

**Motivations for Local Climate Adaptation in Dutch Municipalities:
Climate Change Impacts and the Role of Local-Level Government**

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Abstract

The local government level is considered to be crucial in preparing society for climate change impact. Yet little is known about why local authorities do or do not take action to adapt their community for climate change impacts. In order to implement effective adaptation policy, the motivations for local climate adaptation need to be examined. This paper explores these motivations in Dutch communities by comparing nine urban and rural cases. To be able to draw general conclusions, cases are selected on ‘projected risk’ and ‘extreme weather event experience’. Motivations for local climate adaptation appear much more determined by local institutional factors such as a green party aldermen or innovative network membership than projected risk or extreme weather event experience. This could be explained by the empiric data showing diffuse channels of climate change knowledge into the local government level and limited capacity to translate this knowledge into genuine adaptation strategies.

Key words: adaptation, adaptive capacity, risk perception, local-level government, the Netherlands

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1 Introduction

Based on the most recent data, the Intergovernmental Panel on Climate Change clearly maintains that climate change is an inevitable development. Current observations prove that already many natural systems around the globe are being affected by climate change (IPCC, 2007). Even if we were able to stop our emissions today, the climate will change due to the surplus of greenhouse gases emitted in the past. Thus, even from a sceptical point of view (Lomborg, 2007), it is now widely recognized that we must begin to initiate adaptation measures now.

Climate-change adaptation primarily has had a ‘top-down’ policy perspective with national governments emphasising the importance of the local level. In its 2007 climate adaptation white paper, the European Commission stresses the major role at the local level, where most of the detailed knowledge on local characteristics is available and where civil awareness can be most effectively raised (European Commission, 2009). The Dutch government has also published its own National Adaptation Strategy (Ministerie van VROM, 2007). Known generally as the ARK Programme, the strategy also refers to the importance of

local-level government. The local level is crucial since a country as a whole can often be considered resilient, local areas can nonetheless be vulnerable due to their economic structures, geographic situation and infrastructure (Næss, Bang, Eriksen & Vevatne, 2006). Many decisions affecting vulnerability are decided on the local level too.

The local-level adaptation to climate change is a research theme that has been given increasing interest (Adger & Vincent 2005; Adger, Arnell & Tompkins 2005; Naess et al., 2005; Wall & Marzall, 2006; Wilson, 2006). Despite this, however, there are very few studies addressing the role of local-level government in adaptation initiatives in a multi-level governance structure, particularly as to how local-level capacity affects the level of preparedness. This paper applies a local-level government perspective to adaptation strategies by investigating the motivations for local-level climate adaptation possibilities, focusing on the current and projected role of the local-level government in the multi-government context. The goal is an improved knowledge base for both scientists and politicians involved in local-level adaptation policy.

Firstly, after introducing the impacts of climate change in the Netherlands and the terminology involved with climate-change adaptation, we develop the research questions (Section 1). We then provide a current overview of Dutch local-level preparedness for climate-change impacts (Section 2). Finally, we draw preliminary conclusions on the future role for the local-level government in a changing climate context by focussing on the barriers and drivers we found for local-level climate adaption (Section 3).

1.1 Climate change in the Netherlands and its local-level impact

The leading Dutch climate-change scenarios – considered as the national standard for adaptation questions – are formulated by the Royal Netherlands Meteorological Institute (KNMI). Apart from variations in expectations on temperature rise (+1 °C or +2 °C) and air currents (changed or unchanged), the scenarios show similar characteristics of climate change in the Netherlands. According to the KNMI we can expect the following primary climate-change effects (secondary effects result from these, e.g. higher river discharges due to temperature rise; KNMI, 2007):

- sea level rise
- increased average temperatures,
- more summer droughts,
- a greater number of heat waves,
- increased winter precipitation, and

- greater overall levels of precipitation.

In general climate-change impacts are ‘translated’ into more water entering the Dutch Delta. Besides adapting increasing precipitation quantities, the National Adaptation Strategy focuses on sea level rise and higher river discharges (Ministerie van VROM, 2007). Both the national government and the 2008 Delta Commission (advising the national government on becoming a ‘climate proof’ country) focus at the most vulnerable areas from flooding, while the impacts of climate change will be felt locally throughout the country. In its report on the climate problem, the Netherlands Scientific Council for Government Policy deals with these local impacts, such as a changing water system and shifting agricultural activities (Ministerie van AZ, 2006). The Council states that given its local-scale impacts, local communities shall have to find local solutions to deal with climate change.

1.2 *Climate-change adaptation terminology*

The domain of preparedness for climate-change impacts is concerned with several key concepts: vulnerability, adaptation and adaptive capacity. We discuss these below. In addition to these concepts the idea of ‘risk’ is also important. *Risk* combines the magnitude of impact and the probability of its occurrence. Therefore, as it captures uncertainty in the underlying process of climate-change exposure, it is essential for decision makers (IPCC, 2007). In the Netherlands, many types of risk have been visualised through regional ‘risk maps’.¹ Apart from the exceptional risk of flooding, however, no climate-induced risks are included.

