PLANNING FOR THE FORCES OF NATURE

The performance of decision-supporting planning instruments in including natural hazard mitigation into the local planning process: the Water Assessment in the Netherlands and the Safety Element in California

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Preface

This thesis was written as part of the doctoral program in Environmental and Infrastructure Planning at the University of Groningen, the Netherlands. I have experienced this last phase of my study as a valuable period in which I have acquired knowledge of plan performance and natural hazard mitigation, and practical experience with planning research. Although writing this thesis was quite a lengthy process with many ups and downs, I have generally worked on it with great pleasure.

The main goal of this research is to determine how well certain planning instruments (the water paragraph in the Netherlands and the safety element in California) perform in including natural hazard mitigation into the local land use planning process, and what factors influence this performance. I was first introduced to natural hazard mitigation when I studied at the University of California at Irvine for one semester as part of the NEURUS Exchange Fellows Program. This thesis can be seen as a sequel to my NEURUS paper 'Natural hazard mitigation in Southern California', but now with a far greater emphasis on the planning process and the connection with land use planning, and more firmly based on planning theory. The international approach has given me the opportunity to study quite similar planning instruments in different settings, allowing for a better understanding of the importance of external factors that might influence a plan's performance.

I would like to thank my supervisors, dr. Jochem de Vries en dr. Johan Woltjer, for their ideas and comments that helped me make the best of this research. They have stimulated my interest in the research subject and repeatedly brought up additional literature to broaden my view. I would also like to thank all interviewees, both in the Netherlands and California, for their time and cooperation; their answers have helped me better understand the process of plan performance, and the dilemmas planners face in day-to-day planning practise. But most of all, I would like to thank my family and friends for their on-going support and constant confidence, with special thoughts to my grandfather who followed my study with such great interest but unfortunately did not live to see its completion.

With mixed feelings I am saying good-bye to my student days; it is time for the next -undoubtedly equally exciting- step!

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Abstract

Human society has always been threatened by natural disasters such as floods, earthquakes and hurricanes. In the Netherlands, the river floods of the mid-1990s caused a shift in water management policies. The Dutch government has since then launched several memorandums, policies and amendments that all seem to carry the same message: do not transfer risks to someone or somewhere else; try to accommodate water first before draining it off; and preferably use spatial measures instead of technical measures (Min. V&W 2001). In the United States, FEMA (the Federal Emergency Management Agency) is slowly but surely moving in the same direction. For example, hazard mitigation funds are now not only available for structural projects, but also for non-structural mitigation measures (Godschalk 2004, FEMA 2000). The state of California experiences high natural hazard risks; not only floods, but also earthquakes, landslides and wildfires are very common and have claimed numerous lives throughout history.

There are indications that structural mitigation programs often fail to provide sufficient protection from natural disasters (Weichselgartner & Obersteiner 2002), that the commitment of local planners to address natural hazards through non-structural mitigation is low (Berke et al. 1996), and that the effectiveness of state or national hazard planning mandates is far from ideal (Berke et al. 1996). At the same time, planning theory does not provide adequate guidelines to improve plan effectiveness, and although the variables that influence a plan's effectiveness are not fully known (Mastop & Needham 1997), further research on plan performance is scarce. Since natural hazards have the power to disrupt the lives of so many people, more research on the performance of non-structural mitigation plans can be valuable. The main question in this research is: *How well do the policies formulated by the Dutch and Californian governments perform in encouraging local governments to consider flood risk, or natural hazard risk in general, when drafting local land use plans?*

It is interesting to compare the Netherlands and California because both the Dutch government and the Californian government have adopted policies that aim to encourage or force local governments to consider natural hazard risks in their local land use plans. The planning instruments that are the focus of this research are the 'water assessment' in the Netherlands and the 'safety element' in California. These instruments have in common that they both aim to give natural hazards a place in the local planning process. They do not provide any strict rules on acceptable risks or desired safety standards, but they do form a framework that should guarantee a structured consideration of natural hazards in the local decision-making process. The final decision is up to the local planning departments, but they must consider all options and provide a description of the arguments that lead to this decision. This type of policies will be described as 'decision-supporting planning instruments'.

For as long as plans have been developed and implemented, planners and researchers have tried to evaluate the effectiveness of those plans. This 'quest for effectiveness' is endemic to planning and planning research, since if plans were found to be ineffective, the activity of planning would become redundant (Mastop & Needham 1997). Measuring and evaluating effectiveness, however, is quite difficult. One of the most-used approaches is to investigate the changes that have taken

place in the real world since the adoption of the plan, and determine to what extent those changes correspond with the plan: the degree of *conformance* between plan and reality. By using this approach for determining plan effectiveness, one consciously or unconsciously assumes that that is what a plan is supposed to do: to directly influence and guide changes in the material world corresponding to the plan statements. A plan of this type is often referred to as a 'project plan' or a 'blueprint plan' (Mastop & Faludi 1997, Needham, Zwanikken & Faludi 1997) to indicate the imperative character of such a plan. Strategic decision-oriented plans can be effective too, but in a very different way than a blueprint plan can. Since there is no detailed material object specified in a decision-oriented strategic plan, evaluating the material object in the sense of conformance is useless. This is where the concept of *performance* comes into view: a decision-oriented plan performs if it is used in day-to-day decision-making as a reference framework by those addressed in the plan. The concept of performance provides a possibility to evaluate the effectiveness of strategic, decision-oriented plans that cannot be properly evaluated using conformance. A well-reasoned deviation from a plan statement still has contributed to a consideration of plan interests in the decision-making process, since now the decision is at least taken on the basis of solid arguments. Therefore, this deviation does not mean failure, it just means that the plan statement was either not applicable in this case or not as important as other interests.

For this research, the local land use plans, including water paragraphs or safety elements, of three cities in the Netherlands and five cities in California were studied, as well as the local decision-making process. The performance of the water assessment and the safety element seems to vary considerably among cities. This study has revealed several internal factors influencing plan performance, and an external factor. The external factor (i.e. a city's ambition level) is probably the most important one. Factors influencing the performance of a decision-supporting plan instrument, such as the water assessment in the Netherlands and the safety element in California:

- Factors internal to the plan:
    - provide for regular consultation with experts on the subject, such as water boards or geological department,
    - obligation to elaborate on arguments that determined the final local land use plan,
    - convince the addressees of the plan of its importance and relevance, and
    - offer good-practise examples that can be used as inspiration to find creative solutions.
- Factors external to the plan:
    - the ambition level of the addressee of the plan

The importance of the external factor, a city's ambition level, corresponds to the findings of Bukkems (1989) and Verwijmeren (2001). Talen (1997) argued that there are no external factors known that can influence the degree of success of a plan. This research, together with those of Bukkems and Verwijmeren, suggests that a high ambition level of the addressees of the plan might in fact be one of those external success factors. In general, the findings of this research largely correspond with the criteria that influence performance as established by other researchers. The existing theories on plan performance proved to be useful and matching the reality of planning practise.

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1 Introduction

1.1 Natural hazard risk and the need for mitigation

Human society has always been threatened by natural disasters. Since the earliest times, people have feared the incredible forces of nature. In the last decades, the number of disasters seems to be infinite: One after the other flood, earthquake, hurricane or blizzard shakes up the world (Mitchell 1999). The costs of disaster relief are estimated at $54 billion per year worldwide, and it is likely that this number will increase dramatically over the next 50 years (Benson & Clay 2003, Freeman 2003, Burby 1998). Floods are by far the most common natural hazard worldwide. This is primarily caused by historical decisions to build cities at a strategic location, which often meant near a river. The advantages of living in close proximity to a river outweighed the risks of flood damage. Nowadays, cities accommodate an enormous capital in the form of houses, office buildings, infrastructure and other provisions so crucial for our modern society. Flood damages no longer stand up to the advantages of a close proximity to a river (TAW 1998). However, relocating cities is generally considered too costly and too complicated and is therefore not an option, meaning that the risks of flood damage are larger than ever. At the same time, climate change is likely to increase the number of weather-related events such as floods, thereby further increasing our vulnerability (Mitchell 1999).

Throughout history, the most common way to reduce flood damages was the construction of flood defense works. These are, however, extremely expensive, do not necessarily provide enough safety, and often only relocate the problem to another area that, in today's densely populated world, is very likely to experience great losses too (Burby 1998). During the last decades, the focus of flood hazard reduction shifted from the fore-mentioned structural measures to so-called non-structural approaches. These are characterized by an aspiration to accommodate water, even extremely large quantities of it, in our environment through better land use planning. Land use planning has the power to divert spatial development away from the most hazardous areas and/or to regulate the use of such areas, and can thus contribute to a less hazardous environment (Godschalk 2004). For other natural hazards, similar developments are noticeable. For example, earthquake damages can be reduced through building codes that aim to strengthen buildings so that they can withstand ground shaking. However, these measures are often very expensive, and over time we have come to realize more and more that sometimes the best option is to avoid the hazard by directing new developments away from the most hazardous areas. Overall, the focus in natural hazard mitigation is more and more on non-structural mitigation (Godschalk et al. 1999).

In the Netherlands, the river floods of the mid-1990s have caused a shift in water management policies. The Dutch government has since then launched several memorandums, policies and amendments that all seem to carry the same message: do not transfer risks to someone or somewhere else; try to accommodate water first before draining it off; and preferably use spatial

measures instead of technical measures (Min. V&W 2001). Flooding[1] is the only natural hazard that poses a real threat to the Dutch society.

In the United States, FEMA (the Federal Emergency Management Agency) is slowly but surely moving in the same direction. For example, hazard mitigation funds are now not only available for structural projects, but also for non-structural mitigation measures (Godschalk 2004, FEMA 2000). The state of California experiences high natural hazard risks; not only floods, but also earthquakes, landslides and wildfires are very common and have claimed numerous lives throughout history.

There are indications that structural mitigation programs often fail to provide sufficient protection from natural disasters (Weichselgartner & Obersteiner 2002), that the commitment of local planners to address natural hazards through non-structural mitigation is low (Berke et al. 1996), and that the effectiveness of state or national hazard planning mandates is far from ideal (Berke et al. 1996). At the same time, planning theory does not provide adequate guidelines to improve plan effectiveness, and although the variables that influence a plan's effectiveness are not fully known (Mastop & Needham 1997), further research on plan performance is scarce. Since natural hazards have the power to disrupt the lives of so many people, more research on the performance of non-structural mitigation plans can be valuable. Section 1.2 will further discuss the objective of this research.

It is important to realize that the term 'mitigation' might cause some misunderstanding. In Dutch planning literature, 'mitigation' usually refers to structural mitigation. Non-structural mitigation measures such as land use solutions are seen as a way to avoid mitigation, not a form of mitigation. In American planning literature non-structural measures do fall under mitigation. In this research, the American definition is used, reckoning non-structural measures under mitigation.

1.2 Research objective

This paper will examine the effectiveness of higher level government policies and its instruments that aim to mitigate natural hazard risk through land use planning at the local planning level. The concept of 'performance'[2] will be used to determine plan effectiveness. The actual outcomes of a policy form the bridge between theory and practice and therefore are an important study object in planning research. There are indications that this step from policy to outcome does not always pass off smoothly. With this research, the author would like to obtain a better understanding of this process, which might help to formulate more effective policies in the future. Two policy instruments, one in the Netherlands and one in California, will be studied. These instruments are quite similar both in purpose and procedure. By studying two instruments, the differences in planning instruments and planning setting can be compared to gain a more detailed picture of the process of plan performance. This can lead to a better understanding of the concept of plan performance, and might reveal lessons to be learned for future plan-making.

[1] Sometimes subsidence is also called a natural hazard. Parts of the Netherlands experience subsidence, but because it is not so much the subsidence itself that poses a threat here, but the relative rise of sea levels that it causes, it is counted under flood risk in this paper.

[2] The Dutch concept of 'doorwerking' used in this research has no direct English equivalent or translation. In international planning literature usually the term 'performance' is used (Mastop & Faludi 1997).

The main question in this research is:
How well do the policies formulated by the Dutch and the Californian governments perform in encouraging local governments to consider flood risk, or natural hazard risk in general, when drafting local land use plans?

