

Beyond conceptual understanding of barriers to national adaptation policy: A comparative analysis of South Korea and the UK

Seunghan Lee (✉ eeslee@leeds.ac.uk)

University of Leeds Sustainability Research Institute <https://orcid.org/0000-0002-1214-4808>

Jouni Paavola

University of Leeds Sustainability Research Institute

Suraje Dessai

University of Leeds Sustainability Research Institute

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Abstract

Despite progress with national adaptation policies, the adaptation deficit is growing. Barriers to adaptation are a key reason for the adaptation deficit. Past research on barriers only offers a conceptual understanding of the barriers, with limited insight into real adaptation processes. Common causality, interrelationships and dynamics of the barriers remain under-researched. Examining the cases of South Korea and the UK, this research aims to improve our understanding of the common barriers to national adaptation policy. Drawing from semi-structured interviews and documentary material, we identify 54 common factors in the two countries (17 barriers, 17 origins, 20 influences), and eight key barriers: conflicts between government departments, frequent rotating of civil servants, lack of political will, unclear range of participants in national adaptation policy, low priority of adaptation, uncertainty about the effectiveness of adaptation policy, differences between adaptation and election timelines, and lack of understanding of adaptation. We explain the origins and links between factors and the common causal mechanisms of barriers to national adaptation policy, as well as their influences by mapping them. Based on the mapping, we argue that there are barriers that are easier to address than others, and that there is a need to focus on them to reduce the adaptation deficit effectively. We conclude by discussing the policy implications of our findings.

1. Introduction

Adaptation is receiving more attention (Ford and Berrang-Ford, 2011; Berrang-Ford et al., 2014; Klein et al., 2017) and the role of national adaptation policy is increasingly emphasised (OECD, 2009; Biesbroek, 2014; Russel et al., 2020; Mullan et al., 2013). National adaptation policies define the roles of different stakeholders, provide standardised information about climate risks and projections, establish legal and institutional frameworks, distribute resources, support vulnerable groups and coordinate financing mechanisms (IPCC, 2014). But adaptation also needs to be integrated into other policies beyond the environmental domain (Bauer et al., 2011). Since the Intergovernmental Panel on Climate Change's (IPCC) fourth assessment report, there has been substantial progress with the development of national adaptation policies (IPCC, 2014) and the momentum has increased after the Paris Agreement in 2015 (UNEP, 2018). However, adaptation policies are not keeping up with the increasing need, which has led to an 'implementation deficit' or 'adaptation deficit' (Eisenack et al., 2014; Lonsdale et al., 2017; McClure and Baker, 2018). The literature to date has not addressed the reasons for the adaptation deficit (Dupuis and Knoepfel, 2013), and there is a need for practical solutions to reduce it.

"Barriers" are considered a major reason for the adaptation deficit (Wise et al., 2014). A barrier to adaptation is a factor that may prevent or hinder adaptation efforts but which can be overcome (Barnett et al., 2015; McNamara et al., 2017). Barriers are also a reason for why adaptive capacity is not translated into action, or why low adaptive capacity exists. Adaptation policy stakeholders have identified a number of barriers as factors that hinder adaptation planning and implementation (Eisenack et al., 2014). The research community has identified and catalogued a large number of different barriers to adaptation actions (Hulme et al., 2007; IPCC, 2007; 2014; Adger et al., 2009; Berrang-Ford et al., 2011; Biesbroek et al.,

2010; Wise et al., 2014; Clissold et al., 2020), and barriers to national adaptation policy have also been identified by some studies (Bauer et al., 2011; OECD, 2012; Mullan et al., 2013; Kato and Ellis, 2016).

Although these studies to date offer a broad empirical and conceptual base of barriers to adaptation, there are serious research gaps. Earlier studies on barriers to adaptation have focused on identifying and describing barriers (Prabhakar et al., 2014), not explaining the occurrence of barriers or causal mechanisms giving rise to them (Dupuis and Knoepfel, 2013; Eisenack et al., 2014). Also, important questions about what problems are caused by barriers and how barriers are linked to the decision-making processes remain unanswered (Biesbroek et al., 2011). In other words, barriers to adaptation have been treated as 'isolated entities' (Biesbroek, 2014) distinct from adaptation processes. Thus, research has not been able to provide practical guidance to real adaptation decision-making processes so as to help reduce the adaptation deficit. In addition, as the context-dependent nature of adaptation and barriers to adaptation has been emphasised, little effort has been made to generate general insights into overcoming the barriers. In terms of national adaptation policy, there is little research on how the problems that countries experience in adaptation processes are related to barriers and what causes them. Moreover, studies of national adaptation policies have moved away from exploring barriers to focussing on implementation (Biesbroek et al., 2015). Research bridging the conceptual understanding of barriers to national adaptation policy and national adaptation processes is required, to better understand not only the nature of barriers but also the causal mechanisms between them and the adaptation processes.

Although the occurrence of context-specific barriers in different countries is inevitable (OECD, 2012; Mullan et al., 2013; Russel et al., 2020), it is important to focus on common barriers and factors occurring across national adaptation policies to bridge the conceptual understanding of barriers to national adaptation policy and real national-level adaptation processes. Despite different ways of establishing and implementing adaptation policy in countries, the literature suggests that they experience similar barriers (OECD, 2009; Biesbroek et al., 2010; Bauer et al., 2011; OECD, 2012; Mullan et al., 2013; Prabhakar et al., 2014; Russel et al., 2020). Even developed countries, which are considered to have high adaptive capacity, are experiencing barriers (Dupuis and Knoepfel, 2013). Biesbroek et al. (2014) demonstrated that there is a set of barriers to adaptation that is shared across institutional contexts. Despite these findings, no studies have examined how to overcome barriers and related problems that occur across national adaptation policy processes. Yet Eisenack et al. (2014: p.870) have emphasised that "identifying common causal patterns, interdependency and the dynamics of adaptation will significantly advance our ability to explain the occurrence of barriers and find promising ways to overcome them".

