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Exploring the Prospects for Cross-Border Climate Change Adaptation between North Rhine-Westphalia and the Netherlands

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1. Introduction

As a result of climate change, increasing flood risks as well as droughts are expected to occur more frequently in river basins.[1, 2, 3] Precipitation patterns in the Rhine basin will change in winter, with up to a 15% increase in the near future and a 25% increase in the far future, while in the summer a decrease of between 10% and 30% is expected.[4] The hydrology of the basin will change from a combined rainfall-snowmelt regime to a rainfall dominated regime.[5, 6, 7, 8] Those changes, leading to high and low water problems, as well as changes in the temperature of the Rhine water and the ecology of flood plains, will have impacts on different societal sectors like housing, agriculture, nature conservation and navigation.[9, 10, 11] The potential impact of floods will also increase, due to a growing number of people living in flood-prone areas and increasing economic activity behind the dikes.[12]

The policies for adapting to climate change effects, in short 'climate adaptation', consist of initiatives and measures that reduce the vulnerability of natural and human systems to climate change effects. The Intergovernmental Panel on Climate Change (IPCC) defines this as 'the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates

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1 IPCC, *Climate change 2007: synthesis report*, 2007, fourth assessment report: intergovernmental panel on climate change.
2 P. Kabat & H. van Schaik, *Climate changes the water rules: how water managers can cope with today's climate variability and tomorrow's climate change*, 2003.
3 A.H. te Linde, *Rhine at risk? Impact of climate change on low-probability floods in the Rhine basin and the effectiveness of flood management measures,* 2011, dissertation, VU Amsterdam.
4 K. Görgen et al., *Assessment of Climate Change Impacts on discharge in the Rhine river basin: results of the RheinBlick2050 Project*, 2010, International Commission for the Hydrology of the Rhine Basin (CHR).
5 G. Becker et al., 'Influence of flood risk perception and other factors on risk reducing behavior: a survey of municipalities along the Rhine', 2013 *Journal of Flood Risk Management* 7, no. 1, pp. 16-30.
6 H. Middelkoop et al., 'Impact of climate change on hydrological regimes and water resources management in the Rhine basin', 2001 *Climate change* 49, no. 1-2, pp. 105-128.
7 L. Pfister et al., 'Climate change, land use change and run off prediction in the Rhine-Meuse basins', 2004 *River Research and Applications* 20, no. 3, pp. 229-241.
8 Te Linde, supra note 3.
9 M. Haasnoot et al., 'Impact of climate change and anticipating flood management strategy on floodplain ecosystems of the River Rhine, the Netherlands', in D.G. Jalón Lastra & M.P. Vizcaíno (eds.), *Aquatic habitats: analysis and restoration*, 2004.
10 F. Ludwig & M. Moench, 'The impacts of climate change on water', in F. Ludwig et al., (eds.), *Climate change adaptation in the water sector*, 2009.
11 N. Pinter et al., 'Flood magnification on the Rhine river', 2006 *Hydrological Process* 20, no. 1, pp. 147-164.
12 P. Bubeck et al., *Assessment of upstream flood risk in the Rhine Basin (HSGR02),* 2013, Synthesis Report Knowledge for Climate.

harm or exploits beneficial opportunities'.[13] Thus, climate adaptation is important, since even if the best climate mitigation measures are immediately implemented, climate change is still inevitable.[14] Climate adaptation is inherently transboundary in character, as climate change effects do not stop at man-made borders and cannot be dealt with merely at a domestic governmental level. However, climate adaptation policy has been, up until now, a predominantly domestic responsibility.[15] Transboundary governance is essential in river catchments. Flood losses are, for instance, higher in shared basins that lack institutional flood management capacities such as well-developed early warning systems.[16, 17] Cooperation in many of the world's 263 cross-border catchments – most of them located in Europe[18, 19] – is often complex due to upstream and downstream problems, asymmetries in concerns, solutions and possibilities, sovereignty of States, et cetera. On the other hand, mutual dependency and reciprocal interests in cooperation between border regions could facilitate cross-border cooperation.[20, 21, 22] Understanding enabling and constraining factors for transboundary cooperation in river basins is of significant importance for dealing with climate adaptation issues in the future. In this paper we will explore the prospects for future cooperation on climate adaptation between the Netherlands and North Rhine-Westphalia. Both are located in the Rhine basin, one of the most densely populated, industrialized and economically important regions in Europe. North Rhine-Westphalia, one of Germany's sixteen federal States (*Länder*) borders on the Netherlands and is Germany's most densely populated State, with a population of 18.1 million people.[23, 24, 25, 26, 27, 28, 29, 30] Climate change is predicted to have a significant impact on this catchment area.[31] The occurrence of an extreme 1 in 1250 years flood event in the Lower Rhine delta is expected to be three to five times higher in 2050.[32, 33] Cooperation across borders would be crucial, at the very least, for estimating the risks and devising adaptation policies upstream, for knowing effects downstream related to high and low water, as well as for ecology and nature conservation. The main objective of this paper is to identify characteristics of policy arrangements that may facilitate or constrain cross-border climate change adaptation in river basins.

As we expect that congruence between policy arrangements can have a positive impact on cross-border cooperation, we first describe the adaptation policies and policy arrangement characteristics related to the Rhine river basin in North Rhine-Westphalia and the Netherlands (Sections 3 and 4). Thereafter we compare both arrangements and assess what factors could enable and constrain transboundary governance of climate adaptation (Section 5). We have used a slightly revised version of

13 IPCC, supra note 1.
14 Federal Environment Agency, *Climate change in Germany: vulnerability and adaptation of climate sensitive sectors,* 2005, Potsdam Institute for Climate Impact Research.
15 H.F.M.W. van Rijswick et al., *Normative principles of adaptation: shifts in defining the public interest and the role of principles with regard to adaptation to climate change,* 2011, Knowledge for Climate.
16 M.H.N. Bakker, 'Transboundary river floods and institutional capacity', 2009 *Journal of American Water Resources Association* 45, no. 3, pp. 553-566.
17 R. Basher, 'Global early warning systems for natural hazards: systematic and people-centred', 2006 *Philosophical transactions of the Royal Society A* 364, pp. 2167-2182.
18 I. Dombrowsky, *Conflict, cooperation and institutions in international water management: an economic analysis,* 2007.
19 T. Raadgever & E. Mostert, *Transboundary river basin management: state-of-the-art review on transboundary regimes and information management in the context of adaptive management,* 2005, NeWater report series.
20 T. Bernauer, 'Explaining success and failure in international river management', 2002 *Aquatic Science* 64, no. 1, pp. 1-19.
21 R. Durth, *Grenzüberschreitende Umweltprobleme und regionale integration: zur politischen oekonomie von oberlauf-unterlauf-problemen an internationalen flüssen,* 1996.
22 D.G. Le Marquand, *International rivers: the politics of co-operation,* 1977, Vancouver, University of British Colombia, Westwater Research Center.
23 H. van Duijn et al., 'Chapter 4: Germany', in *International Inventory: water and spatial planning policies*, 2009, pp. 13-21.
24 Die Landesregierung Nord Rhein Westfalen, *North Rhine Westphalia,* <http://www.nrw.de/en/north-rhine-wesphalia/> (last visited 3 April 2014).
25 Becker et al., supra note 5.
26 Bubeck et al., supra note 12.
27 C. Dieperink, 'From the open sewer to salmon run: lessons from the Rhine water quality regime', 1998 *Water policy* 1, pp. 471-485.
28 S. Lindemann, 'Understanding water regime formation – a research framework with lessons from Europe', 2008 *Global Environmental Politics* 8, no. 4, pp. 117-140.
29 Raadgever & Mostert, supra note 19.
30 Te Linde, supra note 3.
31 Middelkoop et al., supra note 6.
32 Bubeck et al., supra note 12.
33 A.H. Te Linde et al., 'Future flood risk estimates along the Rhine, 2011 *Natural Hazards Earth Systems Science* 11, no. 2, pp. 459-473.

the Policy Arrangement Approach as our analytical framework. The next section (Section 2) clarifies this approach. We conclude this paper with a reflection on the findings (Section 6) and concluding remarks (Section 7).