Vulnerability can be seen as the degree to which a system is susceptible and unable to cope with climate-change impacts (Klein, Smit, Goosen & Hulsbergen, 1998). It may refer to the system itself (as a social, biological or geophysical structure), the impacts to the system, or the mechanism causing the impacts (IPCC, 2007). Since climate change is studied by researchers from a wide range of disciplines, it is used in different ‘languages’ and implemented in various types of models. When discussing vulnerability, social scientists tend to think in terms of ‘coping’, while climate scientists generally focus on risk (Brooks, 2003). The Netherlands is considered to be one of the most vulnerable areas in Europe since the majority of the Dutch live below sea level and 70 percent of Dutch GNP is actually earned below sea level (Kolen, Engel, Van der Most & Van Ruiten, 2009).

Stemming from evolutionary biology, the term *adaptation* is relatively new to the climate-change field. In the natural sciences it generally refers to the development of certain

¹ Available on the internet at www.risicokaart.nl (in Dutch only).

characteristics of organisms and systems to cope with environmental changes in order to survive. Adaptation in the climate-change literature generally refers to a process, action or outcome in a system in order for the system to better cope with, manage or adjust to some changing condition, stress, hazard or opportunity. Based on their timing, adaptations can be ‘anticipatory’ or ‘reactive’, and depending on their degree of spontaneity they can be ‘autonomous’ or ‘planned’ (Smit & Wandel, 2006). In the Netherlands, traditional adaptation is reactive, as it has generally involved dike reinforcement in the aftermath of flooding (e.g. Delta coastal defence system after the 1953 North Sea Flood).

At present the actual planning and implementation of effective adaptation is quite limited in the Netherlands due to limited technical, financial and institutional capacity. Planned adaptation is thus either very limited or very costly (IPCC, 2007). As a consequence, adaptation is rarely undertaken in response to climate-change effects alone. Some success in practical implementation has been seen when measures that address climate-change risk are incorporated into existing decision structures. Smit and Wandel (2006) call this the ‘mainstreaming’ of adaptation to climate change.

Adaptation is intimately associated with the concept of *adaptive capacity* which reflects the capability of the system to cope, adapt, or recover from the effects of climate change (Wall and Marzall, 2006). The IPCC defines adaptive capacity as the ‘the ability of a system to adjust to climate change’ (IPCC, 2007). Community-based analyses have shown that conditions that shape adaptive capacity and hence create the need and opportunities for adaptation, are community specific. Adaptive capacity can be influenced by many non-climatic drivers such as managerial ability, access to financial, technological, and information resources and infrastructure. A system’s adaptive capacity is not static, but flexible and responds to changes in economic, social, political, and institutional conditions over time (Smit & Wandel, 2006). In sum, the key concepts of vulnerability, adaptation and adaptive capacity are clearly interrelated. In the following section, we discuss these factors in light of the data gathered.

1.3 Research questions

In order to determine the motivations for local-level climate adaptation, we first need to learn about the actual level of local governmental preparedness for climate-change impacts. Hence, Research Question 1 was formulated as follows: *what is the current and projected role for local-level government within a multilevel governance model for climate adaptation?* The present section thus explores the actual role of local-level government within the climate-

change context and what a future role would look like. The study also investigated the possibilities of a shift from the current role towards the future by studying the motivations for local-level adaptation. Research Question 2 is thus stated: *what are the barriers and drivers for climate change adaptation at local-level governments?*

The research design has rested on the idea that weather events caused by climate change, such as heavy precipitation or increased river discharge, are not new. This makes it possible to focus on similar events that struck in the past to investigate current institutional reactions so as to draw lessons for a future that inevitably is coupled with a changing climate. The model of analysis (Table 2) assumes that both the institutional impact of historical extreme weather events and a perceived risk of future climate-change impacts are decisive dimensions in the assessment of local-level adaptation strategies.

[Insert Table 1]

The specific cases were selected on three criteria²: urban or rural character; having a history or not of exposure to a specific type of extreme weather event; and the existence or not of a projected risk of negative climate-change impact. The first criterion is translated into *size*: urban cases are the largest in population, whereas rural cases are generally much smaller in population. The second criterion is *history of exposure*. For this, we selected cases based on historical extreme weather events that are likely to occur again in the future due to the impacts of climate change. Furthermore, the events selected (the 1953 North Sea Flood and the 1993/1995 high waters)³ are expected to be ‘settled’ in the institutional memory of the concerned cases. The third criterion, *risk perception*, is operationalized in terms of a hazardous flooding location on a regional risk map (Section 1.1; flooding as the only available climatic induced risk). The case selection is shown in Figure 1. The data-collection phase (operating with a pre-determined case study protocol) consisted of preliminary analyses of relevant primary and secondary literature, and face-to-face interviews with local experts in nine different cases.