We aim to offer a better understanding of common barriers to national adaptation policy through a comparative analysis of national adaptation policy in South Korea (Korea) and the UK. Based on the analysis, we generate general but practical insights into overcoming common barriers. The research questions we seek to answer are: 1) what are the common barriers to national adaptation policy in Korea and the UK? 2) what are the characteristics of the common barriers and their influence and origin? 3) what can we do to reduce and overcome the barriers at the national level?

2. Climate Adaptation Policy In Korea And The Uk

Climate adaptation policies in Korea and the UK have several similarities. They are policies with a five-year rolling plan based on specific legislation and involve climate change risk assessments. Both countries have multi-ministerial policies led by an environmental ministry, and both have a top-down political structure. However, there are also clear differences between them. Korea has a multi-party system and centralised government, with the President as the head of state (Park, 2013; Yang, 2019). In turn, the UK has a decentralised political system with parliaments in Scotland, Wales, and Northern Ireland (Tangney and Howes, 2016). Although the policies in the two countries have a specific legal foundation, the content and form of their respective Acts are considerably different. The organisation that supports the making and implementing national adaptation policy has different status and authority in the two countries. The sub-national stakeholders are differently involved in national adaptation policy. These similarities and differences, we argue, helps shed light on the nature of barriers to national adaptation policy and common problems that countries experience in adaptation processes, and improve our understanding of how to overcome the barriers.

2.1. Korea

The 'National Climate Change Adaptation Plan (NCCAP)' of Korea is based on the 'Framework Act on Low Carbon, Green Growth (2010)'. The Article 48 of the Act and the Article 38 of the enforcement decree provide that the government shall assess climate change impacts and vulnerability, and that the Minister of Environment shall establish and implement the NCCAP, every five years, based on consultation with the heads of the central administrative agencies concerned. According to NCCAP, the heads of the central administrative agencies concerned and Mayors and sub-level Governors shall establish and implement detailed action plans. The Articles identify the sectors and subjects that should be included in the assessment and the NCCAP, but they do not define the range of participants or stakeholders to be involved clearly.

Korea has implemented NCCAPs from 2010. The Ministry of Environment (MoE) established the first NCCAP (2011–2015) in October 2010 and revised in 2013 it as NCCAP (2013–2015) to incorporate the results of a new impact assessment based on the IPCC's climate change scenarios (Representative Concentration Pathways, RCP). The first NCCAP included nine sectors (health, agriculture and fisheries, water management, natural disasters, forests and ecosystem land and coast, industry, infrastructure and international cooperation, and monitoring and forecasting), 67 projects, and 13 governmental departments participated. The first official climate change risk assessment was conducted in 2014: it identified 87 priority risks for seven sectors in Korea (Park et al., 2014). Based on the risk assessment, the NCCAP2 (2016–2020) was released in December 2015. Now 20 governmental departments participated in it. The NCCAP2 set five adaptation principles and consisted of five areas and 20 major projects. To prepare the NCCAP3 (2015–2021), the second climate change risk assessment was conducted in 2019 and 93 priority risks by eight sectors of Korea were covered (Song et al., 2019). Risk priorities were

selected only in each sector, and priorities between risks in different sectors were not presented: there is no national top priority risk which is across-sectors in the risk assessment.

Korean government founded the Korea Adaptation Centre for Climate Change (KACCC) to support NCCAPs. It is an affiliated institute of MoE. It plays the role of supporting the formulation and implementation of the NCCAPs, developing and disseminating adaptation programmes and information, and cooperating on climate change adaptation with international and domestic stakeholders.

2.2. The UK

Although every nation in the UK has established and implemented their own national adaptation programmes, we mainly focus on England. The 'Climate Change Act 2008' is the legal foundation for adaptation in the UK. The Sect. 56–63 of the part 4 of the Act directs the government to report on the climate change risks every five years (Climate Change Risk Assessment (CCRA)), and to publish a programme outlining how the identified risks will be addressed (National Adaptation Programme (NAP)). The Act asks for an assessment of the progress made towards implementing the objectives, proposals and policies set out in the NAPs every two years after a NAP is released. The Act also introduces powers for the government to require public sectors and statutory undertakers to carry out their own risk assessment, make plans to address identified risks, and to report to the Government (Adaptation Report Power (ARP)). The Act does not identify sectors or subjects or the participants or stakeholders which have to be included in the NAPs. Outside of England, other governments of the UK have established their own laws and regulations to supplement based on their conditions and status - an example is the Climate Change (Scotland) Act 2009.

Under the Climate Change Act 2008, the Committee on Climate Change (CCC) and Adaptation Sub-Committee (ASC), which changed to Adaptation Committee (AC) in 2018, were established. They are supporting the implementation of CCRAs, preparation of NAPs, and the independent assessment of NAP. In January 2012, the Department for Environment, Food and Rural Affairs (Defra) published the CCRA 2012, which set out the main priorities for adaptation in the UK for the themes of agriculture and forests; business; health and wellbeing; buildings and infrastructure, and; natural environment. Based on nine opportunities and 38 priority risks identified in CCRA 2012, the UK government published the first NAP in July 2013. It had seven main themes: built environment, infrastructure, healthy and resilient communities, agriculture and forestry, natural environment, business, and local government. More than 370 actions were included into the programme; the majority of these actions were owned by central Government departments and their agencies (CCC, 2017). Two progress reports on the first NAP were published by the CCC in 2015 and 2017. The CCRA 2017 was published in January 2017, and it divided the 56 identified priority risks into four categories. It set top six areas of inter-related climate change risks for the UK: flooding and coastal change risks to communities, businesses and infrastructure; risks to health, well-being and productivity from high temperatures; risk of shortages in the public water supply, and for agriculture, energy generation and industry; risks to natural capital, including terrestrial, coastal, marine, and freshwater ecosystems, soils and biodiversity; risks to domestic and international food production and trade; new and emerging pests and diseases, and invasive non-native species, affecting people,

plants, and animals. To respond to CCRA 2017, Defra published the second NAP in July 2018. It encompassed the five themes of natural environment, infrastructure, people and built environment, business and industry, and local government and included 21 main activities. The CCC published a progress report on the second NAP in 2019, suggesting that the government had failed to increase the ambition of adaptation policy ambition and its implementation after the NAP (CCC, 2019).