To identify the characteristics of the arrangements as well as the prospects for future cooperation, we used different data sources. Fifteen semi-structured face-to-face or Skype interviews were executed with key actors (e.g. experts, scientists, policy makers and officials) on both sides of the border between April and August 2013. Interviewees were representatives of the Climate Service Centre Germany, the Euregio Rijn-Waal, the Federal Environment Agency (*Umweltbundesamt*), the *Gelderse Natuur en Milieu Federatie*, the International Commission for Protection of the Rhine, the *Klimakommune Saerbeck*, the *Landesarbeitgemeinschaft Agenda 21 NRW*, the *Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur und Verbracherschutz des Landes Nordrhein-Westfalen*, *Prognos AG*, *Provincie Gelderland*, Research Institute for water and waste management Aachen, *DynaKlim*, University of Bremen, University of Kassel, Utrecht University and Wageningen University. These interviews were supplemented by data from another 22 interviews on transboundary climate adaptation, which had been conducted earlier,[34] a review of scientific literature, policy documents and media reports.

2. The Policy Arrangement Approach as an analytical framework

The Policy Arrangement Approach (PAA) provides an analytical framework for both the dynamics and stability of the organizational and substantial aspects of a specific field of governance.[35, 36, 37] Various successful applications of the PAA preceded our utilization, such as the books by Van Tatenhove et al.[38] and Arts and Leroy[39] or the study by Veenman et al., who used this approach to gain an overview of the de-institutionalization of forest policy in the Netherlands.[40] Wiering and Arts have also used the approach to study discursive shifts in Dutch river management,[41] while Stassen et al. used this framework to compare the impact of environmental discourses on public health policy arrangements in the UK and Flanders.[42] The PAA was also applied in studies analysing cross-border cooperation in the River Cross research project.[43]

According to this analytical framework, a policy arrangement can be defined as the way in which a certain policy domain – such as climate adaptation – is shaped in terms of organization and substance. Therefore, it is seen as a 'temporary stabilization of the content and organization of a particular policy domain'.[44] Policy arrangements are an on-going process of institutionalization and can be analysed by focussing on four interwoven dimensions.[45] The first dimension is concerned with actors and coalitions involved in the policy area under consideration. The roles which actors play, their interests and goals, their influence on the policy process, relations between actors, clusters of actors and their position in the process and the context in which they operate, are all of significance for the development of a policy

34 We are grateful for being able to use the interview data of Ismael Moralis and Vincent van Os regarding transboundary cooperation in the Rhine basin.

35 B. Arts et al., 'Political Modernisation and Policy Arrangements: a framework for understanding environmental policy change, 2006 *Public Organization Review*, pp. 93-106.

36 D. Liefferink, 'The dynamics of policy arrangements: turning round the tetrahedron', in B. Arts & P. Leroy, *Institutional dynamics in environmental governance*, 2006, pp. 45-51.

37 Liefferink, supra note 36.

38 J. van Tatenhove et al., *Political modernisation and the environment: the renewal of environmental policy arrangements*, 2000.

39 B. Arts & P. Leroy, *Institutional Dynamics of Environmental Governance*, 2006.

40 S. Veenman et al., 'A short history of Dutch forest policy: the de-institutionalisation of a policy arrangement, 2009 *Forest policy and economics* 11, pp. 202-208.

41 M. Wiering & B. Arts, 'Discursive shifts in Dutch river management: deep institutional change or adaptation strategy?', 2006 *Hydrobiologia* 565, pp. 327-338.

42 K.R. Stassen et al., 'Impact of environmental discourses on public health policy arrangements: A comparative study in the UK and Flanders (Belgium)', 2010 *Public Health* 124, pp. 581-592.

43 J. Verwijmeren & M. Wiering, *Many rivers to cross: cross border cooperation in river management,* 2007.

44 Tatenhove et al., supra note 38.

45 Liefferink, supra note 36.

arrangement.[46, 47, 48, 49, 50] The second dimension is about resources and power and consists of the core idea that actors are, to different degrees, dependent upon each other for resources. Thus resources are tools within a policy arrangement by which actors could exercise influence and power. Power in this case refers to mobilization, division and deployment of resources that will in turn influence policy outcomes of the policy arrangement. It is important to take into consideration that the division of resources, their usefulness, power and relations of influence will be dynamic and may vary depending on the setting and time span.[51, 52, 53, 54, 55] Rules of the game are the third dimension of a policy arrangement and could be described as institutional patterns and visions that can be laid down in formal or informal rules. This dimension consists of, for example, procedures, norms, regulations, legislation and covenants relevant to a certain policy domain.[56, 57, 58, 59, 60] The rules dimension also includes political culture as influencing the policy arrangement.[61, 62] The last and most abstract dimension of the policy arrangement, and the only one addressing the substance of policy, is the discourses dimension. A discourse is defined as a set of ideas, concepts and narratives which give meaning to certain phenomena in the real world.[63, 64] So, a discourse is 'a particular way of talking about and understanding (aspects of) the world'.[65] A discourse can consist of three layers, namely an ontological layer by which discourses define reality and reflect actors' belief in the truth of certain propositions or the applicability of certain ideas. The second layer is normative, which refers to discourses that express desirable situations. And the third layer concerns discourses of a strategic nature, which means discourses that give options for getting to the desired situation.[66, 67, 68] So, a discourse entails the views and narratives of involved actors and has to do with norms, principles, values, definitions of problems, approaches to solutions included in policy concepts, et cetera. The four dimensions of an arrangement are inextricably interwoven, so a change in one dimension may induce change in the other dimensions.[69] The interrelatedness of the dimensions can be visualized as a tetrahedron (Figure 1).

As institutionalisation evolves and changes, a distinction can be made between emerging policy arrangements and traditional 'old' arrangements. Policy arrangements develop when governance emerges around a certain theme that is placed on the political and social agenda and will eventually become institutionalized as a permanent and relatively fixed policy arrangement. Initially, boundaries will not yet be strict, clear or fixed. Overall, climate adaptation can be defined as a new policy field[70] and thus as an emerging arrangement with, as yet, no strict and fixed boundaries. It is legitimate to question whether climate adaptation as a policy domain is already institutionalized and thus can be typified as a

46 Arts et al., supra note 35.
47 Arts & Leroy, supra note 39.
48 Liefferink, supra note 36.
49 M. Wiering et al., 'Experiences in regional cross border cooperation in River management. Comparing three cases at the Dutch-German border', 2010 *Water Resources Management* 24, pp. 2647-2672.
50 Wiering & Arts, supra note 41.
51 Arts et al., supra note 35.
52 Liefferink, supra note 36.
53 Wiering & Arts, supra note 41.
54 M. Wiering & I. Immink, 'When water management meets spatial planning: a policy-arrangements perspective', 2006 *Environment and Planning C: Government and Policy* 24, pp. 423-438.
55 M. Wiering & J. Verwijmeren, 'Limits and borders: stages of transboundary water management', 2012 *Journal of Borderland Studies* 27, no. 3, pp. 257-272.
56 Arts & Leroy, supra note 39.
57 Liefferink, supra note 36.
58 Wiering & Arts, supra note 41.
59 Veenman et al., supra note 40.
60 Wiering & Immink, supra note 54.
61 Wiering & Arts, supra note 41.
62 Wiering & Verwijmeren, supra note 55.
63 J. Dryzek, *The politics of earth, environmental discourses,* 1997.
64 M.A. Hajer, *The Politics of Environmental Discourse: Ecological modernization and the policy process*, 1995.
65 M. Jorgensen & L. Philips, *Discourse analysis as theory and method,* 2002.
66 G. Therborn, The ideology of power and the power of ideology, 1987.
67 Wiering & Arts, supra note 41.
68 Wiering & Immink, supra note 54.
69 Liefferink, supra note 36.
70 E. Massey & D. Huitema, 'The emergence of climate change adaptation as a policy field: the case of England', 2013 *Regional Environmental Change* 13, pp. 341-352.

policy arrangement. This research will focus on what is visible of this field in the context of river basin management.

