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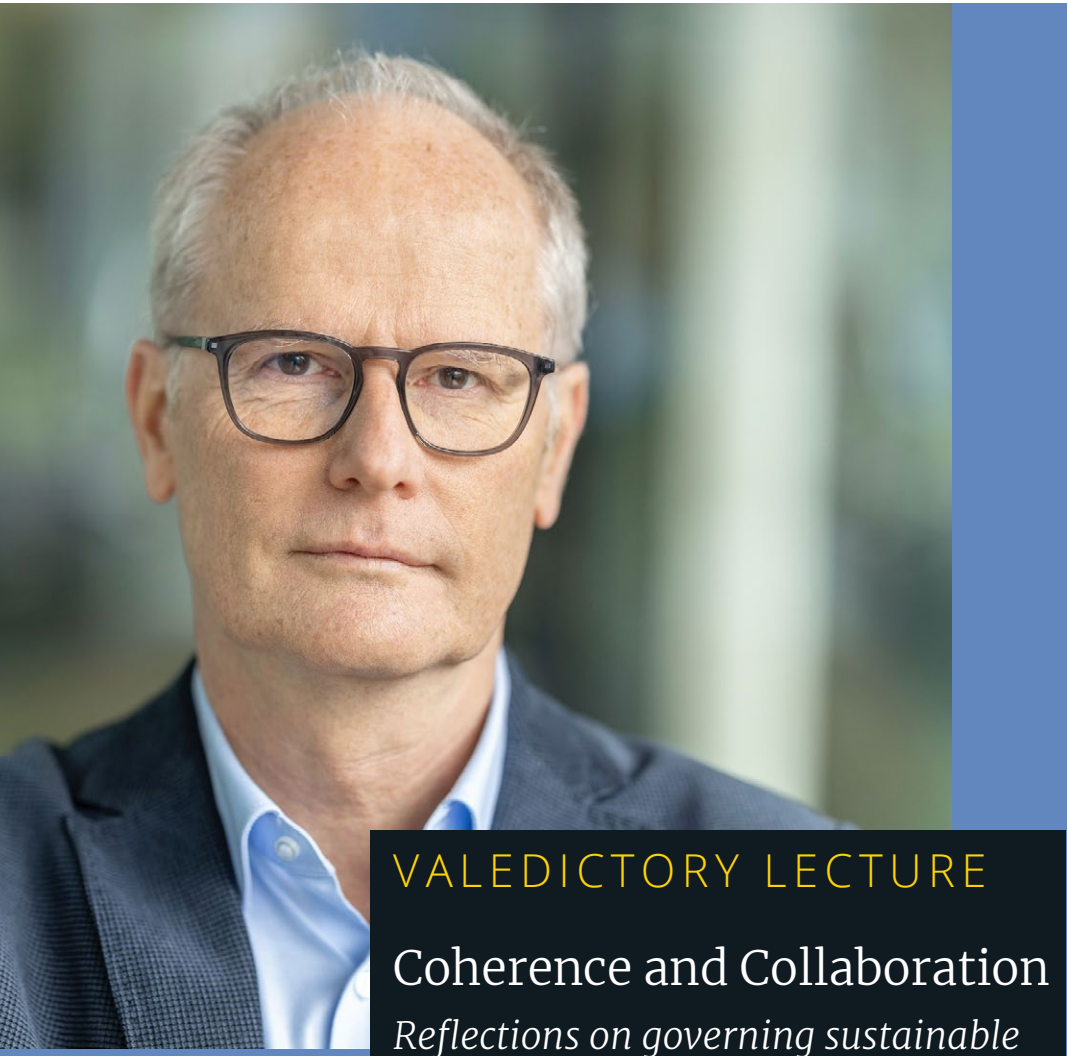

VALEDICTORY LECTURE

Coherence and Collaboration

Reflections on governing sustainable development as a wicked problem

Prof. Peter P.J. Driessen

COLOPHON

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Coherence and Collaboration

Reflections on governing sustainable development as a wicked problem

Speech delivered by

Prof. dr. Peter P.J. Driessen

on the occasion of his retirement as professor of Environmental Governance at Utrecht University on Thursday 9 April 2026

Dear Rector Magnificus,
Dear colleagues, family, and friends

Introduction

I would like to welcome you all to this beautiful historic hall where the Union of Utrecht was concluded in 1579. That agreement laid the foundation for collaboration between Dutch provinces and cities and was in fact the precursor of our Constitution. This collaboration between governments and between governments and private actors is still important today, but for different reasons, as I will argue in a moment.

My farewell lecture marks the end of an academic career that has lasted more than 40 years. I have spent most of that time working at this great university, which has been a special honour. I have enjoyed every day of my work and the collaboration with others. In this final public lecture, I would like to reflect on my academic work and share with you a selection of insights derived from my research. However, science is not an individual pursuit. It is mainly teamwork, in which researchers and teachers collaborate intensively, inspiring each other to achieve exceptional results. I too have worked in various small and large teams and my career owes much to the successes these teams achieved.

Environmental Governance

My field of expertise is environmental governance. Scholars in this field study the efforts made by governments and other societal actors to reduce the degradation of our natural environment and the excessive use of natural resources.[1] They focus on how public and private actors organize themselves to tackle sustainability issues, what strategies they use, and what determines their success or failure. The focus is not only on the framing of problems, the problem context, the level of ambition of the policy objectives, or the suitability and applicability of different types of policy instruments. Attention is also paid to the institutional setting, the formal and informal rules of the game. And finally, it concerns the role of public and private actors who shape policy or are subject to it.