[Insert Figure 1]

² The effects of these three criteria are discussed in Berg, M.M. van den, Lafferty, W.M., & Coenen, F.J.H.M. (2009). *Climate change adaptation in Dutch local communities: Risk perception, institutional capacity and the role of local-level government*. Manuscript submitted for publication, University of Twente.

³ In 1953, dikes in the south-western parts proved not to be resistant to the combination of spring tide and a north-westerly storm. A number of 1,800 people died, comparable to Katrina’s death toll in New Orleans in 2005. In the following decades a heavy set of coastal works was carried out to prevent the threat from the sea for once and for all. In 1997, the project was finalised with the deliverance of the Maeslantkering Dam in the Nieuwe Waterweg, the main entrance to the Port of Rotterdam. Four decades later, the high waters of 1993 and 1995 are the most recent climate related events that were recorded in the International Emergency Disasters Database (EMDAT). In both cases, dikes proved to be stable in the end, but troubles were extremely. During the 1995 ‘near-flooding’ event, the largest post-war evacuation took place: 250,000 people (and all livestock) were forced to move.

For ease of communication and analyses, key words were developed for each of the ‘ideal-type’ cases. The *urban spectator* is viewed as being less vulnerable for climate-change impacts due to a higher ground location; whereas the selected *rural spectator* is seen as the smallest municipality in a less vulnerable, higher-ground region. The *urban veteran in reserve* is seen as having a flooding risk that has recently been diminished due to sluices and water basins, which also counts for the *rural veteran in reserve* which is the smallest municipality in a region currently protected by large-scale coastal defence works after being heavily impacted by the 1953 North Sea Flood. The *urban recruit* has been selected on the basis of location, lying next to large lakes at five meters under sea level. The *rural recruits at the front* were selected from the West Frisian Islands which face sea level rise on all sides. The *urban veteran at the front* faced the 1993/1995 high waters and is expected to be at increased risk of flooding from higher river discharges. And, finally, the *rural veteran at the front* is the smallest municipality close to its urban counterpart. Its inhabitants were evacuated during the 1995 high water and it is expected to be at increased flooding risk from higher river discharges.

2 Current local-level climate adaptation in Dutch climate policy

By signing a climate agreement with the national government, the Dutch municipalities have joined in the national climate adaptation goals (“Klimaatakkoord”, 2007). It is here agreed that local-level authorities will inventory climate-adaptation measures fitted to its existing policies. The agreement maintains that, of all governing layers, the local level has the closest connection to civilians and companies and for that reason can set an example. The local-level authorities also have a specific facilitation and information role vis-à-vis the public. The local level is seen as best capable of mobilizing people to organise effective actions and acting as a stimulator in placing climate change on the local agenda. In practice, however, our data-gathering showed a more complicated reality. In the following sections we focus on the first Research Question: *what is the current and projected role for local-level government within a multilevel governance model for climate adaptation?*

2.1 The role of local authorities in Dutch climate policy

Before discussing local-level climate adaptation in a Dutch context, we briefly deal with the role of local authorities in Dutch climate policy. When classifying local government systems, the Netherlands is placed within the ‘Napoleonic’ system, which is characterised by a relatively high degree of national governmental control (Kok, Vermeulen, Faaij & Jager,

2002). The Dutch ‘decentralised unitary-state’ is based on agreement between all levels of government. Within this co-government system, local authorities have the freedom of initiative as long as they take higher-government legislation into account.

Today, local-level authorities consider climate policy as part of environmental policy.⁴ In the Netherlands, environmental policy has its roots in local-level policy. Until the 1970s, the local-level was responsible for environmental policy. At the end of the sixties, more and more local-level environmental tasks shifted towards the national level due to the complexity and importance of environmental issues. In the 80s and 90s the national level tried to improve the local-level environmental duties. Traditionally, the national government considers local environmental policy as a municipal task financed by central funding. A long discussion on who should pay what in local-level environmental policy was only solved by research showing that municipalities had a severe deficit in funding the extension of environmental tasks in the 70s; from the 90s onward local-level authorities receive earmarked funding to bring their environmental policy to an adequate level (Coenen, 2001).