3. Materials And Methods

Comparative and actor-centred methods are well-suited for advancing our understanding of the barriers and for generating findings that help overcome them (Eisenack et al., 2014). Therefore, we mainly focus on the experience of actors who participate in the national adaptation policy processes in Korea and the UK, to compare common barriers and their characteristics. To identify actors to recruit for interviews, we used the participant lists of NCCAPs (Korea) and CCRAs (the UK) and contacted 95 participants via emails and phone calls. A total of forty-one semi-structured interviews were undertaken: 23 in Korea and 18 in the UK. Thirty-two interviews were conducted face-to-face in Korea and the UK, five were paper interviews, and four interviews were conducted over telephone calls. Interviewees included (A) civil servants of the managing departments (MoE, Defra); (B) civil servants of other governmental departments; (C) experts of official supporting institutes (KACCC, CCC), and (D) sectoral experts. Also, (E) experts of local-level adaptation policy were interviewed. The interviewee group sizes were as follows: Korea (KA = 5, KB = 2, KC = 3, KD = 10, KE = 3); the UK (UA = 4, UB = 4, UC = 1, UD = 9).

The interviews covered three key areas: 1) identifying barriers to national adaptation policy, 2) identifying influences and origins of the barriers, 3) describing solutions for the barriers (used and suggested). Interviewees were asked about their experiences and opinions of working in the national adaptation policy process from risk assessment to monitoring and evaluation (M&E). The main questions were:

1. Based on your experience, what are the barriers to national adaptation policy?
2. What problems are caused because of the barriers?
3. What do you think are the reasons for the barriers?
4. What solutions did you use or/and suggest for overcoming the barriers?

All interviews were recorded and transcribed, and the interviews conducted in Korea were translated into English. The analysis focused on identifying barriers to real national adaptation policy processes and establishing how the barriers are linked with the current problems of the policy and how they occur.

We also analysed the official documents related to NCCAPs and NAPs to supplement interview data. The documentary data included legal documents (Framework Act on Low Carbon, Green Growth (2010)), Climate Change Act 2008), policy documents (NCCAPs, NAPs), climate change risk assessment reports (Korea CCRAs, UK CCRAs), policy assessment reports, national adaptation policy promotion brochures, etc. The analysed documents were published between 2006 to 2020. They were available online and downloadable from the official websites of related organisations of the two countries.

We visualised the interrelationships between barriers, origins, and influences based on the results of the analysis of the interviews and documentary material. The visualisation highlights the interdependencies between factors, common factors giving rise to the barriers, and how the barriers influence national adaptation policy. We suggest a visualisation based methodological approach for diagnosing problems of national adaptation policy, on the basis of identifying barriers related to the problems and actors causally linked to them.

4. Results

The interviews indicated that Korea and the UK have experienced context-specific barriers to their national adaptation policy. For example, in Korea, *an absence of a comprehensive and continuous communication system* is identified as a barrier. Although the NCCAP has a cross-departmental consultative group, it has not functioned. Only an ad-hoc working group to establish the NCAAPs was organised early in each policy period. This barrier causes awareness gaps between the managing department and other departments, as well as underappreciation at the national level of the needs at the local level and in the private sector (KA4, KA5, KD1, KD3). The Korean interviewees also identified *unclear hierarchical status of national adaptation policy* as a barrier. Its relationships with other policies and regulations are not explicit. Hierarchical relationships with local-level adaptation policies are also unclear. This causes overlaps between similar policies and the difficulty of adopting common long-term visions or goals between national- and local-level adaptation policies (KC2, KD8). In the UK, *an ambitious national target of CO₂ mitigation* is considered a barrier to national adaptation policy, as the majority of resources and efforts for climate change are committed to mitigation, and adaptation receives less attention. Thus, adaptation is a lower priority and securing financial and human resources for adaptation policy is difficult (UA1, UB4). *An unsystematic timeframe between CCRA, NAP, ARP and local-level adaptation* is also pointed out as a barrier. Only the timeframes for CCRA and NAP work well. As UB2 said, “as time goes, all adaptation schemes are becoming complicated and fragmented now”.

However, interviewees in the two countries identified many more common barriers than different, context-specific barriers. Although various categories or clusters of barriers to adaptation have been suggested in previous studies (IPCC, 2007; 2014; Biesbroek et al., 2011; Lindsey and Emily, 2011; Mullan et al., 2014; Wise et al., 2014; Waters et al., 2014), this research categorised the common barriers into four types: 1) national political and administrative system, 2) resources, 3) laws and regulations, and 4) nature of adaptation. In addition to identifying barriers, we indicate the barriers’ influences and origins that are common in both countries.

4.1. Common barriers and their origins and influences

4.1.1. National political and administrative system

There are six common barriers to national adaptation policy related to the national political and administrative system in Korea and the UK. Interviewees identified *conflicts between governmental*

departments as a barrier to their national adaptation policy. There was an inter-sectoral competition, and it was challenging to convince the departments to engage in the process (KA3, KA4, KD10). There were tensions between Defra and other departments about regulations, and although Defra made sense for them to think about adaptation, there were many competing goals and sectoral objectives (UC1, UD9). The interviewees considered that this barrier is caused by four factors: unclear provisions in regulations about the range of participants in national adaptation policy, absence of regulations about the accountability of each department for adaptation, indifference of departments, and limited authority and role of the managing department. Interviewees from managing departments and institutes suggested that they do not have authority based on law or regulations to force other departments to participate in the policy (KA3, KA4, KA5, UA1, UA4, UC1). This horizontal fragmentation barrier leads to two problems: lack of responsibility of each department for adaptation, and inability of dealing with cross-cutting issues. Departments' adaptation policies usually consist of soft measures focusing on picking the low-hanging fruit with unclear responsibility for adaptation (KA3, UD9). UA4 also said, "this barrier makes things disjointed. ... the current policies are not connected up to issues and departments".