To sum up, I use the triad of *policy, polity, and politics* to characterise environmental governance (Figure 1).[2] These three dimensions are closely interlinked and must be studied as such. In recent decades, however, the emphasis has sometimes been on policy discourses and policy instruments, sometimes on the interactions between actors, and sometimes on institutional arrangements or the lack thereof. But normative considerations such as principles of legitimacy, justice, solidarity, transparency, and accountability are also important when searching for suitable and effective modes of governance. The importance of these moral values should not be underestimated. Policies on climate mitigation and climate adaptation, for example, will be strongly resisted if issues of justice are ignored. Justice refers to distributional, procedural and recognitional dimensions: a fair distribution of benefits and burdens, a fair participation in decision-making processes and recognition of the diversity of people's values and experiences.[3]

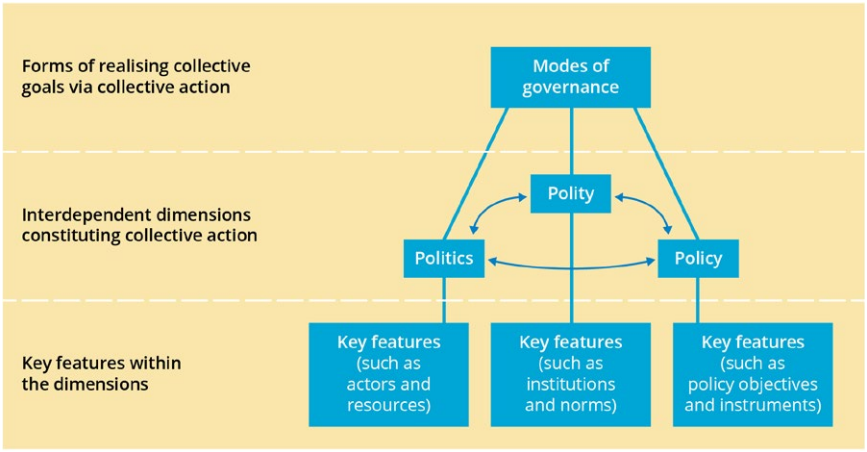

Figure 1: Modes of environmental governance [4]

Throughout my academic career, I have focused on a wide range of sustainability issues, particularly at the national, regional, and local levels and from a comparative international perspective. Concerns about the quality of our living environment played an important role in this. However, my wonder and curiosity were also important motivators. How are societies able

to tackle such complicated issues? Why does a mode of governance work in some cases and not in many others? For example, why haven't we been able to solve the so-called nitrogen problem for more than 40 years, even though so much scientific knowledge is available, including about possible solutions? Why, in 2026, are we still struggling with the problem of noise pollution around Schiphol Airport, first identified back in the 1950s?

These questions can be approached from various theoretical perspectives. I would like to highlight one of these here: the perspective that characterizes sustainability issues as *wicked problems*. The principle architect of the wicked problem conceptualisation was Horst Rittel.[5] He proposed the concept of wicked problems in a public seminar in 1967, describing wicked problems as "(...) that class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision-makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing."[6] In 1973 Horst Rittel along with his fellow professor Melvin Webber, published a seminal paper in the journal *Policy Sciences*, in which they basically rejected the rational and technocratic way of planning and policymaking at the time. The ten characteristics of wicked problems they described in this influential paper are still an important source of inspiration and starting point for governance research (Figure 2). Here are a few they mention: [7]

- First, "there is no definitive formulation of a wicked problem." Rittel and Webber state that the information needed to understand the problem depends upon one's idea for solving it.
- Second, "every wicked problem is essentially unique and can be considered to be a symptom of another problem". Many societal problems are interconnected.
- Third, "wicked problems have no stopping rule". What they mean by this is that these problems lack an inherent logic that signals when they are solved.
- Furthermore they note that "every solution to a wicked problem is a one-shot operation; because there is no opportunity to learn by trial-and-error, every attempt counts significantly."

Wicked problems are "messy", "intractable", "unstructured", and "contested" problems[8], as many scholars would characterize them. The degree

of wickedness is determined not only by complex cause-and-effect relationships, but also by the uncertainty in our knowledge and by the diversity of values and norms that are involved, as Brian Head, another expert in the field of wicked problems, states.[9] Given the analyses of Rittel and Webber, and Head, we should be more surprised when policies succeed than when they fail. However, societal and political opinions are often the opposite. In addition, complexity itself is often seen as a problem, and therefore an issue and the approach for tackling it are usually simplified. But overly simplistic solutions that address only a small part of the complex problem are bound to lead to policy failure and disappointment. Charles West Churchman, another proponent of the concept of wicked problems, even argues that "whoever attempts to tame a part of a wicked problem, but not the whole, is morally wrong."[10] So, complexity should not be brushed under the carpet, it should be acknowledged.