Figure 1 Tetrahedron of the Policy Arrangement Approach[71]

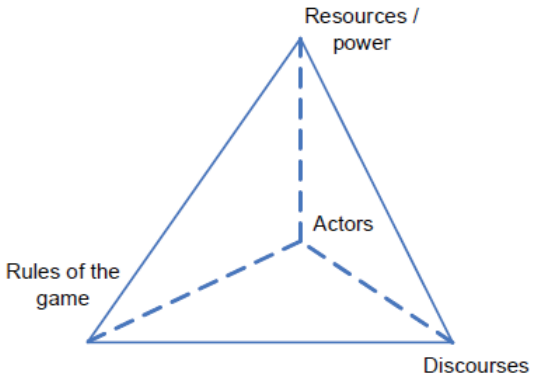
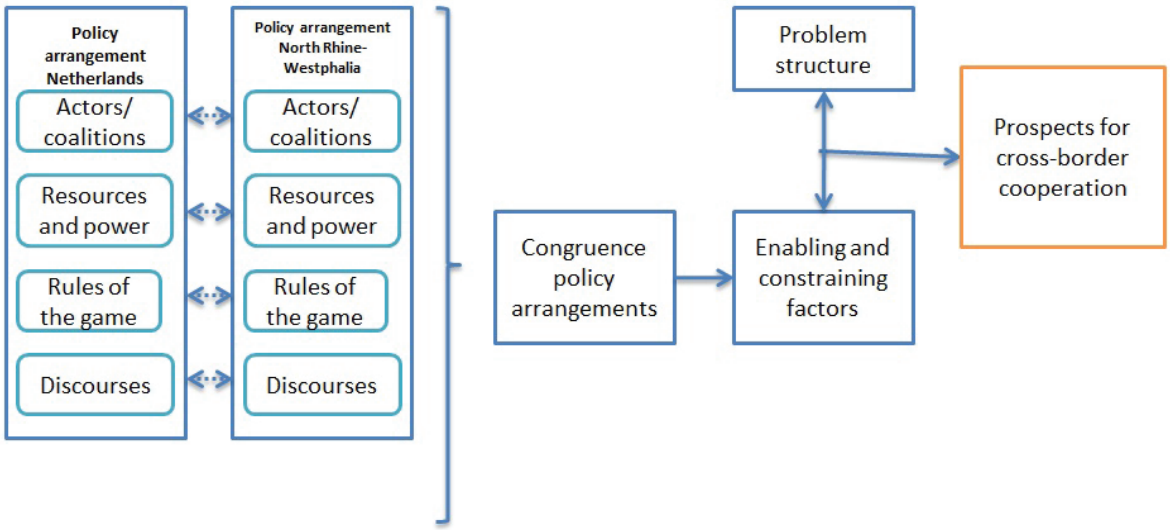


Figure 2 shows the conceptual model of this paper. Key elements in the model are the congruence between arrangements and the underlying problem structure. We expect that congruence between policy arrangements on both sides of the border will positively influence transboundary governance.[72] The prospects for cross-border cooperation will also be influenced by the underlying structure of the problem, as issues related to the problem structure of climate change effects in river basins have both asymmetrical and symmetrical characteristics. Flooding and droughts may especially impact the downstream riparian, while rises in temperature and ecological change could also have implications for the upstream riparian. Both upstream and downstream issues in river basins often lead to complex cooperation processes, due to conflicting interests, goals, discrepancies in impacts and sovereignty of States.

Figure 2 Prospects for cross-border cooperation, a conceptual model



71 Liefferink, supra note 36.
72 Wiering et al., supra note 49.

3. Key characteristics of the North Rhine-Westphalian climate change adaptation arrangement

This section describes the four dimensions of the North Rhine-Westphalian policy arrangement concerning climate adaptation.

3.1. Actors and coalitions

Climate change adaptation in North Rhine-Westphalia is concerned with an integration of multiple themes, affecting a wide range of stakeholders.[73] Public actors play a central role,[74] operating on both the German federal level (*Bund*) as well as on the State (*Länder*) level. The division of competence between States and the *Bund* is very strict, although in 2006 a major reform occurred, giving the States more competences in water management, environmental issues and spatial planning. The *Bund* has the power to specify general, legal frameworks concerning issues such as spatial planning and water management.[75, 76, 77] Since the 2002 Elbe Floods, the *Bund* has become more concerned with flood risk management and climate adaptation as is shown by the publication of its *Klimaschutz-Program*.[78] On this governmental level the *Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit*[79, 80] and various other ministries are dealing with aspects of climate adaptation. The inter-ministerial working group for climate adaptation (*Interministeriellen Arbeitsgruppe (IMA) Anpassung an den Klimawandel*)[81, 82] plays a coordinating role. Besides ministries, the Federal Environment Agency (*Umweltbundesamt*) and Federal Agency for Nature Conservation are also involved in climate adaptation policies.[83] The *Bund* is responsible for the implementation of EU legislation and the management of the main rivers, such as the Rhine and Danube.[84, 85, 86] Overall, it develops frameworks and plans for States, but almost always in close cooperation with those States.

North Rhine-Westphalia (as well as the other States) has the authority to enact its own laws[87, 88] for matters that are affected by climate change, such as water and flood management, agriculture and environmental conservation.[89, 90, 91] It is also responsible for the governance of medium rivers, such as the Lipper, Ruhr and Emscher.[92, 93, 94] Different ministries in the State of North Rhine-Westphalia are concerned with aspects of climate adaptation (e.g. the Ministry for climate protection, environment, agriculture, conservation and consumer affairs).[95] Cooperation between States takes place via joint