Both the Netherlands and California experience a high natural hazard threat. It is interesting to compare the Netherlands and California because both the Dutch government and the Californian government have adopted policies that aim to encourage or force local governments to consider flood risk (in the Netherlands) or natural hazard risk (In California) in their local land use plans. The planning instruments that will be the focus of this research are the '*Watertoets*' in the Netherlands and the '*Safety Element*' in California. The '*Watertoets*' (literally: water assessment) is a tool that aims to include water interests in plan making at various government levels. It is not specifically designed for local plans, but has been obligatory in local land use plans for several years. The main local land use and zoning plan of a municipality, the '*Bestemmingsplan*' (literally: allocation plan), must be assessed on water quantity and water quality aspects. The advice of the water manager and the way in which the municipality deals with this advice must be included in the local land use plan. The safety element is a tool that aims to encourage municipalities to consider natural hazard mitigation in their local plan making. Every city and county in California must include this element in its general plan. The general plan is a city's or county's main spatial plan. It does not only include land use, but also among others traffic circulation, housing, and environmental quality. The municipality must determine which natural hazards it is threatened by and how these threats can be mitigated. This information then forms the safety element of the general plan. Both tools will be further discussed in upcoming chapters. The water assessment and the safety element have in common that they both aim to give natural threats a place in the local land use planning process. They do not provide any strict rules on acceptable risks or desired safety standards, but they form a framework that should guarantee a structured consideration of natural hazards in the local decision making process. The final decision is up to the local planning department, but they must consider all options and in case of a non-optimal choice in risk mitigation they must provide a detailed description of the arguments that lead to this decision. These types of policies will be described in this research as ***'decision-supporting planning instruments'***: they are instruments a city has to implement in the decision-making process, and their goal is to encourage cities to consider certain issues in the land use planning process.

Since the water assessment and the safety element share most basic principles but differ on some aspects, it will be possible to compare these methods and to reveal their respective advantages and disadvantages. The objective is to formulate the disadvantages of both methods as recommendations on how the effectiveness of the policies could be improved. One should realize that the goal is to compare the performance of two planning instruments that are remarkably similar in their use and procedures. We are not comparing flood risk mitigation with earthquake risk mitigation; that would be illogical and also impossible. This means that the technological contents of the instruments are not discussed since the local circumstances are far too different to compare. The research focuses purely on the decision making process in which natural hazards are given a place in local planning.

1.3 Research questions

In order to be able to answer the question stated in the previous section, several secondary research questions require answering. These questions are stated below together with a brief explanation of the method that will be used to answer the question.

1. *Which viewpoints on the relationship between natural hazards and land use planning exist in the natural hazard mitigation policy field?*

Throughout history, the way in which mankind handles natural hazards has changed considerably. It was only recently that hazard mitigation became an integral part of land use planning. More or less parallel to this development was the rise of the concept of 'sustainability' which dramatically changed our view on the interaction between the natural environment and the human, or built, environment. In natural hazard planning the notion of sustainability has led to a concept of 'sustainable communities' or 'hazard-resilient communities'. Both processes have strongly influenced recent policies on natural hazard mitigation and have caused the previously different mitigation approaches in the Netherlands and California to converge. In order to fully understand the latest developments in flood risk mitigation it is necessary to understand these processes. A literature study into natural hazard mitigation will be carried out to examine the above mentioned developments and the way in which they have played a role in the present policies that are the focus of this research.

2. *What is performance of land use policies and how can it be determined?*

Natural hazard mitigation through land use planning is a complex process. Disaster prevention is only one of many goals in land use planning and all those different interests are likely to be opposed to one another in certain situations. The concept of performance provides a framework to evaluate the effectiveness of plans and policies in a field of complex and opposing interests. It is therefore important to obtain an understanding of the performance concept; to find out which aspects influence the performance of policies and plans; and how the level of performance can be measured or determined. This will be done by means of a literature study of planning theory. The aspects found to influence performance can later be compared with statements of concerning plans and policies. The way in which performance can be determined will later be used in the evaluation of natural hazard mitigation in local planning practice.

3. *Which laws, policies and regulations (i.e. the policy framework) influence local land use decisions concerning flood risk management in the Netherlands?*

In order to be able to determine the performance of the water assessment as a tool for integrating flood risk management into local land use planning, it is necessary to obtain an understanding of the policy framework that is connected to the water assessment and the water paragraph in the local land use plan. Their goals and objectives, procedures, and implementation tools must be examined. This will be done through a study of the government documents in question, as well as literature concerning these policies. The outcomes can then be compared with the outcomes of the second question to answer yet another question: *To what extent do these policies correspond with the findings of question 2 regarding plan factors that influence performance?*

4. *How well does the policy framework (from question 3) perform in local land use planning in the Netherlands?*

To answer this question, employees of municipal planning departments and water boards are interviewed in order to unravel the priorities and arguments used in the decision making process. Their experiences with the water assessment and their personal opinions on the effectiveness and usefulness of this tool can shed a light on the performance of the water assessment. Furthermore, local land use plans with a water paragraph are studied with the outcomes of the second research question in mind.

5. *Which laws, policies and regulations (i.e. the policy framework) influence local land use decisions concerning natural hazard risk management in California?*

This question is similar to the third question, only now situated in California. A study of government documents and literature concerning the safety element will provide an answer to this question. Subsequently, the outcomes can be compared with the outcomes of the second question to answer the question: *To what extent do these policies correspond with the findings of question 2 regarding plan factors that influence performance?*

6. *How well does the policy framework (from question 5) perform in local land use planning in California?*

As with question 4, land use plans and the safety elements therein are studied with the outcomes of the second question in mind to answer this question. Local planners are interviewed in order to better understand the local decision making process.

Finally, it will be possible to answer the main research question, as well as to formulate recommendations that might improve the effectiveness of planning instruments such as the water assessment and the safety element.

Figure 1.1 shows a schematic representation of the research. The bracketed numbers indicate the respective chapters in which that aspect of the research is covered. Chapter 2 will explore our relationship with the natural environment and the perceptions that influenced the policies that are the focus of this research. Subsequently, the effectiveness of policies will be discussed from a planning theoretical viewpoint in chapter three. 'Performance' theory will be used to define the conceptual framework of this research. The following four chapters investigate the policies in the Netherlands and California with regard to flood or natural hazard mitigation through local land use planning and their implementation in local planning practice. The final chapter will combine the information from the foregoing chapters to reach a conclusion and provide recommendations for policy makers in both countries.

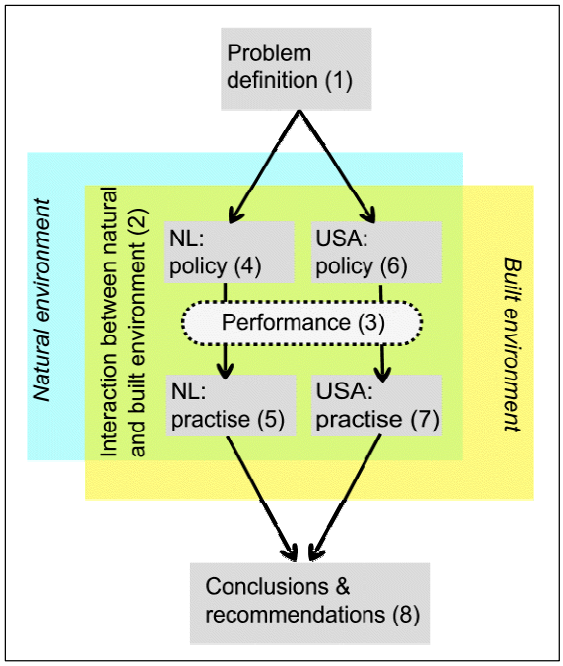

Figure 1.1: Schematic representation of the research

1.4 Research method

The main methods used in this research are a literature study, a study of local planning documents, and interviews with local planners. In order to obtain a better understanding of the whole decision making process, only a few municipalities are studied in depth, rather than a large sample of globally examined cities. Swanborn (2003) makes clear that this type of intensive research is ideal in situations where the researcher is interested in the explanation of a process rather than the testing of a concrete hypothesis, and where the opinions and perceptions by the research objects (in this case: the decision makers in the local planning process) provide an important inside view that might contribute to answering the research question (Swanborn 2003,

p. 22). The performance of the Water Assessment and the Safety Element will be described as a process, in a qualitative way. A quantitative analysis of a concept like performance is difficult (if not impossible) because there is a lack of clarity over its precise definition, and very little knowledge of the exact variables it is determined by. Therefore, this study will not attempt to express 'plan performance' in a number. This corresponds with the use of in depth case studies (Swanborn 2003).

Five different data sources are used in this research:

- literature on natural hazard mitigation, in particular non-structural mitigation,
- theoretical planning literature on performance as a mechanism in the planning process,
- literature on planning studies regarding plan performance in planning practice,
- plans and documents from the planning process of municipalities in the Netherlands and California that include or concern a Water Assessment or a Safety Element, and
- local planners and employees of other authorities concerned with the Water Assessment or Safety Element. The contact with local planners and other authorities can take place in person, or over telephone or email conversations, with regard to practical obstacles such as physical distance.

The research will take the form of an ex-post evaluation, but can from the perspective of the policy transfer concept take the place of an ex-ante evaluation for future policy makers. Policy transfer can be described as "a form of decision making by analogy, using another entity's experience as a source of ideas and evidence" (Mossberger & Wolman 2003, p 428). Dolowitz and Marsh (1996) explain how studying familiar problems in an unfamiliar setting can inspire policy makers to come up with new solutions. In this respect it must be said, though, that differences in the planning context as well as the physical context can create very different outcomes of similar policies (Mossberger & Wolman 2003). This must also be taken into account when drawing conclusions in this research: one can never be sure that an achievement can be solely attributed to the policy itself. Often, the total policy context, the physical situation, historical decisions, the ambitions of the municipality, as well as the knowledge among its employees can also play a role in the success or failure of a certain policy.

2 Merging strategies in natural hazard mitigation

2.1 Introduction

Flood risk mitigation strategies in the Netherlands and in California have long been very different. In the Netherlands, flood risk mitigation is considered to be a part of water management. In California, flood risk mitigation is part of an integral approach to hazard mitigation. In the 1990s, both states were struck by severe floods. These events triggered a new approach in the Netherlands as well as California, based on the same principles. This now gives us the opportunity to study the implementation of this new strategy comparing both states. This chapter will introduce the concepts that underlie the old and the new mitigation approaches. Firstly, many terms and concepts related to floods and other natural hazards will be defined in section 2.2. They will be used throughout the rest of this study. Subsequently the basics of the most used mitigation measures are explained in section 2.3. Section 2.4 will focus on sustainability and concepts derived from it such as sustainable communities and hazard-resilient communities. These concepts shaped the new mitigation approaches in the Netherlands and California and have made their previously different approaches to merge. In section 2.5 the implications of the fore-mentioned changes for land use planning will be discussed.

2.2 Hazard mitigation: terms and definitions

This section will provide definitions and explanations of terms related to natural hazards and their mitigation. It is important to realize that there are many ways of defining these terms. Weichselgartner (2001) for example gives 24 different definitions of 'vulnerability'. This indicates that one standard definition that is widely agreed upon is often not available. In this research, the terms are defined by comprising the different ideas that exist in hazard mitigation literature.

A *disaster* is an emergency event that causes widespread losses in any possible way and is both uncommon and extreme (Cutter 2005, Briechle 1999). The consequences of a disaster can be (Palm & Carrol 1998):

- injuries and casualties,
- loss of or damage to property,
- shortages of food and water,
- social disruption,
- reduction in economic activity,
- disruption of utilities and infrastructure, and
- damage to crops and livestock.

It is important to note that an event is only considered a disaster if there is a large effect on humans and/or human society and/or the economy. An earthquake in a completely uninhabited area is therefore not a disaster but merely an event. This notion holds that a disaster is always the result of the interactions between humans and the natural environment, and that our vulnerability to disasters increases with an unsustainable use of the natural environment (Cutter 2005).