Lack of connection between national- and sub-national-level adaptation policy was another common barrier. The national adaptation policy consisted only of central government departments' actions, and local authorities did not participate in the policy process. It is not clear how much the national-level policy is being used in sub-national adaptation. For example, KD8 emphasised that "in policy processes of both levels, there is no concept of how we link national adaptation policy and local adaptation policy". This barrier has its origin in two factors: unsystematic schemes (timeframes) of different levels of adaptation policy, and unclear range of participants in national adaptation policy. There are no provisions for involvement of local authorities in national adaptation policy (KD2), and local and national level policies follow different timeframes (KD8, UB1). This vertical fragmentation barrier leads to two problems: no linkage between different levels of adaptation and omission of realities on the ground. As a result, national and local adaptation policies have been implemented separately, without common vision or goal for adaptation, and national adaptation policy is not grounded on and does not reflect adaptation actions at the ground. (KE1, KE2, KE3, UB1, UB2).

Lack of linkage between different levels of climate change risk assessments was also identified as a barrier. National and local risk assessments have been conducted separately, and there is no linkage between them. In the UK, although the current CCRA contains risks for England and the devolved governments, the level of detail is not enough for each of the devolved government. They have had to conduct additional risk assessments, and there is no linkage between different governments' risk assessments (UA2, UA3, UA4). KD8 also stressed that "there is no spatial concept in the current risk assessment. ... Risks need to be connected both spatially and contextually between different levels, but national risk assessments don't contain local level risks and vice versa". Two factors originate from this barrier: lack of communication between different levels for adaptation and the unclear range of participants in national adaptation policy.

Limited authority and role of the managing department was raised as an administrative system barrier. National adaptation policy is managed by the department of the environment in the two countries (MoE, Defra). The interviewees considered that the department does not have enough authority and resources to influence other departments. The managing department is one of the least powerful departments in both countries, so, it is hard to lead on adaptation which involves multiple departments (KD2, UC1, UD1). Also, because there are no regulations about responsibility and accountability for adaptation, the managing department cannot require other departments to make efforts or dedicate resources for adaptation (KA2, KA4, KA5, KC3, UA1, UA2, UD3). The origin of this barrier is the limited support in the current institution. There is no legal basis for authority and resources for the managing department; thus, it is a challenge to mobilise other departments (UD6). The influences of this barrier include conflicts between government departments, lack of overarching policy and direction and high dependence on other departments' action and budget. UA2 said, "It could not be overarching policy or direction, it is just a collection of policies because of our limited power". The managing department cannot be involved in the implementation of other departments' adaptation policy, and it only collected the results that other departments sent with high dependence (KC3, UA3).

Frequent rotating of responsible civil servants was also identified as a barrier to national adaptation policy. Civil servants responsible for national adaptation policy are rotated two to three times within one policy period. Rotating civil servants' varying understanding of adaptation introduces variation into the national adaptation policy and its implementation (KC2, KD8, UC1). Civil servant regulation was considered the origin of the barrier. The barrier has four key influences: additional time needed to educate new civil servants, low continuity and connectivity of adaptation policies, low expertise of practitioners and limited accumulation of adaptation policy experience. Because adaptation is a relatively new concept, new civil servants have different levels of and sometimes limited understanding of it. Thus, additional time is needed to educate them and because of it the continuity and connectivity of adaptation policies could not be guaranteed (KA3, KD7, KE2, UC1). KD5 emphasised that "expert knowledge and experience of adaptation have accumulated but that adaptation is always a new topic for civil servants in departments who lead on adaptation policy".

Interviewees indicated that *lack of interest and support from the government (political will)* is a barrier. In both Korea and the UK, the national interest and supports have decreased for the second national adaptation policy cycle. UC1 said, "we have seen a lot of adaptation issues falling away because of political interest. ... Climate change has fallen off the agenda. So, all that institutional arrangement has fallen way over previous years". KA2 said that "it was hard to have a national momentum for adaptation policy in the process of establishing the second NCCAP". Interviewees identified three origins for this barrier: low political salience of adaptation and resulting unimportance for winning votes, short time-horizon of politicians and high-level leaders and the difference between adaptation timescales and electoral cycles. This barrier had two key influences: lack of specific funds for adaptation and continuing low priority of adaptation. It was very difficult to secure funds for adaptation because of the low interest of the government, although the managing department had to spend time and effort to highlight the importance of adaptation policy and funds needed for it (KA2, KA3, KA4, KA5, KC1, UA1, UC1).

4.1.2. Resources

Two resource barriers were identified. First, interviewees said that *no specific funds for adaptation* is a barrier to national adaptation policy. National adaptation policy in the two countries does not provide funds for adaptation policy to other departments, and the majority of provided funds comes from other departments based on the departments' actions, not the managing department. Also, the government and departments in Korea and the UK do not have specific 'adaptation funds' and there is no adaptation funding scheme at national or local level or at the private sector. UD9 stressed that "departments are aware of adaptation and the reason why they need to do. However, because of a small budget, it is like anyone who is operating adaptation, at the moment, hand tights behind backs". This barrier has three factors of origin: absence of institutions for adaptation funds, lack of interest and support from the government and continuous low priority of adaptation. It is difficult to make a case for funding for adaptation to departments because it is seen as a future issue that can be attended later, financial resources are first allocated to emergency or high priority issues (KA2, KC1, UA1, UA2, UB1, UC1).

Lack of human resources in the managing department was the other resource barrier. Just 4–7 people in the managing department operate the whole process of national adaptation policy, and it is too few to handle the policy effectively and to monitor every relevant part of the policy. KA2 said, "tasks related to GHG mitigation are carried out by several teams or departmental units, but only four people manage all climate change adaptation tasks".