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73 S. Kruse, 'The restoration of a floodplain on the Upper Rhine: managing the interface of large-scale policy and small-scale implementation', in T. Moss & J. Monstadt, *Restoring Floodplains in Europe: policy contexts and project experiences,* 2008, pp. 151-174.
74 H. Garrelts & H. Lange, 'Path dependencies and path change in complex fields of action: climate adaptation policies in Germany in the realm of flood risk management', 2011 *AMBIO* 40, no. 2, pp. 200-209.
75 G. Becker et al., 'Transboundary flood management in the Rhine basin: challenges for improved cooperation', 2007 *Water Science Technology* 56, no. 4, pp.125-135.
76 S. Greiving, 'German Country Report', in S. Greiving et al. (eds.), *Report on the European scenario of technological and scientific standards reached in spatial planning versus natural risk management,* 2008.
77 E. Mostert, 'River basin management and planning', 4th national congress on water resources, Lisbon, 27 March 1998.
78 R. Stecker et al., 'Anpassung an den Klimawandel-agenda setting and politikintegration in Deutschland', 2012 *Zeitschrift für Umweltpolitik and Umweltrecht* 35, pp. 125-248.
79 Van Duijn et al., supra note 23.
80 H.P. Meister et al., *Schwimmende Häuser und Moskitonetze: Weltweite Strategien zur Anpassung and den Klimawandel,* 2009.
81 Federal Government, *German Strategy for Adaptation to Climate Change*, 2008.
82 D. Huitema et al., *Handling adaptation governance choices in Sweden, Germany, the UK and the Netherlands,* Knowledge for Climate, 2012.
83 I. Schauser, interview with Inke Schauser, Federal Environment Agency Germany, 5 July 2013.
84 T. Hartmann, interview Utrecht University, 24 July 2013.
85 T. Hartmann, 'Chapter 9: land policy for German rivers: making space for the rivers', in J.F. Warner et al., *Making space for the river: governance experiences with multifunctional river flood management in the US and Europe,* 2013.
86 A.Hartung, e-mail contact Alexander Hartung Emschergenossenschaft/Lippeverband, 9 August 2013.
87 Van Duijn et al., supra note 23.
88 R. Philip et al., *Local governments and integrated water resources management in the Rhine river basin in Germany*, 2008.
89 Becker et al., supra note 75.
90 B. Steenhuisen et al., 'Veiligheid verwaterd? Een narratieve analyse van Nederlands en Duits hoogwaterbeleid', 2006 *Bestuurswetenschappen* 60, no. 3, pp. 227-247.
91 B. Steenhuisen et al., 'Trade-offs versus Safety First: how national differences in flood policy can be bridged', 2007 *Water International* 32, no. 3, pp. 380-394.
92 Hartmann, supra note 84.
93 Hartmann, supra note 85.
94 Hartung, supra note 86.
95 J. Monstadt & T. Moss, 'Policy innovation in the aftermath of a disaster: contexts of floodplain restoration in Germany', in J. Monstadt &

initiatives, such as the Federal States Working Group on Water Affairs (*Länderarbeitsgemeinschaft Wasser, LAWA*).[96] Supporting institutions are the Supreme Water Authority and the State Agency for Environment and Consumer Protection of North Rhine-Westphalia (*Landesamt*).[97, 98]

Following the subsidiarity principle, regions are seen as key actors for the implementation of climate adaptation policies.[99, 100, 101] Regional and local actors in North Rhine-Westphalia are highly autonomous and have the right to self-govern, as long as this does not conflict with the law of the States or *Bund*. North Rhine-Westphalia is divided into two '*Landschaftsverbände*', five administrative districts (*Bezirksregierung*), as well as municipalities (*Kreisen*), self-governing cities (*Kreisfreien Städten*) and communities. Moreover, different levels of water authorities (*Wasserverbände*) and dike associations on the regional governmental level (*Deichverbände*) are concerned with the governing of water issues. The eleven regional water authorities have a legal governing status.

Non-governmental actors also play a role in climate adaptation governance in North Rhine-Westphalia, as do the scientific community, the media and private stakeholders. Citizens have a legal obligation to take care of their own safety with regard to floods and can insure their property against flooding. However, in practice, the *Bund* and States also have a responsibility since, according to the German constitution, the Government has to ensure citizens' welfare.[102]

3.2. Resources and power

In North Rhine-Westphalia, various high-level institutions have been established that provide knowledge regarding climate change, mitigation and adaptation. Examples of those institutions are the Climate Service Centre, the German Weather Service, *Kompass* (Compass for climate impacts and adaptation), *Klimazwei* (Research for climate change and protection for its impacts) and *KLIWAS* (Impacts of climate change on waterways and navigation, searching for options of adaptation). The *Klimzug* programme coordinates the research efforts. As shown in Section 3.1, responsibilities for water management and climate adaptation governance are fragmented amongst actors and levels.[103] Overall, financial resources for adaption policies in North Rhine-Westphalia are lower than in the Netherlands and are diffused among multiple actors and sectors. On the local level, actors have to deal with constraints in both capacity and financial resources.[104, 105, 106, 107, 108] At all governing levels, more resources are allocated to climate mitigation than to climate adaptation.[109]

3.3. Rules of the game

The involvement of multiple actors and sectors in North Rhine-Westphalia leads to a variety of policies and rules relevant to climate adaptation. There were no specific national German policies exclusively addressing climate change adaptation until the publication of the federal Climate Protection

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T. Moss (eds.), *Restoring floodplains in Europe: policy contexts and project experiences,* 2008.

96 Huitema et al., supra note 82.

97 Landesamt für Natur, Umwelt und Verbraucherschutz Nord Rhein Westfalen, *Startseite*, <http://www.lanuv.nrw.de/> (last visited 3 April 2014).

98 V. van Os et al., *Go with the flow? On the development of transboundary policy climate change adaptation in the Rhine basin*, 2013.

99 S. Baasch et al., 'Klimaanpassung auf regionaler Ebene: Herausforderungen einer regionalen Klimawandel-Governance', 2012 *Raumforsch Raumordn* 70, pp. 191-201.

100 Huitema et al., supra note 82.

101 Steenhuisen et al., supra note 90.

102 Hartmann, supra note 84.

103 H.K. Gilissen, *Naar (in)formele samenwerkingsstructuren: uitdagingen in het regionale grensoverschrijdende waterbeheer*, 2010, Essay.

104 C. Feld & O. Locker-Grütjen, 'River restoration in the IJssel catchment', in J. Verwijmeren & M. Wiering (eds.), *Many rivers to cross: cross-border cooperation in river management,* 2007.

105 H. Garrelts, interview University of Bremen, 6 August 2013.

106 K. Lulofs & F. Coenen, 'Chapter 4: cross border co-operation on water quality in the Vecht river basin', in J. Verwijmeren & M. Wiering (eds.), *Many rivers to cross: cross-border cooperation in river management,* 2007.

107 Schauser, supra note 83.

108 Anonymous, interview with an official from the Ministerium für Klimaschutz, Umwelt, Landwirtschaft, Natur und Verbracherschutz NRW, 1 August 2013.

109 Ibid.

Programme in 2005.[110, 111] Currently, the German Strategy for Adaptation to Climate Change (*Deutsche Anpassungsstrategie an den Klimawandel*) of 2008, provides a framework and long-term vision for adaptation activities.[112, 113, 114, 115] Compared with the national adaptation strategies of other EU Member States, the German strategy is very detailed as it deals with the highest number of vulnerable sectors.[116] The German adaptation strategy was further developed in the 2011 action plan[117, 118] whose progress is being monitored at the moment. Rules relevant for climate adaptation can also be found in the Flood Control Act, the Federal Water Act, the Five-Point-Programme and the Federal Nature Protection Act.[119, 120, 121]

North Rhine-Westphalia established its own climate adaptation strategy in 2009. The strategy covers eight themes (e.g. agriculture and soil, tourism, health, cities, biodiversity) and provides an overview of climate change effects and ways of dealing with them.[122, 123] Regulations not directly concerned with climate adaptation have an input to climate adaptation governance as well, such as the State Water Act, the Floodplain Protection Programme and the Energy and Climate Protection Strategy[124, 125] Adaptation strategies also exist at the local level, for example in the city of Essen.[126] However, the goals of most plans and strategies again mainly focus on mitigation. North Rhine-Westphalia's climate adaptation policies are still in a start-up phase.[127] An overarching integrative plan that coordinates all existing strategies and plans is lacking[128] and another criticism is that most of the existing strategies mainly describe possibilities, but scarcely prescribe practical measures.[129] German political culture also affects climate adaptation governance, the culture being typified as hierarchical and rather formal.