2.2 Legal and financial constraints for climate adaptation

The local-level government in the Netherlands is based on the Municipal Law (1851) that prescribes some environmental tasks, such as an annual Environmental Policy Plan, but it does not deal with climate related issues. The Disaster Law (1985) prescribes the municipal tasks involved with disasters and heavy accidents, and it only deals with the possibility of ‘regular’ extreme events such as flooding or extreme weather events. More latent developments, such as an increasing average temperature, are not covered. Further, the most important law on the environment, the Environmental Conservation Law (1993), does not deal with climatic issues. Besides this legal deficit, the existing legislation is also considered to be insufficient as it proves not to be flexible enough to deal with a changing climate (Verschuuren, 2007). Anticipating this, a leading Dutch NGO has been campaigning for a separate climate-change adaptation law.⁵

Several interviewees stressed a lack of tools available to enforce adaptation measurements within their communities. They state that the municipality is unable to implement its adaptation strategies sufficiently, for example that the municipality cannot oblige real estate developers to build climate-proof houses. This also has internal effects:

⁴ VNG, the Association of Dutch Municipalities, defines ‘climate’ as one of the components of the environmental policy domain on its website: www.vng.nl (accessed October 21 2009); this also counts for the Ministry of VROM: www.vrom.nl/pagina.html?id=4178 (accessed February 24 2009).

⁵ On its campaign website, <http://www.coolclimate.nl>, Friends of the Earth Netherlands urges sympathizers to join in it’s striving for a climate law (accessed September 21, 2009).

local administrators first focus on the tasks that are obliged by higher level governments. Local-level voluntary activities such as climate adaptation policy have low priority and funding is minimal.

Also funding constraints can be found. Compared to other EU member states, the Dutch local-level government is largely dependant on the national government for its finances. No less then 68 percent of all income of the lower governments is coming from the national government. About half this central funding is earmarked funding; the other half originates from the Municipal Fund, upon which budgets are distributed based on criteria such as the number of participants. Another nine percent of the lower governments' income is originating from its own taxes; this is the lowest percentage in the EU, except for Malta that hardly has a local governmental layer (CBS, 2008). The many earmarked funds leave little room for voluntary tasks, such as climate adaptation policy. Thus, we can state that limited budget offers a major barrier in climate-change adaptation.

2.3 *Institutional involvement in local-level climate adaptation*

In spite of the fact that climate change induces many climatic *and* meteorological effects, the Dutch local-level government commonly 'translates' its impacts into increasing precipitation quantities and an increasing frequency of heat waves. Therefore, the policy domains involved in climate-change adaptation strategies in general are the spatial planning and environment departments. Concerning local-level water management, municipalities can rely on the regional water board system, which prevents the Dutch from getting wet feet by maintaining water ways and dikes, and it also distributes water equally and cares for the purification of waste water. We will deal with this special governmental level in Sections 2.4 and 2.5.

A broader local-level institutional involvement could also include: disaster management, public health, economic affairs including recreation, economic strategic planning (such as climate-change impact assessments on local industries) and institutional adaptation. The case studies showed a remarkable variation in institutional involvement (Table 2). Next to increasing precipitation quantities and a higher frequency of heat waves, climate change also affects the domain of public health, which is a municipal responsibility. The municipal health care system is organised in the Public Health Services (GGD). The GGD obtains its knowledge from the National Institute for Public Health and the Environment (RIVM), the leading Dutch centre of expertise in the fields of health, nutrition and environmental protection. This RIVM has published several reports on the health effects of climate change on the Netherlands. Due to its close ties, the GGD appears to be well-aware

of effects of climate change affecting the public health, such as an increasing frequency of heat waves and new diseases entering the country. Yet, preventive measurements should be assigned by the municipality itself. In the case studies we found only one case which considered public health to be an issue in its climate adaptation strategy. Also, a GGD interviewee confirmed that in the region of Twente, no municipality requested the regional GGD for additional measurements.

[*Insert Table 2*]

Climate change also involves an increase of climatic disasters and extreme weather events. Disaster management is an important task for local-level government task: the mayor is responsible for public order and acts as the commanding officer in disaster management. However, the cases showed only a limited institutional involvement from this policy domain. In the case of the ‘urban veteran at the front’, about 20 civil servants constituted the municipal safety department. Many disaster-management plans are written and revised here. Yet climate change is considered to be ‘too big and too slow’ to act on. No action is taken since hazardous climate-change effects – being extreme weather events and flooding events – are as such not viewed to be ‘new’ but as already being a part of the disaster plans.

In the following section we concentrate on this local-level civil preparedness more thoroughly by describing the current role for local-level government within a multilevel governance model for climate adaptation. The case studies will be discussed according to the four dimensions distinguished in the four-fold table (Table 1).

2.4 *The current role of the local-level government in climate adaptation*

Spectators

In the selected case for ‘urban spectators’ we found an ‘integral approach’⁶ to climate change and a proactive way of thinking to adapt to it. The case is in the process of formulating an adaptation policy. Further, the ‘urban spectator’ is a frontrunner in climate-change mitigation strategies. On the other hand, the ‘rural spectator’ case shows a ‘minimum-level approach’⁷. The interviewees explain this difference in scope from their size. The ‘urban spectator’ runs economic and societal risks from climate change (because of its huge economic value and a large population), whereas the ‘rural spectator’ runs low economic and societal risks.

⁶ The concept of an ‘integral approach’ towards climate change adaptation is chosen to describe a broad, multi-disciplinary view on climate change preparedness; in table 2, the local-level approach is visualised in the concerned policy domains.