Figure 2: Properties of wicked problems [11]

Much governance research therefore focuses on the question of how solutions can be achieved despite the wickedness of sustainability problems. The fact that the world is still confronted with immense challenges concerning climate change, biodiversity loss, and the excessive use of natural resources shows that, despite extensive research and significant improve-

ments to our knowledge infrastructure, we still have a long way to go. Scientific research has contributed to clear problem analyses, uncovered the root causes of sustainability issues and their interconnections, proposed new instruments and strategies, and developed future scenarios and transformation pathways, including new socioeconomic perspectives for sectors and regions. Some successes have resulted. In many Western countries, the most serious forms of water, soil, and air pollution have been resolved. The transformation to a sustainable energy system has truly begun. In many countries, the quality of the living environment has improved. The circular economy is also gaining ground. Despite these successes, however, it appears difficult to stop the dominant trends. Many problems persist. The solution space often appears to be limited. This has a paralysing effect and even leads to problems being denied or to symbolic, ideologically driven solutions being proposed. Moreover, the wickedness of sustainability problems is sometimes misused as an excuse for political inaction.

As well as its technical and physical dimensions, the solution space has political, institutional, economic, social, cultural, and moral dimensions[12], and it is these that are crucial in governance processes. Every wicked problem is essentially unique, and context matters. In governance research, we are therefore looking for ways in which context-specific societal changes towards sustainability can be initiated. Some advocate radical transformations, others see more benefit in incrementalism and small wins, but every effort, large or small, can have significant effects in the long term.[13] In addition, we seek to achieve transformations in governance itself: what new modes of governance are conceivable and applicable in specific contexts, and how can we use them to make more sustainable futures achievable?

Integrated regional sustainability policies

Many environmental issues are persistent in nature, as I have already mentioned. Let's look at the Netherlands, for example, and consider pressing problems such as the problem of the quality of our surface water, the nitrogen problem, the problem of climate change and the problem of biodiversity loss. Let's imagine an innovative and exciting solution:

- Suppose the government decided to solve these problems once and for all by fundamentally transforming cities and regions through an integrated approach, linking different problems and solutions.
- Suppose that a long-term vision on sustainability is chosen as the starting point, with the ambition of achieving a significant improvement in the quality of our living environment but also taking into account the opportunities of regions and sectors for socio-economic development.
- Suppose that resources from various levels of government are also jointly deployed and that the business community is even willing to make a substantial contribution.
- Suppose that the benefits and burdens are distributed fairly among citizens and socio-economic groups.
- And suppose that a process is chosen in which all important stakeholders are involved, not only to create mutual understanding for the various interests at stake and to promote support, but also to enrich the solution space with innovative ideas.

I think many of you would consider this a great idea, and of course it is. However, it is not new. In fact, this approach was developed 35 years ago, when our national government presented its pioneering ideas on policies for the environment, nature, and water. In the 1990s, the Netherlands was an international leader in systematic environmental planning and the approach was considered innovative and highly ambitious.

Not long after I was appointed assistant professor at this university in 1990, I became involved in a large-scale study commissioned by the Ministry of the Environment into very ambitious attempts to resolve persistent environmental issues at the regional level. To this end, an experimental and integrated policy had been established: *ROM-gebiedenbeleid*.[14] This policy has been forgotten, but it is interesting to re-examen it. Its aim was to combat the existing fragmentation of policies and to integrate spatial planning, environmental policy, nature conservation policy, and water policy at the regional level. The regions where this policy was tested and applied are indicated in Figure 3. I don't think I need to explain to you the problems that regions such as Schiphol Airport, Rotterdam Rijnmond, the Green Heart were facing at the time: these were serious and complex problems of environmental pollution and degradation, and there was much disagreement among the public and private actors involved about the nature and

causes of the problems and the desired solutions. These were truly wicked problems.

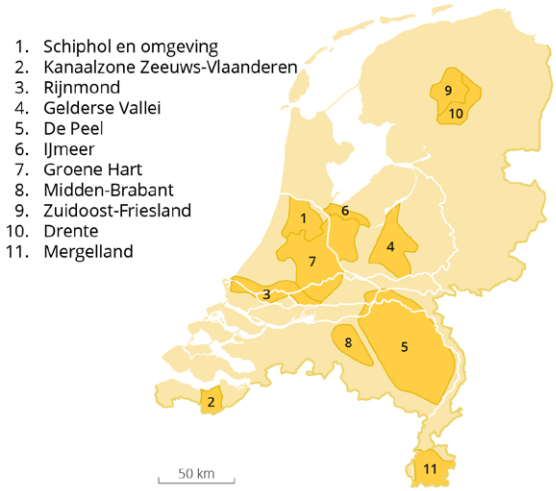

Figure 3: Integrated regional sustainability policies [15]

Our research aimed to analyse and evaluate this new policy, using scientific insights on environmental dispute resolution, interactive governance and network governance.[16] The findings influenced the Ministry of the Environment's strategy for managing policy integration processes, with a greater focus on stakeholder participation and creating space for shared values, joint research, and future-oriented planning. However, this integrated regional policy itself proved to be only moderately successful. In a few cases new solutions were devised and implemented, these were small wins. But overall, the results were disappointing. Although the approach chosen was innovative, ambitious and even courageous[17], the solution space proved to be limited, the expectations too high, the interests and values involved too diverse, the institutional barriers for implementation significant, and the fragmentation within the government too persistent. The high ambitions also led to considerable resistance in some areas. This area-oriented policy was never officially terminated. The focus on policy integration and integrated regional policy has continued to this day[18], but with different problem frames and different trials. As Rittel and Webber might say *policies*

addressing wicked problems do not have a stopping rule.[19] In the last two decades, several new policy initiatives were taken, such as in areas with intensive livestock farming and in the area around Schiphol Airport. However, the problems with intensive livestock farming and noise pollution around our national airport have persisted to this day.

