

Complexity and transition: adaptive planning for the Dutch delta region

Research Master Thesis
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24th August 2015

Groningen, the Netherlands

Acknowledgement:

I would like to thank my supervisor and many of the teachers at Faculty of Spatial Sciences, who have kindly shared their knowledge and experience with me. I would like to also thank my fellow students, with whom I experienced the strength of collective learning and the pleasant time of studying together.

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24th August 2015
Groningen

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Chapter I: Introduction

The Netherlands lies low, lower than the sea level. Dutch are safe, safer than the people living in the many other delta regions. The paper is about the new stories on how Dutch will keep achieving this by innovative understanding on spatial planning. Compared to the stereotype of planning as drawings, we believe it is the ideas that count. The paper presents the lessons we learned by asking and analysing more about the planning ideas Dutch currently hold.

1.1 Issue and research question

Spatial planning is faced with the challenge of climate change and more case studies are needed to explore its promising role of building long-term climate-proof living environment (Aerts et al., 2012; Bauer & Steurer, 2015; Biesbroek et al., 2009; Biesbroek et al., 2010; Compell, 2006; Stead, 2014). Urbanised delta regions have long been the intriguing concern as well as outcomes of spatial planning (Meyer, 2009; Campanella, 2010; Meyer et al., 2010; Meyer, 2014; Meyer & Nijhuis, 2014). This is especially true in the Netherlands where safeguarding the delta territory from water is always one of the pivotal missions (Needham, 2014; IenE & EA, 2014).

In the age of climate change, the risky situation of urbanised delta regions becomes increasingly concerned (Meyer & Nijhuis, 2014). Research on the cases of urbanised delta region is needed to further elaborate the role of spatial planning in climate change adaptation (Compbell, 2006). Comparative research aided by GIS (geographical information system) is done including more than 10 delta regions in the world (Meyer & Nijhuis, 2014), which provides supportive starting stage for further research on each of them. Urbanised delta regions are faced with similar problems and risks, but planning approaches differ depending on the specific geographic, hydraulic, historical, economic and cultural factors (Meyer & Nijhuis, 2014). Our research focuses on RMS (Rhine-Meuse-Scheldt) delta region, which is also coined the Dutch delta region because large area of the delta is in the Netherlands.

The Netherlands is the low-lying country, lower than the sea level (Needham, 2014). Thanks to the Dutch dike ring systems, people can live safely on large part of the interior territory which lies lower than the sea level outside the dikes. This has resulted in a risky situation where although the territory of the Netherlands is to a large degree secured by the dike rings, the consequence would be highly disastrous once the sea overflows the dikes or the dikes are severely breached. While maintaining the work of restoring and improving the dikes, Dutch feel the urgent need for combining alternative solutions considering the sea level rise scenarios and the enormous cost of further heightening the dikes.

Moreover, risks from peak discharge and extreme storms also become increasingly threatening to the interior river side cities (V&W et al., 2005). Much attention has been paid to the large coastal cities like Rotterdam and Amsterdam (Meyer, 2009; Meyer, 2014). In contrast, research at the regional level and the integrated approaches is needed (Wolsink, 2006; Rijke et al., 2012; Dammers et al., 2014; Bauer & Steurer, 2015). Spatial planning with the balance at the regional level is considered a promising approach by the Dutch national government (IenE & EA, 2014).

In addition to the call from practice, planning theory also proposes to consider the delta region as an integrated complex system (Dammers et al., 2014; Meyer, 2014). Complex adaptive system has been one of the most concerned topics in planning theory (De Roo & Silva, 2010; De Roo et al., 2012). Urbanised delta region is researched as a good example of the complex adaptive system in much of the current studies (Dammers et al., 2014; Meyer, 2014; Meyer & Nijhuis, 2014). The empirical research on urbanised delta regions is often connected to the planning theory research on complexity. Complex adaptive system is proposed as a methodological framework (CAS) to elaborate further planning approaches (Dammers et al., 2014).

Complex adaptive system is underpinned by the planning theory that combines complexity sciences and system thinking (De Roo, 2014). The key concepts of understanding a complex adaptive system are proposed in the discussions of complexity planning theory, including uncertainty, dynamics, diversity, transition, co-evolution etc. (De Roo & Silva, 2010; De Roo et al., 2012). Research proposals about the further articulation on those concepts are called for from the theory studies, so that the theory can be stronger support and helpful guidance for more kinds of planning issues (De Roo, 2014). Adaptive planning or non-linear planning is proposed as the innovative framework for approaches dealing with complex planning issues in this non-linear world (De Roo, 2014).

The Netherlands is often considered a frontrunner and educative case for adaptive planning. The national government allocates plentiful resource to study about adaptation, especially to climate change (IenE & EA, 2014). Room for the river as the adaptive strategy (IenE & EA, 2014) is being widely studied and scrutinised as a relevant case for adaptive planning (Covers, 2009; De Vries & Wolsink, 2009; Rijke et al., 2012; Warner et al., 2013; Rijke et al., 2014). It is questioned what kind of rationale and institutions behind the strategy would be more advantageous and feasible to realise adaptability in practice (Bauer & Steurer, 2015).

After the unsatisfied results of the mitigation strategies, and considering the increasing risks to the delta region, the attention on climate change in the Netherlands is gradually moving from mitigation into adaptation (Stead, 2014). Room for the River has been the adaptive strategy under the spotlight in the Netherlands since 1990s when several disastrous floods caused wide trepidation. Room for the river is the Dutch national policy (V&W et al., 2005), the spatial planning programme concerning all of its administrative levels (Rijke et al., 2012), as well as the more than thirty concrete planning projects spreading its delta and river basin (V&W et al., 2005). This strategy is considered representing innovative changes concerning both the institutional system and large-scale spatial transformation.

Room for the river, from dike-heightening to river-widening, is often considered innovative because it challenges the Dutch tradition of dealing with water by hard engineering (De Vries & Wolsink, 2009; Stead, 2014). We find the strategy of room for the river innovative in the sense that it may also challenge the traditional spatial planning strategy of urbanism (Meyer, et al., 2010; Meyer, 2014), in other words, room for the city. The Netherlands, whose entire territory is in the Rhine-Meuse-Scheldt delta, is a small and densely populated country where making room for the city and making room for the river can be conflicting. Innovative ideas challenging the long-existed tradition may sometimes end up “too good to be true,” like the abolished strategy of compact city (De Roo, 2003).

However, the global situation is changing so rapidly that it is not impossible the tradition is faced with a seismic shift. At least, it is not out of the question whether and how urban development is still viable in the delta in the age of climate change (Meyer et al., 2010). On the one hand, climate change and the possible scenarios of sea-

level rise, extreme storms and peak discharge are seen increasingly serious threats to the security of the low-lying country. On the other hand, after ages of delta urbanisation in the Netherlands supported by the land-reclaiming drainage infrastructure and flood-defending dike rings, problems like land subsidence and damage to the ecological system also become urgent.

We can see the issues of climate change adaptation, planning theory discussion and the approaches for the urbanised delta region are tangled in the Netherlands as well as the Dutch strategy of room for the river, which form a good empirical basis to research about our interested issues.

Therefore, the research question is

What respects reflect the meaning of adaptive planning for the Dutch urbanised delta region?

—What is the context of the Dutch urbanised delta region?

—What are the insights from theory on non-linearity to adaptive planning?

—What are the lessons from the practice of the strategy of room for the river in the Netherlands?

The research studies the meanings carried by adaptive planning in the context, in the theory and in the practice. Then we ask if the linkages among the three sides of adaptive planning are strong and relevant enough to form a convincing story about better planning and better living environment in the age of climate change. The answer would demonstrate whether adaptive planning is effectively realised by the many sources of consideration and endeavour, including policy-making, academic research and implementation.

1.2 Research methods

We adopt qualitative methods and case study approach, whose philosophical and methodological underpinnings are elaborated in *Appendix 1: Methodology*. The general structure of the research design consists of firstly clarifying the context, secondly constructing the theoretical framework, then learning from case studies, and finally reflection and discussion. The structure is also reflected by the arrangement of the chapters in this dissertation.

The first part of the research as the context study is conducted with literature study. The large amount of literature in English about Dutch planning and society has sufficiently informed about part of the research question. Moreover, it also provides necessary contextual information for detailed enquiry. The literature is searched by both academic journals and the reference lists of them. Certain key writers of the issue can be identified through literature study so that more of their relevant works are identified and included.

The second part of the research as the theory articulation is done by combining literature study with expert consultancy. The academic works on spatial planning and complexity sciences is studied. Among the large range of emphases in academic publications about complexity planning theory, we choose to focus on the literature about non-linearity and transition. Meetings with the senior researchers (the supervisor of this research as one of them) help deepen the understanding.

The third part of the research as case studies is done by online searching, site-visit, policy analysis and interviews. The Dutch policy and programme of *Room for the River* have official websites where basic information can be gathered. The interviews with the people working in the practice help clarify and explore more information and stories. The participants of the interview include officials in Rijkswaterstaat, municipal

governments and water boards. The specific responsibilities of them include programme management, master plan making, public communication, water management and hydraulic models. More details about the interviews are found in *Appendix 2: Interviews*.

We build the tentative theoretical framework by literature study. During the interviews we ask questions framed by our theoretical framework. Then data collected by those interviews is analysed and reflected also by the same framework. During this process the improvement of theory and the better understanding on reality and issues mutually benefit from each other.

1.3 Readers guide

Chapter II contains more explicit content about the relevant context in the Netherlands including history, debate and reflection. The study of the context provides background information to further understand Dutch planning system where the tasks are very much beyond traditional views on master plans. The history and culture decide the planning concerns significantly on procedure, responsibilities, coordination and democracy. However, a tradition of engineering and design on substantive results is also critical especially when it is related to water. Currently, planning issues are embedded in complex multi-player institutional construct in the Netherlands. Governments and agencies have different ideas about what the responsibility of each one (including themselves) should be, and the differences can cause confusion and troubles in practice. The issue of balance in power and responsibility becomes a relevant key to understanding the context for Dutch planning.

The policy and research context that are more specifically relevant would be climate change adaptation and delta urbanisation. Climate change adaptation is seen in national policies and underpins many concrete projects in the country. The planning policies which emphasise high-level and abstract planning strategies for climate change adaptation are reviewed. We also generically compare the many programmes and projects under those policies to position the case we choose. The goal of adaptation is translated into preferential strategies for specific regions. Room for the river is one of the strategies that combine multiple approaches (dike improvement and river widening). In addition to the considerations on the rivers, the Dutch delta region has become highly urbanised due to the planning strategies and concepts in history. Urbanisation is still considered promising and research strives to support the long-term prosperity of the urbanised region. Stories about the intangible quality of social development in specific cases are needed for both research and practice.

We briefly introduce the programme of *Room for the River* about the chief purpose, the approach of management, and the realisation. The general message is that it is a national spatial planning programme that also involves many local stakeholders. This wide engagement brings about many opportunities in the practical implementation that demonstrates the relevance of the programme not only to the rivers and water management, but also spatial planning and urban development. Complexity planning theory is considered suitable for this context and programme, where coordination, involvement, communication, dynamics, diversity, and openness are integrated.

Chapter III contains the theoretical articulation on complexity and non-linear planning. By considering the many of the planning issues, such as urbanised delta region, as complex adaptive systems, many key concepts and theoretical models can be proposed to change the traditional understanding on planning, which may be no longer effective. The significant change should happen at the rationale level where the belief in the linear world may be too strong.

Planning itself is becoming a confusing subject, because of the epistemological issues of the subject are changing quickly along with the understanding on environment and reality. Reasoning of planning actions and relevant questions for planning research experienced several reformations in history. Currently, much of planning theory concerns profusely on process, management, consensus and intangible social issues. The epistemological issues then have significant indications on the methodological issues. A combination of objective and subjective approaches is considered suitable for the current reality.

However, the balance of the combination is difficult to achieve. The innovative approach in hypothesis also responds to the theory with new questions on a more suitable and insightful understanding on reality. Complexity sciences and system thinking are reflected from the viewpoint of planning theory. The open system with diversity and dynamics may be able to offer practical lessons in interpreting the reality and planning issues. Theory development has raised many significant concepts including complex adaptive system, non-linearity, co-evolution and transition. The concepts build conceptual models to interpret the reality and then propose new approaches for actual issues.

This research focuses on the transition model as part of the complexity planning theory. The transition model has been studied in several cases. This research adopts it in the case of the urbanised delta region and proposes the further construction specifically suitable for this case. The models themselves are also theoretical proposals about the ideal situations, such as resilience and network that we propose in section 3.2.2. Connecting to the topic of the research, the models that consist of the changing among functionality, risk management, resource management, and resilience, as well as among specialisation, communication, coordination and network, are overall considerations on adaptability. Adaptive planning is proposed as this trend towards more dynamic and flexible spatial and institutional constructs.

Chapter IV presents the case studies. The stories about concrete projects are investigated as actual data based on which the reflection on context and theory can be connected with practice. The Dutch cases present interesting and promising stories about how the simple strategy is realised through the complex system. The Dutch are used to their approach of working-together. The whole process from policy implementation includes many phases and stakeholders. Even though the abstract policy goal is translated into the clear and simple operational criteria, it is considered a great success if the many stakeholders are well organised to achieve the chief goal and meanwhile not too much disturb the development ambitions.

Chapter V provides conclusions. The idea of adaptive planning is re-considered through the context, the theory and the cases. We see adaptive planning is interpreted differently in these different parts. There may be mis-connections while the case of room for the river in the Netherlands presents the practice that the strategy and the practice is well connected and realised. Further evaluation is needed in the future.

Chapter II: Context

Spatial planning, cities and water are significantly tangled in the Netherlands. The interactions among planning, cities and water constitute the context of Dutch planning and research on it. More significantly, the attention of Dutch spatial planning and emphases of planning research are embedded in this context, for which discussion taken for granted by Dutch planners may be bizarre for foreign planners. In the other way, foreign researchers may be confused that their focuses of research seem unduly criticised as irrelevant by Dutch researchers. The differences of planning research in different contexts may be more than commonly expected and even become as big as almost completely different subjects. The topic and cases of our research are chosen in the Netherlands, for which we must be aware of and familiar with the context of Dutch spatial planning. Otherwise we may miss the information by asking wrong questions.

Whether this Dutch context of spatial planning should be sacrosanct in an internationally comparative viewpoint is a very interesting question but beyond the scope of our research. The long history of the connection between spatial planning and water-related issues convinces us that Dutch cases are highly educative of relevant knowledge. The faith in Dutch cases then convinces us to dig deeper into the Dutch planning context to discern indirect but significant lessons. This chapter is supported by the assumption that the broader Dutch tradition of dealing with water-related planning issues is worth learning, and can generate good lessons to the specific concern on the urbanised delta region (before we look back and reflect on the context itself as the later part of the research).

Therefore, this chapter reviews the history of Dutch spatial planning and urbanisation, from which we can see how the spatial reality (urbanised and highly-planned territory) today was shaped by the tradition of Dutch planning, as well as where the tradition and potential innovations of Dutch planning today will lead the spatial transformation in the future. The chapter also reviews the considerations and debates about climate change adaptation in the Netherlands, from which abstract but significant strategies surface at the national level. Among those strategies, we choose the one concerns making room for the river as the case to further investigate about the implementation and modification of the strategy through practice at the local level. At the end, we can tell the context of Dutch planning has provided the potential soil to develop new planning approaches that will mutually benefit with the planning theory of complexity and transition.

2.1 Dutch spatial planning

Dutch spatial planning is one of the most interesting cases in international comparison (Meyer et al., 2010; Meyer & Nijhuis, 2014). Dutch have been famous of their planning with the long history and tradition. The pro-planning culture of the country serves as the green house to constantly promote the development in planning research and practice. Dutch spatial planning becomes stronger and stronger with the way planning is integrated into the institutional system. We review the relevant information on history, culture and institutions to form the basic context by which the further study on theory and specific cases can be appropriately interpreted.

2.1.1 History and culture

Spatial planning is an indigenous subject in the Netherlands, for which Dutch spatial planning becomes unique and world-wide renowned. Dutch planning, although much research considers the post war reconstruction as a starting point, can be dated back long before. It was inaugurated specially for the unique geography at the very beginning when people wanted to use the land. Spatial planning started when Dutch intended to use the swampy land that is more than too common in this territory before it was transformed into the modern country today (Needham, 2014). Large part of the land of the Netherlands in history (in Roman times for example) was too boggy to use or build upon (Needham, 2014). Draining the land became prerequisite before any construction and development. The main steps include, for instance, pumping water out, peats oxidise and land dries out (Needham, 2014).

The process of draining the land is thus complicated and expensive. Nobody would or could afford to drain the land individually just in order to build a single house. Thanks to economies of scale, a group of people can invest together to drain a piece of land and build their houses there. As a result of this collective action, the more people invest, the less cost of drainage each should bear. Therefore, it is cost-effective to include more investors for drainage and then build on the land in a compact form. The densely and neatly urbanised territory of the Netherlands today can be rooted in this history, which had existed long before the explicit policy on compact cities.

There are then many issues emerging from the original collective approach of using land in the Netherlands. First of all, discussion, communication and coordination among many people (investors at least) started at the very beginning of draining the land, before any actual construction or development happens on the land. Many issues have to be agreed upon beforehand, for instance, the goal, the area, the method, the cost, and the timetable. Secondly, a preliminary basis of democracy had been constructed when Dutch landowners chose and were allowed to choose to cope with and make decisions on their land by themselves. Landowners have paramount right over land use decisions. Thirdly, economy is a significant concern (another fact as Dutch are often stereotyped) so that land should be used intensely and thoroughly.

Before investors started draining the land, they might vary in terms of certain details of the results, for instance, the ground water level. It was not a simple task of turning the land dry. The land use afterwards would still to a large degree be influenced by and benefit from water. After all, because of the overall geographic characters, ground water is so dynamic that drainage is a constant issue rather than a one-off assignment. Land is thus also a dynamic object which needs to be considered. Landowners and investors must pay much attention to details and possible changes in future than just offering a piece of land suitable for buildings at the moment. Therefore, the collective action of drainage needs to be based on agreement among stakeholders with many explicit details about the results. The agreement on the coordination and a fair procedure of defining this agreement resulted in the traditional organisation known as water boards.

The water boards became the agencies promoting collective actions and implementing the agreement, which can be seen as the original model of planning agencies working for public interest on water-related issues. There used to be more than thousand water boards in the Netherlands, but nowadays they have been merged into 24 which have zoned the country into their responsible regions. There is also a union of water boards (Unie van Waterschappen) considering overall issues. Water boards often act as the local technical expert teams which are responsible for implementing plans concretely and solving tangible problems.

Therefore, spatial planning, known basically as using land, was connected with water, coordination and public interest from the very beginning when planning started in the Netherlands. Planning in this case is both problem-solving and development-aiming. Stakeholders invest planning not only because they want to build houses and live there but also benefit from the land use in the future. Considerations on cost-effective and lucrative plans are constantly in the mind of stakeholders themselves. Compared to the powerful top-down governmental intervening on behalf of the public interest, this nuance may lead to big difference later.

For example, although planning is to a large degree centralised in the Netherlands for which there is the ministry of the national government especially responsible for spatial planning (Ministry of Infrastructure and Environment, IenE), the ministry is not a tax-spending department (Needham, 2014). In history, planning department had to connect the planning policies with other affairs (housing) for the implementation (to get money from the other ministries that have it). Otherwise, the policies and plans have to be able to collect money for their own realisation, by, for example, including certain functions that can make profit in the future (value capture or planning gain).

The tradition of coordination in Dutch spatial planning leads the special way we look at, research about and understand planning. Firstly of all, since there are always many people involved in planning, they care very much about the process in addition to the result. The process was watched carefully to ensure democracy. Secondly, the responsibilities of different people during planning become highly relevant issues. The results of the coordination process depend on the division of responsibilities. Thirdly, clearly defining and awareness of the public interest becomes the precondition of satisfactory (and likely to be implemented) planning.

One of the extreme examples in contrast is the ancient Chinese cities which looked almost identical with the original plan which was often drawn by one person – the singular “planner.” The emperor only paid attention to whether the plan (result) was preferable. The process of making the plan (planning) was the planner’s own business (responsibility) and the public was never involved. In contrast, planning research in the Netherlands studies the various images and responsibilities among stakeholders rather than searching for the singular planner and studying his plans.

The emphasis on processes of Dutch spatial planning draws much attention to the match between original intentions and concrete implementation, which is considered a significant criterion for evaluating specific plans (Needham, 2014). On the other way, planners pay much attention to the procedural issues such as responsibility, participation and communication while considering making good planning. There come the different concerns on abstract planning strategies and concrete plans and implementation, and the links between them. When people want to look back at the planning reasons for the changes happening in reality, it is much more complex and intangible than a map or document. Planning theory and research discuss immensely around these intangible issues such as institutions, legislation, communication and participation. Participation is an issue in planning, as well as a source of ideas, rather than an alternative and maybe trendy approach for planning, which is seen in other contexts.