⁷ A ‘minimum-level approach’ – as opposed to the ‘integral approach’ – stands for a narrow view on climate change preparedness. In practice, the ‘minimum-level approach’ means a national-stimulated adjusting of the local sewage system. Table 2 shows all cases being involved in the ‘minimum-level approach’.

Furthermore, as small municipalities are obliged to fulfil the same tasks as larger municipalities, the larger ones have more capacity to focus on voluntary tasks, such as (currently) climate-adaptation strategies.

This general conclusion does not, however, explain the huge differences between the two concerned cases and can perhaps be better understood in context. In its present climate action programme, the ‘urban spectator’s’ Municipal Board⁸ stresses the presence of many research institutes working with climate change. This ‘favourable’ circumstance is surprising since we did not anticipate effects from such a ‘coincidence’ factor. Yet, this ‘favourable’ factor might explain best why the ‘urban spectator’ is so remarkably active, in addition to its relatively high economic and societal risks. There is also a striking difference in political orientation: the rural case has a rightwing Municipal Board, whereas the Municipal Board of the ‘urban spectator’ (until recently) consisted of leftwing parties with a green party alderman responsible for environmental affairs.⁹

Veterans in reserve

The integral approach of the ‘urban veteran in reserve’ has similarities to the ‘urban spectator’, whereas the narrow approach of the ‘rural veteran in reserve’ is roughly comparable to the ‘rural spectator’. Similar to the ‘urban spectator’, the ‘urban veteran in reserve’ has a green alderman responsible for environmental policy and a ‘favourable’ local context in the form of a regional urban network willing to cooperate in progressive climate policy, along with a stimulating provincial actor stressing the need for adaptation. Whereas the ‘urban veteran in reserve’ stresses the opportunities that climate adaptation brings, the ‘rural veteran in reserve’ has a more limited view on adaptation.

The trigger of experience made no apparent difference for both ‘veterans in reserve’. Only in the rural case did we confirm a striking risk perception by an interviewee, not because of memories of the impacts from the 1953 North Sea Flood (see Footnote 2), but because the national government is considering adjusting the coastal defence works surrounding the island in favour of the densely populated parts to the north. Furthermore, disaster management is explained to be inadequate because national funding for this is limited because of the thinly populated area.

⁸ In The Netherlands, the Municipal Board is the daily management of the municipal organisation. The Board consists of a centrally appointed mayor and –depending on the number of municipal inhabitants- between 2 and 8 locally elected aldermen.

⁹ The Dutch political spectrum varies from leftwing up till rightwing parties. In general, leftwing parties are progressive and more ‘green minded’ (environmentally minded) then rightwing, conservative parties. One of the Dutch leftwing parties is *GroenLinks* (English: GreenLeft), the Dutch Green political party. Aldermen from this party are called green aldermen throughout the chapter.

Recruits at the front

Despite the risk profile of the ‘recruit’ cases, the urban case interviewees deny running increased risks, mainly because of the national government’s promise not to increase the water level of the neighbouring Marker Lake. In a similar manner, the rural case interviewees stressed the national governmental role to protect the population by dikes and dunes. The cases run a much higher risk of flooding compared to municipalities on higher grounds in the eastern or southern parts, but from a local perspective this risk is not perceived as increasing due to climate change.

The ‘recruits’ appear to have developed their own perspective on climate-change impacts. The one is mostly interested in climate-change effects on nature, and the other primarily focuses on climate-change effects and tourism. There is, however, no sense of urgency present and no new climate-related policies are being pursued. This narrow approach can partly be explained by a lower overall capacity, but a more crucial factor would appear to seem to be the general self-interpretation of the municipality’s duties (the ‘perceived role’). Both ‘rural recruits’ emerged as very strict in defining their responsibilities and the responsibilities of other governmental layers. Here we see a striking similarity with the urban ‘veteran in reserve’ that also considers safety and protection from flood as a national governmental task.

Veterans at the front

We have found a very progressive urban ‘veteran at the front’ and a rather passive ‘rural veteran at the front’. The ‘urban veteran at the front’ is very progressive in its civil preparedness because of political support and a context (the river) that triggers action. This corresponds to a pattern we already observed in the other categories. Next to the ‘urban spectator’ and the ‘urban veteran in reserve’ we can add an ‘urban veteran at the front’. The most important triggers in all cases seem to be an active political support by political leaders and a diversity of local-level contextual factors that support more active adaptive initiatives (the presence of respected climate research institutions; a well-informed and concerned ‘urban’ network; and an ever hazardous river).