A *hazard* can be described as the threat of a disaster that might happen. There are two types of hazards: natural hazards and man-made hazards. *Natural hazards* include all hazards that are caused by natural forces. A further distinction can be made between geologic hazards, atmospheric hazards, and biologic hazards. *Geologic hazards* include all hazards caused by tectonic activity such as earthquakes, and those caused by soil instability, for example land slides. *Atmospheric hazards* include drought, floods[1], storms and all other natural events caused by severe weather circumstances. Sometimes a disaster is caused by a concurrence of several hazards. A mudslide, for example, is often caused by a combination of soil instability and heavy rainfall. It is then usually classified by the hazard that contributes most to the occurrence of the disaster at that particular moment. The fore-mentioned mudslide would therefore be called an atmospheric event because it is the rainfall that triggers the event of the mudslide. *Biologic hazards* include all hazards that are caused by viral, bacterial, parasitic and fungal diseases such as epidemics of cholera or AIDS (Mitchell 1999).

New technologies might sometimes help us in our struggle for a safer world; modern technology can however add new hazards in itself: *man-made hazards*. These new hazards include among others radioactivity from nuclear plants, a wide range of pollutants and hazardous substances, industrial accidents and terrorism. A distinction that can be made between the mitigation of natural hazards and that of man-made hazards is that mitigation of man-made hazards generally focuses on the source of the hazard. For example, one would set boundaries to the amount of hazardous substances that a factory may emit. For natural hazards, mitigation usually cannot focus on the source because our technology cannot alter these natural situations. Therefore, mitigation measures for natural hazards aim at reducing the consequences of hazard events by making the receivers (people, buildings) less susceptible to the hazard. A commonly used measure is for example the implementation of building codes that have evolved in many states to reduce the consequences of earthquakes, hurricanes and/or floods.

The most important natural hazards in the United States of America are earthquakes, floods, hurricanes, wildfires and drought. In the Netherlands, flood risk and subsidence (which subsequently increases flood risk) are the only prevailing natural hazards. Occasionally, a light earthquake or storm hits the Netherlands, but these have never had consequences comparable to those of a disaster. Flooding, however, does have that capacity.

Of old, natural disasters were perceived as acts of God or as mystical forces. In more recent times, the notion that they were merely part of nature flourished. During the last decades, scholars realized that these disasters were caused by incorrect human decisions on where to live, where to built en how to interact with the environment (Weichselgartner 2001, Mitchell 1999, Davis 1998, Beatley & Berke 1992, McEntire 2004, Palm & Carroll 1998). This change in perceptions meant that from now on natural disasters were the field of study not only of geophysicists, but also of social scientists, including planners. Land use planning has the power to divert spatial development away from the most hazardous areas and/or to regulate the use of such areas, and can thus contribute to a less hazardous environment. The view that natural hazards are caused by an incorrect adaptation of human life to the natural environment has diminished the line between natural and man-made hazards. Flooding, for example, is often caused by our decision to live on a floodplain or to straighten rivers (and thereby reduce their capacity). This view has also cleared the road for sustainability approaches to natural hazard mitigation since it is this friction between human society and the natural environment that is the key issue of the sustainability concept.

[1] Note that the English term 'flood', or 'flooding', refers to the Dutch concepts of 'overstroming' and 'wateroverlast'. When 'flood' or 'flooding' is mentioned in this research, it refers to both concepts.

Mitigation is only one of four disaster related activities. The term *hazard planning* refers to an integral approach of all four stages of dealing with disaster risks (Quarantelli 2003). These stages are: mitigation, preparedness, response and recovery. *Mitigation* refers to sustained action taken to reduce or eliminate long-term disaster risk, carried out well before the disaster event, for example building codes and zoning regulations designed to make property less susceptible to the hazard (Godschalk et al. 1999, Quarantelli 2003, Orians & Bolton 1992, FEMA 1997). All short-term activities undertaken following a disaster warning, such as temporary property protection and evacuation, contribute to disaster *preparedness*. When a disaster event occurs, the *response* stage begins. It consists of temporary emergency services such as search-and-rescue operations, temporary shelters and food provisions. *Recovery* can then be defined as all activities undertaken to restore normal life after a disaster, such as the rebuilding of damaged property and infrastructure (Godschalk et al. 1999, Quarantelli 2003). This paper focuses on the first step in the hazard planning process: the planning and implementation of mitigation measures.

As seen above, mitigation can be described as all activities that reduce the risks of natural disasters. But what exactly is this risk? In order to answer that question it is necessary to firstly cover two other terms: vulnerability and exposure. *Exposure* is defined by the amount of people and their property that are exposed to the hazard (Mitchell 1999). A person's or a group's *vulnerability* depends on its characteristics: vulnerability is inversely proportional to the capacity of the people that are exposed to the disaster to resist it and recover from it (Wisner 2003). Risk can now be defined as a function of the characteristics of the hazard H (frequency, magnitude), the vulnerability of the receivers V, exposure E, and mitigation M (Wisner 2003, Mitchell 1999):

$$R = f\left((H \cdot V \cdot E) - M(H) - M(V) - M(E)\right)$$

For natural hazards, mitigation primarily aims to reduce vulnerability, M(V), (for example: build stronger houses) or exposure, M(E), (for example: build in a safer area). Reducing the hazard itself, M(H), is usually not possible in natural hazard mitigation. One can, for example, not alter the frequency or magnitude of an earthquake or storm. Mitigation of natural hazards therefore focuses on limiting human exposure and vulnerability. Concerning man-made hazards, M(H) often is possible, for example by making a chemical factory safer.

Before one can start mitigating a hazard, it is extremely important to gain a thorough understanding of the risk itself (Godschalk et al. 1999, Olshansky 2001, Orians & Bolton 1992, Cutter 2005). In a *risk assessment*, the risks of a possible event are examined and defined as clearly as possible. Examples of questions that are answered in a risk assessment are (Cutter 2005):

- What is the likelihood of the event taking place?
- What are the magnitude, frequency and duration of the event?
- Where might the event take place?
- How many people and buildings will be exposed?
- What is the vulnerability of people and places to the hazard?
- What are the potential human consequences of the event?

The first three questions relate to the hazard event H itself. The other questions focus on human interference with the event[1]. The third question, "Where might the event take place?", usually results in one or more *hazard maps* that provide a graphical classification of the area into different hazard zones that experience a certain risk.

[1] Cutter (2005) distinguishes risk assessment (which focuses on the natural hazard) from hazard analysis (which focuses on vulnerability, exposure and mitigation). Because this classification does not correspond with the definition of risk and hazard used in this paper both procedures are gathered under risk assessment.

2.3 Structural mitigation versus non-structural mitigation

Many different tools can be used to mitigate the risks natural hazards. They can be divided into land use regulation tools, construction measures, awareness projects, hazard disclosure and financial impulses. The first two groups of tools are true mitigation measures, the last three are measures that aim to incite people to mitigate natural hazards. Construction measures are often referred to as structural mitigation, and land use regulation tools as non-structural mitigation (Godschalk et al. 1999).

Structural mitigation
Structural mitigation is the most used method of mitigation. It includes for example the construction of dams, dikes and seawalls that aim to reduce the probability of flooding. Storm water facilities can guide a contingent surplus of water to retention basins where it will not cause any damage, or at least not as much as it would if been left to flow freely. These constructions, and land improvements such as beach replenishments, restoration of sand dunes, brush clearing, erosion controls and slope stabilization, are effective in reducing flood, liquefaction, wildfire or other natural hazard damage, but can also be extremely expensive and require regular maintenance (FEMA 1997, Godschalk et al. 1999).

Another group of structural mitigation measures are building design codes. These aim to impose a basic construction standard that can withstand a possible flood, a hurricane, or an earthquake. Every type of hazard demands a specific type of building codes. Building elevations for example can protect against floods, storm shutters against heavy winds, and the bolting of buildings to their foundations against severe ground shaking in case of an earthquake (Beatley & Berke 1992). Nelson and French (2002) suggest that building codes are not an adequate measure against damage and may in fact achieve the exact opposite. Because building codes are designed to resist a disaster up to a certain magnitude, events exceeding that magnitude may cause a catastrophe. However, people often do not realize this and are given a false sense of security by complying with the building codes (Nelson & French 2002).

To ensure a safety standard for all buildings, all structures built before the implementation of the building design codes should be retrofitted if necessary. As with the building design codes themselves the contents of a retrofitting code depend on the hazard. Some retrofitting improvements are major construction activities, others are relatively easy and inexpensive (Beatley & Berke 1992). In general, hazard proofing a building is cheaper if done when constructing the building. Retrofitting an existing building is usually much more expensive. The most vulnerable buildings to floods, earthquakes and storms are un-reinforced masonry, and buildings with a weak first floor (for example multi-family homes with numerous garages on ground level). These two categories of buildings most often need expensive retrofitting (Cutcliffe 2000). The high costs of retrofitting can sometimes be problematic: since retrofitting usually involves considerable expenses for the owner, it is often decided that it is cheaper to demolish the building. If the owner decides to retrofit, rents often increase (Beatley & Berke 1992).

Non-structural mitigation
Opposed to structural mitigation, there is non-structural mitigation. This includes all land use regulations that aim to divert (certain types of) development away from the most hazardous areas (Berke 1994). Zoning is the most used tool because it is in itself inexpensive and effective (Burby et al. 1999). However, local governments are often reluctant to restrict development as they fear the financial consequences of such a decision. Research by Nelson & French (2002) provides evidence that local land use plans and zoning regulations are effective in mitigating natural hazard damage, but

that a higher level mandate is necessary to force local governments to do so. Godschalk et al. (1999) too recognize the advantages of high quality land-use plans and zoning regulations. The effectiveness of these non-structural measures combined with relatively low costs make them an ideal mitigation tool.

Sometimes local authorities will purchase high-risk land and reserve it for parklands and other low-risk uses. If necessary, existing structures will be demolished or relocated. This method of acquisition is a much-belauded mitigation tool among planning experts in the United States (Godschalk et al. 1999, Beatley & Berke 1992, Nelson & French 2002). However, the acquisition of all high-risk land is often too costly for a local government and in areas that are both high-risk and highly urbanized, avoidance of all hazardous locations is simply not a realistic option (Olshansky 2001).

Awareness projects

Natural hazard awareness projects aim to increase public knowledge on natural hazards that pose a threat to a community. It is believed that the provision of public information will encourage citizens to take individual actions to reduce their vulnerability (Olshansky 2001, Pearce 2003, Palm & Carroll 1998). Raising awareness is a rather new aspect of hazard mitigation since officials have long feared panic among citizens when disaster risks would be revealed to the public. However, both scientists and many authorities now agree that community members have the right to know what risks they are exposed to (Pearce 2003). By not only pointing out the risks, but also explaining possible actions community members can take to decrease their vulnerability, panic is avoided and both community participation in the mitigation process and the number of individual risk reduction actions are increased (Godschalk et al. 2003). According to Burby et al. (1999), community members that are educated in hazard risks through awareness projects are likely to use their knowledge to encourage local government to undertake mitigation actions.

Without hazard awareness projects, community members often do not realize the risks of natural hazards in their area. Quarantelli (2003) and Cutter (2005) point out that without personal experience, people usually do not think they are at risk. Experiencing a disaster is therefore the trigger that invokes hazard mitigation actions. With awareness programs, people who have never experienced a disaster will gain a better perception of the risks they are exposed to and are then more likely to undertake action to reduce their vulnerability, whether individually or through participation in the local hazard mitigation process. Sometimes people know that they are threatened by a natural hazard, but because the occurrence of hazard events is uncertain and many societal problems such as crime appear to be quite urgent on a short-term basis, they choose to focus their attention on the last category. Awareness programs can educate the public and help to balance short-term issues with long-term threats (Palm & Carroll 1998). Natural hazard awareness projects do not necessarily aim at community members. At all levels of government, these projects can increase the government officials' knowledge of hazards, and thereby the willingness to actively promote or implement hazard mitigation (Godschalk 1999). As with community members, government officials that have access to hazard information will make more informed decisions on hazard mitigation matters (Pearce 2003).