During the processes of planning, clear responsibilities are or were preferred. Dutch spatial planning traditionally involves many engineers and architects, who often define their specific responsibilities and expertise very clear. The water boards are expected to solve any water-related problems even though the problems are caused by artificial construction (for development). It is possible that the engineers for construction pay less attention to the potential environmental results of their work, and they may also concern less even though they already see the

negative results, which are supposed to be the job of the other engineers for water management. This approach of coordination worked well. Experts could easily focus on developing knowledge and skills within their own province. All the jobs were clearly divided among experts who were excellent for specific issues. Comprehensive planning is built up upon those many clearly-divided compartments of responsibility and expertise.

In addition to the procedural issues, many significant substantive aspects of Dutch planning also find their roots in the context. One of the principles of Dutch planning is concentration (Needham, 2014), for which land is used intensely within clear zoning boundaries. Land is the product of the collective action of drainage rather than nature resource taken for granted. Intense use of the land means sharing the cost with more people and exploiting as much as possible from the product. Wise use of the land can also generate resources (investment) for the implementation. Therefore, in addition to the match of intention and realisation, evaluation of the substantive aspects of the plans becomes much more flexible and difficult. If one of the important goals of planning is development, there seem always more extra possibility of development and thus plans can always be more ambitious.

Spatial quality is the significant principle and concept in Dutch spatial planning in terms of the good-or-bad results of planning. The concern on spatial quality dated back after the awareness of the negative results of rapid housing construction (focusing on quantity more than quality) for the post-war population increase (Needham, 2014). The main meanings of spatial quality consist of experience, functions and time span, for example, the beauty, safety and sustainability of certain space. Spatial quality becomes a very flexible concept for which it is used widely. Any pleasant experience, such as new recreation centre, new pathway for walking and cycling, parks and public realms, potential scenery views, and the connection to heritage, can be added into the interpretation and contribution to spatial quality. Designers, in addition to engineers, are thus very much involved in plan-making.

Because of the pursuit of concentration and spatial quality, Dutch are ambitious about land use and development. Multi-use of space, integrated development and urban growth are in the national planning principles and several most prioritised planning goals (Needham, 2014). Land owners often consider leaving the land as it is a waste of resources (including nature that is protected or conserved in a strict and straightforward way, i.e. without any intervention). Therefore, the potential for development often overrides the plans that may restrict actions. This does not mean Dutch pay no attention to nature, but they intend to influence and manage any process happening on the land, including natural processes. As a result, it is likely to motivate land owners to involve in planning that makes changes in the future while the current situation is quite fine.

The intense use of land also motivates people to think more about integrated development which can achieve more with the same space. Planning projects can be seen as opportunities of further development which can add additional goals to the original main goal of the specific projects. The principles of integrated development allow the integration of existing needs and new goals. Space is a kind of very potential resource whose usage and value can be limitless, and it becomes the exhilarating tasks of planners to be ambitious and try to achieve more with the same space.

So far, we argue that Dutch planning is indigenous and has its unique cultural root. However, we are also aware that Dutch planning is also influenced by planning systems of other countries. Genealogy of specific planning concepts, even the one we will focus on later (room for the river) or pure international comparison of planning

systems does not concern us very much in this research. We pay more attention to what actually happens in practice, whether actions would have intended consequences, and the vital directions of potential development. We will look at the current planning system of the Netherlands in the next section and use the knowledge presented in this section to identify and understand the most significant respects which would have most influence in future changes.

2.1.2 Current institutions

Although the cultural root of Dutch planning can be dated back long, the modern Dutch planning is often considered starting with the post-war re-development, which mainly aimed at providing adequate housing for the rapidly increasing population. Until now, Dutch planning has evolved into a system involving many parties including the three tiers of governments (national, provincial and municipal), and (relevant to water-related issues) the special agency called Rijkswaterstaat and the many water boards. The complex engagement of Dutch planning results in its multiple faces which may seem different stories but exist and work together for the specific environment as well as the overall spatial transformation of the territory.

There are three main tiers of governments involved in planning process and the deliberation on land use. The national government works on strategies. The municipal governments implement concrete projects. The provincial and regional governments work on linking issues among individual municipal projects. More importantly, the relations among those levels also shape planning and its results. The following paragraphs introduce firstly the national government, and secondly the municipal government, which two are considered most significant in Dutch planning (Faludi & Van der Valk, 1994; Needham, 2014). Then we also introduce briefly about provincial and regional government, but the discussion around this tier concerns us less than the other two. In addition to government, there are also important organisations (Rijkswaterstaat and water boards) which have significant influence in water-related issues. They are closely connected with the government but are not completely integrated.

The Dutch national government has great concern on planning. There is the ministry (Ministry of Infrastructure and Environment, IenE) especially responsible for planning issues. Planning tasking used to be more divided when there were Ministry of Housing, Spatial Planning and Water Management and Ministry of Transport and Environment, which two were merged into IenE in 2010. The national government has been publishing national planning policies that lay down the most significant planning principles for the whole country. Planning concerned at the national level is more about strategies and ideas than concrete plans. The national government issue national policies carrying principal planning ideas and strategies. The strategies concern developing directions of critical regions larger than any municipality (e.g. Randstad), connecting networks beyond any municipality (e.g. highway and canal system), and mega projects (e.g. Schiphol Airport). The Dutch urban region of Randstad and Green Heart (significant within the country and also famous in international comparative research) could be dated back to the consideration of national planning policy that intended to prevent overcrowded urban environment and urban sprawl (“the sea of housing”) in the west of the country (Faludi & Van der Valk, 1994).

The national government and its ministry on planning have meanings beyond the administrative sense. Thanks to the planning considerations at the national level, Dutch planning gains its incisive power. There used to be official national planning and national planners who considered the overall land use of the whole country. It

were those national planners that came up with the strategy of Randstad and Green Heart which have persisted and still have the most significant role in Dutch planning strategies. The distribution of urban and rural land of the country can also be seen as heritage of national planning. National planning used to consider planning for the whole country as one mega project to achieve comprehensiveness. The large scale considerations laid down the most fundamental tracks of development and spatial transformation in the long run. This may seem understandable considering that the Netherlands is a small country, but the country is still not small enough to be steered by national planners.

The original national planning and national planners were officially cancelled, because it turned out very difficult to implement ideas from such a high level. The municipal governments want to keep their power in deciding land use within their municipalities. The municipal governments provide concrete site-specific plans to realise the strategies required by the national government. There is much space for the municipalities to integrate their needs into the concrete plans as long as the national government still sees the general strategies are reflected in the concrete plans. The criteria of the approval by the national government can be negotiated between municipalities and the national government. The financial issues can result in the deviation of concrete municipal plans from the national policies. National government can disapprove the municipal plans which allow land owners to develop on their pieces of land. However, this would result in the payment (the land owners can require compensation for being constrained from developing their land) that national government is not always willing to take (Needham, 2014).

Therefore, the municipalities have the power to shape their environment directly, and concrete local work can even be contradictory to the national planning ideas. At the national level, planning considers many issues like population, economy, and climate change. In contrast, at the local level, these issues can become irrelevant or relevant only in the paper work. Because planning involves many stakeholders, the concrete work at the local level often becomes brain storms about how to get things done satisfying the stakeholders and perhaps also the national strategies. The wisdom of people can be very impressive and there seem always possible ways to realise the needs of local stakeholders no matter what the national strategies or planning legislation is (non-linear behaviour). In fact, even though the win-win plans cannot be figured out, cases where legislation is sidestepped by concrete local implementation often happen (Needham, 2014).

Therefore, the struggle between the national planning and the local planning becomes the issue of how to realise both high level strategies and tailor-made local planning. The history of how national planning and national planners were cancelled is the story of the exploration and experiment on how much power should be kept at the national level to achieve effective and incisive planning (Faludi & Van der Valk, 1994). The extreme powerful national planning could not persist because the centralised agency could not fully consider specific local situations. The complete cancellation of centralised planning considerations do not happen either, because many vital issues such as flood prevention cannot be secured without overall supervision. When Dutch have both strategic planning considerations and smart local planners to get things done, the question becomes how to truly realise the strategic ideas within the multi-tier and hard-to-control system.

The attention then moves to the mediating role of provincial governments. The principal consideration is on the mediate role between the generic policies of the national government and the individual local planning of the municipal governments. On the one hand, some issues such as water management and large infrastructure network obviously require attention beyond single municipal boundary. On the other hand, although the

Netherlands is a small country, regional differences are large enough so that one national government is insufficient for specific regional situations. Therefore, the tier in between is needed to translate the national policies into specific regional context and supervise the linkage among individual municipal projects. However, the balance is hard to find. A single question like how large an area the mediate tier should be responsible for caused wide discussion and has been very hard to conclude (Faludi & Van der Valk, 1994).

The Dutch provinces today were formed for historical reasons. Some think they are too large to effectively mediate planning between the national government and municipalities, i.e. there is a “regional gap.” Proposals are raised to create a tier of regional government which is between provincial government and municipal government. Currently this kind of proposal is not adopted. There is no official regional government, but there are indeed organisations especially for regional considerations, for instance, regional steering committees in some of the planning programmes. However, there are also supra-province regional issues where regions are defined larger than provinces, for instance, the central Holland and Randstad concern more than three provinces, the projects on coastal management and the tidal zone of Wadden Sea is beyond political boundaries, and the issues along the rivers. The explicit discussion on the role of provincial governments and potential regional governments concern us less at this moment. We will focus more on the national and municipal governments in this phase of the research. Then we move to the influential Dutch planning agencies called Rijkswaterstaat and water boards for our water-related case (delta region and room for the river).

Rijkswaterstaat is the policy-implementing arm of the Dutch Ministry of Infrastructure and Environment (Van den Brink, 2010). Rijkswaterstaat used to be (also diagnosed by itself) the technocratic bulwark which is insufficiently connected with society. The many engineering experts working at Rijkswaterstaat solved many planning problems with technical approaches. However, the technical approaches often lack sufficient considerations on the local context and social aspects, for which Rijkswaterstaat itself also promotes the transition of itself into a public-oriented national network manager (Van den Brink, 2010).

Rijkswaterstaat used to be superbly powerful on infrastructure planning (especially on transportation and water management) in the Netherlands. It contributed immensely in many mega projects that have protected the Netherlands from water and kept Dutch feet dry below the sea level. For example, the worldwide famous Delta Work closed Afsluitdijk and transformed part of the sea into the Dutch “inner lake.” Land and water were once the “chess board” of Rijkswaterstaat and it indeed has shaped the face of the country with its strong engineering approaches. Logically, people on its chess board should also listen to its commands on relocation, which are in consideration of their own safety.

However, the way to a nearly autocrat was hindered or warned in democratic waves. Public protesters’ success in stopping the Rijkswaterstaat’s project of Oosterschelde storm surge became a historical mark. Although Rijkswaterstaat was very successful in protecting the land from water, its hard engineering approaches which overlooked the local situations had harmed the ecology. Nature preservation (environmental movement) became one of the new goals (others including democratisation and neoliberal politico-economy) that urged Rijkswaterstaat to stop the large-scale engineering project and change its approaches. Rijkswaterstaat intended to change its identity as well as main approaches in infrastructure planning and construction, from engineering to public-oriented, which also poses questions on what the future of the territory will be.

Compared to the strong implementing agency as it used to be, Rijkswaterstaat gives some of the implementing power to the local parties. The responsibility becomes helping the local parties for their knowledge requirement

with the network of experts, knowledge and experience. However, the perspective of the national expert on engineering still seems strong during this process. As a result, the local parties feel that Rijkswaterstaat actually does not sufficiently evaluate their local knowledge or experience, and thus disapproves the local proposals lacking enough considerations (Van den Brink, 2010). Rijkswaterstaat has tried to focus on management, decrease the number of its technical staff and let the water boards who know more about the local situations decide on the concrete implementation.

Compared to the centralised Rijkswaterstaat, water boards are the local plan-implementing agencies. The root of water boards are mentioned in the previous sections. Water boards were initiated to organise the collective actions of draining and using the land. Water boards are also involved in a large range of water-related implementing issues at the local level nowadays. Water boards are not organisations within local government, but their relation with local government is interdependent. As often the case, the local government assigns plans and the water boards implement them. Sometimes the local government can also implement their plans by themselves and thus involve water boards with a less degree. In some other cases, the staff team who make the plan in the local government is redistributed into the relevant water board to continue the work of implementation. The similarity among those cases is that the task of administration (government) and implementation (water boards) is to larger or less degree separated.

The separation of plan-making and plan-implementing could be problematic as well as effective. On the one hand, the separation may result in and enlarge the mismatch between the reality and the plans, and between the expectation of the public and the decision-makers. On the other hand, the separation is responsive to the division of expertise for which plan-makers may be not good at implementation and practical workers may be not very willing to doubt too much before acting. Moreover, the situations could be even more complex than the bilateral relation described above.

For example, when local parties (municipalities, water boards and the public) consider the local situations and question the very initiative decisions made by the national government (parliament and the ministry), Rijkswaterstaat finds itself sandwiched in an awkward situation where the communication between the national government and the local parties is hard to be sufficient. On the one hand Rijkswaterstaat tries to meet the expected conditions proposed or commanded by the national government, and on the other hand it needs the support and participation by the local parties. If there are conflicts between the national decisions and the local reactions, it seems logical to organise meetings to communicate, but mediation is originally not the responsibility or expertise of Rijkswaterstaat, which is supposed to be an implementing agency focusing on the tactical work. In fact, the responsibility of Rijkswaterstaat has been a very difficult question for both itself and others (Van den Brink, 2010).

2.1.3 New understanding on planning in the Netherlands

Although the risky situation of the below-sea-level country is seen very often in literature, the public awareness and disquiet are relatively low. Firstly, the Dutch public feel safe, which has been true so far (the frequency of flooding and the damage and casualty caused by happened flooding are both low compared with other deltas and countries). Secondly, should there be any problems in the future, the national government, the ministry (IenM), Rijkswaterstaat, and the water boards will take the responsibility and secure the safe living environment. So far,

the centralised power has achieved satisfactorily. However, the belief is increasingly challenged by both planning theory and actual situations resulted from climate change.

Underpinning centralised institutions, the concept and work of strategic planning has gained much attention in the Netherlands. The strategic concepts like Randstad and Green Heart have obviously shaped the most significant part of the territory. The strategic planning in the Netherlands is largely seen in the national policies on spatial planning (Faludi & Van der Valk, 1994). The rationale of the several key national planners – the heads of the ministry of spatial planning in history (Faludi & Van der Valk, 1994) – have great impact on the spatial transformation of the country. The Dutch context of spatial planning holds the traditional priority to consider land use on the overall level (Faludi & Van der Valk, 1994).

However, the top-down impact is considered only “half of the story” (Needham, 2014). Municipalities as compared to the central ministry on spatial planning also play vital roles in shaping concrete land use (Needham, 2014). The Dutch planning system is considered pluralism and democratic for which local governments and initiatives have the space to develop their own storylines (Warner & Van Buuren, 2011). Local planning can adjust their plans to simultaneously serve their long-existed needs – often urban development – and adapt to the newly adopted policies.

Both sides of the story complement each other to form the Dutch strategic planning. On the one hand, generic policies intends to settle principals on vital issues but should not be treated as command-and-control guidelines (De Roo, 2003). On the other hand, local projects take into account sufficiently about specific local affairs and also are supervised not to wreak havoc at other locations or accumulate pernicious impact on other scales. Therefore, the balance between central and local is the important issue of strategic planning, in line with the balance between technical and communicative in planning theory (see the next chapter) (De Roo, 2012). The balance also draws attention to regional planning which is gaining increasing attention in addition to national and municipal planning.

The environment, both natural and built, in the Netherlands is the result of both following spatial planning rules (policies, plans, and institutions) and sidestepping those rules in order to achieve pragmatic goals in ad hoc situations (Needham, 2014). The pragmatic approaches of breaching the formal rules of spatial planning are to some degree, ironically though, approved by the rules themselves (Needham, 2014). In this context of accepting both rules and rule-breaching, the responsibility of spatial planning may be more likely to be flexible, fuzzy and adaptive to changes. Therefore, the interdependence among several tiers of governments, various agencies, private companies and the public becomes an essential contextual consideration to understand Dutch spatial planning and actual cases.

2.2 Climate change adaptation and delta urbanisation

Climate change adaptation is an important issue in Dutch spatial planning policies. The national policies take overall consideration on the whole delta region to ensure long-term development. Flood prevention as a significant task of the Netherlands has been taken and supervised by the national government. It can be seen from the flood prevention and climate change adaptation policies that spatial planning is increasingly considered a promising approach. The overall issue of climate change adaptation is also considered with more space (region) specific attention. Dutch strategic planning has used the space wisely and neatly to secure the safety of the environment, especially urban development, in face with climate change. Regional consideration and overall

supervision contribute to the long term development. Moreover, the new interpretation on adaptive spatial planning suggests more flexible approaches for the urbanised delta region where social development, environmental dynamics and concrete constructions are severely tangled.

2.2.1 Climate change issues and strategies

Through the history, before and after the initiation of climate change discussion and reaction, the Netherlands has fought for long against water, especially against the sea. Water is always an essential issue for Dutch. Safety (keep the Dutch feet dry) is highly prioritised in policies. In fact, Dutch indeed have achieved great success in battling against water. The swampy delta has been transformed into one of the most developed modern countries today. The Netherlands, famously known as the low-lying country, has actually suffered much less from water-related problems (less flooding disasters and less damage or casualty from happened ones, compared to many other delta regions in the world). Thanks to this great job largely done by the national government, the awareness of flood risk is actually low within the public who live happily below the sea level and feel secured (Van den Brink, 2010).

Delta Work is one of the most important, most widely known, and most frequently mentioned work done for this water-related issues in the Netherlands. In fact, because of the Dutch tradition of addressing the water-related issues mainly by the national government with the strongest power and most resources, Delta Work is a mega project achieving the overall safety level of the country by much local work such as the dike rings, the straightened coast line, and the drainage systems. Compared to other countries and the probable norm of a dike as a linear huge wall, the fact that a dike often has to be a ring in the Netherlands may have indicated the severe situation and the astonishing achievement of addressing it (dike ring: the entire flood defence system enclosing an area). Delta Work was inaugurated as the reaction to the flooding disaster happened in the Netherlands in 1953 (IenE & EA, 2014). Thanks to Delta Work (or also being lucky since then), the 1953 flooding disaster has become the biggest flooding disaster in the Netherlands since then. As the pursuit of more comprehensive working approaches than the engineering-dominated work, Delta Work has evolved and more often referred to as Delta Programme nowadays.

Anticipation rather than response is one of the key principles of climate change adaptation in the Netherlands. Delta Programme as the major national programme which strives to connect water tasking (flood risk management and freshwater supply) with more other goals such as ecology, economy, and spatial quality concerns significantly about the anticipating and proactive ability of the policies. The attention to anticipation is understood in the programme as adaptive delta management approach. By looking ahead, Delta programme on the one hand makes step-by-step measures for effective actions while on the other hand creates open options to flexibly react to new insights and opportunities.

Adaptive delta management is an essential issue of Delta Programme (IenE & EA, 2014). Adaptive is defined as the proactive attitude looking ahead into the future. Delta Programme strives to increase the ability of the environment and relevant policies to prevent undesirable events rather than react to them as the case in the past. This requires firstly the close link with multi-disciplinary research which can constantly offer insights about the changing situations. The measures considering effectiveness, cost and consequences are adjusted to this insights rather than previously defined standard. Moreover, approaches should be flexible or alternative measures should be considered and timely available should they be necessary in the unpredictable future. Therefore, the adaptive

management requires the coordination of all the government authorities, social parties, knowledge institutes and companies in practical works.

The latest annual report of Delta Programme (IenE & EA, 2014) identifies the three key areas of working on the delta as flood risk management, the availability of fresh water, and water-robust spatial organisation. Flood risk management adds concerns on consequences complementary to the calculation of probability of flooding. The attention to freshwater is due to the increasingly frequent dry summers and probable drought periods. Spatial organisation is a promising approach to assist flood risk management and freshwater supply and is still under study and gaining increasing attention. Among the three key issues, flood risk management and spatial organisation are more relevant to our research and the context about them is explained more explicitly in the following paragraphs.