3.4. Discourses

Climate change is an important issue on the political agenda of North Rhine-Westphalia. There seems to be a basic consensus in the German society that human impact is causing this problem.[130] Over the last hundred years, the average temperature in North Rhine-Westphalia has risen by one degree and this is expected to continue. Expected climate change effects for North Rhine-Westphalia are, for instance, more droughts in summer, increased rainfall in winter, as well as the development of heat islands in urban areas.[131, 132, 133] Originally, the considered opinion was that climate policies should focus primarily on mitigation; adaptation being considered as an inadequate, 'end-of-pipe' solution. This perception still

110 Federal Government, supra note 81.
111 Stecker et al., supra note 78.
112 G.R. Biesbroek et al., 'Europe adapts to climate change: comparing national adaptation strategies', 2010 *Global Environmental Change* 20, pp. 440-450.
113 Greiving, supra note 76.
114 S. Isoard, 'Chapter 4: Perspectives on adaptation to climate change in Europe', in J.D. Ford & L. Berrang-Ford, *Global change research: climate change adaptation in developed nations: from theory to practice,* 2011.
115 Meister et al., supra note 80.
116 G.R. Biesbroek et al., 'Analytical lenses on barriers in the governance of climate adaptation', 2013 *Mitigation and adaptation strategies for Global Change.*
117 Federal Environment Ministry, *Adaptation action plan of the German strategy for adaptation to climate change,* 2011.
118 German Federal Cabinet, *Adaptation action plan of the German strategy for adaptation to climate change,* 2011.
119 Feld & Locker-Grütjen, supra note 104.
120 Garrelts & Lange, supra note 74.
121 Monstadt & Moss, supra note 95.
122 Meister et al., supra note 80.
123 S. Wild, interview with Sara Wild, Ministrium für Klimaschutz, Umwelt, Landwirtschaft, Natur- und Verbracherschutz des Landes Nordrhein-Westfalen, 3 July 2013.
124 Van Duijn et al., supra note 23.
125 Feld & Locker-Grütjen, supra note 104.
126 J.A. Schmidt, *Adapting cities to climate change scenarios for the city of Essen*, University of Duisburg-Essen, Institute of City Planning and Urban Design, 2011.
127 K. Reuter, interview with Klaus Reuter, Landesarbeitgemeinschaft NRW, 22 July 2013.
128 J. Hasse, interview with Jens Hasse Dynaklim, 27 June 2013.
129 P. Bowyer & S. Bender, interview Climate Service Center Hamburg, 23 July 2013.
130 Steenhuisen et al., supra note 91.
131 Federal Environment Agency, supra note 14.
132 Federal Government, supra note 81.
133 W. Straub et al., *Die Klimaentwicklung in NRW*, 2010.

has a strong influence. As a result more attention, funding and capacity is given to climate mitigation initiatives. However, in recent years adaptation has become more important.[134, 135, 136, 137, 138]

For many years, a safety discourse was dominant in which emphasis was placed on technological measures to address the effects of climate change. Recently, a shift has occurred towards a more integrated and interactive management and balancing of interests, which is often described as the 'resilience strategy'.[139, 140, 141] Risk perception in Germany is based on the idea that dynamics in river basins are natural, cannot be prevented and should be accepted, leading to policies that are more focused on damage reduction and evacuation programmes. Safety norms are based on a balancing of interests.[142, 143] The central ideology of creating more space for rivers with specific attention to river restoration and ecology (*den Flüssen mehr Raum geben*) reflects this risk approach. The 'room for the river' policy emerged after the 1993 and 1995 floods.[144, 145, 146, 147] This policy, as well as the more general adaptation policy in North Rhine-Westphalia, is based on the principle of solidarity between riparian States as well as on the precautionary principle. The latter has a long history in German (environmental) policies, as have such general principles as federalism, subsidiarity and proportionality.[148, 149, 150, 151, 152]

4. The climate change adaptation arrangement of the Netherlands

The Netherlands – a deltaic area of the Meuse, Scheldt, Rhine and Ems – is particularly vulnerable to sea level rise, river discharges and salt intrusion.[153] Climate change affects the Netherlands in a variety of ways, such as changing precipitation patterns, increasing flood risks and for a downstream country – often referred to as the drain of Europe – it is clear that one must consider adaptation to climate change in its transboundary context.[154] Although the Netherlands has a long history of managing water, climate adaptation as such has been a relatively new concept for it. The four dimensions of the Dutch climate adaptation governance policy arrangement will be described in this section.

4.1. Actors and coalitions

The Netherlands is a decentralized, unitary State.[155] On the national level, various actors are concerned with climate adaptation, mainly the Ministry for Infrastructure and Environment, including its Public Works Department (*Rijkswaterstaat*) and the Ministry of Economic Affairs, Agriculture and Innovation. In the Netherlands a special programme was created for adapting to climate change. This so-called Delta Programme[156] originated from recommendations of the Second Delta Committee that investigated the

134 Huitema et al., supra note 82.
135 Stecker et al., supra note 78.
136 Wild, supra note 123.
137 Garrelts, supra note 105.
138 H. van Liempt, *Science-policy interactions for climate change adaptation in Germany,* 2009.
139 Becker et al., supra note 75.
140 M. Czychowski, *Wasserhaushaltsgesetz: Kommentar*, 1998.
141 Feld & Locker-Grütjen, supra note 104.
142 J. Rademakers, interview with Jos Rademakers, 25 July 2013.
143 Steenhuisen et al., supra note 91.
144 Hartmann, supra note 84.
145 Hartmann, supra note 85.
146 Lulofs & Coenen, supra note 106.
147 C.L. Johnson & S.J. Priest, 'Flood risk management in England: a changing landscape of risk responsibility', 2008 *International Journal of Water Resources and Development* 24, no. 4, pp. 513-525.
148 G. Becker, 'Germany: transitions in flood management in the Rhine basin, in D. Huitema & G. Becker (eds.), *Water Policy Entrepreneurs: a research comparison to water transitions around the globe*, 2009.
149 Federal Government, supra note 81.
150 Monstadt & Moss, supra note 95.
151 Steenhuisen et al., supra note 91.
152 J. Verwijmeren, 'Chapter 5: cross border co-operation and the Dutch-German Working Group on High Water', in J. Verwijmeren & M. Wiering (eds.), *Many rivers to cross: cross-border cooperation in river management,* 2007.
153 M. van den Brink et al., 'Climate-proof planning for flood prone areas: assessing the adaptive capacity of planning institutions in the Netherlands', 2013 *Regional Environmental Change,* pp. 1-15.
154 W. Ligtvoet et al., *The effects of climate change in the Netherlands,* Planbureau voor de Leefomgeving 2013.
155 T.A. Toonen, 'The Netherlands: a decentralized unitary state in a welfare society', 1987 *West European Politics* 10, no. 4, pp. 108-129.
156 Deltacommissaris, *Working on the Delta: acting today, preparing for tomorrow,* 2011, The Hague, Ministry of Infrastructure and

expected effects of climate change on the Dutch water management and especially its safety.[157] This is unique, since it was not established in the aftermath of a disaster, but rather to avoid one.