Hazard disclosure

Hazard disclosure is a concept that aims to inform potential buyers of property in a hazardous area about the risks that are involved with living at that location. The goal is not only to inform people but also to discourage them from settling in a high-risk area (Beatley & Berke 1992). The idea behind hazard disclosure is that if people are informed about the risks and fully understand them they will hopefully decide to search for a less hazardous location, thereby reducing growth in high-risk areas. If they would decide to settle at the hazardous location, it is their own responsibility to mitigate

hazards or to accept the potential losses that may occur in case of a hazard event. However, in most cases where natural hazard disclosure is used in practice, it is only used as an awareness tool without any responsibility consequences of settling in a hazardous area attached to it. Hazard disclosure leads to a more practical problem: in order to decide whether certain property lies in a hazard zone or not, reliable hazard maps on a parcel scale are necessary. These are often not available or of poor quality because creating hazard maps of good quality is costly and requires a high level of technical knowledge.

Financial impulses

Governments can use several types of financial impulses in order to direct development away from hazardous areas, or to compensate for expenditures made to mitigate hazards. Unfortunately the most used financial tool, disaster relief, only achieves the exact opposite. Disaster relief aims to compensate damages inflicted by natural disasters. This way, citizens can recover from a disaster and rebuilt their property. This may sound as a friendly gesture, but it has some negative side-effects. Disaster relief is usually sustained by a national government. Decisions on local natural hazard mitigation policies are made by local governments, who in most situations also bear the costs of these mitigation measures. Mitigation is expensive, and the knowledge that community members will be compensated for possible disaster losses often encourages local government not to mitigate the hazards and even to develop previously undeveloped hazardous lands. From the local government perspective, this is the most cost-effective decision, even though it includes exposing community members to high levels of risk. Therefore, disaster relief is often said to 'subsidize risk' (Burby et al. 1999, Godschalk 1999).

A more appropriate use of money as a way to discourage development in high-risk areas, local property taxes may be used. Berke (1994) identifies two possibilities: increasing taxes in high-risk areas to discourage development and to cover additional mitigation costs in case the area will be developed, or reducing taxes in hazardous areas if they are used for a low-risk land use, for example parklands. A combination of both is also possible. The increased tax revenues in high-risk areas can be used for hazard mitigation or reserved for recovery in case of a hazard event (Berke 1994, Freeman 2003). The emphasis should always be on rewarding citizens for following risk reducing strategies (Cutter 2005).

Sometimes, encouraging citizens to purchase earthquake insurance or flood insurance is promoted as a mitigation measure. Disaster insurance, however, faces the same problem as disaster relief: instead of truly mitigating disaster risks, people are encouraged to inhabit high-risk areas. On an individual and short-term basis disaster insurance may seem a good idea, but when seen from a long-term perspective it is evident that it does not solve the natural hazard problem (Burby et al. 1999, Godschalk 1999). With ever more people in hazardous areas and increasing numbers of weather related hazard events, the insurances are bound to become prohibitive during the next decades. Encouraging disaster insurance should therefore only be used as a secondary form of mitigation, the need for structural and/or non-structural mitigation measures does not disappear with the purchase of disaster insurance (Burby et al. 1999).

As said before, awareness projects, hazard disclosure, and financial impulses are no true mitigation methods, since in themselves they do not mitigate any hazard. They can only be used to encourage individuals, institutions or governments to use structural or non-structural mitigation measures. Particularly in the United States these mitigation incentives are often mistaken for mitigation measures, and governments often forget that the effectiveness of these methods relies on the individual responsibility and the financial capacity (mitigation is often expensive) of the addressee of the incentives (Godschalk 1999, FEMA 2000).

2.4 Sustainability and hazard mitigation

At the end of the 1970s, the consciousness arises that the way in which mankind deals with the earth and its natural resources cannot continue on a long-term basis. An often heard slogan from that period is 'think globally, act locally': focus on global impacts of your local actions. Slowly but surely, more countries are implementing policies to regulate for example the emission of pollutants. These efforts were not very well-coordinated, but that would change in 1987 (Mazmanian & Kraft 1999). In that year the world commission on environment and development published the report "Our common future". Many ideas on environmental problems that had existed for about a decade now but were still very profuse, were now gathered in what proved to be the first handbook on sustainability. For the first time in history a report on environmental problems had a truly global impact and marked the beginning of a new era in dealing with environmental problems. The report made absolutely clear that the world could not continue the way it had existed during the last decades. Energy should be obtained from renewable sources, food security should be a global issue, fostering existing ecosystems is necessary if we want the earth to be livable generations from now, et cetera (Brundtland 1987). The concept of 'sustainability', though not yet called sustainability, was born.

In the years that followed, many researchers tried to further define the term 'sustainability' and possible methods to implement the concept into day-to-day decision-making. There are many different ideas on sustainability and its implementation. Since sustainability is not the key issue in this study and will only help explain how the mitigation strategies of the Netherlands and California became so alike, it is only important to explain the basic principles of sustainability. Maser defines sustainability as "the act of one generation saving options by passing them to the next generation, which saves options by passing them to the next generation, and so on" (Maser 1997 p.XV). Mazmanian and Kraft define sustainability as "a condition in which social systems and natural systems thrive together indefinitely" (Mazmanian & Kraft 1999 p.45). This reveals the key point of sustainability: meeting the needs of present generations without compromising future generations in meeting their needs, a condition that can only be achieved if human well-being is secured within the regenerative capacity of the natural world (Mazmanian & Kraft 1999) . Maser (1997) points out that this will demand a shift from being self-centered to being others-centered. Key aspects of sustainability are:

- long-term and short-term needs must be satisfied,
- economical, societal and natural needs must be satisfied, and
- the earth must be viewed as a global system.

This focus on long term and short term needs, on economical, societal and natural needs, and on a global world makes the aspiration of sustainability commendable, but also very complicated. The use of 'sustainability' proved to be too ambitious to implement on a short-term basis. The concept is too complex, and too many relations between the human and the natural environment are uncertain, as well as the consequences for future generations worldwide. Since many researchers and policy-makers were enthusiastic about the sustainability concept and were looking for a way to make implementation in day-to-day life realistic, the concept of 'sustainable communities' arose. These communities share the basic principles of sustainability, but focus on a smaller scale: the community. Mazmanian & Kraft (1999, p.48) define sustainable communities as follows: "A sustainable community is one in which economic vitality, ecological integrity, civic democracy, and social well-being are linked in a complementary fashion, thereby fostering a high quality of life and a strong sense of reciprocal obligation among its members. […] Sustainable communities have levels of pollution, consumption, and population size that are in keeping with regional carrying capacity". This approach makes things easier compared to 'sustainability', since not the whole world has to be considered with every decision, yet on the other hand things become more difficult: the idea to 'not

compromise future generations' is now also applicable on other regions. That means that decisions taken in this region should not compromise other regions (Mazmanian & Kraft 1999). It is this concept that later received much attention in the Netherlands in the so-called "Water policy for the 21st century" (see chapter 4).

However, this still proved to be very ambitious. Prevailing methods are not altered easily, and integrating all aspects of community development into one sustainable concept or plan was not easy to achieve. This caused a change in use of the sustainability concept: no longer were all aspects of day-to-day life integrated into one concept, but many 'sectoral' sustainability approaches arose. There were now terms as 'sustainable housing', 'sustainable agriculture' etcetera, and every government department developed its own view on how to make its policies more sustainable. Hazard planning researchers and policy-makers adopted the creation of 'hazard-resilient communities'. Key point of this concept is the use of non-structural mitigation measures wherever and whenever possible. In water management, the natural water retaining capacity of the earth and the river basin became the primary focus (Disse & Engel 2001, Burby et al. 1999). This concept holds that the original river basin should be preserved (and where necessary restored) and that water management should not focus on draining water off as fast as possible, but on holding it in its original retention area. These developments in hazard planning and in water management led to the same approach regarding flood risk mitigation[1] since they share a basic principle: it is better to find a solution to a problem in the area or the process where the problem originates, than to deal with a problem locally without caring about the consequences for other areas. In flood risk mitigation, this meant the use of more non-structural mitigation measures, for two reasons. In the concept of sustainability, the natural world can never be 'wrong' since it is the basis for all life on earth. That implies that one should avoid altering natural systems, firstly because the problem is the adaptation of the human world to the natural world, and secondly because natural systems tend to be very complex and one can never truly foresee what the consequences of altering a natural system will be and those consequences might compromise future generations or other regions (Cutter 2005).

2.5 Natural hazard mitigation as a spatial planning issue

Because the perceptions in natural hazard planning in the United States of America and in water management in the Netherlands slowly began converging to a concept based on sustainability and resilience, their natural hazard mitigation policies now share many principles. Natural hazard mitigation in California and flood risk management in the Netherlands both have largely been integrated into the spatial planning process. From the discussion of mitigation measures in section 2.2, it can be concluded that planning can affect natural hazard risks. Some planning decisions may increase risks by increasingly allowing people to settle in hazardous areas, while other decisions decrease risks by diverting new developments away from hazard zones or by hazard-proofing the built environment. This section will approach natural hazard mitigation as a spatial planning issue.

Berke (1994) indicates that the prevalent planning approach influences the quality of hazard mitigation plans. The results of his research of many local mitigation plans and planning approaches show that for natural hazard mitigation the ideal planning system is one with full partnerships among different levels of government, local institutions, and private organizations. Pearce (2003), Reddy

[1] These developments in natural hazard mitigation are not always assigned to (concepts based on) sustainability. The influence of the sustainability concept on these policy changes is, however, obvious. Sustainability has slowly become a basic aspect of policy making in many policy topics, and is as such not mentioned every time it is applied.

(2000) and Cutter (2005) all argue that natural hazard mitigation planning should consist of a bottom-up approach, combined with ample attention for local interests and public participation. A comprehensive plan that includes natural hazard management and is realized with a public participation process has the highest probability of mitigating natural hazards in an effective way (Pearce 2003). The discussion of natural hazard mitigation issues should begin early in the planning process. A risk assessment should never be absent because it forms the basis of all mitigation measures. Extensive research of many natural hazard mitigation projects by FEMA (1997) provides evidence that mitigation is less expensive when considered early in the planning process. Once a decision has been made on, for example, the siting of certain land uses, adapting land in order to hazard-proof them if necessary can be costly, whilst consideration of the hazards in an earlier stage might have appointed a different land use to the area concerned.

Hazard mitigation plans and comprehensive plans are not always updated regularly. For hazard mitigation, updating of plans is usually triggered by a natural hazard event that affects the community concerned. As seen before, mitigation should be applied as early as possible and the same holds good for reviewing, monitoring, evaluating and updating hazard mitigation plans. The updating process should be precisely described and authorities should ensure the execution of this process (Godschalk et al. 2003). Brody (2003) in this context mentions adaptive management: planners should constantly react to changing conditions and new information. He measured the quality of natural hazard mitigation plans during several years and concluded that the quality of a plan indeed does increase over time if regularly adapted to new knowledge.

Pearce (2003), Godschalk et al. (2003) and Weichselgartner (2001) all show that natural hazard mitigation should be included as an element of a comprehensive plan instead of being a stand-alone mitigation plan. The main reason for this is the fact that natural hazard mitigation affects many other disciplines such as land use planning, building design and land improvement, and vice versa. To ensure an active consideration of hazard risks and mitigation possibilities by officials of all of those disciplines, mitigation should be included in regular planning practice. This will cause a spread of hazard knowledge and increase cooperation between different levels of government and/or local institutions. Goals of different disciplines can then be balanced on a joint basis (Godschalk et al. 2003). To ensure maximum cooperation by all actors, it is important to explain clearly how alternatives were balanced and why a certain solution was chosen.