Flood risk management is a new approach to address flooding as well as a new academic research area for living environment adaptive to flooding. Compared to the previous approach which measures flood risk by only the probability of dikes being toppled, the new flood risk management adds the considerations on the possible consequences of specific areas. That is to say, for areas with serious consequences had the dikes been toppled, for instances, a large number of victims because of dense residence, and vulnerable places like hospitals and elementary schools, the requirement on the flood defence system and the standard of safety level should be higher. Under this new flood risk management approach, the safety level of many places of the Netherlands is insufficient (IenE & EA, 2014). Therefore, resources should be to some degree concentrated to those vulnerable areas, and as a result, the overall safety level of the country is higher than the past when there was only one standard safety level lacking site-specific concerns (IenE & EA, 2014).

Flood risk management is paid the most attention in Delta Programme (IenE & EA, 2014). It is one of the three key issues which are also three of the five key decisions of the latest annual report (IenE & EA, 2014). The other two key decisions are site-specific strategies to the two regions considered most significant for the Netherlands (Rhine-Meuse delta and IJsselmeer region). Within these two region-based decisions, flood risk management is again the most prioritised issue.

Spatial organisation as one of the key decisions and key working areas of Delta Programme will earmark in the immediate future a period when increasing attention will be paid to connecting issues and approaches to spatial organisations. The two most frequently stated goals of this adaptive spatial organisation is water-robust and climate-proof, for which build-up areas of the Netherlands will be more capable to the possible climate change scenarios, including too much and too little water (flooding and drought) as well as issues outside water (heat). The goals of water-robustness and climate-proofness will be largely strived and achieved through spatial planning approaches.

We can see up until now (2014 – 2015), much work has been done on flood risk management, for which it is the most significant part of the current Delta Programme and its latest annual report, and in the future, attention will be moved to spatial organisation, which is based on the well-done flood risk management and thus can achieve further comprehensive goals. The decision on spatial organisation aims for a transition in policy after which spatial planning as the promising approach will be more explicitly explored and realised for development and environmental ambitions in the Netherlands.

The attention to spatial organisation for climate change adaptation is also a sign of the more integrated relation between water and space in the Netherlands. We have argued that water and city are closely tangled in Dutch history and culture. However, new understanding on this relation raises questions to the traditional engineering-dominated way of addressing this relation. Spatial planning and water management were related but clearly divided in terms of responsibility. It was beneficial in the past that for each problem or each zone specialised experts could be identified to take the responsibility and to offer solutions. The complex situations nowadays have demonstrated that this clearly compartmented working style may be no longer impeccable.

Water related issues cannot be fully solved only within water management and spatial planning issues cannot be well addressed while seeing water as a technical element which is the responsibility of water managers. It is increasingly acknowledged that spatial planning can be an effective approach to water management issues and water management can offer great opportunities for spatial quality and social development. This new understanding on the mutual beneficial relation between spatial planning and water management which will result in more comprehensive strategies and policies will come into the fore in the work on climate change adaptation in the Netherlands.

The spatial adaptation then requires the coordination of all the parties including all the tiers of governments, water boards, relevant companies and the public. The adaptive policies issued by the national government need the lower level governments, water boards, relevant companies and the public to be truly implemented. This coordinating working style is new to Dutch, especially in terms of the water issues for which the role of technical experts is so deeply entrenched. New understanding on comprehensiveness, not only zoning and multiple sectoral considerations but also responsibility and flexibility, will be needed for effective climate change adaptation. Therefore, pilot projects and programmes were initiated to learn by doing, and *Room for the River* has been identified as a successful programme so far and will be seen as a benchmark for future programmes (Meyer, 2014; IenE & EA, 2014).

2.2.2 Policies and projects

The Delta Programme adopts multiple technical approaches for the water issues in the delta region. For the case concerning us, the main approach is the combination of dike improvement and river widening. Dike improvement is still (as tradition) the basis of flood prevention. In some cases the dikes are moved inland to make more room for the rivers. The space outside dikes (foreland or floodplain) can be used when the water level is low. The risk of being flooded is taken and the damage is bearable, repairable and replaceable by compensation.

The Delta Programme with many of the sub-programmes is to maintain the overall safety level of the Netherlands while climate change has increased the risks (IenE & EA, 2014). The overall mission is translated into region specific preferential strategies and projects. Regions are identified by the geographical characters, for example, the densely urbanised estuary of Central Holland, the rivers, the coast, the tidal zone of Wadden Sea, and the region of IJsselmeer. An review of examples of projects concerning flood prevention and spatial organisation is in Table 1.

According to Table 1, it can be seen the programme of *Room for the River* is the preferential strategy for the river regions, which is then an important part of the whole delta region. The river region and its significance to the delta region is recognised later than the coastal region (see section 2.3). This new strategy also is widely

considered bearing innovative implications on flood prevention approaches, the challenge to the tradition positions of spatial planning and water management in the Netherlands, and the institutional constructs underpinning the approaches.

Table 1 Examples of region-specific Delta Programme in the Netherlands (source: IenE & EA, 2014)

Region	Issue	Strategy	Project
IJsselmeer region	sea level rise freshwater buffer	discharge by combining pumping and gravity	IJsselmeer Closure Dam Flood Protection Programme
Rhine-Meuse delta and Rhine Estuary- Drechtsteden	sea level rise flood risk (sea and river) discharge ability freshwater supply national economic engine densely populated region (safety in Central Holland)	dike improvement river widening storm surge barriers multi-layer flood risk management sandy foundation coastal zone	New Waterway canal (Nieuwe Waterweg) Grevelingen lake flood storage Haringvliet sluices Flood Protection Programme
Rivers	discharge ability riverside development waterfront quality	dike improvement river widening	Rhine distributaries Meuse Flood Protection Programme Waalweelde Room for the River
Southwest Delta	sea level rise port industry and water way	dike improvement dredging and dumping strategy sand replenishment	Maeslantkering storm surge barrier Hollandsche IJsselkering storm surge barrier Flood Protection Programme Repairs of stone cladding
Coast	sea level rise	comprehensive coastal management (flood risk management, economic development, and ecological conservation)	Flood Protection Programme
Wadden region	intertidal zone sea level rise world heritage	dike improvement sand replenishment	Flood Protection Programme Vlieland and Terschelling dike boundary
Elevated sandy soils	drought	water conservation	National Water Plan

In the Dutch delta region which has been well protected by the dike ring systems, flooding is more concerned as the risk rather than the actual issue. Although the Dutch delta is vulnerable, it is considered safe so far, because flooding happens much less often than in other delta regions or coastal cities, for instance Bangladesh, Bangkok and Jakarta. The latest annual report by Delta Commissioner started to pay more attention to drought (IenE & EA, 2014). However, the disadvantages of this neatly planned and engineered environment are gradually seen. Keeping the flooding away and the land dry is not always impeccable even for the Netherlands which, otherwise, would have been swampy land rather than one of the most modern countries in the world. The land subsidence caused by long-time drainage results in new problems and risks. The highly channelled rivers lose much of their

ecological ability that can cause long-term problems. The challenge is to discern approaches that can enhance both environment dynamics and urbanisation.

2.2.3 Delta urbanisation and urbanism

After the overview of the climate change adaptation policies and strategies in the Netherlands, we move to the concern on the overall urbanised delta region. Urbanised delta regions become the most risky places as well as informative cases under climate change adaptation (Campanella, 2010; Meyer, 2014; Meyer & Nijhuis, 2014; Meyer et al., 2010). On the one hand, deltas are directly threatened by sea level rise, extreme discharge and storms. On the other hand, the highly urbanised and populated condition of deltas makes the risk even higher. Moreover, the way of urbanisation in the delta regions in the past has harmed the ecological system so that the regions become even more vulnerable, i.e. less resilient or adaptive, to climate change (Meyer, 2009; Meyer, 2014; Meyer et al., 2010). Therefore, urbanised delta regions are faced with transition (Meyer & Nijhuis, 2014). The Dutch delta region is among the cases where the issue is urgent and the context for research would be informative (Meyer & Nijhuis, 2014).

Dutch spatial planning tradition makes the delta region a unique and interesting case. The fundamental rationale of Dutch spatial planning is largely urban, which prefers compact cities, concentrated development or “concentrated deconcentration” (Faludi & Van der Valk, 1994; Needham, 2014), which is rooted in the context (see section 2.1). Intense land use has both pragmatic benefit and necessity. This centralising rationale has contributed to the present densely populated territory and the highly urbanised delta region, which can be easily recognised on the land use map (Meyer & Nijhuis, 2014). The neat way of planning results in one of the most modern delta regions in the world, but meanwhile attendant problems like land subsidence and damage to ecology are also caused and become increasingly urgent these years (Dammers et al., 2014; Meyer, 2009; Meyer et al., 2010). Innovative approaches are needed.

Delta urbanisation is still highly desirable. Much research on delta urbanism strives to offer approaches to support long-term delta urbanisation (Campanella, 2010; Meyer et al., 2010). Delta urbanism is considered the spatial planning ideology espousing urban development in delta regions. The research and literature on delta urbanism to a large degree interpret the term interchangeably with delta urbanisation, which is the fact and process of more delta space are built into cities and the number of residents keeps increasing (Campanella, 2010; Meyer et al., 2010).

Dutch strategic planning plays a significant role in steering the overall spatial transformation and delta urbanisation of the country (Faludi & Van der Valk, 1994; Needham, 2014). The urbanised Dutch delta region today is one of the outcomes of the planning rationale of concentration. Urban environment like compact cities and growth centres are encouraged by national policies on spatial planning (Faludi & Van der Valk, 1994). This rationale, coined delta urbanism, is still a significant strategy concerning the Dutch delta region and the development of the country (Meyer et al., 2010; Dammers et al., 2014).

Delta urbanism, like many other “-ism” concepts, can also have a normative stance which suggests that the advantages of developing cities in deltas override the disadvantages. Considering climate change and the fact that many cities are already developed in deltas, the delta cities are confronting increasing risks which may suggest to relocate the existed delta cities or to remove the concentration of population and development from deltas. However, delta urbanism in this specific climate-change context means to continue delta urban

development instead of to relocate or remove. This overall proceeding process of delta urban development regarding many dimensions including economy, demography and culture is conveyed here as delta urbanisation. Therefore, shortly speaking, delta urbanism suggests continue delta urbanisation.

Dutch spatial planning has always supported delta urbanisation. On the larger scale, the development of the country is largely concentrated at the very estuary of the delta, i.e. the metropolitan area of Randstad. On the smaller scale, individual cases like the city of Nijmegen plan to assign or even create more water-related space like waterfront, islands and floodplain for urban development in the future. Therefore, the task assigned by delta urbanism to Dutch spatial planning is to support delta urbanisation in the long term by spatial strategies and planning practice. Delta urbanism can be understood as a decision on how to plan development or manage growth – in the urban form thus always concentrated around or within the cities. Promoting growth through urban development, in line with constraining urban boundaries so that nature is protected from urban sprawl, is always one of the essential task of Dutch spatial planning (Faludi & Van der Valk, 1994). In this way, delta urbanism also endorses the conservation of ecological system.

The urbanised delta region is considered consisting of three main subsystems – substratum, occupation, and network subsystems (Meyer, 2014; Meyer & Nijhuis, 2014). The substratum subsystem is the ecological and environmental layer forming the basic physical conditions of the delta region. River flowing, tides and sedimentation are examples of processes happening in the substratum subsystem. The occupation subsystem is the societal condition developed in the natural environment. Urban, rural, compact or sprawl are examples of the forms developed in the occupation subsystem. The network subsystem is the infrastructure network utilising or constraining the substratum subsystem. Dikes, drainage, and roads are tools of the network subsystem to shape the substratum subsystem in order to serve the occupation subsystem. The occupation subsystem also highly depends on the substratum subsystem, for which society, economy or functions of delta regions are similar to each other while different from interior regions.

Considering the region as a whole and identifying the important elements at the regional level have the long term advantages. Individual cities may overlook the larger scale impact when they focus on their own development and keep their attention only within their urban boundaries. Because of the regional thoughts, Dutch spatial planning has been striving to avoid the division of the country and population into the overcrowded Randstad and the rest (Faludi & Van der Valk, 1994). Regional scale infrastructure has also contributed to promote the balanced regional development. This may be the reason that the hierarchy of cities with an extreme big city (such as London and Paris) has not happened in the Netherlands.

The concern of the environment and the ecological system at the regional level helps to keep the whole delta region in a healthy situation where each city within can benefit. Otherwise, in such a dynamic system as delta region, negative impact of individual urban development can be easily upscaled and damage the potential of future development for the whole region. Room for the river becomes such a strategy. Although the flood risk from the sea can be considered still bigger than the risk from the rivers, actions have been taken to reduce the risks from the rivers so that the safety of the whole delta region is comprehensively secured.

In addition, efforts are made to consider the delta region more flexibly and creatively. One of the examples is sharing the space or multiple land use. The floodplain can be used as farm land (occupation activity) while water level is low. At the same time, the same piece of land is also part of the dynamic ecological and hydraulic system (substratum processes) to be flooded when necessary. In some even more risky cases, concrete development is

supported (occupation activity and network support) even though flooding is possible. The damage is bearable and compensation is considered sufficient to repair the negative consequences, in which way the approaches concerning the occupation subsystem has contributed to share the space and responsibility with the substratum subsystem.

The inter-relation among those three subsystems indicate more complex inter-actions than three physical layers. The many processes happening in each subsystem may also suggest alternative understanding on the tripartite layer model of the delta region. The urbanised delta region is overall a system including a large range of elements. A model to characterise and categorise those many elements can promote systematic management. However, we should be aware that a model is only one perspective interpreting the reality. When we use the model to represent the reality, we still should keep an eye on the practice that may suggest the shortcomings of the model.

We suggest the tripartite layer model of the urbanised delta region is potential to be connected with more social concerns. The interpretation of the layer model focuses largely on the physical elements. The occupation layer is about the social development, but in the model the social affairs are translated into the map of the urban land. The quantitative analysis of the layer model can be more comprehensive with the help of qualitative research and more detailed case studies. For this token, our research can contribute in the temporal and qualitative (compared with geographical and quantitative) understanding on the Dutch urbanised delta region. Complexity planning theory (Chapter III) and case studies (Programme of *Room for the River*) are studied to provide the alternative understanding and arguments.

2.3 Room for the river

Room for the river is one of the Dutch climate change strategies that focus on river flooding prevention. The strategy has attracted wide attention since it was initiated more than twenty years ago (V&W et al., 2005). From the national tradition of flood prevention against the sea, such a strategy on the rivers, which also results in a large number of projects and large scale impact, is considered remarkable from the very beginning idea to the final implementation. The work on the room for the river becomes an important part of the whole comprehensive Delta Programme to make the delta region more water-robust and climate-proof. Moreover, the spatial and institutional implications of the strategy stimulate innovations in many realms other than water. In fact, one of the significant messages is the integration of the separation of functionality.

2.3.1 The Programme of Room for the River

Dutch had fought long against the sea, and the flooding events in the mid-1990s reminded them that fluvial flood risk also became urgent. The flooding before the mid-1990s was in 1953 and it was from the sea. The almost 40 years of safety from flooding was the remarkable achievement of Dutch water management. However, flooding happened in 1993 and again in 1995, both from the rivers, which caused wide disquiet about the flood defence system. First of all, attention needs to be paid to the rivers in addition to the sea. Secondly, the security of dikes is questioned.

Traditionally, the rivers were well kept between dikes. The water level in the river was regularly calculated. With the cooperation with Germany, the warning system about the water level increase worked to remind Dutch about the potential danger. Therefore, thanks to this warning system, the flooding in 1955 did not really cause

great damage, for which some refer to it as a nearly-disaster event. However, a large scale of evacuation was taken in reaction to the flooding warning in 1995. After the evacuation, Dutch started to think about the flood defence system and wanted to initiate new approaches.

The problem was that although the dikes can keep the water away, there seemed increasing chances that they would be toppled by the even higher water level. The dikes could not prevent the water level increase. In fact, the water level could increase even faster because the natural water courses were channelled by the dikes. There seemed to be more frequent evacuation should the traditional flood defence system be not changed or improved. Moreover, Dutch were not satisfied with the passive and reactive (waiting for the warning and evacuate) position against water.

Therefore, the strategy of room for the river was initiated as the new approach to prevent rivers from overflowing the dikes. The essential idea is to let the water move laterally instead of vertically, which requires wider river bed and thus more space between the dikes. The clear goal is to reduce the water level in the rivers. The hydraulic model of calculating the water level was ready and the political decision of room for the river was approved by the parliament. The next step was to make it happen.

Therefore, the national government conducted research about potential locations to make room for the river. The considerations included many aspects about potential and feasibility, such as potential space (unbuilt flood plain), suitable geography (decrease water level effectively), and cost. The national government also studied the potential approaches and had a list of technical suggestions, such as removing the existing dikes, dredging the river bed, lowering the sluices, and creating bypass channels (V&W et al., 2005). Then the national government communicated with the local parties of those potential locations and further shortened the list of the locations from more than 60 to more than 30 (eventually there were 34 local projects (IenE, 2005) under the programme of Room for the River).

If local parties suggested other approaches that were not suggested by the national government, there was space for negotiation. The national government required the approaches to be able to effectively reduce the water level and also to be cost-effective. They hold the considerations on the overall river system and financial feasibility as the benchmarks to evaluate the plans suggested by the local projects. The local parties can integrate their own ambitions such as spatial quality and urban development into the projects of room for the river. This integration can be to a certain degree supported financially by the national government. The national government and the local parties work together and adjust the plan all the time to ensure that the implementation would have outcomes satisfactory to both of them.

The local (municipal) governments of those locations made the plans of making room for the river considering the specific local situations. Many of them also integrated other ambitions in addition to reducing the water level into the plans to make the results more attractive and also the implementation more feasible. The national government gave the space for those integrated ambitions to each local projects as long as they can achieve the intended reduction of the water level. Therefore, there were constant communication between Rijkswaterstaat and the local parties to promote the progress.

Rijkswaterstaat on the one hand supervised the cost and progress, and kept recalculating the water level, and on the other hand provided network of experts about relevant knowledge and experience to help local parties implement their plans. The local parties received fund because of this programme and regularly report their

achievement in the water level reduction. If the local project was too ambitious, they needed to pay the extra expenditure by themselves. However, in most of the cases, the local parties considered the programme a good opportunity for their development and thus were willing to investigate.

Most of the projects have been implemented and the programme will be largely finished at the end of 2015. So far, the programme of *Room for the River* has succeeded in keeping the budget and progress as the original plan. We choose Nijmegen, Deventer and Zwolle as specific cases and stories about those projects are presented in Chapter IV. Generally, the projects have made room for the river with a combination of dike improvement and river widening. The rivers will have more easily accessible room to flow through in the future if there comes any peak discharge.

2.3.2 Relevant and innovative implications of the strategy

The implementation of the strategy has been done punctually and within the budget. The reasoning underpinning this strategy is simple: the water level would reduce naturally if the containing space is larger. The main goal of the deduction of the water level has been clearly calculated. It is considered a successful programme. Moreover, it becomes a very intriguing case and gains much attention, because the implications of the strategy and its implementation are significantly innovative.

Room for the river represents a transition from the command-and-control on discharge to the tolerance of the natural fluvial dynamics. In a country which is famous for making land from water, it is the first time the land is offered to water in such an active way (Rijke et al., 2014). The many engineering techniques including dikes, sluices, dredging and water gate shaped the water courses like wild animals were domesticated. The water was a big challenge, but Dutch “managed” it well. It is the increasing risks in the future that urge the considerations on alternative solutions and preparation. Climate change results in large threats that a big change in tradition to enhance innovation is needed.

The territory of the Netherlands was once reigned by water when the meandering rivers and the sedimentation formed the swampy delta. The Dutch engineers took the charge and made the land suitable for construction and residence by drainage infrastructure and dike rings. The excellent water management and engineering resulted in not only the residence in the delta but also the best harbour cities which promoted the prosperity of the country as well as the interior of Europe. However, the highly channelled rivers threaten the people in other aspects such as land subsidence, the loss of ecological service, the fast increase of water level during peak discharge and storms. Moreover, the threats become increasingly urgent because of climate change.

Faced with these threats, the traditional engineering approaches are no longer prioritised. The threats are considered caused by not only the changing climate but also the traditional command-and-control approaches which have badly “sandwiched” the water courses. Therefore, instead of controlling nature, attention is drawn to adaptive strategies, taking the risks and living with them. Long-term delta urbanisation should be envisioned involving natural dynamics instead of only dominated by men or built environment. The benefits include not only the safety of delta cities from emergencies like flooding but also the long-term ecological and environmental value at a regional and even global scale. Room for the river represents a transition of the prioritised solution to support long-term delta development in the Netherlands from engineering to spatial planning.