The Delta Programme, which is currently the key element in the Dutch policy arrangement of climate adaptation policies,[158, 159] is a nation-wide programme adopted by the Dutch Cabinet in which the national Government, provinces, municipalities and water boards work together to protect the country from flooding and to ensure adequate supplies of fresh water. Every year a progress report is produced and the programme is supported by a national budget. It proclaims a 'down-to-earth' realistic approach called adaptive delta management. For so-called delta hot spots, specific vulnerable regions or issues, regional sub-programmes have been developed. In 2014, five Delta decisions have to be taken: on the topic of flood risks in general; freshwater strategies; spatial adaptation; the Rhine-Meuse river delta; and water levels in Lake IJssel. A Delta Commissioner coordinates these processes and the programme is supported by a Delta Act and Delta funding.

Provinces are involved in climate adaptation governance at the regional level, as they supervise primary and secondary weirs, as well as regional water bodies. Local government, particularly municipalities, has less competence regarding climate adaptation in connection with fluvial floods, but has some responsibility in pluvial flooding matters. Besides these three generic administrative levels, the Netherlands also has a functional level of regional water authorities (*waterschappen*). Dutch climate adaptation policy is typified as functionally decentralized and can be characterized by a sectoral approach, dominated by public actors in the water management sector.

For many years, keeping the country habitable has been a public task and this governmental responsibility is considered essential to the preservation of Dutch society.[160] As the State is also primarily responsible for the goals of the Delta Programme, especially with regard to flood safety, there is little direct responsibility for the market or for the citizens themselves. Thus, although the Delta Programme makes provision for discussions with businesses and with the general public, their direct involvement is limited. There is, for example no – or scarcely any – role for insurance companies to contribute to flood management issues.

4.2. Resources and power

Dutch water plans and the Delta Programme are based on climate change projections and related scenarios of the Dutch Met Office and Dutch planning bureaus.[161] Other knowledge agencies relevant to climate adaptation are the Netherlands Environmental Assessment Agency, *Deltares* and universities. An important research programme is Knowledge for Climate (*Kennis voor Klimaat*). This programme deals with the development of knowledge and services that make it possible to 'climate-proof' the Netherlands, and governmental organisations and businesses actively participate in the research.[162] In contrast to North Rhine-Westphalia, the Netherlands puts more emphasis on climate adaptation than on climate mitigation research. The Knowledge for Climate research programme, for instance, has one consortium that wholly focuses on the governance of adaptation.[163]

Water management in the Netherlands is a functional policy domain. Governmental institutions have their own budgets for addressing water-related issues that are often very relevant to climate adaptation. The water boards can raise taxes to finance their measures. A future Delta Fund 'will be filled with a set, stable and substantial input of at least one billion Euros annually as from 2020'.[164]

Environment and Ministry of Economic Affairs, Agriculture and Innovation.

157 Biesbroek et al., supra note 116.

158 C. Veerman, *Samen werken met water: een land dat left, bouwt aan zijn toekomst: bevindingen van de Deltacommissie,* 2008.

159 S.H. Verduijn et al., 'How the Second Delta Committee sets the agenda for climate adaptation policy: a Dutch case-study on framing strategies for policy change', 2012 *Water Alternatives* 5, no. 2, pp. 469-484.

160 A.M. Keessen et al., 'The concept of resilience from a normative perspective: examples from Dutch adaptation strategies', 2013 *Ecology and Society* 18, no. 2, pp. 500-511.

161 H. K. Gilissen, *Adaptatie aan klimaatverandering in het Nederlandse waterbeheer; verantwoordelijkheden en aansprakelijkheid,* 2013.

162 Knowledge for Climate, *Knowledge for Climate Research Programme website,* 2014, <http://knowledgeforclimate.climateresearchnetherlands.nl/> (last visited 21 March 2014).

163 Knowledge for Climate, supra note 162.

164 Deltacommissaris, supra note 156.

4.3. Rules of the game

In 2004 the '*Klimaat voor Ruimte*' programme was initiated as a broad, integrated climate-proofing programme, dealing with a variety of climate change effects that connect to different policy fields such as water management, nature conservation, agriculture and spatial planning. In 2006 the ARK programme (*Adaptatieplan Ruimte en Klimaat*) introduced a common framework for climate change adaptation focussing on themes like flood safety, spatial planning and the living environment. More detailed measures were anticipated in the National Adaptation Agenda.[165, 166] However, after the recommendations of the Second Delta Committee and the establishment of the Delta Programme, climate adaptation was soon framed as predominantly a problem of water management and flood safety issues.

A general duty for water resources management can be found in the Dutch constitution. The Water Act (*Waterwet)* further specifies this duty. Other rules can be found in the National Water Plan. At the national level, the Delta Act (*Deltawet*), regulating the planning, timelines and budget for the Delta institutions, is also important.[167] Although Dutch political culture is normally thought of as corporatist, having a consensus-oriented style of policy making, Dutch water management is strongly State-oriented.[168]

4.4. Discourses

Traditionally, water management in the Netherlands has been primarily concerned with high water and safety, with all other interests, however important, coming second.[169] This approach evolved towards a more ecosystem based and spatially oriented 'water accommodation' story line, stemming from the 'room for the river' discourses of the 1990s and 2000s. After that, the ARK programme and national adaptation strategy were logically geared towards a broad spectrum of climate change effects. The Dutch approach gradually shifted from this integrated, ecologically and spatially relevant 'climate-proof story line' to a 'safe delta storyline', consisting of the almost exclusively water sector based framing of climate change and adaptation.[170] This may be due to the traditional dominance of the Dutch water management sector and the emergence of the financial crisis that prevented the elaboration of climate adaptation. Moreover, recent right-wing governments are less willing to invest in climate change and nature conservation policies.[171] Although initially not intended, Dutch climate adaptation policy has become almost synonymous with the water dominated Delta Programme. This exclusive water sector based framing of climate adaptation is heavily criticized by the Court of Auditors,[172] which argues that the national adaptation strategy of 2007 had no follow-up, as the Delta Programme was not sufficiently coherent and encompassing. The Multi-Layered Safety approach might address this flaw. A key element in this approach is not to rely only on flood defence and technical prevention, but to limit the impact of floods as well.[173, 174, 175]

5. Similarities and differences between the two arrangements

For both the North Rhine-Westphalian and Dutch policy arrangements it can be concluded that ongoing activities are mostly in a strategic, planning phase. Therefore, both policy arrangements can

165 Biesbroek et al., supra note 116.
166 VROM, *Maak ruimte voor klimaat! Nationale adaptatiestrategie,* 2007.
167 N.M. van der Grijp et al., 'The Dutch focus: a Delta Act for climate adaptation', in M. Peeters et al. (eds.), *Climate law in EU Member States: towards national legislation for climate protection,* 2012.
168 F. van Waarden & Y. Hildebrand, 'From corporatism to lawyocracy? On liberalization and juridification', 2009 *Regulation and Governance* 3, no. 1, pp. 259-286.
169 Steenhuisen et al., supra note 91.
170 M. Van den Berg, 'Translating the global climate change discourse to the local', in C. De Boer et al. (eds.), *Water Governance, Policy and Knowledge Transfer: International Studies on Contextual Water Management*, 2013, p. 207.
171 A. Crabbé et al. 'Adapting Floods Management to Climate Change: comparing policy frames and governance practices in the Low Countries', *submitted*.
172 Algemene Rekenkamer, *Aanpassing aan klimaatverandering: strategie en beleid,* 2012, *Kamerstukken II* 2012/13, 33 470, no. 2.
173 D. Boezeman et al., 'The Dutch Delta Committee as a boundary organisation', 2013 *Environmental Science and Policy* 27, pp. 162-171.
174 F. Hoss, 'A comprehensive assessment of Multi-layered safety (Meerlaagsveiligheid) in flood risk management', Delft University, 2010.
175 Keessen et al., supra note 160.

be characterized as emerging arrangements. However, the Dutch arrangement is somewhat more institutionalised and formalised.