2.5 *Local-level preparedness within a multilevel-governance system*

The water boards¹⁰ are clearly present to fulfil their duty as regional flooding protectors. Most of the cases are on good ‘speaking terms’ with the concerned water boards so to ‘fine tune’ local strategies, but mostly it is the water board telling municipalities to meet certain rules. Where primary water dams are involved, the National Executive Authority on Water Management (Rijkswaterstaat) is responsible. Yet, despite its regional presence, the role of Rijkswaterstaat in general is experienced to be rather difficult. While local authorities experience the cooperation with the water boards to take place on an equal basis, the Rijkswaterstaat is felt to be rather distant and incommunicative.

When we enquired as to a potential future role for the local-level government in climate adaptation, most changes were expected to occur within the organisation. This means taking time for local awareness raising or simply ‘waiting’ for climate-change related events to occur. More external demands are not salient at this moment, except for a general wish for more effective coordination at the national level and some demands for money.

The national government is considered to be a coordinator and facilitator. Some interviewees indicated a strong need for national recognition for their adaptation efforts (the ‘rural veteran at the front’); or will only start with their adaptation measurements if national support is forthcoming (the ‘rural veteran in reserve’ and ‘urban recruit’). Others do not need more national support but expect that the state will upgrade and adapt the dikes (the ‘rural recruits’). One interviewee also suggested a national adaptation ‘toolbox’ with more specific guidelines (the ‘urban veteran in reserve’). Another interviewee stressed the need for national attention to be paid to adaptation since that would motivate local administrators to start working with climate adaptation from the top down (the ‘urban veteran at the front’).

The importance of the national government setting an example was frequently mentioned. This could be in an international context, with the Netherlands representing ‘best practice’ on water protection (the ‘urban spectator’); but it was also viewed as counting within the Netherlands. From another angle, the responsible ministry was considered to be failing in the integration of spatial planning and adaptation, with a wish that it more actively propagate an interdisciplinary approach (the ‘rural spectator’). Some cases experience the national-level government to be ‘distant’ in both senses of the word (the ‘rural recruits’, ‘rural

¹⁰ Already in the early middle ages, local communities were involved into water management cooperation. In the thirteenth century these communities grew into the water boards we know until now. Nowadays, the water board still prevents the Dutch from wet feet by maintaining water ways and dikes, and it also distributes water equally and cares for the purification of waste water.

veteran in reserve’, and ‘rural spectator’), while for others a concern over climate change is considered to be part of this distant state (the ‘rural spectator’, ‘rural recruits’).

3 Looking ahead: a future role for local-level climate adaptation

Climate-change adaptation is one of the major political challenges we face today. Its context is very complicated, not only because of the many uncertainties that are associated with the climate-change problem itself, but also because we deal with a very premature policy domain which lacks national focus in its implementation and which is characterised by a lack of uniform understanding and approach. The political-administrative apparatus must learn to deal with these uncertainties. Risk control in society is a basic political responsibility. Identifying threats and adapting to risks throughout the centuries has been a driving force of political culture and democratic development (Van der Donk, 2008). Today, however, as first formulated by Ulrich Beck (1992) in his concept of ‘the risk society’, modern society has become so complex that politicians and governments must increasingly rely on science and research for effective decision-making.

There are, moreover, few other areas where this dependency is both more critical and more controversial than in the area of climate change. Our analysis clearly shows, however, that, in the area of adaptation, the current channels of knowledge and coordination across different levels of government are fragmented and diffuse (Table 3). The availability of advanced knowledge and preparation is most abundantly present at higher levels of governance, most particularly the active work of Water Boards to stress the need for more water storage areas. Local communities express a wish to learn from frontrunner examples, yet there is hardly any direct connection between the frontrunners and others. A major capacity for increasing local adaptation awareness and resources should be available here. More effective means of dissemination and top-down/bottom-up communication are necessary to realize the potential.

[*Insert table 3*]

We finalise this paper, therefore, by broadening our perspective on a future role for local-level climate adaptation in terms of the barriers to more effective initiatives revealed by the project by focussing on the second Research Question: *what are the barriers and drivers for climate change adaptation at local-level governments?*

3.1 *Conquering the barriers*

Throughout the case studies, most of the barriers mentioned by informants are internal: sceptical colleagues, lack of political support, lack of interest in climate change, and difficulties involved in cooperation between different departments and domains. If a certain sense of urgency has already developed at the local level, most interviewees foresee shortages in the capacity to implement actual adaptation actions. This barrier can also account for the fact that several local administrators, with scarce time to devote to the many areas of responsibility held, simply do not have the necessary capacity to go deeper into the climate-change challenge. Shortages of staff in general are mentioned as a relatively common barrier in the small municipalities, where working on non-legal tasks such as climate adaptation cannot be prioritized.

There where sufficient adaptive capacity and political support for climate-change adaptation is available, several more practical barriers emerge. First, due to their urban situation, cities face major challenges in visualizing and risk-scoping the highly complex and interdependent environment constituted by the urban infrastructure. A further complicating factor is the uncertainty as to the functionality of the most effective adaptation solutions. And, even if a ‘best-possible solution’ does emerge, it must then be decided who is going to make the investment. These implementation barriers can only be overcome by more concentrated coordination efforts within and across national, regional and local governmental domains. Our study also shows, however, that best-practice at the local level can also be a major knowledge input into these processes.