In addition to the transition to spatial planning and the benefit to delta dynamics, making room for the river is also closely connected with urbanisation and urbanism. Many of the specific projects assigned by the national policy line of room for the river are located in or near the cities. Municipal land use plans practicing this policy integrate other functions which may promote urbanisation (recreational space, public realm and transport) in line with the process and outcomes of making room for the river. Some call these “urban projects” within the policy line (Needham, 2014). It can be seen that although planning projects are permitted in order to make room for the river, room is also made for the planning ambition of urbanisation.

Room for the River is also the first large scale infrastructure programme in the Netherlands that has involved and organised well a large number of stakeholders and experts. The multiply levels of government is understood and organised in a combination of centralised and decentralised manner rather than the traditional hierarchical one. A balanced coordination and communication between the national and the local governments is aimed to connect the advantages of both sides to achieve the large scale regional goal. The decision making framework becomes flexible that decisions and actions are constantly reflected through the process of implementation. Large space of freedom and input is provided to the local governments.

Because of the coordination institutional adjustment and the region specific preferential strategies, a larger degree of consideration can be paid to spatial planning approaches. Since local authorities are provided enough power, the potential of the local space is also more explicitly explored. Therefore, although room for the river may seem a subject within water management, river basin management and other more hydrology related fields, it also intrigues us in the sense of urban planning. It is treated as an opportunity to promote further urban development, since the open-water system is considered a new strategy to increase the attractiveness of cities and promote urban expansions (Meyer et al., 2010).

In summary, the Dutch context has highlighted a few concepts including coordination, institution, adaptability, innovation, transition and intervention. It also brings together both water management and urbanisation ambitions. The next question is how the ambitions on the urbanised delta region can be integrated into this context and get realised. Spatial planning in the Dutch context is a complex task involving a large range of considerations. It requires the framework to activate every potential actors to make the usage of the limited space and resources more robust as well as flexible. In the next chapter, we articulate the complexity planning theory which is suitable for this kind of context.

Therefore, confronting the increasingly risky situation of the urban delta region, delta urbanism may not be impeccable, and room for the river may not be the straightforward answer either. We wonder if there is the third case where both the strategies can be complementary and co-promote the prosper and safe urban delta region in the long run. The logic underpinning making room for the river in an urbanised delta may point to space sharing or overlapping, dynamics and complexity theory.

Chapter III: Theory

Theory maybe the basis where academia distinguish their work from that of journalists, documentary makers, novelists, musicians, painters etc. The list can go very long to include all the professionals whose work is the same as observing humanity and society and presenting the essence of them. So in addition to proclaiming the paper as academic work, why do we have this cumbersome chapter of theory and why do readers want to read it? The answer can be difficult: why, what, when, how on planning theory are questions in debate for long and seem not to be conclusive soon or ever.

However, the answer can be also simple: we are more ambitious than knowing stories only about the Netherlands and a few places there. It is almost an instinct of human beings to imitate, learn and transfer from what we experience in the specific pathway of daily life. Every reader would think more than what they read in the plots of stories. This chapter presents this thinking-more-and-thinking-beyond work of us as the readers of the stories before we became the authors re-presenting them. If readers are also interested in how others interpret the stories other than just enjoying the stories by themselves, this chapter is where they can have a look.

Another question before taking the plunge is whether we need to generically present the diverse landscape of planning theory, compare and articulate why we choose this particular one. The answer is yes, because it is the requirement of, again, academia being open-minded and analytic. However, we would not do this explicitly because a few reasons that can almost suggest the irrelevance of it. First of all, it is not easy to define or demarcate planning theory. Concerns of planning theory overlap with those in all social science disciplines concerning social development and spatial transformation, which is too wide a prospect to take into a single photo.

Secondly, the field charted as planning theory is also too broad and fuzzy to be a choice list with exclusively separate options. Some categorise them into two main streams (procedural and substantive), but some argue that planning is about both aspects which also integrate and depend on each other. We also argue that planning research cannot overlook either aspect by simply stating that the research focuses on institutional or designing side. In other words, why bother so much comparing the differences of things that are obviously different although related, and why bother so much comparing the similarities of things that are fundamentally integrated although possible to be partially differentiated.

Therefore, instead of reviewing many planning theories one by one, we start directly with the theory we choose. However, the comparison with other theories can be seen in the review of history during which complexity theory has been developed and the methodology comparison to further clarify the most principal statements of complexity theory. Transition as part of the complexity theory is highlighted in this research to build the conceptual models proposing the framework to interpret the reality of the urbanised delta region.

3.1 Complexity

Complexity theory is the concise as well as equivocal term to introduce the theory for our research. Complexity theory proposes the rationale among planners who may need to consider their work and subject differently (De Roo & Silva, 2010; De Roo et al., 2012). Students may find complexity theory, which suggests that the reality is complex, is also complex itself. One of the reasons is that students tend to expect straightforward and very clear

practical guidance on planning methods from planning theory. In contrast, the implication of complexity theory is more about the rationale and the fundamental way we interpret the reality (Byrne, 2012; Wilkinson, 2012). Once the stereotype of planning work is reflected and switched, the methodological implications of complexity theory are abundant.

3.1.1 Planning Rationale

It is debatable whether planning theory has presented an image of diverse theories explaining the similar spatial phenomena with different viewpoints, or an evolving process of the history of thinking (paradigm shift). It is debatable not because only one is true, but because it underpins our rationale position when we try to apply one particular theory and convince others. In the former case of diversity of theories at the same time, we choose our theory which may explain the reality relatively better (none of the theories is perfect or universal). In contrast, in the latter case of theory development, the latest theory may have learnt from the previous ones and added the considerations on the current situation, and therefore should be the theory most capable to explain the current reality. In the former case we may compare a group of theories and articulate our choice of particular one, while in the latter case we may analyse the route of theoretical development and propose the theory suitable for the current situation or the particular issue at hand.

However, the two cases are not exclusive. The development of society is not clearly divided into continuing phases or contiguous compartments, for which new theories may not always replace the old ones and the old theories may not be outdated. The fundamental factors of society persist, although it also allows various theoretical lenses for different interpretations. The study of theory would not abandon a theory completely because of cases where reality deviates. Instead, a large range of different cases challenging the theoretical statements are needed to further develop the theory. Some researchers may propose a new theory while some others may still explore the old (but not outdated) ones. Therefore, the diversity of theory can be seen both evolutionary and revolutionary.

Moreover, suitable theory varies with the geographical locations. Cases and situations in different places can differ greatly from each other. The process of globalisation has enlightened and broadened the awareness of this implication from geography to theory. The belief in a universal theory of everything becomes problematic or unrealistic in social sciences. Most of the theories have been developed in the contexts of developed countries. They cannot apply well in the contexts of developing countries. There are more and more further instances where the theories and the publications about them cannot reach the target, because a considerable proportion of the targeted people may be illiterate. More and more researchers devote themselves into those newly seen contexts and develop various new theories or at least sub-theories.

Planning theory was supposed to educate people (planners) about how to use space. Space is one of the facts that manifest reality. Correct planning would lead to good organisation of space, such as good city forms (De Roo, 2014) or wise site selection of locations and functions, which go along with the underlying reality and can promote development. In contrast, incorrect planning uses space in a wrong way that can cause unnecessary problems. A line of potential flooding water level can matter significantly for many people's lives. When there are too many considerations, i.e. too many lines on the map, the lack of consideration can also cause failure or even disasters of planning actions. Planning theory tells about whether the philosophy underpinning plans is correct or incorrect.

It became more and more difficult to justify the correctness of any plan, because people gradually realised that reality with infinite number of facts was practically impossible to fully understand. Hypothetically, if we had enough time and resources to study, we would know. Many new considerations on various aspects of influences can be added to the scientific model. The model can become more complicated and may therefore provide sophisticated output. The task of research is to keep collecting knowledge to reach the boundary of the huge amount of information and facts, so that the model and science can offer comprehensive and definitive recommendations.

However, practically the fully grasp of all the facts would never happen. Similarly in nature sciences, if nothing can be faster than the extending of the universe, for which nothing can reach the boundary of it, the relevant conclusion becomes that there is no boundary. The task of research, especially planning research, is to offer suggestions to live within the process rather than to wait for an answer that would never come. As a result, the correctness of planning can only be preliminarily justified. We could approve certain plan based on the facts we knew, but it was possible that after we would know more facts we realised that the plan was incorrect. Therefore, to prevent the waste of time and resources (many planning disasters that went too far beyond the budget happened), scientific studies with higher ability of predicting became significant to spatial planning.

In addition to the pursuit of predictability, people also realised that it became irrelevant to definitely justify the correctness of any plan, because there was no clearly right or wrong. In addition to the infinite number of facts, values as the different way with which different people look at the same facts also should be taken into account while evaluating planning. Values based on the same facts can vary so greatly that planning became a matter of choice. There are always too many to consider so that the decision is a question of compromise. Political decisions may need to compromise to fashionable movements.

Furthermore, because planning is a collective action, especially when democracy is increasingly appreciated and required, plans lacking sufficient considerations on the values of the public may not be implemented at all. Therefore, consensus building became an essential issue to make good planning, in line with the rigorous scientific evidence of reality and future trend. Planning theory started to pay increasing attention to the procedural aspects in addition to its traditional concerns on the substantive aspects. It is believed that democratic and balanced procedure would naturally produce satisfactory decisions. Because sufficient considerations have been taken into account, satisfactory decisions could be at the same time wise decisions.

3.1.2 Planning methodology

In the methodological sense, when planning deals with facts (thoroughly or preliminarily) it is possible to present the spatial aspects of the concerned facts on blueprints. When the facts are manifested on the blueprint, we could see clearly what the problems are and how to solve them. Planning is based on the facts we present on blueprints and there is one clear and scientific way of interpreting them. Planning theory could in this way suggest the principles of spatial organisation.

For instance, the proximity of some buildings could be dangerous while of some others could result in convenient lives. Roads connecting certain kinds of buildings should be at certain width and certain number of crosses could result in the most efficient traffic. There might be conflicts. Certain building should be located somewhere because of certain consideration but it would be undesirable if certain other aspect was taken into account. Planners were supposed to figure out a blueprint that would have the best compromise.

When values are taken into account, it becomes very difficult to still use blueprints to present them. In addition to the issue of the proximity of certain functions, the proximity of certain people or social groups with different values or attitudes can also be problematic. Moreover, since people are much more flexible and mobile, planning is no longer the game on the maps. Planners might need very long time to know about the people they plan for, after which people might have moved and the situation become different again. It is also difficult to sufficiently and efficiently include all the opinions that are needed for a good plan. Planning theory on communicating and consensus building is thus studied to solve these issues and keeps planning work pragmatic, which should be the ultimate goal of this subject.

Therefore, planning should be considered a subject tangling with both science and values. This means more difficult tasks in practice than in theory, because the tradition of science and technology has been so deeply entrenched in people's mind. The technical rationale is still largely stable and clear at the social scale. Large planning programmes can begin with flexible and adaptive argument but still be operated in fixed frames in practice. It is still hard to imagine how the new rationale would actually work, for which practice could only choose from the existing approaches.

The insights of planning theory (including complexity theory) imply changes on the ontology of the long and widely accepted Newtonian world. In the Newtonian world, which is also influenced by Aristotle's philosophy (De Roo, 2012), objects are defined with single definitions. A cannot be B or any non-A. Rivers and land are different objects that cannot inter-transform. The relations among objects are or can be found causal. Based on the causality, many scientific laws can be described and predict the future. Planning can benefit from science that can tell planners the causal relations between actions and consequences. This action of planning for the predictable future is interpreted as adaptation. The causality behind the prediction becomes the strong support of these planning actions.

Social sciences have promoted the statement that the world is rather subjective than an absolutely objective reality out there. Much of the causality and prediction is rather socially constructed than natural. The influence of history, culture, custom and norms is strong. Many of the phenomena believed as the consequences of certain natural laws may actually resulted from the proposals and hypotheses by people in history. If we try to deconstruct, we find the role of culture, politics and discourse in shaping the reality is much bigger than they are estimated. In many cases, the socially constructed influences are disguised as natural causality. Much of the misinterpretation can cause irrelevant enquiry and disappointing practice.

However, the view that reality is complete subjective and can be based on an agreement among majority is also criticised. Firstly, the physical world should not be totally denied. Serious consequences can happen because human beings show insufficient respect to nature and think nature can be tamed. Secondly, power is recognised as a notorious issue in consensus building, for which an agreement still implies something out there which may be manipulated by certain superior agent. As a result, spatial planning involving both physical environment and intangible perspectives must address the reality as the ontology merging objective laws and subjective opinions. Planning theory can go too far with the attempt to over simplify the understanding on reality so as to suggest single methodology.

Many see the world as inter-subjective ontology where no one can have definitive top-down impact. Each individual is all the time influencing the world as a whole. This view significantly concerns spatial planning whose function and thus power may fade in this unpredictable and unmanageable world. The ontological and

methodological reflection makes the question on the subject of planning as a discipline or profession highly relevant. Planning could be about space, geography, architecture, demography, economics, culture, politics and so on. The mix of disciplines and approaches confuses students and planners in practice. Complexity theory proposes to consider planning issues in the middle of order and chaos (Geldof, 2005), and thus requires the mixture of approaches (De Roo, 2010).

The spectrum between technical rationale and communicative rationale provides insights to understand planning issues and the choice of appropriate approaches (De Roo, 2010). Figure 1 presents the spectrum which connects complexity, system thinking (see below) and the methodological implications. Technical issues are possible to be solved in a straightforward way which hardly involves diverse opinions. This end is underpinned by technical rationale, for which we keep exploring and inventing technology to solve problems. In contrast, communicative issues are value-laden and of no definitive solutions. Communicative rationale strives for consensus rather than correctness that does not exist. Planning actions based on the communicative rationale think hard to come up with plans that can be finally approved and implemented not only by the decision makers but also by the public. The priority moves from the content to procedure.

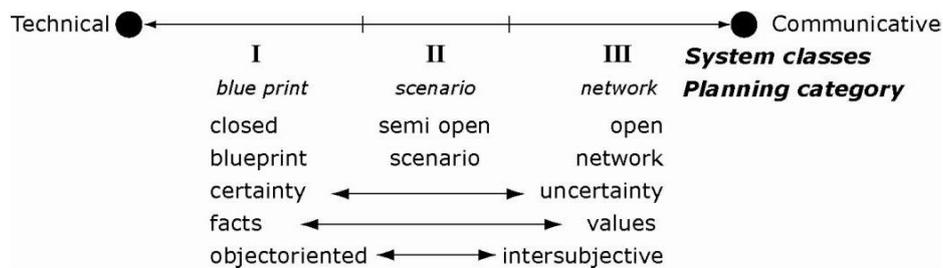


Figure 1 The spectrum of complexity and the methodological implications (source: De Roo, 2014)
 The issues in the middle between technical and communicative – fuzzy issues (De Roo & Porter, 2007) – are seen in most of the cases. The difficulty lies on the identification and balance between the aspects that need technical intervention and the aspects that require consensus or even could tolerate diversity and self-organising. The issues contain both objective and subjective aspects. Physical environment has laid down basic conditions that are beyond subjective perceptions. In contrast, social development is promoted to a large degree by human actions that are guided by subjective interpretations. Prosperity is found in the compatible relation of the objective and the subjective.

Moreover, collective actions as planning make inter-subjective a relevant issue where it is the collective interpretation but individual ones that matters. Planners need to understand what they should centralise and intervene as well as what they should let be and appreciate self-organising. Inter-subjectivity becomes a basis of planning considerations (De Roo, 2010). It results from the various interpretations on reality and the inter-actions among actors. It results in the need of research to discern the inter-subjective reality from the perspectives of a large number of actors.

3.1.3 System thinking

System thinking is proposed to construct planning theory and thus suggest people and planners the way of understanding and acting (De Roo, 2012). Systems categorised from Class I to Class III can well match the way

we understood planning issues through the history. The systems posed in the past interpreted the reality as static and causal linkages. Class IV systems then suggest the way we understand planning issues at hand and in the future. The new system presents the characters as openness, dynamics, non-linearity, diversity and adaptability. System thinking offers abstract reasoning to generate more overarching planning theory.

Class I systems are closed and static. They are closed so they do not interact with the world outside. Things identified within a Class I system are not influenced by the things outside the system. The systems can be isolated from the external environment and studied individually. The systems are also internally static. Time does not matter for Class I systems because they do not change along with time. By the same token, it does not matter how long it takes to study the Class I systems as long as one day the mechanism is understood. The mechanism within the systems would stay the same and repeat without ending. Examples of Class I systems can be seen in nature sciences like physics, chemistry and micro biology. Moreover, the way those subjects study the world (such as physical particles and biological cells) has successful suggestions in real life, for instance, making cars and curing patients.

Class II systems are semi-open and largely static. There are possible influences that would change along with time, but the fundamental mechanism about how the systems work stay the same. Instead of fully knowing about the systems, the approach is to build another reacting mechanism that can ensure the systems work as intended. The reacting mechanism consists of feedback loops. According to the things happen in the future, which is one of the possible results limited by the largely static system, we have plans to react. These feedback loops also constantly give us input to improve our mechanism to react and to predict. As time goes by, we can know more and more about the systems, and the systems and the interaction between us and the systems (feedback loops) can ensure the practice work well before the systems would be fully understood one day.

Class III systems acknowledge open networks. The active actors in the network are acknowledged as active contributors to the development of the systems rather than passive receivers subordinated to the system. By communicating with people, planning does not only try to know about the world and predict the future, but also to influence and construct. Planning on the physical environment cannot be better done by planning on the people who are involved in building the physical environment. The relation between planners and space becomes indirect and can be intercepted by the public. Planners become either the mediators between the space and its users or the ambitious actors who can only change the space through the minds and hands of other people. In either case, planners have to work more with the people than with the space or the systems.

Class IV systems are open and dynamic systems. The systems are no longer static objects awaiting us to study them. The systems, their internal factors and the interactions with the external context, are always changing. There is no single Class IV system that can be frozen or identified if we understand them as Class I, II, or III system. The way we define a Class IV system needs revolution, and to accept and understand reality as Class IV systems also requires revolution in planning approaches. Class IV systems are defined as complex adaptive systems which have more practical implications. This is further explained in the next section.

Before proceeding to the next section, a brief reflection on system thinking can be helpful for further understanding. The classes of systems in system thinking are theoretical and hypothetical conceptual models proposing the approaches to interpret reality. The hypotheses themselves, which offer the interpretations on the reality, are raised from the experience in reality. This seemingly circular reasoning process appears in many social science subjects.

For example, Central Place Theory in geography was originally a result of the observation on the urban geography of Germany. Later, when people believed this geographical pattern could effectively promote social development, the pattern was reproduced artificially in many other cases, after which the original hypothesis was reinforced and became stronger theory. Another example is the Rank-size Distribution of urban population (Zipf's Law). The observational law is not explained in the way as the laws in natural sciences. On the one hand, many new cases are added to test the law (hypothesis) and explore the deeper mechanism. On the other hand, people are making new cases following the suggestions of the law (theory). Overall, the hypothesis becomes the theory, although the theory is often not impeccable or universal. The theory keeps being reproduced and society has developed during this process.

System thinking is also an example of the theory that still calls for further articulation and case studies. System thinking provides the nascent model that is potential for our research, for which we search for data and materials within the discussion and cases of spatial planning to develop the model into a new one that is more suitable and specific for planning. Many more explicit models for planning have been proposed in complexity planning theory (De Roo, 2014). Based on these new models in planning theory, we strive to build some more specifically for the case of the urbanized delta region and the river-related considerations.

3.1.4 Essential concepts

Planning theoretical debate has included diverse views and one of the emphases is on the insights gained from the marriage of complexity sciences and spatial planning. Complexity represents not only one but several theoretical angles which share the fundamental viewpoint and some core concepts (De Roo & Silva, 2010; De Roo et al., 2012). These concepts such as co-evolution, non-linearity and self-organising lead to innovative views on spatial planning and attendant approaches (De Roo, 2012; Wilkinson, 2012). Each concept proposes certain analytic angle to interpret the reality. The concepts are closely related and together promote changes in the epistemological and methodological basis of both research and practice.

Planning should consider its subjects (cities, regions, environment, infrastructure etc.) as complex adaptive systems. Complex adaptive systems are systems that the internal parts are mutually connected and also exchange mutual influences with the external context. The system is complex in the sense that those internal and external influences are highly dynamic rather than static. As a result, there is no eternally stable mechanism by which we can predict the exact results of any influence.

For example, as a comparison to the dynamic complex system, a system of cogs, no matter how huge number of cogs it contains, allows machinists to identify its mechanism, and thus to know what would happen if any of the cog turns. Because the positions and size of the cogs stay unchanged, they are possible to be fully controlled. Whereas in a complex system, even if certain patterns work similarly as a group of cogs, they can change all the time, as if any single moment, we are faced with a new different system.