Table 1 gives an overview of the main similarities and differences between the policy arrangements of North Rhine-Westphalia and the Netherlands.

Table 1 A comparison of the North Rhine-Westphalian and Dutch policy arrangements on climate adaptation

Dimensions	The Netherlands	North Rhine-Westphalia
Actors and coalitions	Unitary decentralized State	Federal decentralized State
	Safety is a State responsibility	Safety is also an individual responsibility for citizens
	Multi-actor involvement	Multi-actor involvement
	Participation of multi-level actors	Involvement of actors on multiple levels
	Sector based approach, dominated by the public, water sector	Integrated approach, since all types of sectors are involved, trade off of interests
Resources and power	• Financial resources are available • Concentrated mainly in the Delta Fund	• Less financial resources available • Diffused among sectors, levels and organizations
	• High quantity of knowledge available • Various actors involved in knowledge generation • Focusing especially on water management	• High quantity of knowledge available • Various actors involved in knowledge generation • Research covers various themes and sectors
	• Delta Commissioner has a coordinating role	• No all-encompassing institution present
Rules	• One main, comprehensive plan and law (Delta Act and Delta Programme) • Uniform safety standards • Mainly rules in the water field	• Different plans, policies and programmes • Safety standards differ across regions • Address all aspects of climate adaptation and protection
	Informal rules based on a consensus, rather horizontal policy style	Informal rules based on a hierarchical and formal policy style
Discourses	One Delta Programme	Various strategies and programmes
	• Relatively high feeling of urgency • Focus on flood risks	• Relatively high feeling of urgency • Focus on climate issues (particularly mitigation)
	Shift from flood defence towards multi-layered-safety approach	Broad approach of flood strategies, incorporating other interests as well (e.g. ecological risk approach)
	'Safe Delta', but also 'Room for the River'	'Room for the River', ecological focus and aim for resilience
	• Sovereignty • Solidarity • Retain-store-drain • Multi-layered-safety	• Federalism • Solidarity • Subsidiarity • Precautionary

An apparent difference between the two countries is that the Netherlands is a unitary decentralized State, while the German State has a federal decentralized institutional character. Perhaps more importantly, climate adaptation in the Netherlands is framed as water management and focuses on the water sector, which in this policy arrangement is a functional domain and corresponds mainly to the interest of safety. Meanwhile, German and North Rhine-Westphalian climate adaptation governance is based on generic administrative levels and tries to apply an integrated approach by incorporating all relevant sectors and the balancing of interests and stakes. An example is that the Dutch adaptation strategy covers only four themes, while the German national adaptation strategy incorporates fourteen themes and eight for the strategy of North Rhine-Westphalia. However, in practice this integration is difficult and some sectors are still dominant. This discrepancy is related to another difference, namely that the Dutch climate adaptation policy arrangement is dominated by public actors from the water sector (functional water governance), while in North Rhine-Westphalia no sector or actor group dominates the policy arrangement on climate adaptation. The State, however, has most water management responsibilities.[176] The differences mentioned above lead to dissimilarities in the allocation of responsibilities between policy arrangements with regard to climate adaptation governance. Van Kempen and Gilissen confirm that differences in the institutional setting hamper cross-border cooperation,[177, 178] although institutions can find their counterparts across the border. The Dutch provinces and water boards, for instance, work together with district governments, regional environment agencies and water authorities in North Rhine-Westphalia. An important difference, however, is related to the public–private relationship, since in the Netherlands the State is responsible for the safety of citizens concerning floods and climate issues, whilst in North Rhine-Westphalia citizens have an individual responsibility or are at least co-responsible for flood protection and climate adaptation. As a result flood insurance is available and relatively common in Germany, while this is not the case in the Netherlands.

In comparison, the Netherlands has relatively more financial assets available for climate adaptation than North Rhine-Westphalia, as we are counting billions in the Netherlands and millions in North Rhine-Westphalia,[179] which can be explained by the concurrence with the importance of a safe delta and therefore a high prioritization of water management in the Dutch policy arrangement. In the Netherlands, financial resources for climate adaptation issues are mainly concentrated in the Delta Fund, leading to relatively easily accessible resources and also ensuring the continuity of policy. In Germany and North Rhine-Westphalia, specific financial resources are also available, yet most are spent on climate mitigation instead of adaptation and those resources are widely distributed among sectors and actors and thus less easy to obtain. In particular, local actors in North Rhine-Westphalia deal with financial and capacity resources constraints. On the other hand, knowledge resources in both policy arrangements are comparable and relatively easily available. Both countries invest in research projects on climate change and adaptation issues. However, research and policy in the Netherlands mainly focus on water management issues, while Germany's policies address a mixture of themes and sectors. In North Rhine-Westphalia power for dealing with climate change effects is diffused among a multiplicity of actors, levels and sectors, while in the Netherlands power is more concentrated, since the Delta Commissioner coordinates adaptation measures in the water sector.

Rules addressing adaptation issues were developed sooner in the Netherlands, as Dutch policies already focused on climate adaptation in 2005, whereas Germany and North Rhine-Westphalia started to address adaptation issues in 2008. However, the Dutch national adaptation strategy (ARK Programme, 2006) has been replaced by the water focused Delta Programme. In North Rhine-Westphalia, each sector and governmental level has its own adaptation policies and strategies. Overall, the North Rhine-Westphalian policy arrangement covers more aspects of climate adaptation. Most initiatives are still in a planning and start-up phase, while the Netherlands already applies more concrete measures, especially in the water sector. Another contrast between the two States is that the Netherlands has uniform safety

176 Ministerie van Verkeer en Waterstaat, *Ontwerp stroomgebied beheerplan Rijn delta,* 2008.

177 J.J.H. van Kempen, *Europees waterbeheer: eerlijk zullen we alles delen? Een juridische analyse van de Europese stroomgebiedbenadering in het licht van de grensoverschrijdende verontreiniging van water tussen lidstaten,* 2012.

178 H.K. Gilissen, *Internationale en regionaal grensoverschrijdende samenwerking in het waterbeheer,* 2009.

179 Based on statements of the interviewees.

standards, while safety norms in North Rhine-Westphalia differ across regions and are often less strict than Dutch standards. Informal rules of the game also differ. The Netherlands' policy style is consensus oriented and referred to as the '*polder model*', often leading to delays during the policy making and implementation process. Climate adaptation governance in the Netherlands can also be typified as horizontal and rather informal. On the other hand, the North Rhine-Westphalian policy style is more hierarchical and rather formal, leading to consistent and relatively fast policy making and implementation processes.

Problem perceptions seem to be different, as North Rhine-Westphalia focuses more on the human causes of climate change and the natural occurrence of floods. Also perceptions regarding flood management differ, since the Netherlands prioritizes safety above all, while North Rhine-Westphalia tries to balance safety with other interests, such as ecology. The Dutch flood risk approach mainly focuses on flood defence, whereas Germany tries to incorporate five different flood risk management strategies, namely flood prevention, defence, mitigation, preparation and recovery. However, in the Netherlands a shift towards a broader flood approach is also visible, particularly since the introduction of the Multi-Layered-Safety approach. Both border regions apply the 'Room for the River' concept, although in North Rhine-Westphalia this concept is more focused on ecology. Another similarity is the presence of a sense of urgency in both countries, yet North Rhine-Westphalia is mainly focused on climate mitigation, while the Netherlands mainly concentrates on flood risks. North Rhine-Westphalia seems to put more emphasis on (local) subsidiarity as local and regional actors are key for climate adaptation governance, whereas the Dutch have a national framework (the Delta Programme) including regional actors, themes and hotspots.