Although interviewees in both countries considered this barrier is significant, no one clearly said about the origin of the barrier. One influence of the barrier was identified: difficulty of handling and monitoring the policy. UB4, e.g. mentioned that "more people of our division are needed to check everything and to make sure things are progressing".

4.1.3. Laws and regulations

In this category, two barriers were identified. Interviewees found that *unclear range of participants of national adaptation policy in the current regulations* is a barrier. The current adaptation Acts and regulations in the two countries do not clearly indicate the range of horizontal and vertical participants of national adaptation policy. In other words, under the current legislation, it is not clear who should be involved in the policy process and what the involved stakeholders' accountability is. Interviewees considered that it was difficult to engage stakeholders and that some departments were reluctant to interact (KA2, KE3, UB4, UD6). Secondly, national adaptation policy does not involve all relevant stakeholders as it is implemented by a small number of central government civil servants and experts in a top-down way (KD5, KD6, KD7, UC1, UD7). The barrier has one origin: complicated governance arrangements of the national adaptation policy. The complicated governance arises from the nature of adaptation, which has unclear audiences, and because the responsibility for adaptation is not sufficiently defined. Thus, the range of participants in the policy process is also unclear (KD6, KE2, UB2, UB3, UB4, UC1, UD9). This barrier has five influences: conflicts between governmental departments, lack of connection between national and sub-national levels of adaptation policy, lack of linkage between

different levels of climate change risk assessment, inability to deal with cross-cutting adaptation issues and inconsistent range of participants (horizontal and vertical). The first and second policy cycles involved different stakeholders. In Korea, although the range of stakeholders engaged with was extended, there are still questions about who should be involved – e.g. what should be the role of local authorities and private sector. In the UK, as adaptation issues have lower priority and adaptation team was trimmed down, the engagement in the second policy cycle was weaker than in the first one.

Unclear or absent monitoring and evaluation (M&E) provisions are identified as a barrier to national adaptation policy. Although both countries have a M&E system for adaptation policy, interviewees saw problems in it. The current system only evaluates administrative attainment, such as whether the planned projects have been executed, or the planned budgets used, rather than evaluating the effect on adaptation. In other words, we do not know whether the policy is effective for national adaptation (KD2, KD5, KD7, KD10 UA1). Also, interviewees said that feedback from the current system is not helpful for improving the policy going forward (KD9 UB4). Absence of a clear indicator for adaptation was considered an origin of this barrier. KC2 said "because there is no proper indicator, NCCAP cannot have a clear direction of monitoring and evaluation", and UC1 also said, "we have 180 indicators that we used. ... but it is not saying risks are coming down with our indicators". This barrier originates from and influences the uncertainty on effectiveness of adaptation policy. For example, UD9 emphasised that "lack of legal measures means nothing is happening at the end".

4.1.4. Nature of adaptation

This category involves seven barriers. Interviewees indicated that *continuously low priority of adaptation* is a barrier. Adaptation is never a priority issue that governmental departments invest effort and money in: it is an additional or future task on top of their existing responsibilities. UA4 stressed that "adaptation has not been something at the front of people thinking. ... I think adaptation just has not had focus", and UB2 said "it (adaptation) is always just seen as kind of an added work". There are seven origins for this barrier: adaptation does not help winning votes, short time-horizon of politicians and high-level leaders, competing priorities and interests of departments, lack of immediate and visible results of adaptation, lack of interest and support from the government, the difference between adaptation timescales and electoral cycles and lack of economic approaches and research on adaptation. KD1 said, "The reason is that there is no immediate visible result. Civil servants and leaders cannot show the achievements of the policy; thus, they do not prioritise adaptation", KE3 viewed that "climate change adaptation measures are a mid- to long-term plan, but leaders are changed every four or five years. So, it is important that leaders can show achievements right away and get votes". UD8 said "it is not about vote winning. I think it is something that needs to be done, but actually, it does not make into the higher levels of priority compared to education, health service, security etc. ... Other priorities are coming first, and adaptation can get left out". It influences one factor in both countries: lack of specific funds for adaptation.

Interviewees identified *uncertainty of effectiveness of adaptation policy* as a barrier. It is difficult to demonstrate that we are making the right adaptation decisions. KD2 said "there is a key question concerning the effect of doing adaptation projects, but we cannot find answers within a short time", UA2

and UA3 said that we don't know adaptation policy is working or not. UB1 emphasised that "something we have to bear in mind when we work in this field is that we are not going to get those exact figures on impacts of the adaptation measures". There is one origin that interviewees mentioned: absence of clear indicators for adaptation. It is difficult to find suitable indicators; the national adaptation policy has some indicators in both countries, but we still don't know those are good to show the effectiveness of the policy (UA1, UA2, UC1). Three factors are influenced by this barrier: unclear results of national adaptation policy, difficulty in setting clear targets for adaptation and assumptions that have not been proved. UB2 mentioned that "you can read the national adaptation plan, but it can be quite vague of what it is asking people to do. So, what is asking government departments, for example, to do. It is not easily measured", also UC1 said "we would love to be able to measure things (policy results) but we are not able to measure". UB4 stressed that "we had to accept some assumptions of policies from other sectors. We worked with some assumptions that have not been proved and have not enough scientific evidence". In addition, as mentioned above, this barrier gives and takes an influence with unclear or absence of monitoring and evaluation regulation.