Our urban and rural areas will have to undergo radical change in the coming years if we are to tackle the interconnected challenges posed by climate change, biodiversity loss, land subsidence, and water quality. Policy fragmentation and inadequate implementation remain significant barriers. Scientific insights from research into integrated national, regional, and local policy can help to find a way forward. In the past few years, together with several PhD students, I have continued empirical and evaluative research into policy integration in various ways. For instance, Tanja Verbeeten's research focussed on governance strategies for the Wadden Sea.[20] Roos den Uyl, Henk van Hardeveld, and Mandy van den Ende investigated the challenges surrounding agricultural development, nature conservation, water management, and soil subsidence in peat meadow areas.[21] Miriam Weber researched the integration of noise pollution and spatial planning[22]. John van den Hof, Rien van Stigt, Didi van Doren, Stef Koop, Andreas Huck, and Astrid Mangnus investigated sustainable urban development in the context of climate change from different scientific perspectives.[23] Hanneke Peeters is currently investigating suitable governance strategies for safeguarding freshwater resources in the dry sandy soil areas in the Netherlands. And Caro Mooren will soon complete a study on the water-energy-food-ecosystem nexus in transboundary river management.[24]

Each one of these studies deals with complex sustainability issues and diverging interests and the need to decrease policy fragmentation and to improve policy coherence at the local, regional and national levels. Over the years, all kinds of ideas have emerged for new modes of governance that are more interactive, participatory, reflexive, anticipatory and transformative. The broader scientific literature also recognizes that progress in the field of sustainable development requires collaborative and interactive forms of governance based on knowledge sharing, stakeholder participation, and innovative partnerships between multiple actors and at different administrative levels.[25] In order to tackle the wickedness of sustainability issues we need a new kind of governance arrangement to arrive at acceptable solu-

tions. The key aim of this arrangement should be to strengthen collective responsibility, collective leadership and connectivity[26], that is to connect different public and private actors; to connect different problem frames, values and norms; to connect long-term outlooks and short-term intervention strategies; to connect different policy sectors, administrative levels and jurisdictions; to connect formal and informal networks and institutions; and, finally, to better connect science and policy.

Knowledge for Climate

After the turn of the century the problem of climate change and the need to adapt to its effects gradually became a more important topic in my work. Although research into integrated regional sustainability policies continued, a new research line was added focussed on climate adaptation. This issue was rapidly gaining prominence at that time but had received only little attention in scientific research. An important stimulus for this research line was a new position I obtained in 2007 as director of a national research programme on climate adaptation on behalf of Utrecht University.

This programme was called *Knowledge for Climate* (in Dutch: *Kennis voor Klimaat*) and was intended to prepare the Netherlands for climate change and to support regions and sectors in developing adaptation strategies through knowledge development. Climate change leads to sea level rise, increased risk of flooding, droughts, salinization in coastal areas, urban heating, and health risks, among other things. Adapting to climate change means taking measures to reduce vulnerability to these impacts. Climate adaptation encompasses a wide range of measures, from planting crops that are more resistant to drought and saline conditions, to building stronger defences against flooding and greening our cities to combat overheating and prevent severe flooding after extreme rainfall.

The programme was launched during a period of great controversy about climate change and even widespread denial of the problem, which is a common response to wicked problems. Despite the financial crisis that broke out in 2008, the cabinet at the time – Balkenende IV – decided to spend 50 million euros on this research programme. It was stipulated that an additional 30 million euros in co-financing from other public and pri-

vate organisations had to be found. The programme involved collaboration between Utrecht University, Wageningen University & Research, the Free University of Amsterdam, TNO, and the Royal Netherlands Meteorological Institute (KNMI). Later, other knowledge institutes joined this consortium.

I had the privilege of leading this programme together with two exceptional colleagues: Prof. Pier Vellinga from Wageningen University as co-scientific director and Kees van Deelen on behalf of TNO as managing director. It was a very exciting collaboration, and we were lucky to have an excellent team of supporting staff. It was a time of pioneering, developing new research themes, and finding new ways of interactions between science and policy in order to achieve the necessary societal impact. At the same time, the programme had to strengthen the climate adaptation knowledge infrastructure in the Netherlands. A solid knowledge infrastructure is important to be able to provide society with reliable information about climate risks and how we can help improve the quality of our living environment through innovative and effective adaptation measures.

We decided to focus the programme on eight research themes and eight hotspots where climate adaptation strategies and measures could be tested. The research themes had emerged after extensive stakeholder consultation and some of them had received little or no attention up to that point. We distinguished between the following eight themes: flood risk management, fresh water supply, rural areas, cities, infrastructures, climate projections, governance, and decision-support tools (Figure 4). We would have liked to include the theme of public health too, but governments and other stakeholders were not interested in this topic at the time. However, the relationship between climate change and public health is certainly an important theme.[27] Heat waves are increasing in intensity, frequency, and spread and can have serious health consequences. Wildfires, which are closely linked to extreme heat, contribute significantly to exposure to air pollution and other hazards. Droughts and floods are also becoming more frequent and can create life-threatening situations. The effects on mental health can be significant as well. And prolonged temperature changes will alter vegetation and seasons, contributing to changes in pollen allergies and the spread of infectious diseases. Although there is now greater interest in the health effects of climate change, investment in research is unfortunately lagging behind.

