberal Coalition Government introduced substantial changes to the regulatory and planning framework within which LAs are situated. Not only was the indicator set dismantled, but the Localism Act 2011 promoted a voluntary approach to climate change adaptation, causing an 'erosion of resolve' in LAs to progress on adaptation (Dixon and Wilson 2013). The Act also abolished the

regional tier of government and planning, leaving responsibilities for housing developments and planning to Local Governments (Lowndes and Pratchett 2011).

The Localism Act stipulates that local planning is to occur within the frame of a Local Plan, which reflects the 'local area's vision' (UK Parliament, 2011), arguably not sufficiently taking into account impacts happening at higher scales (Wende et al. 2012). At even finer resolution, the government encourages the creation of community-led neighbourhood plans, which are not required to specifically consider sustainability or environmental issues as long as they align with the planning framework set out in the respective Local Plans. However, as 38% of Local Authorities do not have a Local Plan (TPI 2015), neighbourhood plans would be directly guided by the NPPF (Scott 2011), which has no specific stipulations for adaptation. Due to the changes imposed by the central government, adaptation is thus not sufficiently considered in local development planning (ASC 2012).

The LAs have made over 50% efficiency savings (Hastings et al. 2015) and made staff redundancies of over 30% (Hastings et al. 2015). Spending on planning has more than halved in some places (Fitzgerald and Lupton 2015). These cut backs increase focus on mandatory frontline services and tasks: largest cuts will hit those services that LAs are not legally tasked to provide (Fitzgerald and Lupton 2015). This new emphasis on frontline services does not bode well for precautionary 'discretionary' concerns such as climate change adaptation. Competing priorities (Cooper and Pearce 2011), the lack of mandatory targets and the loss of capacity have marginalised adaptation planning (Porter et al. 2014).

Whilst the English story is one of rise and demise of the use of climate projections for local adaptation planning, Germany is much more in the beginning of this journey. The use of climate function and planning recommendation maps discussed in Section 3.2. highlights that the use of past and present climate data for the assessment of current vulnerabilities and exposure is well embedded in the German planning system, predating more recent concerns related to climate adaptation. This planning style resonates with a vulnerability driven approach to adaptation (Adger 2006, Fussel 2007), which prioritises current exposure and may thus see less need to use future climate projections. Too narrow a focus on past and current exposure and vulnerability, however, may not prepare German LAs sufficiently to cope with future climate change (Dilling et al 2015).

The use of climate data in the German planning system is firmly regulated by law, regulations and directives (Matzarakis et al. 2008). They make the use of climate projections difficult, because they do not fulfil the formal expectations about the nature of the information they provide (BMVBS 2013). Spatial planning recommendations have to be based on data that is spatially sufficiently concrete and accurate so that valid planning recommendations can be made (BMVBS 2013). This is something climate projections struggle to help with due to their inherent uncertainty. That is, climate projections do not "fit in" to the planning system rather than there not being demand for them as such.

Although NRW has passed a climate protection act, it is considered a political declaration of 'advisory character' due to the lack of clear targets, responsibilities and sanctions in the law. But making adaptation and its planning mandatory is also problematic in a situation where strapped council budgets would not easily cope with additional expenses (Nalau et al. 2015) as statutory duties would not be fundable from national schemes (SUG 2013).

Our findings highlight that an exploration of contextual factors, impacting the perception of usefulness and capacity to use different kinds of information, clearly needs to extend beyond the immediate institutional context to a much closer consideration of the external institutional context as well. In England, the momentary drive for adaptation and demand for climate projections before 2010 was largely created by the top-down regulatory and planning framework and the push for the use of UKCP09 by national departments and organisations. When local government was hit by austerity and the policy and planning framework changed, the usefulness of climate projections for local adaptation planning evaporated. In Germany there may be greater capacity to use climate projections in local planning due to planners' familiarity with the use of past and present climate data. This capacity is again an outcome of the wider planning system and its requirements. Yet the rules and requirements of the planning system also render climate projections un-usable for local planning, because of their lack of fit with the requirements of planning regulations. Therefore, it is unlikely that there will be a substantial increase in the demand for climate projections in Germany in the near future (BMVBS 2013), as planning law is unlikely to change quickly (McDonald 2011).

Whilst climate projections are not considered usable in local adaptation planning for different reasons in the two countries, their experiences highlight the impact and importance of the external institutional context on the usability of climate projections. Our findings are largely based on interviews within our three focus regions and thus spatially limited and only provide a snapshot in time. Our additional interviews from outside the focus regions, whilst limited in number, nevertheless support our findings and thus show that these are not due to regional particularities but instead highlight that LAs in both countries are equally subject to the external influence of the national planning frameworks, laws and regulations.