Next, *difference between adaptation timescales and electoral cycles* is identified as a barrier. Climate change impacts and adaptation are long-term issues requiring long-term processes. However, time horizons of politicians and leaders are short. Politicians and leaders don't want or need to plan very far into the future, and they want to achieve something within the election cycle (KE3, UA2, UB3). UB2 said, "the government is working on election timescale ... but adaptation is the much longer time period over the election periods". This barrier influences and is influenced by short time-horizon of politicians and leaders. It also influences three other factors: lack of interest and support from the government, continuous low priority of adaptation and difficulty of establishing long-term goals for adaptation. Interviewees emphasised that it is hard to set long-term goals for adaptation in the current governmental system which changes every five years (KA2, KD9, KE3). Also, because of the barrier, asking politicians to sign up to adaptation actions is difficult (UC1), and adaptation is never really treated as a priority area. It never had many people working on it. It never had visibility or popularity. It was never something that government departments put much money on (UB2).

Interviewees pointed out that there is *a lack of understanding of adaptation*. The awareness of adaptation has increased, but the understanding of adaptation is still limited. Differences between adaptation and mitigation as well as between adaptation and Disaster Risk Reduction are not well understood yet. Interviewees suggested that there are still three poorly answered questions: what is adaptation? what do we need to do for adaptation? what can we do for adaptation? Even practitioners and civil servants who lead the policy cannot answer the questions and have different levels of understanding (KA2, KC2, KD7). UA4 also said, "even now, we don't know what to do for adaptation. ... I think we are still developing our understanding to answer what we need to try to deal with it". This barrier originates from three factors: lack of examples of adaptation, limited range of participants in national adaptation policy process and lack of adaptation experts. There is a lack of examples of adaptation which could demonstrate what adaptation is and what each department can do (UB4, UD7). KC1 said, "although departments secure budgets, they don't know what projects they can do. We don't have good

and clear examples of adaptation projects”. Climate change adaptation is still an agenda for selected few people (KD6, UA1, UA2), so only a small number of people share the understanding of it. This barrier’s influences include indifference of departments, terminology gaps between stakeholders, lack of relevance for current issues and weak linkage between adaptation policy and climate change risk assessments. A few departments did think adaptation is not their job and did not link adaptation with their current work. In other words, with the current understanding of adaptation, national adaptation policy does not appear relevant for the current issues, especially for other departments.

Also, there is a *terminology gap between stakeholders*. The definitions and concepts of key terms of adaptation are not mutually agreed or clear: these include the terms adaptation, risk, vulnerability and adaptive capacity. Experts and civil servants who participate in the policy process differently interpret and use the terms based on their understanding, training and expertise (KA4, KD10, UC1). This barrier is influenced by lack of adaptation experts and lack of understanding of adaptation. Its influence includes misunderstanding or confusion between stakeholders.

Insufficient economic approaches and research on adaptation is identified as a barrier. Interviewees mentioned that we do not know the cost of taking adaptation actions as well as the cost of not taking the actions. So the costs and benefits of adaptation remain unclear. UD9 said, “we have a quite clear climate science, but there is big uncertainty of climate policy and cost of adaptation, cost of not doing adaptation”. This influence of this barrier includes continuous low priority of adaptation and low awareness of the urgency of adaptation. “The national adaptation policy does not make financial implication; thus, it cannot attract attention from the public and politicians(KD5, UB2).”

Lastly, a *lack of linkage between climate change risk assessment and current issues and ongoing tasks* is considered a barrier. “We are looking at the climate change risks in isolation, not making implication in departments’ work context, although the risk assessments are very systematic” (KD1, UD7). The government cannot demonstrate the importance of adaptation based on risk assessments, and civil servants of the departments cannot link their tasks with the results of the risk assessments (KA4, KA5, UD9). There is one origin for this barrier: lack of consideration of climate change risks by policy-makers. KD2 said, “although adaptation policy should be based on climate change risks, there was no consideration of them. The current policy is a set of similar policies which were going on in departments”. UD3 said, “They (civil servants) just put those things we are going to do; actually it is not a plan: it is a wish-list, not consideration of risks”. This barrier weakens the linkage between adaptation policy and climate change risk assessments.

4.2. Characteristics of the common barrier map

We present a map that indicates the relationships between barriers, origins, and influences as well as between barriers – we call it ‘the common barrier map of national adaptation policy’ (Fig. 1). In the map, we identify 54 factors common for the two countries: 17 origins, 17 barriers, 20 influences. Seven barriers relate to the nature of adaptation, six are to the national political and administrative system, and resources and laws & regulations categories include two barriers each. As the nature of adaptation

category has the largest number of barriers, it also has the largest number of origins (14) and influences (17). The national political and administrative system category has 13 origins and 13 influences. The arrows from the categories of nature of adaptation and laws and regulations head to influences, other barriers, and origins in a complex way. The majority of arrows from national political and administrative system and resources point towards influences. Ten influences are related to the national political and administrative system barriers, eight are related to the nature of adaptation categories, three influence factors are linked with the laws and regulations barriers, and one is linked with the resources barrier.

4.3. key barriers

Each barrier has a mean of 4.2 arrows: 1.9 input and 2.2 output, and there are eight barriers which have more arrows than the average, these are shown as key barriers in Fig. 1. Although the number of arrows does not indicate the importance of the barriers, the eight barriers play a more prominent role than the other barriers. The key barriers can be classified into three types.

In the first type, four barriers are originated by one or two factors but give influences on four or five factors. In the map, *frequent rotating of civil servants* is a barrier that is caused by only civil servant regulation, but it leads to four problems in national adaptation policy. Also, *unclear range of participants of national adaptation policy in the current regulations* is derived from one origin, complicated governance of national adaptation policy, but it affects to not only two problems of the policy but also three other barriers. *Uncertainty of effectiveness of adaptation policy* has one origin, absence of clear indicators for adaptation, and it influences on three problems. This barrier also inter-influences with the unclear or absence of M&E regulation barrier. *Timescale difference between adaptation issues and election periods* causes a problem and gives effects on two other barriers. The origin, short time-horizon of politicians and high-level leaders, inter-influences with this barrier.

In contrast, two barriers in the second type have only one or two influences but many origins. These barriers are a result of a complex set of origins and barriers. *Continuous low priority of adaptation* has seven origins and one influence. Four origins and three barriers cause this barrier, but it influences only on specific fund for adaptation barrier. *Conflict between governmental departments* is also derived from four factors: two origins and two barriers, and it affects two influences.