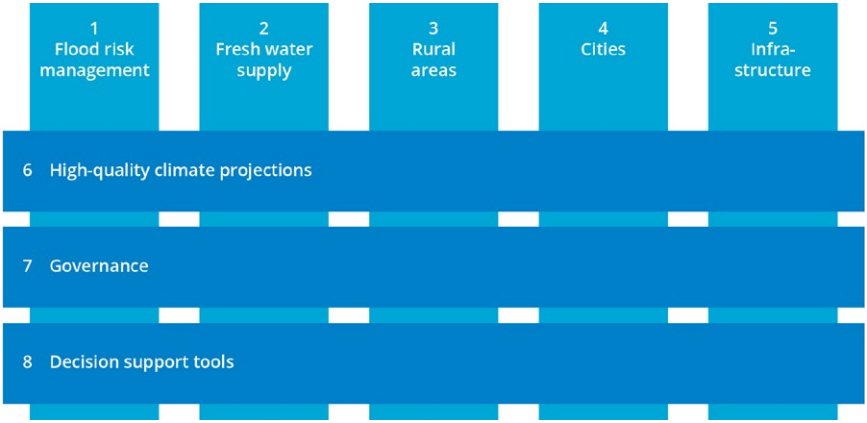

Figure 4: Knowledge for climate research themes [28]

We also identified eight areas in the Netherlands that are highly vulnerable to climate change, and for which we aimed to develop knowledge that could contribute to successful adaptation strategies, plans, and measures. It is striking that these areas partly overlap with the areas I showed earlier when discussing integrated regional policies. Regions such as Schiphol Airport, Mainport Rotterdam, Southwest Delta, peat meadow areas, and dry sandy soils had been designated vulnerable again, but from a different problem framing.

The programme provided scope for both fundamental and applied interdisciplinary research. Because of this broad objective, we also developed a broader review system, in which not only scientists but also representatives of public and private organizations were invited to assess research proposals and research reports. This was unique at the time. We also decided not to simply distribute the financial resources among the five founding organizations initially involved in the programme, but to allow other knowledge institutes to participate too, such as the Amsterdam, Delft, and Nijmegen universities, Deltares, and various consultancies.

Despite a challenging political climate, the research programme yielded some successful results.[29] We managed to secure more than 30 million euros to co-finance research, which is remarkable considering the financial

crisis our country was facing at the time. Thanks to the research budget, we carried out numerous research projects, including 60 PhD projects at various universities in the Netherlands. Many senior researchers were involved in the programme as well, and I am pleased that some of them are here this afternoon. I am very grateful to them for their innovative and high-quality contributions to the programme. The efforts of all these researchers resulted in numerous dissertations, hundreds of articles in leading scientific journals, and many advisory reports.

However, applying all this knowledge in regional and sectoral policies proved difficult. Although we succeeded in developing building blocks for adaptation strategies for the eight hotspots, it was difficult to get adaptation policy off the ground in these regions. In that respect, the programme was ahead of its time. Unfortunately, we were also unable to continue the programme after 2014 and give it permanent status.

Now, more than 10 years after the end of the programme, attention to climate adaptation has moved into the spotlight. Global attention to this issue has grown exponentially in recent years, with some positive results. International research has identified various adaptation pathways for different areas and sectors[30] and a wide range of solutions is now available. Nature-based solutions are receiving a lot of attention and appear promising, not only because they contribute to increasing resilience to climate change impacts, but also contribute to health, wellbeing and biodiversity.[31] However, progress with systematic adaptation planning is unfortunately worryingly slow. For example, international research shows that only half of the cities in Europe have an adaptation plan, and the quality of these plans is far from optimal and could be improved.[32] Implementation, monitoring, and evaluation appear to be weak aspects of urban adaptation planning and need to be given more attention in the coming years.[33] Without adequate monitoring and evaluation systems, we are not able to determine and understand what progress is being made in climate adaptation. Research conducted by my colleagues and myself has also shown that there are still many challenges ahead. For example, governments are struggling with the different roles they can play in climate adaptation processes. Although government intervention is important in many cases, governments' capacity to act is limited. Governments do not know when they should take the initiative, or whether their role can be limited to supporting private initia-

tives.[34] What citizens and businesses can and should do themselves is also unclear. More public debate is needed on this issue.[35] And, there is still not enough public participation[36], too little attention is being paid to accountability in adaptation processes[37], the mainstreaming of adaptation in spatial planning remains a major challenge[38], and the institutional conditions for successful climate adaptation are weak, fragmented, or absent.