The English experience raise the question to what extent the discussion on the usability of climate projections at a local level is sensible at all at the moment. It rather looks as if the discussion should be about the creation of a new external institutional setting which would be conducive to fostering local adaptation planning, with or without the use of climate projections. A shift in attention is also necessary in Germany, where the lack of fit is more likely to be addressed effectively if planning regulations become more amenable to using climate projections as data for evidence based decision-making. The framework for the use of such information is already in existence, as past and present climate data is already integral to planning.

Addressing the question of usability is not just about better understanding the interplay between what science can provide and what users need or want, but also about what users can actually do within the political and economic constraints within which they act. This question of ‘what can be done’ is not determined by the immediate internal institutional setting only: the wider external context clearly matters too. There may be challenges outside of the user-producer interaction that even co-production or co-creation cannot overcome, and we do need to be aware of them to obtain a pragmatic understanding of the usability of climate projections in adaptation planning. Adaptation has long been considered highly contextual (Fussler 2007) and so is usability of climate data and projections. We may run the risk that our current focus on too narrowly defined improved usability tries to come up with smarter and smarter solutions through tailoring and customisation of information, whilst being ignorant of the wider context by which its usability is impacted.

This is not to say that we do not need to continue to gain a better understanding of the user-producer interface in order to make information more usable (cf. Lemos et al. 2012). Rather, it is to say that we also need a better understanding as to how to nest the usability debate into the bigger institutional and contextual debate of adaptation planning.

5. Conclusion

In this paper we explored the usability of climate projections within local adaptation planning in England and Germany. We find that although it is well recognised that the external institutional context strongly impacts local adaptation planning, this recognition needs to be more clearly integrated into the discussion on the usability of climate projections at the same scale. Whilst initially there was a very ambitious drive in English LAs to use climate projections, this was very much a top-down policy-driven demand, which no longer exists after the policy framework was dismantled. In Germany the progress in using climate projections is much slower and less ambitious but on the other hand past and present climate data is widely used in local planning. This is partly explained by the strict regulation of planning in Germany which does not facilitate the use of climate projections as part of the planning process (BMVBS 2013).

The usability of climate projections is influenced by a myriad of factors, but the external institutional context clearly plays a crucial role in both countries. This means that just as the progress on adaptation at the local scale can be helped or hindered by the wider rules, policies and regulations, so can the usability of climate projections.

The debate on tailoring and customisation of climate information is about making climate information as usable as possible in a given setting. To achieve this it needs to look beyond the immediate institutional context within which users and producers interact and look outwards to the wider setting and legal and regulatory system within which they are placed. The developments and changes in the wider setting,

may in turn be better understood through insights from policy studies on such questions as policy innovation and adaptation (Massey et al. 2014, Massey and Huitema 2015), but also the impact of policy dismantling (Jordan et al. 2013, Bauer and Knill 2012).

If this wider setting, however, proves not to be conducive to the use of climate projections for adaptation planning, we need to ask ourselves whether our endeavours to increase usability are futile. Whilst striving to ensure greater usability at local level, we cannot let our attention slip away from the question as to how we create a wider setting that encourages both local adaptation planning and the use of climate projections at the same time.

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Annex 1

Table 1 Overview of interviewees

Case Study Region	Interviewee	Index	Interview	Date
East Midlands – England	Employee of a LG	EM01	Face-to-Face	15 Oct 2013
	Employee of a LG	EM02	Face-to-Face	17 Oct 2013
	Employee of a LG	EM03	Face-to-Face	22 Oct 2013
	Employee of a LG	EM04	Face-to-Face	4 Nov 2013
	Employee of a LG	EM05 & EM06	Face-to-Face	5 Nov 2013
	Employee of a LG	EM07	Face-to-Face	20 Nov 2013
	Employee of a Regional Organisation	REG02	Face-to-Face	7 Nov 2013
South East – England	Employee of a LG	SE01	Face-to-Face	24 Oct 2013
	Employee of a LG	SE02	Face-to-Face	25 Oct 2013
	Employee of a LG	SE03	Face-to-Face	29 Oct 2013
	Employee of a LG	SE04 & SE05	Face-to-Face	30 Oct 2013
	Employee of a LG	SE06	Face-to-Face	8 Nov 2013
	Employee of a LG	SE07 & SE08	Face-to-Face	9 Dec 2013
	Employee of a LG	SE09	Phone	18 Dec 2013
	Employee of a LG	SE10 & SE11	Face-to-Face	23 Oct 2013
	Employee of a Regional Organisation	REG03	Face-to-Face	13 Nov 2013
	Non-case study England	Employee of a LG	ENG01	Phone
Employee of a LG		ENG02	Phone	18 Sept 2013
Employee of a LG		ENG03	Phone	26 Sept 2013