An adaptive complex system means the complex dynamics of the system are not totally random. Instead, the changes are to some degree restrained by the context and the previous changing route (contextual and path-dependent). Therefore, instead of changing for no particular reasons, complex adaptive systems can actively react to the externally contextual and internally path-dependent influences and change towards the situations where, or while moving from situation to situation as there will be no eternal stable situation, the tension of conflicts is bearable and thus the system would not completely collapse.

Cities and regions are considered complex adaptive systems (Meyer, 2014; De Roo et al., 2012). Looking through the history, most cities have been resilient, adapted to many great changes and persisted. Researchers study the patterns behind the resilience and adaptation, so that it is more convincing to inform about urban development in the future. Complexity theory is one of the theoretical fields advocating that dynamic rather than static complexity is the essence underpinning the adaptive ability. Therefore, thoughts and practice following complexity theory would be effective in understanding and managing cities and regions. The challenge for planning is that intervention should not force the system to move towards collapse, or waste time and resources on changes that contradict to the path of the system itself and thus would not happen.

The adaptability of the complex systems points to the transition of the complex adaptive systems. The thoughts about transition raise the question that, if the complex adaptive system is constantly changing, whether it matters to know where the system is. If things will change anyway, probably in positive ways because of the adaptability of the system, why bother planning? We have seen too many examples of failure in terms of social development resulted from the lack of planning. The belief and experiment in complete free market turn out to some degree disappointing. On the other end, fully control ended up with utopian and could not last long. The task of planning is to nudge the system towards its transforming pathway which is also appreciated by us. Small stimuli can cause great changes (De Roo, 2014). The relation between the original stimuli and the actual changes is only partially understood, which may be the target of planning research.

One example of transition is the spatial transformation of port cities. When the economy was largely dependent on the transportation, large area of the waterfront was developed into port facilities. Nowadays, we see the decline of the port economy and many of the important docks are not in use any more. As a result, in the port cities like Rotterdam, large area of the port needs to be used in other forms. The transformation of the port area can be considered a key phase of transition, where decisions made during this phase would have significant impact in the future. Once the decisions and the impact are done, it would be very difficult to reverse or convert again. Moreover, after successful transition, the usage of space is appreciated, so that there will be no intention of reversing or converting. In contrast, if the transition is not successful, significant transformation may not happen at all and the space will remain largely vacant although actions of stimulus or even command have been done.

Planning is never a project beginning from zero or a drawing on the clean slate. The initiative situations faced with planners often are already very complex. Certain initiation pointing towards certain directions may be identified within the system itself. Planning needs to understand the situations themselves as well as the direction and pathway the situations are becoming (De Roo, 2010; De Roo, 2014). The key of planning is proposed as understanding the global trend and managing the local affairs accordingly (De Roo, 2014; Rotmans et al., 2012).

Transition can be understood with the extent of “out of equilibrium” (De Roo, 2012). The extent of out of equilibrium, which is proposed as an identity also a key variable of describing and characterising the complex system, indicates if or during which period of transition the system is (De Roo, 2012). The identity then points to the appropriate planning approaches for potential transformation and development at the very moment (De Roo & Rauws, 2012), compared with the traditional planning approaches of extrapolating the past and posting blueprints for the future, during which the present is overlooked. The new planning approaches are proposed as watching the trend and managing the change for the present (De Roo, 2012; Rotmans et al., 2012).

In the sense of management, planning needs to understand more about non-linear behaviour. Non-linear behaviour is unpredictable. One of the examples is about traffic and road widening (De Roo, 2012). The traffic congestion seems the straightforward result of too many cars and too narrow roads, for which it is quite logic to solve the congestion by widening the roads. However, since the roads are wide now and driving becomes more efficient, more people who did not drive before want to drive now. Therefore, there are more cars in the roads and the congestion may happen again.

Another solution may be to prioritise public transportation which is more efficient in terms of space-consuming. If public transportation is as pleasant and fast as driving private cars, people may choose to take buses instead of driving individually. However, when there are less people driving, the people who drive can drive faster. Since private cars do not stop every now and then to have passengers aboard, they will always be potentially faster than buses. Therefore, as long as there is no traffic congestion, there would be more people who want to drive individually. The consequence seems that congestion is a must-happen situation rather than an avoidable or solvable problem.

In fact, some cities are indeed more severely suffered with traffic congestion than some others, which may indicate there are reasons behind, although the reasons are not the width of the roads. The non-linear interactions among actors cannot be understood with linear logic. Our case is not about traffic and road widening, but similarly we ask about the implications of river widening. The changes stimulated by river widening can be much more than or different from the original intention.

Speaking of unpredictability as one of the results of non-linear behaviour, the reflection with hindsight is that although we acknowledge the unpredictability of the world, we actually think we just predicted it wrong and still try to do it right this time. The significance of understanding non-linear behaviour is rather to demonstrate that the dominated linear way of planning and predicting does not work any more, than to showcase step-by-step handbooks. It tells us what not to do more than what to do. It is a remind for us that instead of keeping pushing functional technological innovations, we should open our eyes to alternative and additional views (De Roo, 2014) of promoting social development.

The urgency is to have more practical planners and decision makers acknowledge the non-linearity of the complex adaptive system. The question of research is to explore what should planning do with non-linearity. If cities themselves are already adaptive and the traditional position of planners may contradict the fundamental ontology of human world, what is the role of spatial planning in actively making better environment? Systems so complex are path-dependent and tend to be locked in situations which may become volatile considering newly emerged or increasingly urgent risks (Rotmans et al., 2012). Therefore, although cities have adapted through history, reforming changes happen only when the abrupt force is strong enough for disrupting and the results are often disastrous. Planning aims at more than being reactive with hindsight.

Keeping the situation lock-in to prevent disastrous change is naive denial of the changing reality, while straightforwardly forcing changes towards ideal situations is often ineffective. Spatial planning needs to stimulate the inherent dynamic and adaptive ability of the city as a complex system so that changes, especially any external and sudden changes, can be more smoothly and safely addressed. In this way, the city gradually moves out of the lock-in situation and is resilient enough to face surprising events.

Urban development, which encompasses enormous aspects, is a co-evolving process where changes of any aspect influence other aspects and then reciprocally influence the actor itself. The process becomes even more complex when all the aspects are also interwoven for which definite differentiation of those aspects becomes impossible and irrelevant. Therefore, urban development is a non-linear process where the future trajectory is unpredictable. The unpredictable trajectory explains the ordained losing battle where planners try to command and control. Instead, planners need to stimulate and watch the trend, since despite non-linearity, certain direction of development is still pursued (De Roo, 2012), especially in risky situations, and generic patterns indicating the future pathway can be to a certain though limited extent identified and managed (Rotmans et al., 2014). Co-evolution is the overall stage where patterns can be synthesised.

The co-evolution and the role of planners can be understood with thinking on scales (De Roo, 2012). The non-linear changes of the urbanised region form certain trends at the macro level, which demonstrates possible directions of the co-evolution of the smaller scale subsystems, the transition of the system as a whole, and ultimately the concrete spatial transformation at the regional level. Autonomous actors interpret and adapt to the macro trend at the micro level – individuals choosing places to live and work, companies locating their new investment – which form significant dynamics influencing the macro trends rather than simply being subordinate.

Planners stand on the meso level reflecting on the possible and viable macro trends and fostering innovative and experimenting micro changes. The evolution of the whole system is both external and internal. On the one hand, the urbanised delta region is faced with global changes that transcend but significantly influence any individual region, for instance, climate change, global competitions of capitals and ports. On the other hand, regional transformation is accumulative processes based on local changes that lead towards the similar direction, for example, reclaiming land. Planners' job is to stimulate micro-level projects that are promising under the general trend and up-scale those projects to form macro-level transition (Rotmans et al., 2012), so that “the local adapts to the global” meanwhile “the global receives impulses from the local” (De Roo, 2012, p.151). The global and local are always recursive (Byrne, 2012).

Cities mean much more than a group of zones or concentration of human settlement. There are many intangible aspects that are also associated with cities. Among those aspects, institution becomes an increasingly significant one. We gradually find that understanding on key factors influencing physical environment is not found on maps (linear) but in institutional constructs (non-linear) (De Roo, 2014). Institutional constructs reflect the existing intangible social reality and frame the potential tangible environment (De Roo, 2014). Spatial planning can keep its relevant role by moving the attention from drawing blueprints to designing institutions.

3.2 Transition of urbanised delta region

Because of the geographical and historical reasons, delta regions become one of the most concerned places where population is concentrated and social development is advanced. Delta regions have the highly dynamic nature processes which bring abundant resources and opportunities. The dynamics of the delta regions have sustained the development and earmark the long term geographical advantages. The urbanised delta regions nowadays are faced with the big challenge of climate change. The complexity theory and the model on transition are proposed to analyse the urbanised delta region during this critical age of climate change.

3.2.1 Transition in case studies

The model of transition demonstrates the process from uniformity to diversity (external transition) and from robust to dynamic (internal transition). The complex adaptive system can be characterised by the two pairs of duality (De Roo, 2012). Uniformity and diversity represent the spectrum between order and chaos, at the edge of which two (in between) is the complexity (Geldof, 2005). Uniformity and diversity are both ideal states in theory but they are not the best situations in practice. Complete uniformity may lead to dead close system while too much diversity may result in out-of-control. The transition from uniformity to diversity can be understood as the capability of complexity to add active input into the stable basis, which is supposed to promote manageable development.

Robust and dynamic characterise the internal change of the complex adaptive systems. Robust actors reflect the contextual and path-dependent information and hold the system on track. Dynamic actors stimulate innovations for evolutions. The relation among actors can change from static to dynamic. The balance between the robust and the dynamic tells the position of the transition. When the robust actors dominate, the system prospers in a certain phase of development. When the dynamic actors become active, the system may transform into another phase where fundamental functions may evolve.

The model has its root in regional economy where the region and the relation among regions are understood through the concept of cohesion, competitiveness, compatability and complementarity (De Roo, 2014). Cohesion indicates the mono-dominated source of development. When some region develops quickly because of transportation service, for example, then many other regions should find their possibility to develop the transportation service in their region too.

However, situations vary among locations. Not all the regions are geographically the key note on the transporting network. Therefore, some regions develop because of other form of economy, such as tourism, financial service, and technology research and production. Then competitiveness is seen. Regions develop because of different sources and in different forms. Overall, because of the competition, capital is accumulated more efficiently.

The further insight based on competition is that if we look at development at an even higher level, development can be promoted by cooperation. Regions that were considered competing can now be considered as a whole to enhance the social development of all of them. Regions develop the advantages of their own and share the results and products, which forms a relation of compatability. In this model, each region chooses its promising form of development and commit to it.

In contrast, in the relation of complementarity, this division of development forms is less definitive and more flexible. Regions have different advantages but not very much dominated so as other forms have to subordinate. In a prospect of diversity and dynamics, all the forms of economic sources have their roles in enhancing development so that they can flexibly react to the changing situations.

The model of transition is also studied in social capital studies where neighbourhood and the social relation of people are under consideration (De Roo, 2014). The cohesion relation is understood as social cohesion for which most people in the neighbourhood have similar identities as well as expectations on the identities of others. In this situation, we may see neighbourhood with most people in the same or similar profession, religion, nationality root, and political attitude.

It is possible to include people with different social background if the differences can be tied. People with different political attitude can also be united to collectively enhance the situation and environment of their neighbourhood. Alliance can be formed among mutually beneficial social groups. Trust can be developed along with the alliance.

People in the same neighbourhood may have conflicting social-cultural attitude but they can tolerate each other. After all, people do not have to always brandish their social-cultural attitude while reacting to each other in daily life. This tolerance results in less pressure for the members with differences. New residents have less stress of committing to the attitude of others. Overall, this would enhance to reduce social division or discrimination. Diversity can be developed as the new parameter for a healthy neighbourhood.

The further situation is proposed at the higher level of understanding the neighbourhood. With different people in the neighbourhood living together, connecting with social ties among some, a tolerating and sharing experiences among some others, a neighbourhood can develop and facilitate a special attractive and pleasant sense of community, which can be understood as branding (De Roo, 2014). The community can form their sense of place and shared by individuals with different social background.

The model of transition is also proposed in political settings of decision making (De Roo, 2014). The setting of equality allows people with equal power in decision making, which is the basic condition where each individual may be willing to participate and take responsibility. People would be willing to coordinate when they anticipate themselves being treated equally as others in the coordination process.

However, ambition on innovation is hard to be stimulated in superficial equality. Moreover, people may value freedom more than equality. The freedom of individuals in terms of choice, attitude and actions is considered more significant as basic political setting than the equal treatment. A resilient and competent institution requires diverse opinions and debate.

Therefore, in the balance between equality and freedom, innovative parts are empowered to promote changes and dynamics. A few actors are elected to coordinate and organise. With the consideration on diversity, individuals and groups with less power can be also empowered by sufficient involvement and respect. Early engagement can promote better communication as well as prevent potential tedious discussion. Furthermore, emancipation is the more dynamic situation compared to equality to take enough account of the position and advantages of the less empowered people.

Figure 2 is a graphical summary of the transition models in the cases described above. We see the similar model is adopted in different cases with different key notions. Below we will adopt the model in the case of urbanised delta region and water (river) related issues.

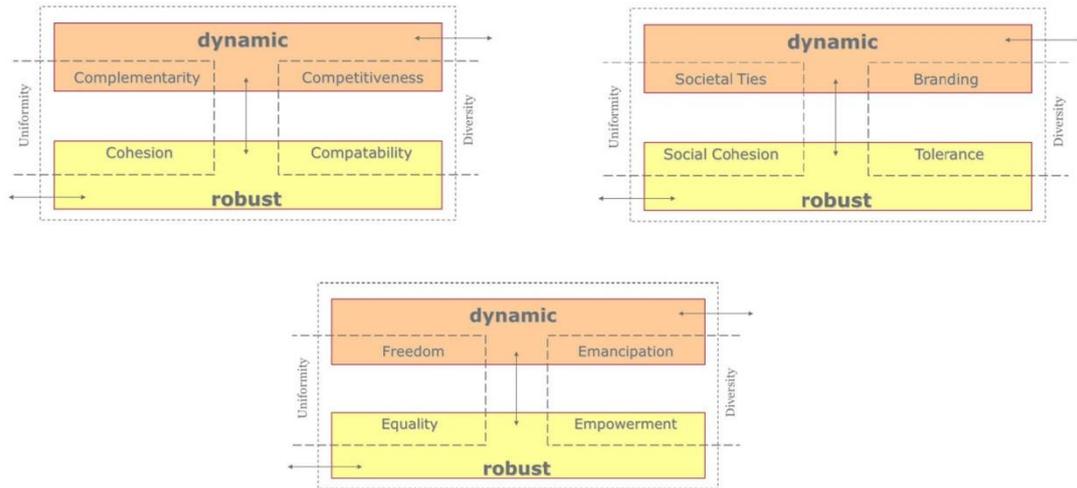


Figure 2 Models of transition in different cases (source: De Roo, 2014)

3.2.2 Transition of urbanised delta region

Based on our case studies (room for the river in the Dutch delta region), we propose the model of transition more particular for spatial planning in water-related (river-related) issues. We propose two separate models. One focuses more on the spatial aspects and the other more on the institutional aspects. However, the issue and spatial planning itself is not considered separately as physical issues or political issues. The model is expected to deepen understanding on the two main aspects so that they can be better integrated to enhance the overall performance of spatial planning and better, more resilient, flexible and adaptive, living environment in the urbanised delta region.

Overall, in the case of urbanised delta region and river related issues, we see a strong and clear role of technical models. For example, models of calculating the water level, models of estimating flood probability, models of evaluating the performance of hydraulic engineering, models of cost and benefit, models of environmental and ecological impact assessment, and so on. There are therefore teams of experts who have strong authority whenever these models are used. They may hold a line of right or wrong, based on which others can talk about good or bad. Water may be separately considered as technical issues from people as social aspects. The transition of this kind of issues may need to overcome this boundary between technical and social considerations and take into account the comprehensive spatial considerations.

The model of transition of the urbanised delta region and its spatial aspects include functionality, risk management, resource management and resilience. Functionality suggests the situation that different space has clearly defined functions. Rivers are the realm of water and cities are the realm of land. There is clear and stably defined boundary between the river and land. Rivers function within their realm, for example, discharge taking away drainage, supplying water and fish, and supporting waterborne transportation. In contrast, the land functions within its realm. Buildings can be constructed for residence and work. Roads can be built for transportation and travelling. The similarity is the stable function within its own boundary. However, the two elements can in some cases disturb each other for their functions. Flooding is the example of rivers disturbing the land. The land can also disturb rivers by, for instance, building dams, after which discharge is blocked and a chain of ecological impact would be triggered. Therefore, planning is supposed to clearly plan the boundary

between water and land, so that either of them can function well and not disturbed by the other. Dikes become the concrete examples of this boundary.

Risk management deals with situations when the boundary between the land and rivers can no longer held very definitive. For example, the attitude towards flooding is not absolute prevention since it is ultimately impossible and even undesirable in some cases. There is always possibility that water would overflow the dikes. It is also undesirable to absolutely avoid the interaction between the land and rivers. After all, we must live on the land while also take resources from the rivers. This is the dilemma where we want to be close to the rivers although we are meanwhile afraid of damages because of the very proximity. We realise that there is no clear boundary which can simultaneously enhance usage and prevent damage. Therefore, risk management indicates the rationale that damage may happen in certain situations, to which we pay some extra attention. In contrast, in most of the other situations, the land and rivers can function well by themselves without much disturbance, for which we can still largely hold our belief and approaches as functionality.

Resource management tries to understand the advantages and disadvantages, enhancement and disturbance between the land and rivers more comprehensively. If we understand space, both the land and rivers, as an integrated resource, then we may find approaches to utilise them comprehensively instead of considering them separately. The integrated utilisation can lead to the concepts of mutual influence and disturbance. In this way, room for the river does not mean taking some space from the land to the rivers. Instead, it suggests a different way to consider and use the waterfront. If we abandon the traditional viewpoint that land and the rivers should have a static boundary in between, or the traditional viewpoint that only the substantive aspects like water, flora and fauna, land and buildings can be resources, we may see the benefits from the dynamic process between the land and rivers. From the dynamic changes of high and low water level, many activities can be developed and then enhance social development. For instance, the recreation of sailing and the ecological parks. Moreover, in the other way around, the cost saved from keeping the land and water within their realms can be also understood as the benefit from more tolerance of the dynamics between them.

Resilience proposes a more flexible ability of space. It is a dilemma that on the one hand we want the space to be able to adapt to changing situation, while on the other hand the physical environment cannot be resilient like a spring. Buildings are concrete. The resilience of space is often interpreted as multiple usage with sharing and overlapping. The floodplain can be used as agriculture, recreation, farming and grazing when the water level is low. When the water level is high the space can be flooded. Even though the flooding causes damage, the cost is bearable and can be compensated in other forms.

The question is whether this resilience is considered an obstacle of development ambitions, for which investors still want to develop the floodplain and protect it with dikes even though they are aware of the flood risk and the advantages of limiting the usage of the floodplain. Resilience can also be disturbed by the fact that the potential benefit of the developing form on the floodplain is in most cases higher than the potential damage and compensation cost. In these cases of multiple land use and overlapping special functions, the way of realising the resilience of space may be in the institutions.

Therefore, the model of transition for the urbanised delta region and its institutional aspects is also important. We propose the transition consisting of specialisation, communication, coordination and network. Specialisation implies the situation where each individual, each organisation and each institute have the specialised responsibility and capability. There are hydraulic engineers specialised for the rivers so that they can be fully in

charge of the function of the water. There are planners who know the advantages of the proximity of certain types of land use so that they can design more potentially lucrative site. If all the specialised people are matched with the issues that they are specialised for, each compartment of the world, in terms of both space and institution, would promote development by themselves and the development can sum up as the overall social development.

Communication tries to remind us the unrealistic image of definitive specialisation. Some consider the complete thorough communication and free speech are unrealistic. Similarly, the definitive division of specialisation and the belief that each problem can match with a clearly defined specialisation and thus be solved by the specialised experts, are also unrealistic. The two extreme unrealistic ideal are already articulated as the two ends of the spectrum between technical rationale and communicative rationale (De Roo & Silva, 2010; De Roo et al., 2012; De Roo, 2014). Therefore, planners cannot close their eyes to any water-related aspects and assume the water managers and hydraulic engineers can take care of water as if there would be no troublesome water in the way to the realisation of their plans. The physical environment is an integral system that separate and specialised thinking on it would ultimately fail.