Lastly, two barriers in the third type have similar numbers of origins and barriers. *Lack of interest and support from the government (political will)* is influenced by two origins and one barrier, and it also influences on two other barriers. Lack of understanding of adaptation is derived from three origins, and interestingly, it gives influence to every type of factors (two influences, one barrier, one origin).

Based on the characteristics, we also can see that each type needs different approaches to overcome the barriers. It is relatively easy to address the barriers of the first type with a small number of origins, and the responses should help reduce the adaptation deficit somewhat. For example, lack of economic evaluations of adaptation could be addressed by funding a programme of research to generate an improved evidence base, as well as to improve the understanding of adaptation. However, more

comprehensive measures are required to overcome the second and third types of barriers. For example, uncertainties related to the effectiveness of adaptation may need research efforts but may also need communication strategies, case examples of successful adaptation and new processes and solutions to enhance understanding of adaptation among key stakeholders. The approaches should cover multiple origins and barriers simultaneously and consider the relations between the barriers to clarify which barriers need to be handled first.

4.4. Commonly used solutions

Interviewees in both countries often mentioned that there was no specific solution to address a specific barrier, although they have experienced and recognised the barriers. There was no concept of barriers in the process of establishing and implementing the policy, which led to the absence of specific solutions for the barriers (KA3, KC2, KD2, UC1, UD1). KD5 criticised the current situation saying that “we have passed the matter over unnoticed without any solutions”. There are common actions that both countries have tried to take to improve the processes, such as providing recommendations from the managing institute/advisory body to the other government departments or holding workshops, debates, and open forums to communicate with the stakeholders. However, these actions were based on approaches that seldom analyse specific barriers or origins of their problems. Interviewees don't seem to clearly grasp what barrier is to be overcome through the chosen solutions and what are the results of them.

5. Discussion And Conclusion

There were clear commonalities in terms of barriers to national adaptation policy between Korea and the UK. By focusing on them, we answered what common barriers to national adaptation policy are, how they affect policy (influence), and why they occur (origin). An underlying ‘dynamic web of barriers’ which has been suggested only conceptually (Agrawala, 2005; Eisenack et al., 2014) was demonstrated by mapping the interrelationships between factors. Based on it, we could also decipher common causality and dynamics of the barriers, which have been recognised as an ‘unopened black box’ (Biesbroek et al., 2015; Eisenack et al., 2015; Biesbroek and Candel, 2019).

Seventeen common barriers to national adaptation policy in Korea and the UK in four categories were identified. Based on previous studies (Swart et al., 2009; Eisenack et al., 2014; Kato and Ellis, 2016; Lonsdale et al., 2017; UNEP, 2018), and particularly the results of a systematic literature review on barriers to national adaptation policy (see Lee et al., 2020), we argue that there are four common key barriers to national adaptation policy across contexts: ‘low priority of adaptation’, ‘conflict between government departments’, ‘lack of political interest’, and ‘unclear related regulations’. We identified seven barriers which are practically more concrete to national adaptation policy: ‘frequent rotating of civil servants’, ‘unclear range of participants of national adaptation policy in the current regulations’, ‘lack of linkage between climate change risk assessment and current issues, and ongoing task’. In addition, ‘lack of linkage between different level's climate change risk assessment’, ‘lack of human resource in a managing department’, ‘uncertainty of effectiveness of adaptation policy’, ‘timescale difference between adaptation issues and election periods’ offer more concrete detail than previously identified barriers, such as lack of

connection between different levels, lack of human resource, uncertainty of climate change and adaptation, or timescale conflicts. In terms of a practical understanding, although a financial resource barrier has frequently been reported as an influential barrier (Agrawala, 2005; IPCC, 2007, 2014; OECD, 2009; Biesbroek et al., 2013; Waters et al., 2014), it was not influential in the cases. KC1 commented that “even if the budget was secured, there were many cases where they don’t know what to do for adaptation”. Therefore, we emphasise that it is necessary to reconsider the barriers that were taken for granted for a practical understanding of them.

Origins and interdependencies between barriers were analysed, and we observed common causal mechanisms regarding national adaptation policy in Korea and the UK. An empirical understanding of social mechanisms has been emphasised to understand the nature of causality and explain connections between causes and effects (Hedström and Swedberg, 1998; Gerring 2008; Mason et al. 2013). The understanding of mechanisms is important to open up the ‘black boxes’ of barriers and to practically use the results of research on barriers in real adaptation processes (Wellstead et al., 2018; Biesbroek and Candel, 2019). It is possible for researchers and practitioners to collect diagnostic evidence, theorise variables and empirical examples, and test hypotheses (Kay and Baker, 2015; Wellstead et al., 2018). In this respect, we provided a methodology to diagnose problems of national adaptation policy, to identify related barriers and to analyse their causal mechanisms. The results of this research that focused on common barriers can play a critical role as a milestone to theorise causal mechanisms of barriers to national adaptation policy.

This research also indicated the barriers’ influences in detail, and it contributed to understanding the barriers more practically. We identified 20 influences caused by barriers, which are common problems of national adaptation policy in the UK and Korea. Previous studies on barriers to adaptation focused only on a barrier itself, without revealing the actual impacts related to adaptation policy establishment and implementation, and it led to a separation of the barriers from real policy processes. However, this research indicated how barriers are influencing the policy process by revealing concrete influences, and in this way, barriers could practically be considered within the adaptation policy process.