It is important to remember that despite its specific characteristics, mitigation planning is still a type of planning. That means that for hazard mitigation plans, planners also need to observe some basic planning principles. Kaiser, Godschalk and Chapin (1995) name a strong factual basis, clearly defined goals and objectives, and appropriately directed policies as the basic characteristics of any good plan. These characteristics are also necessary in a good natural hazard mitigation plan. Continuing this line of thought and combining it with the information found in hazard planning literature, it is now possible to create a list of demands, concerning both plan contents and the planning process that encourage high quality natural hazard mitigation planning:

Demands regarding the planning process:

- Start thinking about natural hazard mitigation early in the planning process since mitigation tends to become more complicated and more expensive if it has to be molded around a decision made earlier.
- Include natural hazard mitigation in a comprehensive plan to ensure embedding in other disciplines that are strongly connected with mitigation, such as land use planning.
- Establish full partnerships among all levels and departments of government and other institutions involved.

- Monitor, evaluate and update the plans regularly so that the plan is always adapted to the latest knowledge and developments.

Demands regarding plan contents:

- Provide a strong factual basis by means of a thorough risk assessment and by providing clear hazard maps.
- Define the goals of the plan as clearly as possible and describe how different interests were balanced in defining the goals and specific policies.
- Develop strong natural hazard mitigation policies. It is important to realize that even though awareness projects, hazard disclosure, and financial incentives are important, they can by no means be a substitute for structural or non-structural mitigation measures. If possible, non-structural mitigation is preferred.

Within the scope of this research, the demands regarding the planning process are most important because the procedure of a planning policy has a large influence on its performance, as will be seen in the next chapter. In the chapters 4 and 6 it will be explained that the water assessment and the safety element instruments meet these criteria and therefore have the potential to lead to high quality mitigation planning. The demands regarding plan contents are more specific and compliance to these demands is largely up to individual municipalities, although the water assessment and safety element policies do aim to stimulate these through the planning process.

3 Performance of plans and policies

Performance /pe'fawmens/ **noun** **1** the act or an instance of performing
2 a presentation to an audience […]
3 the ability to perform or work […]
- The new Penguin English dictionary, 2000 -

3.1 Evaluating plans and policies: conformance versus performance

For as long as plans have been developed and implemented, planners and researchers have tried to evaluate the effectiveness of those plans. This 'quest for effectiveness', also described as the *effectiveness theorem of planning*, is endemic to planning and planning research, since if plans were found to be ineffective, the activity of planning would become redundant (Mastop & Needham 1997). Measuring and evaluating effectiveness, however, is quite difficult. One of the most-used approaches is to investigate the changes that have taken place in the real world since the adoption of the plan, and determine to what extent those changes correspond with the plan: the degree of *conformance* between plan and reality. By using this approach for determining plan effectiveness, one consciously or unconsciously assumes that that is what a plan is supposed to do: to directly influence and guide changes in the material world corresponding to the plan statements. This is graphically represented in figure 3.1. A plan of this type is often referred to as a 'project plan' or a 'blueprint plan' (Mastop & Faludi 1997, Needham, Zwanikken & Faludi 1997) to indicate the imperative character of such a plan.

Following this planning approach is not always possible. Often, there are too many uncertainties to pursue a certain fixed outcome of the plan implementation: the planning object (i.e. the real world) may change over time, there may be a large number of actors that influence decisions on the planning object, et cetera (Faludi 2000). Wildavsky has argued that this is inherent to planning. When planning is defined as blueprint-planning, as controlling the future, it is bound to fail simply because the future is uncertain and unknown (Talen 1997). As Talen (1997) puts it: "As the future cannot be controlled, [blueprint] planning is essentially an act of faith and is doomed to fail". This statement is quite strong and maybe somewhat exaggerated; it does not mean that the concept of planning has to be discarded completely but merely that another means of planning has to be found and pursued, for our notion of planning influences the manner in which we evaluate the effectiveness of plans (Coenen 1998).

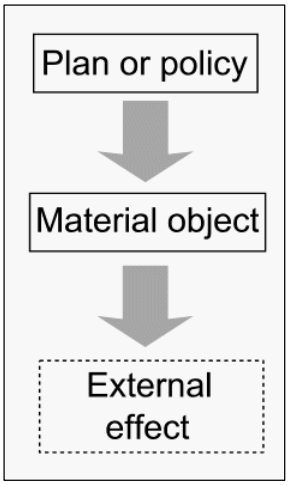

Figure 3.1: Blue-print planning (based on Faludi 2000)

As described by De Roo and Voogd (2004), there is a difference between operational plans and strategic plans. The concept of an operational plan largely corresponds to the concept of the blueprint plan. This type of plan may work after all, but only if it is aimed at a relatively short planning period of for example one or two years, and a relatively small planning area, for example one neighborhood. These plans are (often legally binding) guides to developments in the material world. This concept of an operational plan is opposed to the concept of a strategic plan: a plan that is intended to work on a

larger timeframe and a larger area (spatially and/or in terms of policy areas), is less specific, and/or often aims at a multitude of actors (De Roo & Voogd 2004).

A strategic plan as described above should be designed in a different manner than a blueprint plan. Since it is not possible to precisely guide developments in a situation that involves a large timeframe this should not be the goal of a strategic plan. A strategic plan should function as a reference framework in day-to-day decision-making, in order to help decision-makers balance interests. The final decision is unknown, but with a strategic plan one can try to ensure that certain interests are at least considered in the decision-making process. This does not mean that these decisions will always correspond exactly with the plan because there may be many opposing interests and another one can be judged as being more important. This explains why this planning approach is also referred to as decision-oriented planning, as opposed to blueprint planning. The goal is not to provide a blueprint of the future, but to help decision-makers make complicated decisions concerning future developments. Those decision-makers do not precisely follow a detailed plan, but are fully functioning autonomous actors (Mastop & Faludi 1993, Mastop & Faludi 1997, Mastop 1987, Faludi 2000). Figure 3.2 presents a graphical representation of the decision-oriented planning approach.

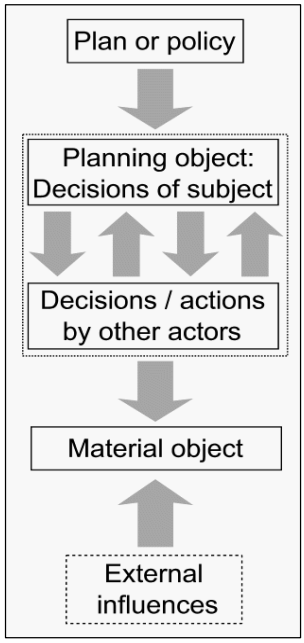

Figure 3.2: Decision-oriented planning (based on Faludi 2000)

Wildavsky was right about plans being doomed to fail, but only when it concerns strategic plans being handled as operational plans. An operational plan is considered to be effective if the material object is developed according to the plan. This type of effectiveness is referred to as 'conformance'. Strategic plans can be effective, but in a very different way than an operational plan can. Since there is no detailed material object specified in a decision-oriented strategic plan, evaluating the material object in the sense of conformance is useless. A decision-oriented plan can be effective in a very different way: it aims to provide an intelligence framework that leads to better decision-making. It is effective if the plan statements are considered by the addressees of the plan and form a functional part of decision-making processes (Coenen 1998).

This is where the concept of *performance* comes into view: a decision-oriented plan performs if it is used in day-to-day decision-making as a reference framework by those addressed in the plan. The concept of performance provides a possibility to evaluate the effectiveness of strategic, decision-oriented plans that cannot be properly evaluated using conformance. A well-reasoned deviation from a plan statement still has contributed to a consideration of plan interests in the decision-making process, since now the decision is at least taken on the basis of solid arguments. Therefore, this deviation does not mean failure, it just means that the plan statement was either not applicable in this case or not as important as other interests. This means that although there is no conformance between plan and decision in this situation, the plan does in fact perform well (Mastop & Faludi 1993, Needham, Zwanikken & Faludi 1997, Mastop & Needham 1997). The ultimate goal of decision-oriented plans is communicative in character: they form a reference framework in the decision-making process; that means that a plan or policy 'performs' if it is used as a reference in decision-making along the planning chain. It is not enough to simply 'use' the underlying policies, they must be actively used as a reference framework and be considered in decisions, whatever the final decision is.

Based on Iedema en Janssens (1993), three criteria can be derived that justify the use of performance as an evaluation criterion instead of the more often used conformance.
These are as follows:

- The plan or policy has a strategic character.
- The plan or policy has a long term of execution (longer than the average operational plan).
- The administrative context is complex and the addressee has a certain freedom to decide when balancing the interests of the plan or policy with other interests.

Flood and/or natural hazard risk mitigation policies in the Netherlands and in California meet these requirements:

- They are strategic in nature: they propose a strategy rather than a blueprint.
- They propose long-term strategies rather than short-term implementations or solutions.
- They acknowledge the fact that flood risk mitigation is only one of many concerns of local policy makers and aim to provide a framework that might support decision-making.

This means that these policies will be evaluated in the light of performance, not conformance.

There is something quite remarkable about these Dutch and Californian policies. Usually, a strategic decision-oriented policy will rely on its own power to communicate its message and the ability of decision-makers to acknowledge the appropriateness and usefulness of the policy in their decision-making process. Both governments, however, have chosen a rather unique approach[1]: the policies in itself are purely strategic and indicative, but attached to the policy is an instrument that forces local government to actively use the policy: local governments are to include a section in their local land use plans in which they explicitly communicate in what way they included natural hazard concerns in their land use plan. There are specific requirements that this section has to meet (these strict demands and the enforcement of instruments usually are a feature of operational planning), but local governments are still free to make their own decisions on land use planning and natural hazard mitigation. These instruments can therefore be described as ***decision-supporting planning instruments***: instruments that guide local governments in the decision-making process (more on these policies and instruments in the upcoming chapters).

It is very interesting to find out exactly how these policies, and the attached instruments, perform. One might expect that the performance of these policies is quite good, since local governments are forced to consider them and formulate sound argumentations on their decisions. The opposite might also be true: the instrument guidelines only offer an indication for considerations. Local governments might focus too much on these instruments and forget that these instruments are only intended to help use the underlying policies. Focusing purely on the instruments might therefore lead to too narrow a view on the intentions and goals of the policies.

The objective of this research is to analyze the performance of the plans and instruments, and identify factors that either encourage or constrain a proper performance of the plan. Since there are certain differences in the policies, the instruments and the administrative planning context, it is possible to evaluate the influence of these aspects. It will then become possible to formulate learning aspects for the governments concerned as well as for plan-makers considering a similar policy/instrument approach.

Note that although this research might suggest some factors that affect plan performance, one can never be sure that these suggestions are actually true without performing a with-without analysis

[1] The only similar policy/instrument combination known by the author is the use of environmental impact assessments in land use planning processes

because otherwise it is not sure that the efforts found were only caused by the existence and use of the plan (Mastop & Faludi 1997). Performing a with-without analysis, however, is virtually impossible: one would have to find two planning situations that are exactly identical except for that one aspect: the presence or absence of the plan. In practice, planning projects always differ on more aspects: planning context, geographical context, and financial situation are never identical. The only way to further investigate suggestions that might come from this research would be in a policy game situation. This notion, however, holds good for many policy topics and does not have to constrain anyone from doing research: as long as one is aware of this problem and formulates his/her findings accordingly these can still be valuable. Since 'absolute truth' is unobtainable in many social sciences, a 'feasible truth' can be obtained when multiple researches all point in the same direction.

Research on plan performance, unfortunately, is scarce, and mostly carried out by a rather small group of Dutch planning researchers (Mastop & Needham 1997). Internationally only about half a dozen researches on plan performance can be found. In 1997, a theme issue of 'Environment and planning B: Planning and Design' provided an overview of prominent performance studies. This issue speaks of a *theory of performance*, but on further consideration it appears that this theory is as yet not nearly fully developed (Needham, Zwanikken & Faludi 1997, Mastop & Needham 1997). It merely defines 'performance' as something different than 'conformance'. The factors that determine or influence plan performance are largely unknown, and regarding research methods to determine or measure the degree of performance, the authors provide only a few vague and often contradictory indications (this in contrast to the large amount of literature available on determining conformance of operational plans using ex-post evaluation methods).

Mastop and Needham (1997, p.882) offer four possible solutions to deal with the fact that so much is unknown when it comes to plan performance:

- an empirical approach: conducting more research on how policy works in practice,
- a theoretical approach: scrutinizing theories and developing better ones,
- a methodological approach: make better plans, and
- a pragmatic solution: stop bothering about it.