In addition, we must also realize that climate adaptation is not about technical optimization processes, but about important political choices and risk assessments that may be questioned and contested. Climate adaptation is a complex process of societal change and should be studied as such.[39] Adaptation measures can have significant social consequences and will have an impact on the daily lives of citizens. Some will benefit from these measures, for others the costs will be high. Without sufficient attention to distributional effects and issues of justice, any adaptation policy will be met with considerable resistance. Science can make an important contribution to the debate on what kind of justice is at stake in various adaptation measures and how this can be dealt with in practice. In addition, citizens and politicians must be supported in shaping a climate-proof future, emphasising not only the sacrifices that must be made, but above all the benefits that such a future can bring. Finally, it goes without saying that focusing on climate adaptation should not diminish efforts to mitigate climate change.

Flood risk governance

One of the most important themes in climate adaptation research and policy concerns reducing flood risks. Floods are the most common type of disaster and are worldwide responsible for large numbers of casualties and significant economic damage. According to the IPCC Synthesis Report of 2023, between 2010 and 2020, human deaths from floods, droughts and storms were 15 times higher in regions highly vulnerable to climate change than in regions with very low vulnerability.[40] Flooding remains a significant threat in the Netherlands as well. Many of you may still remember the crisis of 1995, when the risk of flooding was so acute that over 250,000 people and 1 million farm animals were evacuated from areas near our major rivers.[41] It was a wake-up call in a country where people generally feel very safe behind the dikes, but nevertheless prove to be vulnerable.

After the Knowledge for Climate programme ended, a few colleagues and I came up with the idea of continuing research on flood risks resulting from climate change with a new international consortium. Together with colleagues from the Faculty of Law, Economics, and Governance, the University of Nijmegen, and Sweco, we developed a proposal for research into flood risk governance arrangements. The new project, named STAR-FLOOD, was funded by the European Commission under the Seventh Framework Programme (FP7). It was the first project in which the research approach combined political and legal science; previously, much of the research in this field had been conducted from a natural science and engineering perspective. STAR-FLOOD set out to develop flood risk governance arrangements in vulnerable urban regions in six European countries – England, Belgium, France, Poland, Sweden, and the Netherlands – and involved research groups from all these countries.

To be *flood-resilient*, countries must have sufficient capacity to resist, absorb, and recover, plus the ability to transform and adapt. Based on this international comparative study, we concluded that several key governance strategies will increase flood resilience.[42] And these governance strategies proved to be relevant to different physical and institutional contexts. First, approaches to flood risk management need to be diversified by combining flood risk prevention, flood defences, flood mitigation, flood preparation, and flood recovery (Figure 5).[43] To apply these approaches, public and private actors must be involved and must collaborate at the local, regional, and national levels. And there must be sufficient formal rules that strike a balance between legal certainty and flexibility. Finally, it is important to provide guarantees for a fair distribution of benefits and burdens.

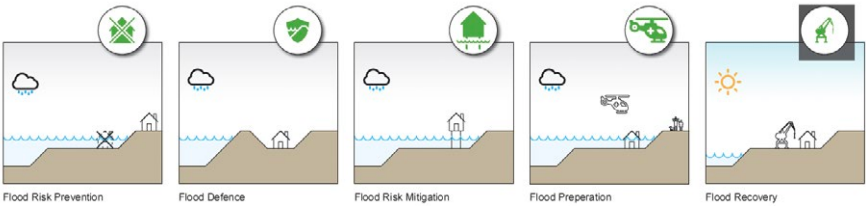

Figure 5: Five flood risk management approaches [44]

Like any wicked problem, flood risks are in principle unique and embedded in a physical, historical, cultural, economic, and social context. Administrative and institutional traditions play an important role in policy development too, which is why countries often opt for a different combination of strategies. But which principles of justice are chosen is also relevant. From a *solidarity perspective*, a fair policy would require people in low-risk areas to also contribute to flood protection measures in high-risk areas. In contrast, a fair policy based on the *beneficiary pays* principle is based on the rule that those who benefit most also pay the most. Yet another normative principle gives priority to measures that protect the most *vulnerable people and communities*. Flood risk governance always includes normative choices about fairness and justice which can vary from country to country and from case to case.[45]

In the future, climate change will make it necessary to continue to pay attention to flood risks and appropriate governance strategies. Wicked problems, such as flood risks, are never completely solved, as Rittel and Webber would argue.

In the past few years, I have continued my research into climate adaptation and water policy with various PhD students and postdocs. Heleen Mees conducted research into the public and private responsibilities of climate adaptation[46]; Hannelore Mees investigated the co-production of flood risk governance between authorities and citizens in Flanders[47]; Azeb Mersha investigated the influence of gender on the adaptation strategies of small farmers in rural Ethiopia[48]; Heleen Mees, Dries Hegger, Caroline Uittenbroek and Mandy van den Ende investigated the role of local governments in climate adaptation, the design of public participation, and the mainstreaming between climate adaptation and spatial planning[49]; Susanne Wuijts investigated water quality governance and the implementation of the European Water Framework Directive[50]; and Badrul Hasan researched community management of drinking water systems in Bangladesh in the context of climate change.[51] Zakia Sultana is currently conducting comparative research into heat stress in urban slums in Bangladesh and South Africa, which will hopefully provide insights into how individuals and small communities are adapting to increasingly hot conditions.[52] Last but not least, Dinda Prayunita investigates suitable governance strategies to protect mangrove forests in Indonesia, which not only harbor great biodiver-

sity but also form a natural barrier against storm surges and flooding – in short, they are a nature-based solution.