Besides these institutional barriers, knowledge gaps are also a major hindrance. This involves climate-change knowledge in general and its application on the local-level in particular. In general, uncertainties as to the ‘starting point’ of climate-change impacts were mentioned by several informants. Some cases explicitly view a lack of effective instruments a major barrier in climate adaptation, but very few sources were able to suggest specific means for addressing the problem. Others simply ask for national funding to support adaptation measures, as this would motivate local administrators to start working with climate adaptation.

When applying climate-change knowledge at the local level, major difficulties also occur when down-scaling and visualising climate change in combination with the large scope of the climate-change scenarios. Several of the case studies viewed the national scope of the prevailing KNMI as being too broad in formulating their adaptation strategies. They feel a

need to know the impacts in a manner as detailed as possible in order to prepare as efficiently as possible. Informants also mentioned that predictions as to climate-change must be reliable and consensual if they are to convince local administrators to act on climate change. Provincial climate scenarios do not fulfil the need for downscaled knowledge as they are based on the national scenarios.

It is unlikely, however, that this deficiency can be solved in the near future, since our original scoping of down-scaling models reveals that the degree of resolution for model predictions will not be specific enough to accommodate individual variance in local-community conditions. This is an issue which clearly requires further multi-disciplinary research (Jacques, 2006). While most provinces in the Netherlands already are covered by detailed model predictions, the challenge in the future will be to adapt regional predictions to local-community conditions. Effective adaptation can only take place through the interaction of top-down (climate-related) and bottom-up (socio-economic) modelling (Aall & Norland, 2005; Clausen, 2007).

Limited attention to climate-change adaptation is mentioned as a general problem. More attention is desired both within the organisation as well as throughout society. Some interviewees foresee changes in the course of time due to an increasing chance of events occurring and due to increased awareness within society, and several feel that the specific issue of climate adaptation could benefit from more focused legislation. Supported by national law, municipalities could then act more forcefully to implement resource-demanding adaptation initiatives, particularly for example in new residential areas.

3.2 Drivers for local-level climate adaptation

In addition to the major perceived barriers, we also gained insight into several more positive factors for promoting local climate-change adaptation. In a manner similar to earlier studies of 'Local Agenda 21' in Europe (Lafferty & Coenen, 2001), the project indicates that local 'firebrands' are of significant importance in a positive direction. The presence of a green party alderman in one case (and, more generally, specifically 'environmentally oriented' administrators otherwise), was seemingly crucial to the promotion of climate-related initiatives. The factor usually reflected, and thus enhanced positive institutional support for addressing the climate-change issue.

Similarly, we also found that the more 'willing' and positively disposed cases were also active in all sorts of networks. This varied from EU projects to urban networks and inter-municipal cooperation. Interviewees actively confirmed that these networks played a key

role, as they enable the local level to exchange knowledge and best practices, and to share the costs of research and trial projects. Within such stimulating networks, local political units are more motivated to explore climate-adaptation actions that would otherwise be too ambitious (resource-demanding) for a single municipality.

The ‘drivers’ revealed show similarities to key factors that Bulkely and Betsill (2003) have identified for the implementation of local climate mitigation efforts: (1) a committed individual in a local-level government that (2) manifests a solid climate-protection policy (preventing GHG emissions), (3) has funding available, (4) has power over mitigation-related domains and (5) – perhaps most crucially – has the political will to act. By adjusting factors (2) and (4) from mitigation to adaptation, this list provides a solid baseline for future adaptation initiatives. On the basis of our study, however, we would also add such local contextual factors as: (6) an awareness of the specifics of local climate-change impacts (see Table 5); (7) hands-on experience with emission-preventing policies; (8) attempts to factor risk assessment into long-term policies; (9) experience with previous extreme-weather events; and (10) the size of the municipality population.

4 Conclusions

Our study has shown that motivations for local climate adaptation are much more determined by local institutional factors such as a green party aldermen or innovative network membership than projected risk or extreme weather event experience. Most decisive barriers prove to be internal, which also includes a major lack of political support for climate adaptation. If capacity and support are present, then barriers merge such as the complex infrastructural context of cities or the question of who will pay. Furthermore, knowledge gaps are a major hindrance. Current channels of knowledge and coordination across different levels of government are fragmented and diffuse. Local communities express a wish to learn from frontrunner examples, yet there is hardly any direct connection between the frontrunners and others. More effective means of dissemination and top-down/bottom-up communication are necessary to realize the potential.