To effectively address overall barriers and reduce the adaptation deficit, we argue that focusing on overcoming barriers which have simple and a small number of origins would be practical for real adaptation processes. Stakeholders could take action on these barriers applying the approach used in this research. In Fig. 1, several problems caused by the ‘frequent rotating of civil servants’ barrier can be addressed with solutions that supplement the current civil servant regulation, for example, establishing a ‘boundary organisation (Biesbroek et al., 2010; Bauer et al., 2011)’ that can continuously participate in the whole policy process from outside the civil servant system. By doing so, it could retain continuity and connectivity of adaptation policies as well as expertise and accumulated experiences of the policy. Through legally specifying both horizontal and vertical participants of the governance of national adaptation policy, it would help to reduce conflicts between government departments, to improve not only connections between national- and subnational-level adaptation schemes but also the inability of dealing with cross-cutting issues. ‘Uncertainty of effectiveness of adaptation policy’ could be overcome through

setting a clear M&E regulation and making appropriate indicators for adaptation. If making appropriate indicators is difficult now, governments could set clear measurable goals for the policy to make sure of the effectiveness of the policy. By availing funds for research programmes, 'insufficient economic approaches and research on adaptation' could be addressed. It will help improve low awareness of the urgency of adaptation and continuous low priority of adaptation problems through strengthening the evidence base on adaptation and providing examples of successful adaptation. In addition, these approaches will provide a basis for overcoming more complex barriers.

This research has limitations. First, this research focused on common factors related to national-level barriers, but we cannot deny that context-specific factors can have a great influence on the occurrence of the barriers. This issue should be dealt with in each case study. Secondly, still, the cases are insufficient to generalise the results of this research. To identify general barriers to national adaptation policy and theorise the causal mechanisms, more national-level case studies with the same methodology are required.

Our results do have policy implications for reducing the adaptation deficit in national adaptation policy in Korea and the UK. First, civil servants and stakeholders should examine the problems that they have encountered in establishing and implementing the policy among the influence factors. Next, they should identify what barriers cause the problems and their origins through tracing causal mechanisms backwards. Then, based on the characteristics of the barriers and adaptive capacity, they should prioritise barriers and find out an entry point to overcome the barriers. Doing so would make adaptation to climate change more effective and efficient and reduce the adaptation deficit.

Declarations

Ethics approval

This research obtained ethical approval from ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee, University of Leeds. (AREA 18-071)

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Figures

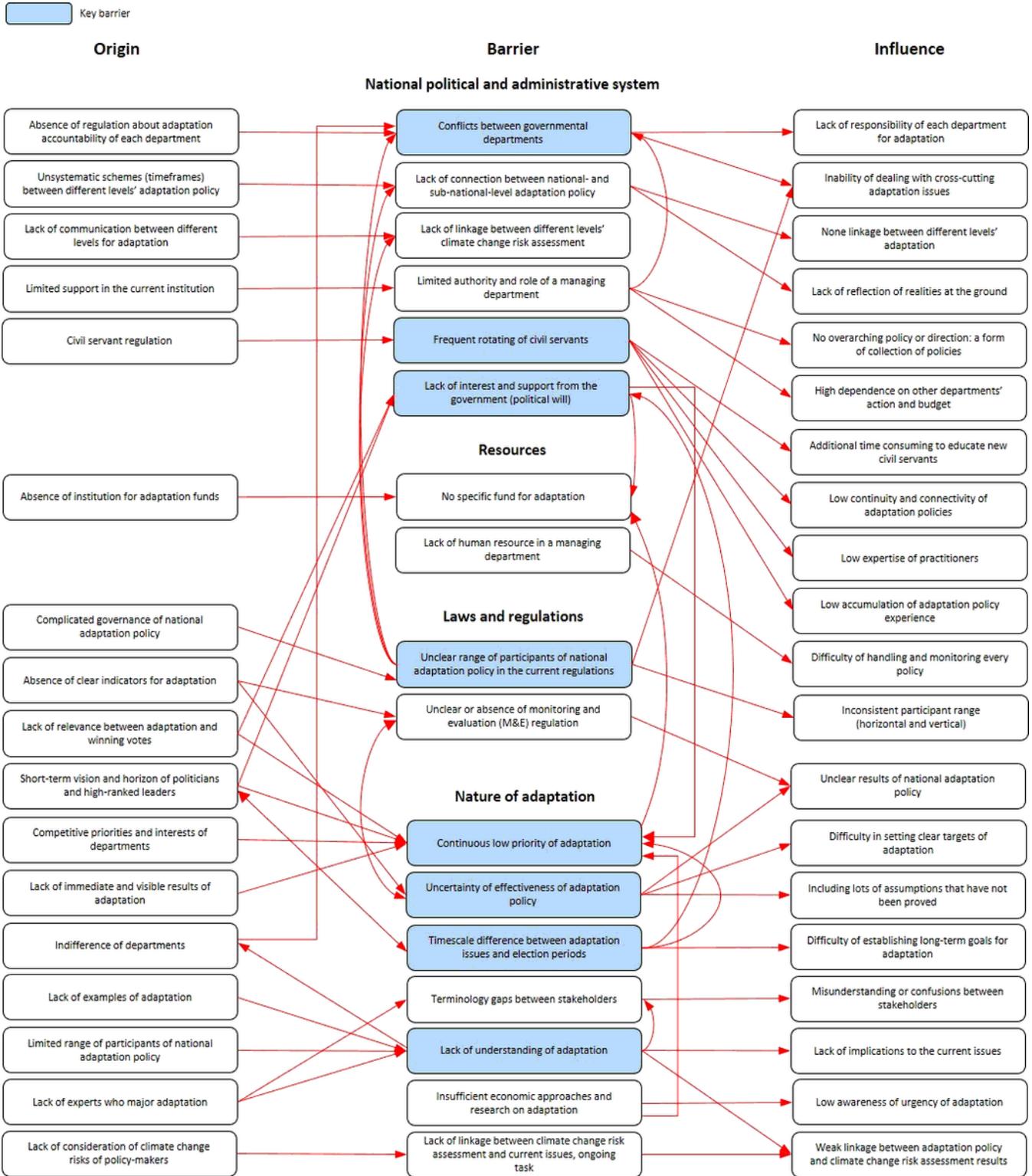


Figure 1

Common barrier map to national adaptation policy of Korea and the UK