Coordination suggests the balanced aspects on power relation and democracy. First of all, communication can be endless. If the agreement is hard to achieve, no actions would be taken for a long time, which is not the intention we initiate communication for planning. With coordination we indicate certain actors who are aware of and share certain goals so that in line with communication they are constantly promoting changes and decisions. Secondly, communication should not be misunderstood as the destination. Communication can be taken as the approach during coordination where effective actions and reflection have enough involvement and attention. Diverse angles of input are considered in the coordination manner.

Then we see the moves taken in our cases to achieve the more adaptive situation we propose as network. The network includes and connects the possible active individuals who can make potential contributions to the conditional issues (De Roo, 2014). Should there be any ad hoc issues, it is possible to identify and get access to the people who are suitable to deal with the situation. The network is also a collective brain which can consider the overall situation with a large range of respects, which is expected to be comprehensive as well as flexible. The network can be understood as an informal basis where formal coordination can be conveniently and efficiently formed.

Figure 3 is a graphical summary of the transition models in the case of the urbanised delta region. One of the potential misleading points of drawing models on paper is that linear expressions are always difficult to avoid (Byrne, 2014). The models we propose present clear lines between each part. However, the meaning of the models suggests the non-linear situations where all the single aspects within are mixed and overlapped. This will be clearer after the analysis of cases in the next chapter. The actual practice is more complex than the simplified models, but the difference aims at better understanding rather than misunderstanding or disguising.

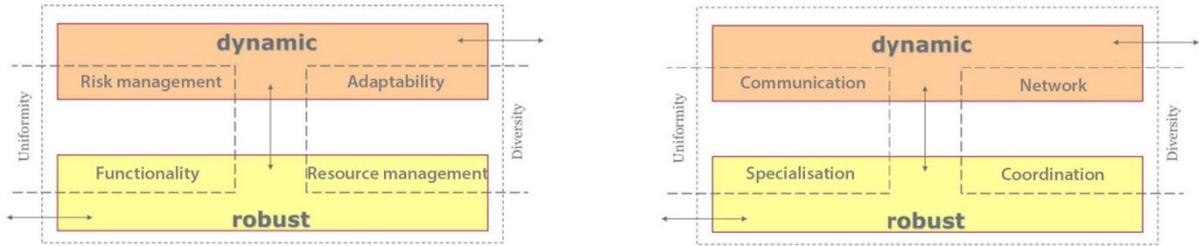


Figure 3 Model of transition in river-related planning issues (spatial aspects: left, institutional aspects: right)

In summary, this chapter reviews the relevant development route of the complexity theory, highlights the essential concepts and proposes the models suitable for the particular topic. The insights from complexity theory propose to understand planning issues with both technical and communicative rationale. The space should not be definitively separated from the institutions. It is possible to explore the potential of multiple land use to enhance resilience. The models of transition and the particular notions for the water (river) related issues are proposed to analyse the case studies in the next chapter. The notions will help discern and manage the critical element in the complex planning issues.

Chapter IV: Cases

In this chapter, we present about the three local projects under the programme of *Room for the River* in the Netherlands. The three cases are among the in total more than 30 projects, which together strive for the overall reduction of the river water level for the Dutch delta region. Figure 4 shows the locations of the local projects included by the programme of *Room for the River*. Most of the projects are located near cities where extra space is available for floodplain and can effectively contribute for water level reduction. Space around cities is also potential to develop recreational activities that are considered as good spatial quality. The three cases included in our research demonstrate the same goal of water level reduction but different ambitions in spatial quality improvement.



Figure 4 Overview of the programme Room for the River (Source: V&W et al., 2005)

4.1 Nijmegen

Nijmegen is chosen as one of the locations to make room for the river Waal. The city of Nijmegen is located near one of the bottle necks of the river. The width of the river becomes narrower, for which should there be any peak discharge, the water level can increase quickly at this particular location where the city centre of Nijmegen is located. For the same token, the water level can be reduced most efficiently at this location. Therefore, the national government proposes the actions to the municipality of Nijmegen. The municipality appreciates this opportunity and works together with other relevant parties to implement the specific project.

The city of Nijmegen does not escape from the risk of the water level and the particular location of the bottle neck. Nijmegen has the plan of urban extension and the land at the other bank of the river across the city centre of Nijmegen becomes the best choice. Among all the possible directions of the urban extension, the location of new housing districts in the north would be the nearest to the city centre, which would contribute to the compact

form of the city and prevent further urban sprawl in the other directions where the urban land is already to some degree extended.

Therefore, the goal is to reduce the water level so that the city, including the new district across the river, will be safe. Part of the river dikes is moved so that more space is reserved as floodplain. The floodplain, the old area and the new created area, is lowered and part of them is excavated to form a bypass channel along the original main water course. A low barrage is built at the entrance of the bypass channel so that when the water level is high, the water can be discharged through the bypass channel, while when the water level is low, the water can only flow through the main water course and ensure the water level in the main water course is high enough for ships. As the separation of the bypass channel and the main water course, an island is formed in between. Both the island and the bypass channel used to be the land of the north bank. Some residents there move to make space for the bypass channel and some others remain but find themselves on an island.

Based on the newly created spatial frame of bank-river-island-channel-bank, other actions are taken and also included in the masterplan for the project of room for the river. There creates some little beach on the island and part of the flood plain is designed as parks where routes are built for walking, running and cycling. Because of the housing project on the north bank, the old railway station which was abandoned before is re-opened. A new bridge is built after which there are now in total three bridges (one railway bridge and two road bridges, all are available for cycling and walking). The construction of the newest bridge used to be lingering but it is promoted again thanks to the project of room for the river. On the other way around, because of these transport connections, the progress of the housing projects on the north bank is further stimulated. Many of these actions other than water level reduction are included as the contributions to the spatial quality, which is the other main goal of the project of room for the river in line with water level reduction.

The evaluation of the project of room for the river Nijmegen reports positively. First of all, the water level is reduced as intended. Secondly, the spatial quality of the waterfront increases. Thirdly, the existing projects of urban extension are encouraged. Fourthly, there is no case of protest in court. Fifthly, the progress is kept as scheduled and the cost stays within the budget. Moreover, the masterplan won the top honour award in an annual international competition of waterfront plans in 2011.

4.2 Deventer

Deventer is one of the cities along the river IJssel. The project is part of the work at IJssel delta, which is the region near IJsselmeer (the big lake Dutch made from the sea by a huge dam). IJssel region has the most significant strategic role in securing water-robustness in the Netherlands. It is the region where flood prevention and land reclaiming are most extendedly implemented. The city of Deventer is largely located on the east bank of the river IJssel, but also has a part of the municipal territory on the west bank. The connection between both sides of the river, which played the important role in World War II, is considered potential for cultural and historical education.

The chief goal of the project at Deventer is also water level reduction. The approach of the project Deventer is to lower the floodplain. Compared to the project in Nijmegen, the river dikes are not moved in Deventer. The project of Deventer is less concentrated at the location of the city centre. Implementation covering a long distance along the river bank has achieved larger reduction of water level. Most of the area under the

implementation of the project is outside the city centre, for which there are less residents directly influenced or removed.

The space for the river is made by lower the existing floodplain so that river water can flow laterally more easily. The land outside the river dikes (floodplain) was used for agriculture. It was considered that should there be flooding, the damage on the floodplain is bearable. However, the floodplain was actually too high to achieve the goal of water level reduction. Should there be flooding, the river water may have increased quickly, caused damages at other locations along the river, before the floodplain at Deventer can be used as water retention or buffet. In other words, the current floodplain at Deventer may function for the city of Deventer, but it may not provide sufficient assist considering at the larger regional level. Therefore, the floodplain is lowered and bypass channels are made, after which the water level can already decrease as expected and there is no extra need to move the dikes.

Spatial quality is also considered at Deventer, although not as ambitious as at Nijmegen. In the new floodplain whose landscape is also more pleasant, a new small recreational harbour and a new farm are built. At the waterfront near the city centre of Deventer, a ferry line crossing the river is initiated with a floating dock which can vividly demonstrating the result of the project of room for the river. The floating dork as an interesting construction is expected to draw the attention from the public to the work on making room for the river. As a result, people can appreciate the work and understand the river which they live so close by in a dynamic rather than static way.

The project at Deventer is implemented largely by the water board of Groot Salland. The water board has the team with members specialised in many areas related to water. The plan for the project of room for the river was at the beginning initiated by the municipality government of Deventer. The plan makers were the staff working for the municipality government. After the plan-making phase, the team of plan makers, who also include people with different expertise such as engineers and lawyers, was re-located to the water board to continue the work of implementation. Therefore, the work of plan-making and implementation seem separated between the municipality government and the water board, but it is actually done by the same staff members.

The project at Deventer will also close at the end of 2015. So far it is also reported positively, with anticipated schedule and budget. The contribution to the overall water level reduction is significant. The landscape and spatial quality is increased and less people are directly influenced.

4.3 Zwolle

Zwolle is another city along the river IJssel and also part of the flood prevention work at IJssel delta. The water level reduction is achieved by combining dike displacement and floodplain excavation. Part of the river dikes are moved inland so that there is more potential space to flood. The foreland outside the dikes is bigger and allows more chance for the nature to develop the gradual transition between water and land. Part of the existing floodplain is excavated and lowered so that the water can flow laterally more easily at Zwolle. Overall, the water level of the whole river course would not increase so quickly during peak discharge.

The new foreland provides space for new river channels. The larger channel has the open connection to the river IJssel. New natural parks and recreational activities are designed in the new foreland are where the landscape is changed. The flat farmland is changed into dynamic waterfront with richer elements of nature and changing

processes. For the foreland where many buildings have been built, a combination of canal system and bridges work as water retention. The current canals are deepened to have more ability to contain water and prevent quick water level increase. The approach also considers the prevention of the large relocation of the residents at the specific location.

The ambition of spatial quality of the project at Zwolle focuses on the nature environment. Most of the floodplain undergoing changes is the area outside of the city centre of Zwolle. The spatial quality of the area increases because the nature and ecology will become healthier thanks to the dynamic and thus more natural river banks, compared to the channelled river bank. The pleasant countryside and riverfront is created to allow people from Zwolle and other cities to enjoy the nature environment. The number of birds and species of them have increased since the project was implemented. The railway bridge is improved to adapt to the changes in the river and the space.

Some people in the planned area are directly influenced and have to move or sell their business. The conjunction of the government, the water board and the residents are gathered together to notify the development ambitions and negotiate about the compensation for any possible damage. The residents are aided by the project in rebuilding their new houses. The new houses near the new dike now have formed a new community.

4.4 Regional transformation

When we look back at the cases of room for the river, what lessons we can learn and are they valuable cases for our and generally spatial planning research? The plans are promising and have been well implemented. Some achieve more development ambitions than others, but as the same, the water level is reduced and the places are safe in the future, which is the original chief goal of the strategy of room for the river.

The Dutch delta region will become safer, at least as safe as now when climate change will increase the risk of the overall environment. The work of keeping the Dutch delta region safe is not new. The strategy of room for the river has drawn so much attention to regional transition, because the approach to keep the Dutch delta safe may transform the region into a complete different prospect in the future. Knowing how the engineering approach in the past has transformed the region into the current situation, people imagine how the strategy of room for the river will influence the overall landscape of the delta region in the future.

One of the most significant contributions of the strategy of room for the river is to spread the image in which river and land are no longer separated by a clearly definitive line but a transition zone where water can go laterally. In this dynamic relation nature can prosper. This image fits well into the waves of nature conservation movement that challenge the engineering authority and will gain support from the public. The programme of room for the river and its consisting projects are so far widely appreciated.

However, the programme of room for the river is at the end of its implementation. Some may argue that the regional spatial transformation caused by the programme of room for the river is not so obviously impressive. Most of the changes are only seen at the local scale. Responding to this critique, the contribution of the programme may be the very fact that the delta region will not experience dramatic spatial transformation in the future. If the room had not been made for the river, the water level would keep increasing. One day perhaps severe flooding happens and population and development have to be relocated at the higher and drier places, which becomes the (unwanted and passive) spatial transformation of the delta region. The current Green Heart

may need to be planned as another big lake in the Netherlands for water retention. In contrast, because of the work of making room for the river, the risk is decreased so that many of the river cities can expect long term prosperity at the same locations.

As for the transition interpreted with the model proposed in section 3.2.2 and Figure 3, the trend to resilience can be seen in the Dutch case of the regional programme of room for the river. The policy and strategy of room for the river is campaigned as climate change adaptation which can ensure the safety of millions of people's lives in the Netherlands. The innovative difference is that the functionality tradition of engineer is changed, so that the relation between the river and land is considered dynamic and interchanging processes. The diversity of the environment is appreciated more than the streamlined water courses.

The actual approaches taken in practice reflect the characters of risk management and resource management. The regional consideration of water level reduction is rooted in flood risk management. The rationale of implementing the operations at the locations where the risk is high is adopted when the national government researched about the best locations to make room for the river. The municipality governments take the programme as a good opportunity for their resource management. The new image of the riverfront is used as the stage to embark on a new framework to integrate water resource, land resource, ecological services, diverse activities and social capital.

The nuance may be argued between the approaches of risk management or resource management and the ultimate intention of resilience. Resilience proposes to reflect on the static engineering approaches. However, the practice of room for the river can be considered still largely engineering. The difference is the result, from concrete river bank to flexible transforming zones, but the approach of engineering, of controlling the water level and of holding the dike lines stays unchanged. In these cases we see the difference between risk management and resilience, as well as the difference between resource management and resilience. The policy may argue those differences are not true, but we would argue that the current approaches are still not ideally resilient. However, the ideal picture of resilience is still under enquiry in theory. The Dutch case offers a promising stage to keep researching and imaging about this direction of transition and the ultimate goal of resilience.

4.5 Institutional transition

Room for the river is the first planning programme with such a large scale that has organised the close involvement of all the tiers of government and many other stakeholders in the Netherlands (Rijke et al, 2014). The programme experiments the decentralised working style for the effective implementation of the national policy. The Ministry of Infrastructure and Environment and the central implementing agency of Rijkswaterstaat no longer take charge of spatial transformation all by themselves. They have less control on the concrete implementation and local outcomes of the programme. Instead, the municipal governments and water boards have more space to decide on the concrete plans and construction, based on the sufficient considerations on the specific situations.

The institutional transition is a complementary side to the overall regional transition to adaptive environment. The task of planning is understood more inclusively, which will be not only about physical changes but also the institutional constructs (De Roo, 2014) which are more flexible and adaptive than the concrete physical environment. As the physical environment cannot be so changeable, the adaptability of planning increases by the adjustment of the institutions.

Rijkswaterstaat is changing its viewpoint about its own position as a specialised agency. The size of the agency and the number of the staff member are becoming smaller because the pressure of a perfect experts team is being eased. The programme of room for the river becomes an opportunity for Rijkswaterstaat to experiment the new management-oriented working style. The practice has shown its success in efficient and effective implementation which is punctual, cost-effective and appreciated by the public.

Coordination is the key that has contributed to the effective practice of the programme of room for the river. The political decision and national policy are implemented with enough involvement with the local governments. The specific local plans are the result of the communication among all the government bodies. Most of them are also still involved and coordinate the process of the implementation. A relation of enough freedom with necessary supervision plays the role to satisfy the goals of all the coordinators. The national government pays the attention chiefly on the water level reduction. The local government can make their decisions about how this goal of water level reduction can be achieved, during which many of the planning and development ambitions can be integrated.

A network including the national government, Rijkswaterstaat, provincial and municipal governments, water boards and the public is built to better connect people at all the levels and enhance exchange of knowledge and experience. The technical experts have the information about the social context and specific situations from the local parties. The implementing teams for concrete constructions can find support and help from technical staff through this network. The responsibility of the whole planning programme is no longer divided and decided by administrative structures. Instead, it is resolved into the network where the people who can solve the problem can be easily identified and accessed should there be any specific problem or task at hand.

Responsibility becomes the relevant issue within this network. People involved in the programme think no longer about what their responsibility is and how they can contribute without enough consideration on the actual issues. The responsibility becomes more flexible and conditional. Planners worry less about their responsibility because any problem or issue should be considered by the network as a collective brain which has included all the people who can take different kinds of responsibility.

However, the responsibility at the organisational level may stay clear. The communication at the early stage helps to make the responsibility of each organisation as explicit as possible, such as the national government and the municipal governments. The plans can be efficiently implemented without unnecessary overlapping or misunderstanding on each stakeholder's work. The question is whether the communication has actually achieved an adaptive and flexible implementation.

The most important message that is held by all the people in the network is to reduce the water level. Water level reduction is the specific action that is translated from the abstract strategy of climate change adaptation. The higher level government and the local implementation staff constantly communicate about and calculate the water level. People at different levels or positions can have different ambitions as long as they share this responsibility of water level reduction.

In the network organised by Rijkswaterstaat, we see a linear line of translating the adaptive strategy into the local approaches. The water level reduction has contributed to prevent this translating process from becoming a whispering game where the message can be completely lost during the process of passing it. The water level reduction is also an operational key for the efficient implementation of the strategy. However, this key may also

lead to the engineering approaches for which adaptation is insufficiently considered at the local level. Dutch with their traditional strength of dealing with water are too good at realising practical goal about the water. The adaptation strategy may have been over simplified as water level reduction, so that the institutional transition to network still maintains a large part of linear process.

In summary, we see both similarities and big differences among the local projects of the programme of room for the river. The similarities include the water level reduction, the spatial approaches, and the integrated ambitions. The difference is the extent the ambitions of spatial quality. In all the cases, room for the river is made by enhancing the dynamics of the water flow. Space is assigned for the rivers, although it is also used for other suitable activities when the water level is low. The question of what potential activities can be combined into the space becomes designing issues in the local projects. Different municipalities have different ambitions and situations, for which different concrete changes happen in different projects. There are no strict criteria to evaluate or judge whether or how the authority should be ambitious. At least, the room for the river has been made and the safety level of the whole delta region has increased.

The question about what non-linear behaviour would happen in the future is still early to know at this stage where the projects are just about to be completed. It is possible that although the room for the river has been made, the space that keeps changing because of people's reaction to planning intervention can be different in the future. For example, the fire alarms installed in the building are supposed to alert people so that they can use the critical short period of time to excavate quickly. However, after a while, people are used to the fact that the alarms can be and often are triggered just because somebody is smoking in the room. As a result, people are hardly alerted by the alarms any more. This kind of non-linear behaviour can also happen in the cases of room for the river.

We see the attempt of transition strived by the programme of room for the river. Many of the approaches are innovative and promising, although the ideal situation of adaptability is not sufficiently showcased in these cases. The programme is just about to complete. The non-linear reaction in the future is hard to see. The contributions to the regional safety and development of the strategy and projects should still be researched in the future.

Chapter V: Conclusions

The aim of the research is to clarify the understanding on adaptive planning for the urbanised delta region. The previous chapters touch the concept of adaptive planning in different angles. In the context of the Netherlands, adaptive planning is the tasking to ensure the safety of the country faced with climate change risks. In planning theory, adaptive planning is the inconclusive planning approach striving to impart flexibility into the concrete environment. In the case of room for the river, adaptive planning is the spatial approach that reduces the threat of the increasing water level.

Adaptive planning in the Dutch policies tries to spread the impression that considerations on the future are in the agenda of the government. It is the action of looking ahead that imparts planning adaptability. Plans and reacting mechanisms are prepared for the future changes. Planning becomes more pragmatic and tries to build the framework with which people can get things done in the future. As climate change is considered such a significant issue and fact, the policies on the related realms such as the development of urbanised delta region suggest the indication that adaptive planning is currently considered adaptive largely to climate change. The concept of adaptation almost automatically points to climate change. Climate change then to some degree assigned some quite clear tasks, including preventing the damage of sea level rise and storm surge, peak discharge and extreme storms, as well as heat waves and drought. Therefore, adaptive planning is understood the exploration to help us live with those increasing threats. The Dutch policies have suggested combine technical and communicative, engineering and spatial, centralised and decentralised approaches to realise this adaptive planning tasks.

Adaptive planning in theory is proposed as the new planning rationale to deal with the non-linear world. The issues planning is faced with are then broader than climate change. Adaptive planning or non-linear planning is the theoretical proposal awaiting further interpretation. Adaptive planning is the term that can better connect with the policy realm, but non-linear planning may be a clearer term. Non-linear planning is the planning in the non-linear world where linear planning is no longer effective. The suggestion of reflecting and abandoning the false belief in linear planning (blueprints) is at this stage more significant than the step-by-step guidance on specific planning methods which may be expected by practice. The non-linear world requires further understanding for which the entrenched tradition of Newtonian rationale should be thoroughly reflected on. The statements about transition, out of equilibrium, complexity and coevolution are proposed to enhance the understanding on the non-linear world and the planning for it.