This research will use the first method, empirical research, to obtain a better understanding of policy implementation and performance. The absence of large amounts of previous performance research means that it will not be possible to follow a generally accepted strategy since such a strategy does not yet exist. The strategy used in this research will be largely based on the existing knowledge and assumptions regarding plan performance and the few performance studies carried out in the past. In the next section, known factors that influence plan performance will be discussed. Then, the method used in this research will be explained. It is important to keep in mind that purely 'measuring' the degree of performance in itself is not very interesting; what is more meaningful is to establish which factors determine that degree of performance (in general or specifically for a certain case study) since that information might reveal how the performance of plans can be improved (again: in general or for a certain case study). That is exactly what this research tries to do: investigate how national or state natural hazard mitigation policies perform in the local decision-making process, what factors are responsible for that performance, and what the strong and weak elements of the policies are, so that they can be compared and lessons can be learned on what to do and what not to do. Furthermore, the results of this study can be compared to other studies on plan performance, and we can find out if the performance as found in the case studies matches the knowledge and assumptions on performance in existing planning theory.

3.2 Factors determining performance

Talen (1997) has made an inventory of research that has been conducted to explain the success or failure of plans and policies. She analyzed factors that have been found to influence the degree of success of a plan and distinguishes into factors that are internal to the planning process and external. Her findings are presented in figure 3.3. It is remarkable that multiple external failure factors are known, but no success factors. The most important point in the light of this research is the fact that a 'strategic focus' (by which a decision-oriented planning approach is meant) is one of the success factors for planning. This implies that governments that recognize this function of planning will be more successful and their plans will be more effective than governments that stick to the notion of a plan as a blueprint. Both the Californian and the Dutch governments have applied this in their flood or natural hazard mitigation policies. Talen's research suggests that this is already one step on the way to successful plans. This does, however, not mean that applying a decision-oriented approach will in itself be enough to guarantee success.

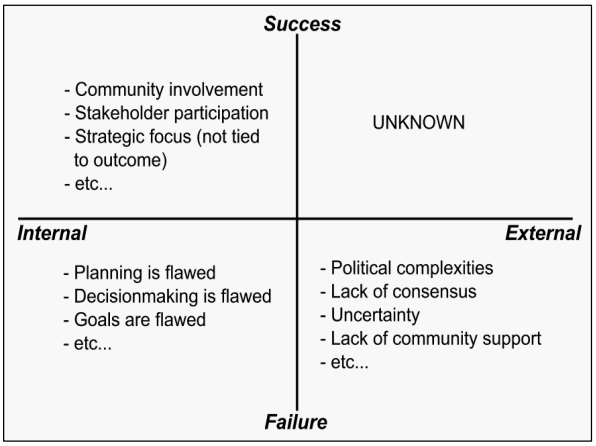

Figure 3.3: Factors influencing success and failure of planning (Talen 1997)

There are few researches available that provide some suggestions on what requirements a decision-oriented plan or policy should meet in order to perform well. The most relevant ones to this research are those by Mastop and Faludi and by De Lange and Mastop. Mastop and Faludi (1997) provide two prerequisites for a decision-oriented plan or policy to perform optimally. These are as follows:

- decision-makers must be aware of planning statements relevant to them, and
- decision-makers must accept these statements as part of their context of operations.

Compliance with both prerequisites is necessary, otherwise there can be no performance. It is possible that decisions conform to a plan or policy without the plan or policy ever being used. By complying with the fore-mentioned prerequisites this coincidental conformance can be ruled out and will not be mistaken for performance of the plan. There are three factors that now determine whether the plan performs or not (De Lange & Mastop 1997, Mastop & Faludi 1993, Mastop 1987, Faludi 2000):

- the plan must specify the operational decisions for which it is intended to provide a framework,
- the recipient must judge the plans as of continuing relevance to the evolving situation, and
- the plan must give significant assistance in defining operational decision situation which involve further measures.

These prerequisites plus three factors affecting performance are similar to the factors that Van der Schraaf and Roessen (2004) identified as of major importance in performance issues:

- knowledge of the plan/policy,
- degree of acceptance of the regulations, and
- loyalty and obedience of the addressee.

The first factors are very similar to the prerequisites and factors determined by De Lange, Mastop and Faludi. The third may be surprising; one might not expect loyalty and obedience to be of any

importance when it comes to the performance of plans. The research by Van der Schraaf and Roessen, however, is not the only one that suggests these factors are important. Verwijmeren (2001) found that the ambition level of a locality was of great influence on the performance of environmental impact assessments in local land-use plans. Localities with a high ambition level are in his research defined as localities that give a high priority to environmental issues. It is possible that a similar ambition level regarding water management and/or natural hazard mitigation will be of influence on the performance of the policy instruments that are the focus of this research. Bukkems (1989) too defined conditions that, when met, will help increase plan performance. These conditions are very similar to the ones stated by other authors, but Bukkems furthermore emphasizes the importance of the ambition level of the executing authority. He explains that a plan is more likely to perform when it contains attractive plan concepts , when its contents are explained to policy makers in an extensive information campaign, and when there is sufficient social support for the concepts and principles underlying the plan.

Mastop and Needham (1997) argued that the performance of plans does not depend solely on the plan and the planning or implementation process, but also on the planning context. With this planning context they mean factors such as existing legislation, policy institutions, prevailing planning doctrines, planning history, consensus, and culture (Mastop & Needham 1997; Mastop & Faludi 1997; De Lange, Mastop & Spit 1997; Faludi 2000). These factors may have a high impact on the performance of plans yet they cannot be changed through individual plans or policies. Mastop and Needham argue that although these factors have an effect on performance, they should not be the primary concern of performance research. Contextual factors must be ruled out before ascribing a certain extent of performance to a plan or policy by complying with the fore-mentioned prerequisites since they cannot be changed on a short term basis by adapting plans and policies. The main concern of plan makers and of performance studies are factors that are internal to the plan or policy. Since in this study, the main research object is the comparison of two decision-oriented planning strategies (not prevailing planning doctrines or culture), this research will focus on internal factors. External contextual factors will be ruled out as far as possible by testing the plans with the prerequisites by Mastop en Faludi (1997). The focus of the research is the identification of success and failure factors internal to the plans.

All in all, this leaves us with only a few plan internal factors that affect plan performance. Most fore-mentioned researchers argue that more research has to be done in order to develop a broader understanding of these factors and their effects (Needham, Zwanikken & Faludi 1997; Faludi 2000; Mastop & Needham 1997). This research will try to do so by analyzing two quite similar policies in two different countries. The next section will explain how performance can be determined and the implications for this research.

3.3 Evaluating performance

Now performance has been defined and some factors that affect plan performance have been identified, the question arises how performance can be determined or measured. Talen (1997) is rather skeptical on this subject and argues that once a plan is defined as an instrument to influence decision-making instead of an instrument to provide a blue-print for future development, the evaluation of a plan is unclear and totally dependent on the ideas of the evaluator. In other words: determining the performance of a plan is arbitrary. This does not seem realistic: although performance is a rather new concept in planning and widely accepted evaluation methodologies are not (yet) available, the ideas of the evaluator will be systematically based on performance theory, and

therefore plans will be judged on the basis of the goal of planning according to the decision-oriented planning approach.

The connection between the decision-oriented planning approach and the use of performance as an evaluation criterion instead of conformance has been explained in section 3.1. From this viewpoint, a decision-oriented plan performs if it actively provides a reference framework for decision-making (Alexander & Faludi 1990; Faludi 2000). Or, as Mastop and Faludi put it: "a strategic plan has performed if it is used. […] The demonstrable use of a plan implies performance, even if this leads to non-conformant results" (Mastop & Faludi 1997). Based on this it becomes possible to determine performance on the basis of the actual use of a plan.

De Lange and Mastop (1997) provide a three-step approach to determining performance:

- determining the communication of the policy,
- determining conformance, and
- determining the application of the policy in day-to-day decision-making.

The inclusion of conformance in this list implies that they consider performance not to be something utterly different from conformance, but something broader. This means that according to them, using the plan or policy as a reference framework in day-to-day decision-making is on its own not enough to ensure high performance; decision-makers must conform to the plan as well. But since strategic plans are supposed to be used as guidelines, not as a blueprint plan, a substantiated deviation of the plan should be possible, and does not necessarily mean that there is no performance, as seen on the previous page. Based on Iedema en Janssens 1993, one could make a distinction between the 'internal conformance' of a plan (i.e. the way in which decision-makers use the plan as a guide) and the 'external conformance' of a plan (i.e. the way in which the real world changes according to the plan). In this research, the concept of 'internal conformance' will be used; 'external conformance' seems illogical as it would judge strategic plans based on blue-print plan objectives. More specifically, the choice for 'internal conformance' is a logical one regarding the instruments studied in this research, because they are aimed at the consideration of the policy's goals and objectives throughout the local planning process. That brings us the following three step approach:

- determining the communication of the policy,
- determining conformance to policy goals, statements and intentions, and
- determining the application of the policy in day-to-day decision-making.

The fore-mentioned three step approach can be combined with the information on aspects that affect plan performance in order to formulate a research design that is effective and to the point:

1. Analyze the concerning plans and policies. What are the goals and intentions? Which plan statements are important for the local government regarding their land use plans?
2. Analyze the communication of the plans and policies. What method is used for informing local governments about the plans and policies? Do they only provide regulations, or also more practical guidelines? What efforts are taken to convince local governments of the importance of the plans and policies? Do local governments know in what situations the plans and policies are applicable and how they should be used?
3. Determine whether the two prerequisites for performance are met (decision makers must be aware of the plan, and must accept the plan statements as part of their context)
4. Analyze local land use plans in order to determine the level of internal conformance to plan goals, statements and intentions. Do the goals of the Water Paragraph and the Safety Element correspond to the goals of the original plans and policies?
5. Analyze the use of the plans and policies in local decision-making regarding the local land use plan through interviews with decision-makers and documents from the planning process. Is the plan used as a reference framework? In what situations is it used?

6. Determine to what extent the plan-making government, local decision-makers, and knowledgeable institutions on the topic of natural hazard mitigation (for example Water Boards in the Netherlands; Division of Mines and Geology, Department of Fish and Game, and Office of Planning and Research in California) consider the plan to perform.

These questions will be answered based on the original plans and policies, local land use plans, interviews with local land use planners, and interviews with experts from knowledgeable institutions. The sixth question is not strictly necessary to determine performance, but it would be interesting to see if the professional experts agree on this subject. If they disagree, the policy or its communication to local officials might need revision because in that case it is likely that local governments do not perceive the goals of the plan and/or the working of its instruments the way the plan-maker intended. The six steps above provide for the viewpoint of both plan-makers and addressees (in this case local governments). Needham, Zwanikken and Faludi (1997) argue that performance is to be judged solely from the perspective of the plan-maker: is the plan or policy used in the way the plan-makers intended? Mastop & Faludi (1997) argue that the usefulness for the actors addressed should be the main concern. This research will use both perspectives, since both aspects are important: if the plan is not used as intended, the goals of the plan-maker are not likely to be achieved, but if the addressees do not consider the plan to be useful they will be less willing to use it.

Both in the Netherlands and in California three to five municipalities are selected for the research. They are selected on the basis of several criteria:

- They must experience risk of flooding (Netherlands) or natural hazards in general (California).
- They must already have adopted a local land use plan including a water paragraph or safety element.
- They must be willing to be interviewed and have their plans and planning documents studied.

For the Netherlands, these cities are Roermond, Maasbracht and Arnhem. For California, they are Irvine, Fairfield, Anaheim, Burbank, and Redwood City. In the upcoming chapters, the natural hazard mitigation policies of the Netherlands and California will be analyzed, and the policy statements applicable to local governments will then be used as a basis for an analysis of the performance of these policies. The goal is not to summarize the performance of a plan into a quantitative unit, but to analyze the performance process in order to describe and further understand the concept of performance and the performance of these policies. The results will be qualitative and descriptive rather that quantitative. Due to practical limitations the scope of this research is limited; hence the pragmatic choice to study only three to five municipalities per country. Also, when studying professional institutions such as Water Boards or California State Departments, the willingness of that institution to cooperate in the research is essential and limits the possibility to study every applicable institution. Chapters 5 and 7 will further elaborate on the research process.