Interactions between science and policy

In all the research projects I have mentioned, the question of how research results can positively affect society has always been important: how can research help solve wicked sustainability problems, how can research impact policy practice and how can this be promoted? In recent years, there has been increasing attention on the usefulness and applicability of results of scientific research, which means that this theme is also subject of research itself. Much research focuses on forms of interactions between science and policy[53], knowledge co-creation[54], joint knowledge production[55], research uptake strategies[56], participatory action research[57], and transdisciplinary research[58]. A key question in this regard is how to combine societal engagement in sustainability issues with safeguarding scientific independence.

The connections between science and policy are complicated and both domains are intertwined in a kind of love-hate relationship. The results of scientific research are not always applied in government and business policies, as we observe almost daily. The reasons for this are manifold. Of course, science does not dictate policy, and research is always interpreted in many valid ways in policy and politics. However, scientific knowledge is also regularly used strategically – or even misused – in social and political practice; for example, when scientific uncertainty is used as the main argument to postpone or challenge much-needed societal interventions. Moreover, there is often a significant mismatch between the production of knowledge by scientists and the knowledge needs of policymakers.[59]

In a groundbreaking paper published in 2003, David Cash and colleagues of Harvard University presented three conditions that knowledge and knowledge systems must meet in order to contribute to sustainable development: credibility, salience, and legitimacy.[60] *Credibility* refers to the scientific adequacy of the evidence and arguments. Sources of knowledge must be deemed trustworthy and reliable. *Salience* refers to the relevance of the knowledge to the needs of decision makers. Finally, *legitimacy* refers to the extent to which the produced knowledge has been respectful of the diver-

gent values and beliefs of stakeholders, unbiased in its conduct and fair in its treatment of opposing views and interests. Problems in the relationship between science and policy do not always arise from a lack of knowledge, but rather from imbalances between the credibility, salience, and legitimacy of the knowledge produced.[61] In their paper, Cash and colleagues present several strategies that can contribute to the production of useful knowledge, such as better communication between experts and decision-makers, a more adequate translation of scientific insights into practical action perspectives, and mediation. In addition, they argue for *boundary work*: working at the interface between science and policy.

In the past few years, I have continued research into boundary work, boundary workers and boundary organizations with various colleagues and PhD students. Lisa Andrews, for example, is currently investigating how boundary work should be organized in the various stages of a transdisciplinary research project. The analytical framework of this research consists of twelve boundary work activities that can increase credible, salient, and legitimate knowledge (Figure 6).[62] We want to find out whether implementing these activities successfully in the different stages of a transdisciplinary project will trigger a domino effect that makes it more likely scientific knowledge will be used and will bring about impactful sustainability transformations. This assumption is currently being tested empirically in transdisciplinary research projects in the Netherlands and in some other European countries. We hope our research findings will help researchers and research funding agencies to better organize their transdisciplinary research, making it more likely that projects will have a real impact.

The research conducted by various other PhD students has also contributed to better insights into interactions between science and policy: for example, Wanda van Enst's research into boundary work strategies in the management of the Wadden Sea[63]; Rien van Stigt's research on local administrators' views on expert knowledge in urban planning[64]; Theo Henckens' work on the development of a specific boundary organization in the form of an international competence centre for mineral resource management[65]; Dhanush Dinesh's study of the engagement of science and policy to accelerate climate action in food systems[66]; and Danick Trouwloon's ongoing investigation on context-appropriate research uptake strategies.[67] A recent line of research was developed by PhD students Karlijn Muiderman and Lucas

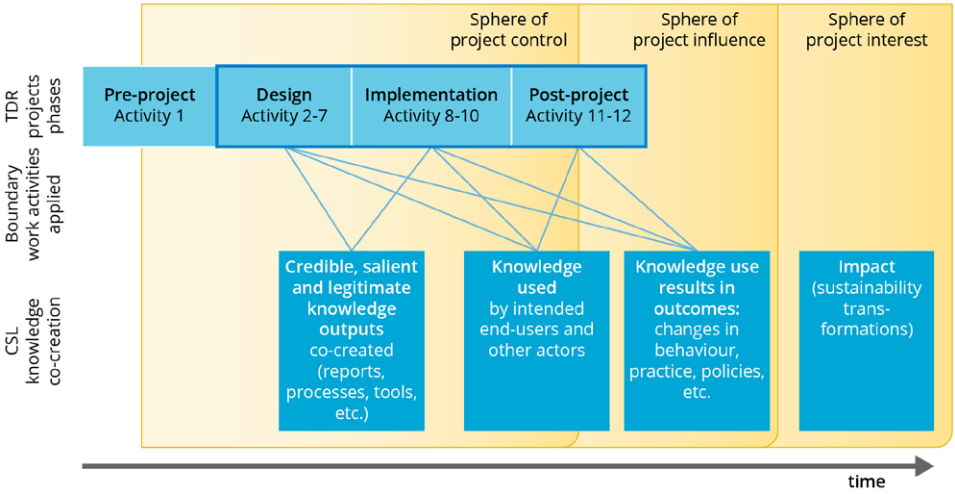

Figure 6: Boundary work activities enhancing credible, salient and legitimate knowledge in transdisciplinary research projects [68]

Rutting and addresses the question of how foresight studies can contribute to sustainability transformations in practice.[69]