Adaptive planning in the Dutch case of room for the river is translated into very clear tasking of reducing the water level. This task and the hydraulic model of calculation have made the assignment so clear that actions can be taken effectively. Adaptation is not so frequently talked in the practice as in the policy. Space is used as the approach to realise this adaptive task, for which issues beyond technical (engineering) control should be taken into account, and they are well managed in this Dutch case. In the case of Nijmegen, the space and the understanding on the dynamic and adaptive space is further explored to enhance urban development. In other cases where the work is simpler are also evaluated positively because the chief goal is achieved efficiently. The institutional network which plays significant role in successfully managing this programme becomes a good example of planning implementation.

The most important conclusion of the research is the theoretical proposal of the transition models for the urbanised delta region, for which it is actually already presented in the chapter of theory (see section 3.2.2). The question about adaptive planning raised by the proposal of the transition models is about the link between the adaptive environment and the adaptive planning itself. Adaptive planning may be understood as the plans that produce adaptive space, such as the cases of room for the river. The waterfront with diversity and dynamics is at the moment interpreted as the good case of adaptive space. In contrast, adaptive planning may also be interpreted as the adaptive decision making framework by which the institutional constructs can act flexibly to the changing situations. The link between the space and the institution needs to be improved to truly realise the overall goal of adaptability for the whole region.

In summary, the programme of room for the river is the opportunity to look into the Dutch planning that endeavours to be comprehensive and inclusive. Planning is becoming a comprehensive large project which includes people from a large range of relevant professions and positions to take into account all the issues and possibility sufficiently. We studied the context where this current attempt of comprehensive and inclusive planning is rooted. The historical stories also highlight the key issues that should be paid special attention, such as the power balance between the national and the local governments. We studied the complexity planning theory which provides innovative suggestions on planning under this comprehensive and inclusive rationale. Many concepts, models and notions proposed by the theory serve as the power points through which we may better understand the complex planning tasks. We also investigated the specific cases to hear about the concrete stories and know about the actual happening. The programme of room for the river looks quite simple and it has been managed very well, at least based on the fieldwork that is done until this stage.

The further question is whether the practice of translating the abstract strategy into the very simple and highly operational parameter can be indeed long-term effective. To answer this question and evaluate this planning approach, more time may be needed, during which the strategy, the programme and the environment are tested by more actual events in the future that are unpredictable at this moment. Based on the lessons learnt from history and other cases, we believe and hope this story can still be very positive in the future.

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Appendix 1: Methodology

A-1.1 Introduction

This appendix presents the reflection on the philosophical and methodological assumptions of the research. The next section briefly articulates the philosophical paradigms that are relevant to the later reflection. The reflection is in the third section where the rationale behind my research design is considered with the explanation developed in the next section. The final section presents summary and connects our research with the wider field of planning research.

A-1.2 Paradigms

A thorough review of philosophy, epistemology or methodology is beyond the scope of this appendix. This section intends to explain the key paradigms which would be used to reflect on our research in the next section. For choosing the key paradigms, we follow Morçöl's (2001) articulation and differentiation about positivism, post-positivism and post-modernism. The differentiation of these three can be considered a spectrum of philosophical assumptions. We reflect on our own research by considering at which point in the spectrum our research could be. These three paradigms – positivism, post-positivism and post-modernism – turn out enough for the goal of this appendix. Therefore, other paradigms, including those ones similar to these three, are only listed in Table 1 for convenience. The later section only focuses on the chosen three. Table 1 also lists the significant principles of the chosen three which are more explicitly explained in the following paragraphs before Table 1.

Positivism strives to know about the objective reality and physical nature which are separated and independent from human activities. Nature has her universal laws which can do good to human beings if we understand and apply them properly. The universal laws underpin all the facts we can observe. Facts can also be analysed by separating the constituent parts, and knowledge about separated constituent parts can be reversely generalised. Every time knowledge is gained by observing and analysing some facts of nature, we get closer to the universal laws. Human-made experiment can be no different from natural conditions and thus can be well used to verify knowledge. Knowledge about universal laws suggests causality by which we can predict future and consequences of actions.

Post-positivism holds the same basis of objective reality as positivism, but post-positivism raises doubts about whether human beings can truly observe and fully understand the reality. Although the reality exists, it is too complexly tangled with human world. It is hardly possible to see through the veil of context and identify the pure and universal nature behind. Observations are immensely influenced by observers' own minds, for which knowledge gained from the observation can hardly be universally verified. Analytical methods can be problematic because it might be almost impossible to differentiate which parts can to be objectively verified and which parts are the contextual mind-stuff (De Roo et al., 2012).

Therefore, post-positivism tries to preliminarily deal with the reality as a whole where ourselves are involved. We still produce knowledge by observation, but we accept that observation cannot be perfect. First of all, the "objects" we observe are always contextualised and intertwined with observers' subjectivity. Then, observation itself can be distorted by our perceptions, for which insights gained by observing the same fact can greatly differ

(McCann, 2007). Therefore, we are aware that knowledge based on observation can only be preliminarily generalised and applied, but we still assume it “correct” until it is falsified. Researchers try to be always critical of the preliminarily correct knowledge and test it in various cases in order to understand further, if not falsified, how it can work well.

If post-positivism considers positivism with doubts, post-modernism treats it with outright rejection. There is no objective reality or universal laws. The world is the world as it is, with diversity, no right or wrong, no good or bad, and no superiors or subordinates. However, since long before, we are so deeply constrained by the frames developed by positivism that we can now hardly fully see and accept the diverse world. Therefore, the task of research is to deconstruct, to break all the possible frames preventing us from seeing the diversity of the world. Any knowledge or prediction seem irrelevant before the true face of the world – diversity – is fully understood and accepted.

Table 2 Relevant paradigms, their principles and similar paradigms.

Paradigms	Positivism (Mor çöl, 2001)	Post-positivism (Mor çöl, 2001)	Post-modernism (Mor çöl, 2001; Allmendinger, 2001)
Principles	Objective reality, physical nature universal laws observation verification linear causality predictability generalisation analytic, quantification	unknown although objective reality context perceptions falsification non-linearity path-dependent, patterns limited generalisation attention to qualitative methods	subjective language diversity, non-privilege deconstruction
Similar Paradigms	Modernism, Empiricism (Allmendinger, 2001) Realism (De Roo et al., 2012) Newtonian (Mor çöl, 2001; De Roo et al., 2012)	Critical realism (De Roo et al., 2012) Social structuralism (Allmendinger, 2009; De Roo et al., 2012) Relativism (De Roo et al., 2012)	Post-structuralism (Allmendinger, 2009) Relationalism (De Roo et al., 2012)

A-1.3 Reflection

The main line of our research design starts with describing the issue and the context where the issue is embedded, then framing the way of considering the issue and context by choosing a theory, and finally studying cases to see whether or how the general theory is practiced in specific settings. The three major parts of the

research – identifying the context, choosing a theory, and focusing on specific cases – are influenced by post-positivism.

The context matters because there is no universal law or single truth. Issues and questions are connected with time and space for which they can only be raised based on certain context (Allmendinger, 2009; Flyvbjerg, 2001). Planning in delta regions is very different from planning in mountain regions, for example, because they are based on knowledge about different geological conditions. Furthermore, planning in the Dutch delta and planning in other deltas such as the Chinese Pearl River delta are also very different although they are both delta regions, because the difference between contextual perceptions on the similar physical conditions also matters. This emphasis on contexts brings our research away from positivism.

However, one important goal behind our research is to seek relevant similarity among different delta regions, although international comparison is not substantially included. By studying the Dutch delta, the research strives to identify at certain degree general knowledge that can be learned by other delta regions in the world. The fundamental assumption is that the physical conditions of delta regions are largely similar, for instance, hydrology, sedimentation, and ecology. Planning for delta regions seriously concerns those physical conditions which are independent from perceptions and consensus. Therefore, although planning differs among contexts, the physical world faced with by planning is real and similar. This belief on the real world agrees with post-positivism and differs greatly from post-modernism.

The action of choosing a theory from many, regardless the specific content of the theory, reflects the deviation from positivism. There is no single theory which can explain the world or even the specific region. Instead, the prospect of theories with the attendant methods are fragmented. The choice of the theory is highly subjective, but subjectivity is not necessarily a “wrong or bad thing” as positivism considers, and it is seldom avoidable. Social theories can teach and guide us, although simultaneously constrain and frame, to research and know about the perceptions on the objective world. Perceptions, no matter whether socially constructed or not, are no less significant than the objective world itself. The distinction between the subjective and objective fades away when the subjective perceptions are studied by subjective minds.

However, our research as planning research cannot fully accept the postmodernism world view (Allmendinger, 2001), which may lead to complete chaos or anarchy, in other words, no planning at all. Therefore, choosing a theory as the framework becomes significantly necessary. I indeed tried to think without the constraint of any theory and to independently think about what is the real issue, but it turned out a failure. Through doing this philosophical reflection, the failure seems obvious. First of all, while “thinking,” it is already hardly independent. Minds are already framed by contexts since the very beginning of being able to think. Secondly, the “real” issue maybe not real any more if I have to “think” about it. By trying to “think about” the “real issue” without any theory, I set myself a mission impossible to merge the fundamentally conflicting points between positivism and post-positivism. After all, theoryless planning itself is planning theory (Talvitie, 2009).

Case studies, in a holistic way with the intention of accumulating knowledge, does not agree with positivism. The assumption of “context matters” (Flyvbjerg, 2001) underpinning case studies already starts moving away from positivism, as discussed above. Moreover, the research studies specific cases and the perceptions of people inside to accumulate knowledge, compared with to analyse the case aiming at finding some fundamental and maybe universal law behind it. The research studies cases to contribute to the discipline which requires infinite cases to promote further understanding (Flyvbjerg, 2001). Stories of cases themselves are considered significant

knowledge, while what positivism considers knowledge is only the generalised or deduced information independent from specific stories.

However, our research is not post-modern because the selection of cases is carefully considered and it is believed some cases are “better” than others (Flyvbjerg, 2001). The case study does not only tell anecdotes within cases or celebrate diversity. Instead, through deliberately selecting representative cases, the research intends to generalise knowledge which can be transferred to other cases. Although the generalisation must be preliminary, the more representative the selected cases are, the less preliminary the generalisation is, and thus the more useful or relevant the gained knowledge is. This can be agreed by single case study, and our research wants to study multiple cases to further validate or justify the knowledge generalisation.

Therefore, our research is identified largely post-positivistic as between positivism and post-modernism. Complexity science, where the theory of our research embeds, is also considered post-positivistic (Morçöl, 2001). However, some basic assumptions of the research can be considered very positivistic (Morçöl, 2001), while some others are closer to post-modernism, neither of this two kinds of assumptions are considered post-positivism. Conflicting aspects cannot be merged but still all included.

Planning approaches for the urbanised delta region pay increasing attention to the ecological system and natural phenomena. Complexity theory in planning criticises the communicative planning approach of consensus building, which may overlook the natural dynamics which are independent from any human consensus. Climate change debate emphasises the suggestion that natural dynamics are more than able to cause disastrous impact on human society if planning actions overlook the physical conditions or try to command and control (De Roo et al., 2012).

However, complexity theory in planning also accepts the infinite possible local situations rather than consider natural dynamics as universal. The theory endorses neither that the reality is seen “black and white” nor that certain agreement about how to see reality prevails, in other words, neither positivism nor post-positivism (De Roo et al., 2012). The appreciated assumption is to some degree postmodern that “the world is seen as one in which objects, situations, values, ideas and behaviour acquire meaning in their relationship to other objects, situations, values, ideas and behaviour” (De Roo et al., 2012, p.9).

Therefore, planning for the complex adaptive system is fuzzy with nature and perceptions, for which complete causality and prediction are rejected while patterns and pathways are still strived for to partially manage non-linear transitions (De Roo & Porter, 2007; De Roo et al., 2012). In some situations, generic rules may surface, while in others, a specific strategy highly embedded within the local context may be necessary. Approaches following complexity planning theory can be both positivistic and postmodern, although the two philosophical assumptions almost reject each other outright. In this sense, although our research following complexity planning theory is considered in the middle of the two extreme ends of positivism and post-modernism, it also differs from post-positivism, which is considered in the middle of the spectrum from positivism to post-modernism in the section above.

The inclusive but preliminary integral assumption results in the questions of our research both positive and normative. On the one hand, the specific situation of the delta region at the moment is highly emphasised and aimed by analysis, although it is assumed probably too complex to analyse. Only approaches specifically addressing the present would be relevant and effective, compared with the traditional planning model of

extrapolating from the past and posting blueprints for the future, i.e. the present is overlooked. On the other hand, the motive of planning research, as the assumptions of almost all the planning theories (Allmendinger, 2001), is to larger or less degree normative. No matter whether research posts blueprints, certain ideal situation and the approaches to realise it in the future are always indicated. Quests strive to inform approaches to make changes actively resulting in the future different from the present in the way we want. Policy recommendation is often expected in the conclusions of planning research.

A-1.4 Discussion and Conclusions

Therefore, our research thesis is largely post-positivistic, but in some sense I try to be more postmodern while not willing to abandon the positivistic parts. Looking through planning theory and research, this “fuzzy” character is gaining increasing support.

“Can we have postmodern planning? No (an answer that is itself not postmodern). Can we have a planning that is more open, sensitive to the needs of the many, radically challenges existing notions and actively seeks to encourage wider participation from those previously excluded in a continuously open discourse? Yes.” (Allmendinger, 2001, p.257).

The philosophical and methodological assumptions of planning, both research and practice, have greatly changed from the blueprint tradition, so great as crises (De Roo et al., 2012). However, the prevalence of natural science tradition still persists. Considering the quotation above, perhaps the negative answer to the first question would stay the same no matter what prescription in the question is. Not postmodern, but not positivistic or post-positivistic either. Similarly, the answer to the second question may also stay the same even though the many open or equivocal elements in the question are adjusted or new ones are added. Planning is too good at being normative, for science reasons or power reasons, and positive practice can always be interpreted normatively. Similar disciplines are possible to adopt completely different methodology (McCann, 2007), and planning doctrine is too accustomed to being heterogeneous.

Last but not least, thinking of the goal of our research, planning research as producing planning knowledge is non-linear processes where researchers appreciate the work by themselves and by others although they do not agree with each other and any of them might be proved wrong after probable revolutions in the future which is to certain degree differently shaped within different contexts by their own work applied in present practice. This is, again, a fuzzy, positivistic-and-postmodern statement. Planning maybe losing the absolute authority gained from the Newtonian world, but the significance of planning research is increasing in the fuzzy world.

References for *Appendix 1: Methodology*

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Appendix 2: Interviews

A-2.1 First interview

A-2.1.1 Background information

Interviewer: Dexter Du

Participant: Mathieu Schouten (Mr. Schouten is a landscape architect involved in the project *Room for the Waal Nijmegen* and contributed immensely to the waterfront master plan.)

Time: 10:00 – 11:00 a.m. 7th July 2015

Place: City Hall of Nijmegen (Korte Nieuwstraat 6, Nijmegen, NL).

Note: The interview is semi-structured, for which some questions about specific aspects are elaborated and arranged before the interview, while the participant is free to choose his way of organising the story. Relevant information that surface outside our prepared questions is highly appreciated. Opinions and adjustment to the questions by the participant are also welcomed.

A-2.1.2 Main points of interest (for participant)

Main points of our interest are listed below. The list is sent to the participant before the interview.

The goals of the project *Room for the Waal Nijmegen*

The actions taken and spatial consequences

The relevant institutional arrangement

The connections between the overall programme and the two projects

A-2.1.3 Interview guide (for interviewer)

The timetable, key questions and the aspects that are expected in the answers are listed below. Questions may be arranged differently depending on the answers of the participant in the interview (semi-structured).

Introduction (5 min)

Explain the interest (spatial planning)

Explain the goal of the interview: the participant's own perception and semi-structured interview

Inform interview procedure and timetable, and ask for agreement.

Consent issues (record, transcript and anonymity)

Questions

Clarification of the plans and goals (20 min)

1. What are the goals or expected consequences of the project, both short-term and long-term?

Flood prevention

Ecology restoration

Urban extension

Public space making

Attractive cities

Adaptability/adaptation/adaptivity (to climate change?) If mentioned (under this question or others), ask for a brief definition by the participant about what is adaptability, and try to identify key notions that can connect with the theory.

Actual actions and spatial consequences (10 min)

2. What spatial changes have been or will be done by the project?

The old and new dikes. What used to be located where the new dike is and what is new where the old dike was?

The bypass channel

The riverside pathways and public space

The new bridge and train station

The housing project across the river

3. What consequences have been seen after those spatial changes? (some may have been answered in question 1)

To the rivers and ecological system? Hydrology, creatures in water, sands and soil, riverbed, floodplain.

To the infrastructure network? New roads, bridges, ferries, parks, riverside pathways or houses?

To the city and urban development? Spatial quality, economic impulse, residents well-being or migrants attraction.

Do you see any connections among those changes (integrated goals/win-win situation)? Which of them are expected to be kept unchanged after achieved? Which of them are to stimulate other goal situations or new changes?

Institutional arrangement (10 min)

4. How do the actors and managers promote these changes or consequences?

Are there any special institutional arrangement for these projects?

Are there new governmental or similar administrative or managing bodies initiated?

What are the advantages of these new institutional arrangement?

What are the reactive and proactive mechanism?

Who are involved and how? Is it sufficient engagement?

Implementation (5 min)

5. Are there any corporations with or considerations on other places in the region?

Upstream and downstream riverside towns and cities?

Surrounding cities with strong or new network connections?

Other projects under the programme of *Room for the River* or the overarching policy?

6. What difficulties and new options are confronted during the project?

Are the plan and prospects adjusted during the implementation?

7. Will there be a closure of the projects?

What are the criteria of closing the projects?

What will be the management over the new places or constructions after the closure?

Ending (5 min)

Acknowledgement

Ask for other potential participants

A-2.1.4 Summary

Goals:

1. lower the water level
2. improve spatial quality, which consists of many aspects including housing, traffic, recreation, and nature. Spatial quality is considered and reflected in the master plan.

It was a good opportunity for the urban extension of Nijmegen to be integrated in the project of room for the river. Before the project, it was the project Waal Jump (Waalstrong) that planned extension to the north across the river. The underpinnings of this extension include national policy (VINEX, the supplement to the fourth national policy on spatial planning), and considerations on compact city (to the north instead of other directions where urban sprawl has already to some degree happens).

The goal on ecology and hydrology were not very much mentioned, but it could because I more or less mentioned technical aspects are not the interest of my interviews. In the chance I asked clearly what about the ecology, it was said the ecology was also improved.

Actions:

1. Dikes moved backwards (more than 300 meters) at the bottle neck of the Waal, which results in about 35 centimetres of water level decrease.
2. New bridges, whose construction sped up because of the project room for the river.
3. New train station.
4. New housing projects.
5. New water front projects (8-year experiment field of self-organisation at the water front fabric of Honig).
6. New hotel at lent.

Consequences:

1. water level decreased
2. urban extension (with infrastructure network extended)
3. ecology improved (although not explicitly mentioned in the interview).

Institutions:

There is not a clear department division within the project team, but it was considered consisting of several themes/teams.

1. Spatial quality team, accessibility team, communication team, and schedule arrangement team.

2. Technical team, financial team and communication team.

There are people moving across those teams, which enhances communication within the organisation.

Proactive management

The master plan is modified based on communication and negotiation with the public. Some details such as the specific location of the bridge entrance are different from the original plan, but the general idea or overall picture of the master plan remains. Nowadays people are happy with the master plan and its implementation. There are nobody oppose this to the court.

The ship barrier reflects risk management. It is constructed for the flooding situation but it is hoped never be used.

The national government and the municipality cooperate. At the beginning the national government initiated a plan of canal system which was not liked by the municipality. Then the municipality made the master plan and worked with the national government. Finally it turned out into the project today.

Implementation

Largely as original planned. Some examples of changes include ships barrier at the entrance of the bypass channel and the enforcement of the new bridge. The ships barrier prevents ships sail into the bypass channel instead of the main water course in the case of high water level, because when the water level is high and the low dune dike at the entrance of the bypass channel is underwater. The enforcement of the new bridge was considered damage the scenery aspects of waterfront which is considered as part of the spatial quality.

Two main benchmarks of the implementation: 1. water level decrease and 2. financial and time schedule. The municipality only reports the water level decrease to the national government and ensure the project is implemented on time. Other responsibility like regional considerations is owned by the national government. For example, it is the responsibility of the national government to negotiate with the upstream cities if they want to initiate any.

Nobody opposes in the court so far. Some people are afraid of river dikes moving towards their houses, because of the possibility of water intrusion through under the dikes. The deep water wall is then constructed under the dike.

There will be an official closure of the project room for the river (anticipated at the end of 2015), but the waterfront and relevant space will be taken care by upcoming new projects, such as Riverpark Nijmegen (?).