4 The policy framework in the Netherlands

4.1 Brief introduction to the Dutch planning system

In the Netherlands, spatial planning as well as water management takes place at all levels of government. Both will be discussed briefly to provide an overview of the institutional framework of the water assessment and the local zoning plan.

The State Department of Housing, Spatial Planning and Environment drafts national plans that guide spatial developments on a large scale. These plans ("national policy documents on spatial planning") are strategic in nature and are renewed approximately every ten years. They show the desired spatial developments and they should guide planning at the regional and the local level. At the regional level, there are provinces that draft regional plans, further specifying the ideas from the national policy document on spatial planning and providing a somewhat more detailed framework for local plans. Municipalities draft structure plans that envision desired spatial developments at the local level, and zoning plans that specify the views from the structure plan into a specific land use allocation for every parcel of land. The zoning plan must be approved by the province which determines if the local plan corresponds with the regional plan. The zoning plan maps are accompanied by texts that demonstrate the underlying principles.

At the national level, it is the Department of Transport and Water Management that provides the national vision on water management. Water management itself then takes place at different levels. The Directorate for Public Works and Water Management is in charge of all national waters (sea, rivers, IJssel Lake et cetera). At the regional level, water boards that are defined on the basis of river basin boundaries manage surface water and water levels, and they draft regional integral water management plans. Provinces are responsible for ground water management, and municipalities for sewerage. The responsibility for water management lies solely with the government, but because it is shared by municipalities, provinces, water boards, and the Directorate for Public Works and Water Management, it is important that these institutions work together to achieve the best possible water system quality.

Municipalities have the authority to allocate land uses through the local zoning plan, and therefore have great potential power to influence the water system. This zoning plan is the only plan in the Netherlands that is legally binding to citizens. It reflects a city's desired spatial design in a very detailed way and citizens can derive rights from it; the zoning plan acts as a form of legal protection for citizens since both the city and citizens cannot deviate from the zoning plan (or at least not without complicated exemption procedures, and in most cases approval by the province is required).

4.2 Water management in the 21st century

During the 1990s parts of the Netherlands experienced river flooding and excessive water levels. Exceptional river discharges combined with heavy rainfall strained the water system. Dikes threatened to burst and polders had to be inundated to get rid of the surplus of water. The total losses

amounted to hundreds of millions of euros. Up to then water management had not been much of a political issue and there had been insufficient attention to the problems that might occur as a result of planning decisions. Urban developments took place in areas that, from a water management perspective, had better be left untouched. Water management was mainly based on structural mitigation and technological solutions, while increasing river discharges and heavy rainfall combined with climate change, subsidence and the disappearance of natural areas suitable for water retention slowly caused a system overload.

As a response to the flooding of the past years, the national government appointed a commission in 2000 to evaluate which adaptations to the water system are necessary to prevent future calamities, taking into account expected climate change, sea level rising, and subsidence. The findings of this commission were gathered in a report that provides a detailed overview of the present situation, its threats and its opportunities. The conclusions and recommendations of this report were then integrated into a national resolution "*Waterbeleid voor de 21e eeuw*", further referred to as WB21. WB21 is effective as of February 2001. The main goal of this policy is to raise the attention and awareness of all involved at all levels of government in order to make space (both literally and figurative) for water. From now on, in all decisions on spatial plans and policies, the consequences of those plans for the water system should be considered, and all water-related problems that the plan might cause must be addressed and solved in order for the plan to be approved. The water system should guide and arrange spatial developments rather than the other way round, and only by reserving space for water can safety from flooding be ensured. This does not necessarily have to be a hindrance but might offer new opportunities to improve spatial quality, and by designing multifunctional spaces it would not even have to take too much extra space. A simple three-step approach should reduce problems such as flooding or drought and is now obligatory for spatial decision-making at all levels of government. The three steps are as follows:

1) "*vasthouden*": retention of water in the soil or in surface water within the plan area
2) "*bergen*": storage of water in areas with a primary zoning designation 'water retention'
3) "*afvoeren*": carrying off water to elsewhere, or -in case of emergency- controlled storage in areas with a different allocation.

Plan makers must consider their options in this order; retention is the first priority; storage and carrying off may only be considered if retention is either impossible or cannot provide sufficient capacity to guarantee safety.

Some policy statements from WB21 are aimed at national or regional governments, such as the improvement of sea defenses, increasing the sluice capacity in the Afsluitdijk -the dam that separates the IJssel Lake from the Wadden Sea- , and adjusting the safety standards for the main rivers and the coast. Furthermore, there are many statements that are also aimed at local governments. Some of these are stated below:

- loss of space for water retention should be prevented,
- the water system should guide future spatial developments,
- water issues must be considered when making decisions on spatial issues, and
- water issues should be dealt with at the source and should not be transferred to other localities or to future generations.

In order to ensure the balancing of water issues in the plan-making process, an instrument called "*Watertoets*" (water assessment) was developed.

4.3 Water assessment and water paragraph

The term water assessment may suggest that we are dealing with a simple test that evaluates a plan which is then either approved or rejected. This is not the case at all, the water assessment process encompasses much more. It refers to a process that starts at the first initiative of making new plans and continues throughout the whole planning and decision-making process. The water assessment is an instrument that guides planners through the planning process and ensures balancing of water interests during all phases of that process. More precisely: the water assessment intends to guarantee that water will be considered 'structurally, explicitly, and substantially' (BN 2001, p. 14) in spatial plans, policies, and decisions. It should lead to a 'creative process' of balancing between water management and spatial planning issues (BN 2001, p. 15). There are already some other tools available for this purpose such as "*stroomgebiedsvisies*" (river basin visions) and "*waterkansen-kaarten*" (water opportunity maps) but those regard plan contents rather than the planning process. The water assessment focuses on the planning process and guides the deliberation between water boards (sometimes provinces or the Directorate for Public Works and Water Management) as the water manager and provinces and municipalities (sometimes state offices or departments) as the spatial planners. The water assessment demands that the water manager actively participates in the planning process and that spatial planners explicitly consider water management issues that might arise from their plans (Van Heesen, 2001).

The water assessment has been effective since 2001 with the signing of the "*Startovereenkomst Waterbeheer in de 21e eeuw*" (preliminary agreement WB21) by all governments and governmental departments involved. Since 2003 the water assessment is ruled by law in the "*Planologische Kernbeslissing Vijfde Nota Ruimtelijke Ordening*" (central planning act on the fifth national policy document on spatial planning). It affects all spatial plans and policies that are rooted in the WRO that are expected to have a relevance to water management, such as "*streekplannen*" (regional plans designed by provinces), "*bestemmingsplannen*" (local zoning plans designed by municipalities), infrastructural plans, restructuring plans, and raw material extraction plans. In this way it is most likely that water issues will be considered in all land use planning decisions and from the earliest planning stages dealing with the choice of location. It is these choices of location that offer most possibilities for non-structural mitigation; once it comes to site planning sometimes only structural mitigation options remain (depending on the local situation and the intended future land use). The water assessment process comprises four phases:

1) initiative phase: the plan maker informs the water manager of the proposed plans and consults them in the early stages of plan development.
2) development and advice phase: the water manager provides advice while the plan-maker develops a plan. This phase ends with a final '*water advice*' from the water manager in which mutual agreements and further points of attention are recorded.
3) consideration phase: the results of the water advice and the consultations are processed in the plan. The plan maker must describe how the water manager's comments are incorporated in the plan. This usually results in a water paragraph in the plan.
4) review phase: the plan maker draws up the plan and submits the plan to the appropriate authorities who will then review the plan based on the applying rules and laws and will weigh all applicable interests. The plan is then either approved or rejected.

The water assessment has to be used in all stages of spatial planning: choice of location, site planning, and redevelopment. In a location choice, alternative project sites are compared on the basis of their suitability for land use functions. Questions in this stage are "which possibilities does the local water system offer for specific functions?", "Which functions can be combined in this area", and "Which functions should be (or should not be) located near one another" (BN 2001). The intention is always

to minimize flood risk, by reserving possible water retention areas from intensive uses that do not combine well with water retention, and by preserving natural habitats and drinking water extraction sites from uses that might be harmful. The task in site planning is to newly design and develop a given area while preventing or limiting negative effects on the water system. The balancing of plan alternatives should be based on social needs and social costs. Structural mitigation measures or compensation should always be a last resort and not a calculated starting point. When it comes to redevelopment, the main objective is to improve both spatial quality and water balance. Over the years, many sites have been developed with little attention to the effects on the water system; redevelopment provides an opportunity to restore the capacity of the water system. Thereby the water assessment theoretically[1] creates a cyclical process in which, from now on, water system qualities will be considered and improved in every round of the land use planning process.

Although flooding in the 1990s was the primary motive for WB21 (including the water assessment instrument), the water assessment does not merely address flooding and safety issues, but also many other water related themes. In the water assessment and the water paragraph, plan makers have to evaluate all possible effects of their plan on the total water system, including water quality and water quantity, ground water and surface water, water supply and sewerage, and safety and public health.

The water assessment instrument meets the criteria for good quality natural hazard mitigation planning as established in chapter 2:

- Water management (including flood control) now has to be considered from the earliest stages of the planning process, providing for a timely discussion of the effects of land use developments on the water system and vice versa.
- Water management (including flood control) is included in a land use plan.
- Regular consultation among the governments involved is guaranteed throughout the whole planning process if the water assessment procedure is carried out as intended.
- The water paragraph will automatically be updated regularly because the local zoning plan must be updated at least every ten years. Because the water assessment is meant as a cyclical process, one should not just update the water paragraph in itself, but follow the water assessment procedure throughout the whole updating process of the zoning plan.

All in all, this gives the water assessment the potential to provide high quality plans with regard to flood risk mitigation.

4.4 Communication of the water assessment

In order to communicate the water assessment instrument, several manuals have been drafted to support plan makers and water managers in introducing this new instrument into the planning process. The two most important and most elaborate ones are the "*Handreiking Watertoets - waarborg voor water in ruimtelijke plannen en besluiten*" (Water Assessment Guide - guarantee for water in spatial plans and decisions) and "*De waterparagraaf - handreiking water in bestemmings-plannen*" (The water paragraph - a guide to water in the municipal land use plan). The first has a

[1] This cyclical process of the water assessment might very well never fully develop in practise due to ever changing planning tools and policies. A cycle will usually take decades to complete and, considering the major changes in planning policies over the last decades, it is highly unlikely that the water assessment instrument will still be the same several decades from now. However, if we really are at the onset of a new era in which attention to the effects of our actions on the natural environment and vice versa gains a constant and central place in land use planning, some cyclical process as described above might develop (even if the water assessment would be replaced by other instruments), thereby ensuring a firm basis for water management issues in the planning process.

broad approach and provides flowcharts to illustrate the application of the water assessment in different planning processes, examples to demonstrate in what way small measures can reduce the impact of a plan on the water system, and directives that offer design guides for new developments. The exact criteria used to review a proposed plan are molded by policies and plans of the local water manager but because these are also based on the principles of WB21, the examples used in the water assessment guide will generally give a good impression of the type of measures suitable in certain situations. The guide also provides ample examples on how the water assessment can be implemented in the plan making process and how local governments, water managers and project developers together can shape the new consultation and advice phases of the planning process. The second manual, on the water paragraph, is specifically designed for the use of the water assessment in local land use plans. It includes a checklist 'water in local land use plans' that sums up all relevant water themes that the plan should deal with, as well as instructions on how to include that information together with a summary of the consultation with and the advice from the water manager in the water paragraph of the plan. The guide also provides a comprehensive list of points of attention on all kinds of water related topics, varying from which water works have to be marked on the land use planning maps to how the local government can protect water related socio-historical elements such as water-lines and mill-races.