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Appendix: Figures and tables to be inserted

Table 1: Four-fold table approaching climate change impact on Dutch local-level government

		History of exposure to a specific type of extreme weather event	
		No	Yes
Projected risk of negative climate-change impact	Low	Spectator	Veteran in reserve
	High	Recruit at the front	Veteran at the front

Figure 1: Map of the Netherlands with case selection indicated

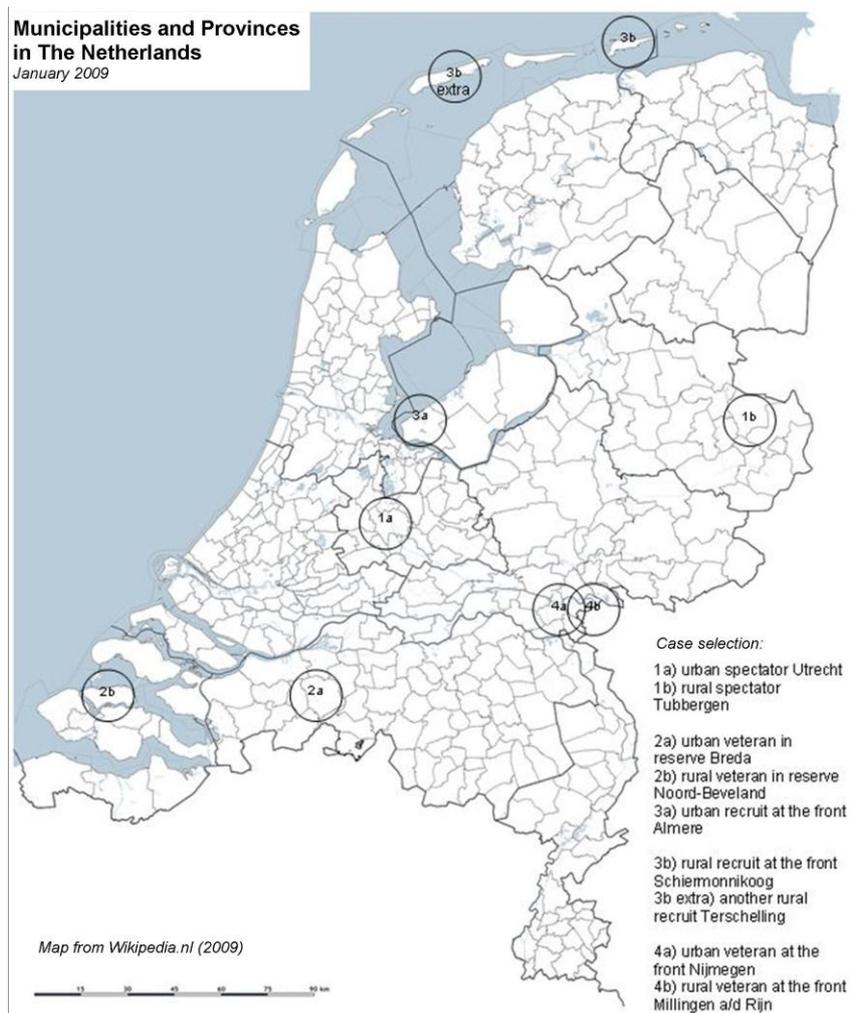


Table 2: Institutional involvement in local-level climate adaptation

	<i>Environment (trigger of adaptation file)</i>	<i>Public space (adjusting public spaces to heat and/or water storage)</i>	<i>Local-level water management* (adjustments for water storage and smart discharge)</i>	<i>Spatial planning (adjusting new housing development areas to heat and/or water storage)</i>	<i>Economical affairs (plans for recreation in the new climate)</i>	<i>Public health (involvement of public health issues in adaptation)</i>	<i>Internal adaptation measures (awareness rising, cross-department corporation)</i>	<i>Disaster management (adjusting the planning and training system to new climate conditions)</i>
Urban spectator	X	X	X	X			X	
Rural spectator			X					
Urban veteran in reserve	X	X	X	X	X	X	X	
Rural veteran in reserve			X					
Urban recruit		X	X	X				
Rural recruit	X		X					
Extra rural recruit	X		X					
Urban veteran at the front	x	X	X	X			X	
Rural veteran at the front	X		X				X	

**) all cases are adjusting their sewage systems to the predictions of an increased precipitation ('minimum-level approach')*

Table 3: Channels of climate change knowledge of local-level civil servants

	<i>Mitigation frontrunner network</i>	<i>Professional networks (Rioned, VNG)</i>	<i>Municipal networks (Wadden, B5, MARN)</i>	<i>EU projects (Building with CaRe, Future Cities)</i>	<i>Higher-level government</i>	<i>Direct scientific contacts</i>
Urban spectator	X				X	
Rural spectator		X			X	
Urban veteran in reserve	X		X		X	
Rural veteran in reserve				X	X	
Urban recruit					X	
Rural recruit			X		X	X
Extra rural recruit			X		X	
Urban veteran at the front	X		X	X	X	X
Rural veteran at the front			X		X	