Key notions mentioned: spatial quality, safety, urban extension, compact city (invoked by the interviewer), proactive management, master plan, participatory approach

A-2.2 Second interview

A-2.2.1 Background information

Interviewer: Dexter Du

Participant: Deepen D. Bruin (Mr. Bruin works in the information centre to share information and communicate with the public about the project.)

Time: 13:00 – 14:00, 7th July 2015

Place: Information Centre Room for the Waal Nijmegen (Waalkade 100, Nijmegen)

Note: The interview is semi-structured, for which some questions about specific aspects are elaborated and arranged before the interview, while the participant is free to choose his way of organising the story. Relevant information that surface outside our prepared questions is highly appreciated. Opinions and adjustment to the questions by the participant are also welcomed.

A-2.2.2 Main points of interest (for participant)

Main points of our interest are listed below. The list is sent to the participant before the interview.

The goals of the project *Room for the Waal Nijmegen*

The actions taken and spatial consequences

The relevant institutional arrangement, especially the part of communicating with the public

A-2.2.3 Interview guide (for interviewer)

The timetable, key questions and the aspects that are expected in the answers are listed below. Questions may be arranged differently depending on the answers of the participant in the interview (semi-structured).

Introduction (5 min)

Explain the interest (spatial planning)

Explain the goal of the interview: the participant's own perception and semi-structured interview

Inform interview procedure and timetable, and ask for agreement.

Consent issues (record, transcript and anonymity)

Questions

Clarification of the plans and goals (20 min)

1. What are the goals or expected consequences of the project, both short-term and long-term?

Flood prevention

Ecology restoration

Urban extension

Public space making

Attractive cities

Adaptability/adaptation/adaptivity (to climate change?) If mentioned (under this question or others), ask for a brief definition by the participant about what is adaptability, and try to identify key notions that can connect with the theory.

Actual actions and spatial consequences (10 min)

2. What spatial changes have been or will be done by the project?

The old and new dikes. What used to be located where the new dike is and what is new where the old dike was?

The bypass channel

The riverside pathways and public space

The new bridge and train station

The housing project across the river

3. What consequences have been seen after those spatial changes? (some may have been answered in question 1)

To the rivers and ecological system? Hydrology, creatures in water, sands and soil, riverbed, floodplain.

To the infrastructure network? New roads, bridges, ferries, parks, riverside pathways or houses?

To the city and urban development? Spatial quality, economic impulse, residents well-being or migrants attraction.

Do you see any connections among those changes (integrated goals/win-win situation)? Which of them are expected to be kept unchanged after achieved? Which of them are to stimulate other goal situations or new changes?

Institutional arrangement (10 min)

4. How do the project communicate with the public?

Are there any special institutional arrangement for the communication team of the project?

Implementation (5 min)

5. Will there be a closure of the projects?

What are the criteria of closing the projects?

What will be the management over the new places or constructions after the closure?

Ending (5 min)

Acknowledgement

Ask for other potential participants

A-2.2.4 Summary

Goals:

1. safety, lower the water level
2. make the city more beautiful (largely up to the municipality)

Actions and spatial consequences:

The project turns out a good opportunity for the city of Nijmegen. The historical value of the river and the old bridge are developed. The new bridge would not have been finished had the project not been implemented. Other things include new railway station, houses, parks, bikeways, island, nature museum.

Ecology: cleaner water and more fish.

Institutions:

There are a lot of stakeholders (government, companies, and individuals) involved in the project (complicated organisation, Dutch way of doing things). Every people can involve in the project as long as they convince the municipality that their plans are desirable and feasible (get the implementation permission).

The main role of the national government is to keep track on the financial and timetable issues.

Operations to make the city beautiful are up to the municipality of Nijmegen.

There have been regular meetings to communicate about the projects through the more than ten years of this project from the very beginning until now. There will still be this kind of meetings in the future.

Communication team of 3 main and about 20 part-time employees.

Implementation:

There are 2 cases of opposition in court, but it is considered optimistic compared to the many cases where people were happy with the project.

From Waal Jump (Waalsprong) to Room for the River to Nijmegen Embraces the Waal (Nijmegen omarmt de Waal), a continuing process of waterfront planning.

It will be a continuing process of negotiation about the potential riverfront space.

A-2.3 Third interview

A-2.3.1 Background information

Interviewer: Dexter Du

Interviewee: Hans Brower (Mr. Brower is one of the officials in Rijkswaterstaat (part of the Dutch ministry of infrastructure and environment) who generally organise the programme of *Room for the River*.)

Interview date: 14th July 2015

Period: one hour

Place: office (Griffioenlaan 2, Utrecht, NL).

Note: The interview is semi-structured, for which some questions about specific aspects are elaborated and arranged before the interview, while the participant is free to choose his way of organising the story. Relevant information that surface outside our prepared questions is highly appreciated. Opinions and adjustment to the questions by the participant are also welcomed.

A-2.3.2 Main points of interest (for participant)

Main points of our interest are listed below. The list is sent to the participant about a week before the interview.

The goals of the programme *Room for the River*

The connections between the policy and projects *Room for the River*

The actions taken and spatial consequences,

The relevant institutional arrangement.

A-2.3.3 Core interview questions (for interviewer)

The timetable, key questions and the aspects that are expected in the answers are listed below. Questions may be arranged differently depending on the answers of the participant in the interview (semi-structured).

Introduction (5 min)

Explain the interest (spatial planning)

Explain the goal of the interview: the participant's own perception and semi-structured interview

Inform interview procedure and timetable

Consent issues (record, transcript and anonymity)

Questions

Clarification of the plans and goals (15 min)

1. What are the goals of the programme *Room for the River*?

What is the core similarity of the many different projects included by the programme?

How to understand the goals at regional or national levels (programme) and at the local level (projects)?

Flood prevention, a safer delta region

Ecology restoration

Urban extension

Public space making

Attractive cities

Adaptability/adaptation/adaptivity (to climate change?) If mentioned (under this question or others), ask for a brief definition by the participant about what is adaptability or adaptation, and try to identify key notions that can connect with the theory.

Actual actions and spatial consequences (10 min)

2. What spatial changes have been done to the delta region?

What are the common principles among the different projects and actions?

The several approaches introduced in the policy, or new ones surfacing in local projects?

Communication between Rijkswaterstaat and municipalities?

Institutional arrangement (20 min)

3. What is the function of the policy? What is the role of the programme?

Is the policy a guidance/manuscript of approaches, rules of managing multiple projects, or a proposal of innovative ideas inviting concrete implementation?

How the programme can serve the realisation of the anticipated function of the policy?

How does the programme consider or manage the process that local projects may implement the policy differently?

Institutional arrangement

Communication, leadership and responsibilities

Reactive and proactive mechanism

Implementation (5 min)

4. What are the connections among the policy, the institution and the actual spatial changes? Are they well implemented so far?

Does the practice largely go along with the prospect envisioned ten years ago when the policy was written?

Do the anticipated spatial changes influenced by the actual process of implementation? Problems and new opportunities?

Ending (5 min)

Acknowledgement

Ask for other potential participants

A-2.3.4 Summary

The main goal and initiation of the programme *Room for the River* is to protect the Netherlands from discharge flooding, started because of the high water events in 1990s. One of the two main goals is increasing safety of the country, by decreasing the water level in the rivers. The safety level (assessed by certain international measure) should be maintained while climate change may cause the overall safety level decrease.

The approach taken is a paradigm shift from dike heightening to river widening. The traditional approach of dike heightening is gradually problematic because several reasons including land subsidence and water level increase.

During 2006 to 2007, the research on the national level studied about the possible locations for the implementation of the strategy room for the river, and narrowed the choices from more than 60 to 34 considering the effectiveness of decreasing the water level for the whole river system and feasibility of implementation.

Rijkswaterstaat works with regional steering committee, provincial and municipal governments for the implementation. Rijkswaterstaat works for the communication and knowledge exchange among the projects. It provides the network of knowledge and experts in case any project enquires.

Many local government consider the project as chances to improve the spatial quality of both the river and the place.

The responsibility of the national government is to firstly provide knowledge and expert network, secondly supervise in terms of timetable and financial issues, thirdly control limitedly about the approaches and fourthly watch the general main goal of safety.

Local municipalities make the detailed plan and the water boards implement. The water boards are not so used to the new approach but the communication and knowledge network helped for this adaptation.

During the programme management, it is believed that nothing is static. So the calculation of water level and adjustment of implementation happen all the time. The goal is to identify potential problems and issues as early as possible.

In Rijkswaterstaat, the programme team can roughly divided into three parts, the managers, the technical team and the spatial quality component. There are experts on various kinds of fields who act as consultancy when the national government and the local municipalities discuss detailed plans, so that the national government still has

some degree of knowledge about technical issues even though they admit and accept the fact that they know very limitedly about the specific local situations.

A-2.4 Fourth interview

A-2.4.1 Background information

Interviewer: Dexter Du

Interviewee: Govert Geldof (Dr. Geldof is a practical water manager who has contributed in many urban water management projects in the Netherlands. He researched about complexity during his PhD after which he has worked to put the theory into practice. His abundant experience in practical work and background of water management are specially interested.)

Interview date: 12:00 – 13:00, 15th July 2015

Place: office (Holprijp 2, Tzum, NL).

A-2.4.2 Main points of interest (for participant)

Main points of our interest are listed below. The list is sent to the participant about a week before the interview.

The advantages and difficulties of practicing complexity theory,
the particular uniqueness of complexity combined with water-related issues,
the relation between water management and spatial planning,
the integration of water, space, people and institutions.

A-2.4.3 Core interview questions (for interviewer)

Questions with Mr. Govert Geldof are more about understanding on the theory and thus not prepared as very specific ones.

1. How to understand scales when coping with complexity?

How do we transfer lessons learnt at the local level to the national level?

How to differentiate nonlinear behaviour from emergent patterns?

2. What are the uniqueness of water-related issues in complexity practice?

How to understand or treat the technical aspects or models in water issues and engineering respects of projects?

3. How to deal with time?

How to say the time for a kind of activity, like policy writing, plan making, public hearing, is enough already? Or we should work in parallel? To what extent things are in sequence?

A-2.4.4 Summary

Information of this interview can also be referenced in Geldof (2005).

A-2.5 Fifth interview

A-2.5.1 Background information

Interviewer: Dexter Du

Participant: Jan van Lanen (Mr. Jan van Lanen works previously chiefly as the hydraulic engineer and nowadays more as the contract manager, in the water board which is in charge of the both the projects *Room for the River Zwolle* and *Deventer*.)

Interview date: 10:00 – 11:20 a.m. 20th July 2015

Place: office (Dokter van Thienenweg 1, Zwolle, NL).

Note: The interview is semi-structured, for which some questions about specific aspects are elaborated and arranged before the interview, while the participant is free to choose his way of organising the story. Relevant information that surface outside our prepared questions is highly appreciated. Opinions and adjustment to the questions by the participant are also welcomed.

A-2.5.2 Main points of interest (for participant)

Main points of our interest are listed below. The list is sent to the participant about a week before the interview.

The goals of the projects *Room for the River Deventer* and *Room for the River Zwolle*

The actions taken and spatial consequences

The relevant institutional arrangement

The connections between the overall programme and the two projects

A-2.5.3 Interview guide (for interviewer)

The timetable, key questions and the aspects that are expected in the answers are listed below. Questions may be arranged differently depending on the answers of the participant in the interview (semi-structured).

Introduction (5 min)

Explain the interest (spatial planning)

Explain the goal of the interview: the participant's own perception and semi-structured interview

Special note: ask the participant's suggestions on how to address the possible different answers for the two projects under the same questions, and make an agreement about this.

Inform interview procedure and timetable, and ask for agreement.

Consent issues (record, transcript and anonymity)

Questions

Clarification of the plans and goals (25 min)

1. What are the goals or expected consequences of the projects, both short-term and long-term?

Flood prevention

Ecology restoration

Urban extension

Public space making

Attractive cities

Adaptability/adaptation/adaptivity (to climate change?) If mentioned (under this question or others), ask for a brief definition by the participant about what is adaptability or adaptation, and try to identify key notions that can connect with the theory.

Actual actions and spatial consequences (15 min)

2. What spatial changes have been or will be done by the projects?

The old and new dikes. What used to be located where the new dike is and what is new where the old dike was?

The bypass channel (Deventer)

The new bridges and ferries (Deventer)

The canal system in the floodplain (Zwolle)

The riverside pathways and public space

3. What consequences have been seen after those spatial changes? (some may have been answered in question 1)

To the rivers and ecological system? Hydrology, creatures in water, sands and soil, riverbed, floodplain.

To the infrastructure network? New roads, bridges, ferries, parks, riverside pathways or houses?

To the city and urban development? Spatial quality, historical value, economic impulse, residents well-being or migrants attraction.

Do you see any connections among those changes (integrated goals/win-win situation)? Which of them are expected to be kept unchanged after achieved? Which of them are to stimulate other goal situations or new changes?

Institutional arrangement (20 min)

4. How do the actors and managers promote these changes or consequences?

Are there any special institutional arrangement for these projects?

Are there new governmental or similar administrative or managing bodies initiated?

What are the advantages of these new institutional arrangement?

What are the reactive and proactive mechanism?

Who are involved and how? Is it sufficient engagement?

Implementation (10 min)

5. Are there any corporations with or considerations on other places in the region?

Upstream and downstream riverside towns and cities?

Surrounding cities with strong or new network connections?

Other projects under the programme of *Room for the River* or the overarching policy?

6. What difficulties and new options are confronted during the project?

Are the plan and prospects adjusted during the implementation?

7. Will there be a closure of the projects?

What are the criteria of closing the projects?

What will be the management over the new places or constructions after the closure?

Ending (5 min)

Acknowledgement

Ask for other potential participants

A-2.5.4 Summary

The two main goals of the projects are safety and spatial quality. Safety mainly refers to the decrease of the river water level which is calculated by the hydraulic model. Spatial quality is difficult to explain. The examples that reflect the increase of spatial quality of Deventer include a new riverside farm, a new recreational harbour, and the new ferry line. The case in Zwolle is slightly different. The new houses are the ones that are moved because the relocation of the dike. In one of the two sub-projects in Zwolle, even the dike is not moved. The work is mainly about re-shaping the landscape of the floodplain so that the water can flood there more easily and thus level decreased.

For the project in Deventer and one of the sub-project in Zwolle, dikes are not moved. The landscape of the existing floodplain is re-shaped so that water can more horizontally more easily. In the other sub-project in Zwolle, dike is moved and a few houses between the new and old dike are relocated. The project compensates for the cost of the infrastructure to re-connect the houses that are influenced.

Rijkswaterstaat selected the locations of the projects *Room for the River* at the beginning, which was based on the effectiveness of decreasing the water level of the whole river network and the feasibility of implementation at local places. The Deventer and Zwolle were chosen and then the province and municipality government made the land use plan that allowed the room for the river. Then the implementation was passed to the water board which took the work of realise the plan and the decrease of water level. In the case Deventer, Mr. Jan van Lanen and some of his colleagues used to work in the municipality government for making the plan and then were re-distributed to the water board to implement the plan.

During the implementation of the project, water board has to get permissions from local government or Rijkswaterstaat if they are originally responsible for the areas concerned.

The working team of the project can be roughly divided into four parts, the technical team including staff responsible for the hydraulic model and the spatial quality, the project management team responsible for the schedule and financial issues of the projects, the communication team responsible for communicating with the public, and the contract management team responsible for legal issues and consultancy about relevant laws.

There are meetings (about four or five times a year) where people from different projects of *Room for the River* can communicate and exchange knowledge and experience.

A-2.6 Sixth interview

A-2.6.1 Background information

Interviewer: Dexter Du

Participant: Gerrit Kuper (Mr. Gerrit Kuper is the project manager for both the project of room for the river at Zwolle and Deventer.)

Interview date: 13:30 – 14:30 20th August 2015

Place: office (Dokter van Thienenweg 1, Zwolle, NL).

Note: The interview is semi-structured, for which some questions about specific aspects are elaborated and arranged before the interview, while the participant is free to choose his way of organising the story. Relevant information that surface outside our prepared questions is highly appreciated. Opinions and adjustment to the questions by the participant are also welcomed.

A-2.6.2 Main points of interest (for participant)

Main points of our interest are listed below. The list is sent to the participant about a week before the interview.

The goals of the projects *Room for the River Deventer* and *Room for the River Zwolle*

The actions taken and spatial consequences

The relevant institutional arrangement

The connections between the overall programme and the two projects

A-2.6.3 Interview guide (for interviewer)

The timetable, key questions and the aspects that are expected in the answers are listed below. Questions may be arranged differently depending on the answers of the participant in the interview (semi-structured).

Introduction (5 min)

Explain the interest (spatial planning)

Explain the goal of the interview: the participant's own perception and semi-structured interview

Special note: ask the participant's suggestions on how to address the possible different answers for the two projects under the same questions, and make an agreement about this.

Inform interview procedure and timetable, and ask for agreement.

Consent issues (record, transcript and anonymity)

Questions

Clarification of the plans and goals (25 min)

1. What are the goals or expected consequences of the projects, both short-term and long-term?

Flood prevention

Ecology restoration

Urban extension

Public space making

Attractive cities

Adaptability/adaptation/adaptivity (to climate change?) If mentioned (under this question or others), ask for a brief definition by the participant about what is adaptability or adaptation, and try to identify key notions that can connect with the theory.

Actual actions and spatial consequences (15 min)

2. What spatial changes have been or will be done by the projects?

The old and new dikes. What used to be located where the new dike is and what is new where the old dike was?

The bypass channel (Deventer)

The new bridges and ferries (Deventer)

The canal system in the floodplain (Zwolle)

The riverside pathways and public space

3. What consequences have been seen after those spatial changes? (some may have been answered in question 1)

To the rivers and ecological system? Hydrology, creatures in water, sands and soil, riverbed, floodplain.

To the infrastructure network? New roads, bridges, ferries, parks, riverside pathways or houses?

To the city and urban development? Spatial quality, historical value, economic impulse, residents well-being or migrants attraction.

Do you see any connections among those changes (integrated goals/win-win situation)? Which of them are expected to be kept unchanged after achieved? Which of them are to stimulate other goal situations or new changes?

Institutional arrangement (20 min)

4. How do the actors and managers promote these changes or consequences?

Are there any special institutional arrangement for these projects?

Are there new governmental or similar administrative or managing bodies initiated?

What are the advantages of these new institutional arrangement?

What are the reactive and proactive mechanism?

Who are involved and how? Is it sufficient engagement?

Implementation (10 min)

5. Are there any corporations with or considerations on other places in the region?

Upstream and downstream riverside towns and cities?

Surrounding cities with strong or new network connections?

Other projects under the programme of *Room for the River* or the overarching policy?

6. What difficulties and new options are confronted during the project?

Are the plan and prospects adjusted during the implementation?

7. Will there be a closure of the projects?

What are the criteria of closing the projects?

What will be the management over the new places or constructions after the closure?

Ending (5 min)

Acknowledgement

Ask for other potential participants

A-2.6.4 Summary

The project of room for the river at Zwolle has two locations (sub-projects). One is Westenholtte, and the other is Schelle, which two are located along the river IJssel and at either side of the city of Zwolle. Speaking of the goal of the projects, they have to be embedded into the overall programme of room for the river, which will increase the discharge ability of the whole river basin (from 15,000 to 16,000 m³/s) so that the whole delta region and the river system will be safer. This overall viewpoint is communicated with the residents who are directly influenced by the projects to persuade them to participate.

For both the project of Westeholte and Schelle, bypass channels are made on the floodplain. For the project at Westenholtte, the existing dike is moved inland. Most of the land involved in the two projects are farmland, so the number of residents are limited. A few houses have to move. The projects help them to design and build new houses at the new locations which are still along the river and not far from their old houses. In one of the cases, a new community is created. The quality and view of the new houses are ensured by the financial aid of the projects.

The spatial quality, as the second chief of the projects, is mainly about nature at Zwolle. This is suitable for the local situation here. So far there are already more and more birds seen living in the newly created space. The two projects will be finished in less than two years, after which another programme of High Water Protection Plan will concern the river and riverfront area.

The original plan for the projects were co-made by Rijkswaterstaat, the province of Overijssel and the municipality of Zwolle, during which the water board of Groot Salland and many other concerned stakeholders were also involved. At this moment, the projects are at the implementation phase, which is chiefly operated by the coordination of the water board of Groot Salland and the contracted company. The team at the water board for these projects is a management team, consisting of an overall project manager, a communication manager, a contract manager, a technical manager and a legislation manager. Their work is to organise the implementation of the projects, which involved much work of communication and agreement.

During the planning and implementation of the projects, the water board acts as a mediation between the government (including Rijkswaterstaat, the province and municipality governments) and the instructor company.