	Employee of a LG	ENG04	Phone	27 Sept 2013
	Employee of a LG	ENG05	Phone	27 Sept 2013
	Employee of a LG	ENG06	Phone	30 Sept 2013
	Employee of a LG	ENG07	Phone	21 Oct 2013
	Employee of a Regional Organisation	REG01	Face-to-Face	12 Nov 2013
North-Rhine Westphalia Germany	Employee of a LG	NRW01	Face-to-Face	23 Jan 2014
	Employee of a LG	NRW02	Face-to-Face	27 Jan 2014
	Employee of a LG	NRW03, NRW04 & NRW05	Face-to-Face	28 Jan 2014
	Employee of a LG	NRW06	Face-to-Face	31 Jan 2014
	Employee of a LG	NRW07	Face-to-Face	3 Feb 2014
	Employee of a LG	NRW08 & NRW09	Face-to-Face	4 Feb 2014
	Employee of a LG	NRW10	Face-to-Face	5 Feb 2014
	Employee of a LG	NRW11 & NRW12	Face-to-Face	6 Feb 2014
	Employee of a LG	NRW13 & NRW14	Face-to-Face	7 Feb 2014
	Employee of a LG	NRW15 & NRW16	Face-to-Face	18 Feb 2014
	Employee of a LG	NRW17	Face-to-Face	19 Feb 2014
	Employee of a LG	NRW18	Face-to-Face	26 Feb 2014
	Employee of a LG	NRW19	Face-to-Face	27 Feb 2014
	Employee of a LG	NRW20	Phone	7 Mar 2014
	Employee of a LG	NRW21	Phone	7 Mar 2014
Employee of a LG	NRW22	Phone	10 Mar 2014	
Employee of a Regional	NRW23 & Regional	Face-to-Face	29 Jan 2014	

	Ministry	NRW 24		
	Employee of a Regional Authority	NRW25	Face-to-Face	30 Jan 2014
	Employee of a District Government	NRW26	Face-to-Face	4 Feb 2014
	Employee of a Regional Organisation	NRW27	Face-to-Face	30 Jan 2014
	Employee of a Regional Organisation	NRW28	Face-to-Face	5 Feb 2014
	Employee of a Federal Authority	DEU01 & DEU02	Face-to-Face	28 Feb 2014
	Employee of a Federal Weather Service	DEU03	Phone	17 Mar 2014
	Employee of a Federal Weather Service	DEU04	Phone	25 Apr 2014
Non-case study Germany	Employee of a Regional Authority	DEU05 & DEU06	Face-to-Face	15 Apr 2014
	Employee of a Regional Ministry	DEU07	Phone	5 May 2014
	Employee of a LG	DEU08	Phone	7 Apr 2014
	Employee of a LG	DEU09	Phone	29 Apr 2014
	Employee of a LG	DEU10	Phone	5 May 2014
	Employee of a LG	DEU11	Phone	9 May 2014

Annex 2

Table 2 Overview of planning and climate change (adaptation) documents reviewed

Case Study Region	Local Government	Index	Core strategies	Climate change strategies	Climate change adaptation strategies or concepts
East Midlands – England	LG_E_1	EM01			
	LG_E_2	EM02			
	LG_E_3	EM03		✓	✓
	LG_E_4	EM04			
	LG_E_5	EM05		✓	
	LG_E_6	EM06	Not a PA*	✓	
	LG_E_7	EM07	✓	✓	✓
South East – England	LG_E_8	SE01	Not a PA		✓
	LG_E_9	SE02	✓ (draft)	✓	
	LG_E_10	SE03	✓	✓	
	LG_E_11	SE04 & SE05	Not a PA		
	LG_E_12	SE06			
	LG_E_13	SE07 & SE08 SE09	Not a PA		✓
	LG_E_14	SE10 & SE11	✓		
Case Study Region	Local Government	Index	Climate protection concepts	Integrated climate protection and adaptation concept	Land utilisation plans
North-Rhine Westphalia - Germany	LG_D_1	NRW01			
	LG_D_2	NRW02			✓
	LG_D_3	NRW03, NRW04 & NRW05	✓		
	LG_D_4	NRW06			
	LG_D_5	NRW07 NRW10	✓		
	LG_D_6	NRW08 & NRW09	✓		✓
	LG_D_7	NRW11 & NRW12			
	LG_D_8	NRW13 & NRW14			✓
	LG_D_9	NRW15 & NRW16	✓ [#]		
	LG_D_11	NRW18			✓
	LG_D_10	NRW17		✓	✓
	LG_D_12	NRW19		✓	✓
	LG_D_13	NRW20		✓	
	LG_D_14	NRW21		✓	
	LG_D_15	NRW22		✓	

*PA = Planning Authority; [#]LG_D_9 and LG_D_11 commissioned a joint climate protection concept