6. Reflections

The main assumption of this research is that the extent of transboundary governance of climate adaptation is influenced by the level of congruence between the domestic policy arrangements on both sides of the border. Differences and similarities between these arrangements are expected to hamper or stimulate cross-border cooperation. According to theory, congruence between cooperating actors or regions is one of the prerequisites for cross-border cooperation,[180] because similarities between institutions, approaches, applied discourses and legislation require fewer adjustments to be made for establishing an agreement or cooperation structure and thus involve less transaction costs, effort and time. Overall, scholars state that the benefits of cooperation should be higher than the costs.[181]

The previous sections have shown that the congruence between the policy arrangements of North Rhine-Westphalia and the Netherlands is relatively high. The involvement of multiple actors on multiple levels and the high level of decentralization stimulates cooperation, as counterparts of actors can be found relatively easily on the other side of the border. Also, the relatively strong feeling of urgency in both regions will have a positive influence on transboundary governance, as both regions are aware of the necessity of cooperation. The overlap in and cognizance of each other's (policy) concepts, discourses and principles (e.g. solidarity) stimulates cooperation too.

The difference, however, between the Dutch focus on safety and high water issues and the North Rhine-Westphalian focus on a balancing of interests is an influential discrepancy that could hamper cooperation. Other differences identified in this research that could constrain transboundary governance relate to: the availability of resources; the formal and informal rules of the game; programmes and strategies; and differences in responsibilities between the public and the private sectors. In addition, different views regarding problems, solutions and related flood strategies and standardization of norms could make it more difficult to cooperate. Because of those differences it could be harder to find common solutions and decide on joint approaches, since compromises would have to be made.

In addition, it should be noted that the identified differences between both policy arrangements are not by definition merely constraining; they could in some ways even stimulate cross-border cooperation.

180 F.G. Boonstra, *Laveren tussen regio's en regels: verankering van beleidsarrangementen rond plattelandsontwikkeling in Noordwest Friesland, de Graafschap en Zuidwest Salland*, 2004.

181 Le Marquand, supra note 22.

Especially when arrangements are both interdependent and complementary,[182, 183] the actors involved can learn lessons from each other's approaches, strategies and plans. Dutch actors for instance, have elaborate knowledge of flood and water management, while actors within North Rhine-Westphalia may have more knowledge of ecosystem management. The general knowledge base in the basin can be improved if these actors exchange their ideas. In theory, the Netherlands could also offer payments for retention measures to be taken in North Rhine-Westphalia as it could also benefit from such measures. This kind of cooperation could be beneficial for all actors involved. In general scholars argue that this type of cooperation is more easily established when the benefits of cooperation are clear.[184, 185, 186, 187]

Based on our explanatory analysis we conclude that the prospects for cooperation are good. However congruence is not the only factor that stimulates cooperation. Several scholars have argued that cooperation also requires a good structure for interactions,[188, 189] that long-term and recurrent relationships will stimulate the development and maintenance of cross-border cooperation[190, 191] and that existing cross-border institutions and a shared system of norms, procedures and rules could enable further transboundary governance.[192, 193, 194, 195, 196, 197] These additional requirements seem to be in place, as both regions not only cooperate in several permanent cross-border organisations, but also in ad hoc initiatives. The International Commission on Protection of the Rhine (ICPR), for instance, works on the development of a preliminary climate adaptation strategy for the whole Rhine river basin, which will be finished before the end of 2014.[198] The Dutch–German working group on high water is concerned with information exchange, research and planning development, alignment of strategies and the improvement of crisis management, particularly for high water issues in the border region.[199, 200] The climate corridors project of the Dutch province of Gelderland is an example of an ad hoc initiative, aiming to strengthen the significance of the Rhine as a hydrological, ecological, economic and social backbone of Europe through for instance, restoration of natural processes and building sustainable links between the river, people and economies.[201]

7. Concluding remarks

In this paper we have explored the prospects for cooperation between the Netherlands and North Rhine-Westphalia on climate adaptation. As the degree of congruence between the arrangements of the two States seems to be high, we have concluded that the prospects for cooperation are good. This

182 Wiering et al., supra note 49.
183 Le Marquand, supra note 22.
184 Durth, supra note 21.
185 F. Marty, *Managing international rivers: problems, politics and institutions*, 2001.
186 Van Os et al., supra note 98.
187 J. Waterbury, 'Between unilateralism and comprehensive accords: modest steps toward cooperation in international river basins', 1997 *Water Resources Development* 13, pp. 279-289.
188 Bernauer, supra note 20.
189 Lindemann, supra note 28.
190 A. Jagerskög, 'Why states cooperate over shared water: the water negotiations in the Jordan river', 2007 *Water Resources in the Middle East* 2, pp. 195-196.
191 J. Song & D. Whittington, 'Why have some countries on international rivers been successful negotiating treaties? A global perspective', 2004 *Water Resources Research* 40, pp. 1-18.
192 See Jagerskög, supra note 190.
193 N. Kliot et al., 'Institutions for management of transboundary water resources: their nature, characteristics and shortcomings', 2001 *Water Policy* 3, pp. 229-255.
194 G.T. Raadgever et al., 'Assessing management regimes in transboundary river basins: do they support adaptive management?', 2008 *Ecology and Society* 13, no. 1, pp. 1-21.
195 J.L. Uitto & A.M. Duda, 'Management of transboundary water resources: lessons from international cooperation for conflict prevention', 2002 *The Geographical Journal* 168, no. 4, pp. 365-378.
196 Wiering et al., supra note 49.
197 A.T. Wolf, 'Shared waters: conflict and cooperation', 2007 *Annual Review of Environmental Resources* 32, pp. 241-269.
198 A. Schmid-Breton & B. Van de Wetering, interview with the International Commission on Protection of the Rhine, 19 March 2013, Koblenz.
199 Steenhuisen et al., supra note 91.
200 G. Becker & T. Raadgever, *Interview report: Dutch-German 'Arbeitsgruppe Hochwasser': long- term flood management in the lower Rhine region,* BSIK ACER Project, VU Amsterdan & TU Delft, July 2006.
201 Provincie Gelderland, *Water shortage and climate adaptation in the Rhine basin,* Inspiration document, based on the International Rhine Basin Conference 29-31 October 2012, Kleve.

conclusion, however, requires further amplification as we have only explored key characteristics of the national arrangements. International relations theories (for instance regime theory, negotiation theory or cognitive approaches) offer other factors, such as the clarity of procedures,[202, 203, 204] division of property rights,[205] the existence of dominant actors[206] or epistemic communities,[207] stakeholder participation and network connectivity[208, 209, 210, 211, 212, 213, 214] that have to be taken into account, since they could determine the prospects for cross-border cooperation as well. Future studies should address these factors in order to get a more comprehensive image of the prospects of transboundary climate adaptation. ¶

202 Durth, supra note 21.
203 Marty, supra note 185.
204 Waterbury, supra note 187.
205 Song & Whittington, supra note 191.
206 Le Marquand, supra note 22.
207 Song & Whittington, supra note 191.
208 Bernauer, supra note 20.
209 Kliot et al., supra note 193.
210 Raadgever et al., supra note 194.
211 Song & Whittington, supra note 191.
212 Uitto & Duda, supra note 195.
213 Wiering et al., supra note 49.
214 Wolf, supra note 197.