Delta Climate Center

Coincidentally, one of the last major projects I carried out brought together many of the lines of research I have pursued since the beginning of my academic career. In 2021, the rector asked me, in my capacity as vice-dean, to represent Utrecht University in a consortium that was to set up a new knowledge institute focusing on sustainability issues in delta areas. A considerable amount of government funding – 88 million euros – was made available for this institute, as part of a broader stimulus package for the province of Zeeland. Also involved in this initiative in addition to Utrecht University are Wageningen University & Research, the Royal Netherlands Institute for Sea Research (NIOZ), Scalda, HZ University of Applied Sciences, and University College Roosevelt.[70]

Deltas are typically densely populated, attractive and prosperous regions due to their fertile soil, abundant water resources, and rich biodiversity. In these areas, issues of water management, energy and food production, biodiversity conservation and creating sustainable livelihoods are closely intertwined. Worldwide, more than 500 million people live in delta areas. But deltas are also high-risk areas: storm surges and floods have caused many casualties in the past and continue to do so today. Throughout the world, the liveability and prosperity of deltas are under pressure from the cumulative effects of climate change and other human activities. Deltas are confronted with rising sea levels, increasing flood risks, land subsidence, pollution, loss of biodiversity, salinization, and conflicting claims about the use of land and sea.

Opened in 2024, in Vlissingen, the Delta Climate Center focuses on these broad issues and uses the Zeeland delta as a testing ground to devise solutions that could have broader significance and impact in the long term. The aim is to develop transformation pathways, towards a sustainable delta, linked to concrete action perspectives and practical applications. The focus is not only on interdisciplinary and transdisciplinary research, but also on the development of new forms of education, combining scientific, applied, and practice-oriented education. The DCC now has an ambitious and energetic scientific staff, which includes my fellow professors Albert Klein Tank, Herman Kasper Gilissen, and Hugo de Boer as well as many other talented researchers and teachers from the other knowledge institutes involved. Ambitious plans and projects are unfolding rapidly and expectations for groundbreaking results and international recognition are high.

Words of gratitude

Dear colleagues and friends, I have come to the end of my farewell lecture. Over the past ten years, my colleague Frank Biermann and I have been leading the Environmental Governance research group, one of the five sections of the Copernicus Institute of Sustainable Development. The group has grown considerably in recent years, thanks to its successes in education and research. It has been a great honour to work for many years with this group of exceptionally talented and motivated researchers and teachers. I would like to thank Frank Biermann for his excellent cooperation and his

outstanding initiatives in establishing new international networks and partnerships with leading research institutes around the world. Thanks also to all other staff members for the superb teamwork that formed the basis for the many successes we have achieved together. It has been a privilege to be able to contribute to your careers.

Although most of my work has been completed, after my retirement I will continue to supervise a few PhD students and provide scientific advice, including to the excellent University College Roosevelt in Middelburg. It seems that's not just policies that do not have a stopping rule; scientific work doesn't seem to have a stopping rule either. But don't worry, I will try to enjoy my retirement, together with my lovely family.

As I mentioned at the beginning of my lecture, scientific work is always teamwork. Without the support from and collaboration with others, I would not have been able to build this career. Over the past forty years I have worked with hundreds of people. You understand that I cannot possibly thank everyone personally, but I would like to make an exception for a few colleagues. I would like to express my sincere gratitude to professors Piet Hoekstra, Wilco Hazeleger, and Hans de Bresser for their wonderful, inspiring, and collegial cooperation in the faculty board during the period 2015-2021. I would also like to thank my fellow professors Martin Wassen, Marko Hekkert, and Ellen Moors for their leadership of the Copernicus Institute and the department. Finally, I would like to thank Professor Marleen van Rijswick of the Faculty of Law, Economics, and Governance for the many years of intensive and successful collaboration. Since 1995, our two research groups have jointly set up and carried out numerous research projects, and this combination of governance and legal research has always proven highly fruitful in delivering innovative results.

Finally, I would like to thank everyone who has shaped me academically and with whom I have had the pleasure and privilege of sharing a passion for science, in research projects, in writing scientific articles, in organizing conferences and symposia, in teaching, in developing curricula, and in the management of the research group, the department and the faculty. And this gratitude extends not only to fellow scholars, but also to all those who had a supporting role in the secretariat, the HR department, the finance department, the communications department and the university adminis-

tration department. Finally, I would like to express my sincere thanks to the PhDs I have had the opportunity to work with and the many students I have had the opportunity to mentor. That was perhaps the best part of my job.

Ik heb gezegd.

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PPeter Driessen is full professor of environmental governance. He holds degrees in urban and regional planning and in political sciences. His research contributes to the scholarly and political debate on sustainability governance, by analysing interventions that have the potential to make governance outcomes more congruent with sustainability goals. His research addresses a long-standing theoretical and empirical concern of *what works where, when and why*.

Peter Driessen's research is well known for the analyses and evaluations of water safety, water quality management, climate adaptation policies, sustainable urban development, interactive policy making, and science-policy interactions. He participated in and took the lead in several nationally and internationally funded interdisciplinary research projects. As part of these projects, strategies were developed to make urban agglomerations in Europe more resilient to flood risks; action perspectives were developed for European cities to address the challenges of adapting to climate change; diagnostic tools were developed for cities to improve water management and promote resilience; and strategies were designed for successful interactions between science and policy.

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