Alongside these manuals there is also a website (www.watertoets.net) with information on the water assessment procedures, downloadable brochures and booklets, and answers to frequently asked questions. The brochures offer examples and guidelines on a wide array of topics such as 'water assessment and nature', 'water assessment and project development', 'water assessment in infrastructure planning' and 'groundwater in water assessments'. Many brochures are developed by the Directorate of Public Works and Water Management, but some were made on the initiative of water boards or provinces. The structure of the website is clear; one can easily find the information one is looking for.

Together, the manuals, the website and the various brochures provide a vast centre of knowledge that can be consulted by any plan maker or water manager. In general the information is clear, the presentation invites the reader to leaf through all available documentation, and the given practical examples look catching.

All this looks very promising for the expected performance of the WB21 policy through the water assessment: there is a large amount of information available to local planners to make them aware of the policy, to explain its goals and objectives, to convince them of the importance of the policy, and to support them in integrating the water assessment in day-to-day planning practice. This means that it meets the internal criteria for plan performance as established by De Lange, Mastop and Faludi (Lange & Mastop 1997, Faludi 2000), as seen on page 21. The next chapter will investigate the practical performance of the water assessment.

5 The performance of the water assessment

5.1 Case: the Dutch water assessment

The Netherlands have a history of battles against water. Some were won, some were lost. Over the years, many floods have shaped the country to its present form. During the last century, several man-made constructions (such as the cutting off of deep sea-inlets such as the Zuiderzee) reduced the countries coastline from 3,400 to 650 kilometres (Lintsen 2002). About one-third of the country lies below sea-level, and the rivers Rhine and Maas carry off rain and melting water from a considerable part of Western Europe.

The country has water boards that guard water management issues at a regional level. The national Directorate for Public Works and Water Management deals with water management at a national level, as regards rivers, main lakes and the Wadden and North Sea. This directorate also manages many structural flood control works such as storm surge barriers, weirs and levees.

Figure 5.1: The cities in the Netherlands that take part in this research

Because, due to subsidence, a changing climate and rising sea levels flood risk mitigation becomes an increasingly important issue, the water assessment policy aims to encourage plan-makers to consider the consequences of their plans with regard to water management. This should lead to plans that respect the demands and opportunities of the natural environment, including flood risk. One of the most important plan types in the Netherlands is the local zoning plan, which allocates specific land uses to specific areas. These plans must include a water paragraph which shows the results of the water assessment during the plan-making process. When a municipality is updating or developing a zoning plan, the appropriate water board (and, depending on local circumstances and water issues, the province and the Directorate of Public Works and Water Management) provides a so-called "water advice" to the municipality, evaluating all relevant water issues regarding the proposed plan, and explaining which measures can be taken to improve the plan's consideration of water topics.

In order to evaluate the performance of the water assessment as an instrument to include water topics into the local planning process, several cities were approached, asking them for their cooperation in this research. Three cities were willing to answer questions on the decision-making process when drafting or updating a zoning plan: Roermond, Maasbracht and Arnhem. Because local governments are only one link in the chain that encompasses the water assessment procedure, several other institutions were approached too. Two water boards, a regional office of the Directorate of Public

Works and Water Management, a province and an urban developments consultancy firm were willing to answer questions. All institutions were asked questions on the water assessment procedure, on the water paragraph en water advices, and on WB21 in general. For Roermond and Maasbracht, the whole chain was studied more intensively in order to unravel the total decision-making process and find out why certain decisions are made. Staff members from the city of Roermond, water board "Roer en Overmaas", and the "Directorate of Public Works and Water Management - region South", were interviewed in person. The other institutions were interviewed by email and/or telephone. The water paragraphs of Roermond, Maasbracht and Arnhem were studied, several water advices from the water boards were analysed, and more detailed information on the decision-making process was gathered in the interviews and email contact. Only zoning plans, water paragraphs and water advices were analysed; other information such as reports of city council meetings as regards a zoning plan were either irretrievable or non-existing.

5.2 Research findings

In this section, the findings of the case study will be discussed. For every city there is a description of the water paragraph of a zoning plan, and for all institutions there is a description of their thoughts on the planning process, followed by a brief evaluation of plan performance (a more extensive discussion of the performance of the water assessment will follow in section 5.3). It is important to realize that much of this information is obtained from employees of these institutions, rather than official documents. This means that some of the information might be biased or incomplete. However, since eventually the plan-makers are the ones who have to make the water assessment work, their ideas and experiences with the water assessment are valuable because they provide an insight in the day-to-day decision-making process that the water assessment aims to influence. Furthermore, interviewees were asked specifically for their experiences with the water assessment in the local planning process (in particular the zoning plan); it is possible that their opinions on the water assessment in other plan types (regional plans, project development plans et cetera) are different, but this research focuses on the water assessment as a means to consider water management issues in the local planning process.

The information gathered is evaluated based on the criteria for plan performance found in chapter 3, combined with the intentions of the water assessment as seen in chapter 4: the conformance to the policy goals, statements and intentions (such as the three-step approach "vasthouden-bergen-afvoeren", prevention of loss of space for water retention, letting the water system guide spatial developments, and no rolling-off of water issues on other localities) and the application of the policy in day-to-day decision-making (such as early consideration of water issues, consultation with other water managers during the planning process, and a thorough reasoning of water interests in the decision-making process).

5.2.1 Roermond

Roermond is a city in the province of Limburg and is situated along the rivers Maas and Roer. The city has experienced flooding in the 1990s.

The water assessment and water paragraph

The zoning plan that was studied for this research is "*Bestemmingsplan Stadsweide - deelgebied kazernevoorterrein*", for an area close to the Maas and the city center that will be redeveloped into offices, an entertainment center with movie theatre, and a parking garage. The first design of the plan

stems from January 2004, and the plan was approved in December 2005. The plan's water paragraph covers three relevant topics:

- protection of the area from high water levels of the Maas,
- protection of the area from seepage of water from the Maas, and
- securing a sufficient carrying off of rainwater and sewage.

The plan area is situated in the Maas foreland; this means that there is a chance that the area will be inundated. State laws and regulations rule that in that case, development of such an area is possible if either the maximum risk is 1:1250 or the maximum risk is higher (with a maximum of 1:250) but the zoning plan or another local regulation specifies who is responsible financially in case of economic losses due to inundation. Roermond chose the first alternative: building levels are adapted so that the risk of inundation of the properties is no higher than 1:1250. In most cases when a foreland is developed, the loss of water retention capacity must be compensated elsewhere, but because the Kazernevoorterrein area is located within the 'city contour' this rule does not apply.

The water paragraph explains the water assessment process, and includes copies of all correspondence with the water board, the province and the Directorate of Public Works and Water Management. It describes the influence of the proposed developments on the water system and explains that, although the area is situated in the river foreland, possible flooding would only result in property damage (especially to the underground parking garage) and would not threaten people living or working in the area. The technical construction of the buildings would guarantee that flooding of underground parking levels will not cause structural damage threatening the rest of the building.

The water board's water advice shows that the water board approves with the proposed developments, but suggests that the city could further explicit the percentage of ground surface disconnected from the sewerage (meaning that excess rainwater does not go into the sewerage and will not cause unnecessary pressure on the sewer system). To mandate project developers to do so it would have to be included in the zoning plan. The city of Roermond has followed this advice and has specified in the final plan that 100% of the paved surface must be disconnected from the sewerage.

The Directorate of Public Works and Water Management also drafted an advice, which appears more urgent than the one from the water board. When calculating the minimum level for the ground level of the buildings in the area which would ensure a maximum of 1:1250 risk of inundation, the city has made an error: Roermond calculated that ground level for buildings in the area has to be at at least 21.70 meters above NAP, while according to the directorate it has to be at least 22.19 meters. The city has taken this advice to heart and changed the minimum ground floor building level to 22.19 meters in its definitive zoning plan.

The province approved the plan after the city had adopted the suggestions by the water board and the directorate.

The planning process

The planning department of the city of Roermond described the cooperation with the water board as useful, yet sometimes problematic. The water assessment is a rather new concept, and both the water board and the city are still examining how it works best. The city feels that, now the water board has a voice in spatial planning, the board suddenly wants to decide everything, even though the responsibility for spatial developments lies with the cities. For example, in the residential neighborhood "*Roer en Hambeek*", a park along the Hambeek creek has always had the allocation 'green' (parkland or recreational area). The water board would like to see the allocation changed into 'blue' (primary function: water retention), even though that would not constitute any real changes

since 'green' areas may be used for water retention whenever necessary, and would cause much bureaucratic issues for the city because it would mean an adaptation of the zoning plan. It is just one example of why this city sometimes feels, as a staff member put it, "like the whole city has to be turned into a 'blue' zone".

At the same time, there are also many good experiences. The city is currently preparing a new zoning plan for the area east of the city, which will be developed as a residential area ("*Componistenbuurt-Oost*"). This plan will follow the principles of WB21 through the water assessment and water paragraph, and water truly was the structuring principle in spatial planning, rather than the other way around. The city feels that the water assessment has far greater potential in new developments than in spatial management or redevelopment, which is certainly true but does not mean that it does not have any potential at all in management and redevelopment, even though it can be harder to implement there. Spatial consultants at Buro5, who designed the plan for Componistenbuurt-Oost for the city of Roermond, include water management issues in their plan-making process. They use the water assessment as a guide to make sure all relevant water aspects are considered. In their opinion, the water assessment proves to be most helpful in the spatial design phase, to reduce possible negative impacts of a project on the water system. In their opinion, open space is important in new developments, and issues such as water retention can be combined with other spatial elements to create spaces of high quality that are comfortable to live or work in and do not impact upon the natural water system any more than necessary.

Performance of the water assessment
There seems to be reasonable conformance to the goals and intentions of WB21, but it varies greatly among different plans. The three-step approach "vasthouden-bergen-afvoeren" is applied regularly and there is attention for water retention. But in most plans and decisions, the water system does not guide spatial developments. The water assessment is applied in day-to-day decision-making, but with a large emphasis on the latter stages of the planning process and in most decisions choices regarding water issues are not well-substantiated (or at least the argumentations are not documented). Overall, the water assessment performs quite reasonably; there is not always enough attention to non-structural mitigation measures, but the water assessment does secure a structural role for water issues in the planning process. Although the regular consultation with water managers is sometimes perceived as awkward or difficult it has proven to be helpful and might improve over time when both the city and the water board learn what to expect and how to consider each other's interests.

5.2.2 Maasbracht

Maasbracht is a small town along the Maas River, just south of Roermond.

The water assessment and water paragraph
The plan studied for this research is the zoning plan "*Maasbracht - Brachterbeek*". The plan was approved in August 2006, and covers an area that was in use as sports fields, but will be developed into a residential area of approximately 130 houses. The water paragraph of the zoning plan only includes the outcomes of the deliberation with the water board and directorate; the preparatory considerations are gathered in a report called "*Sportvelden Linne - Onderbouwing t.b.v. de waterparagraaf*". This report was drafted by Kragten, a spatial consultancy firm. The report contains a detailed description of the geophysical, hydrological and ecological situation of the area. This information is followed by a list of demands and preferences of the province, the water board and the town itself. These demands primarily focus on the design of the area, are quite technical in nature and provide few guidelines for the spatial design of the area. The only truly spatial demand is to

include a so-called "wadi" in the plan through which rain water can infiltrate into the surface in a central green zone in the neighborhood. The list further includes information on the desired water drainage system and disconnecting rain water from the sewer system.

The report also includes the water advice from the water board. The water board has only a few comments on the proposed plan, which mainly deal with zoning plan specifications (such as subtle changes in the plan maps, not the allocations) and some technical comments on the water drainage system for which the home owners are responsible themselves, but bad maintenance on even a small part of the system might cause the whole system to fail. The water board therefore suggests including the obligation to undertake all necessary maintenance on the drainage system in the home owners' purchase agreement. The water paragraph is rather general in nature and does not provide any specific information on how Maasbracht deals with the comments from the water advice.

The planning process
Maasbracht perceives the water assessment procedure more as an extra bureaucratic exercise rather than a meaningful extension to plans. The town does not seek any contact with the water board unless really necessary for the plan's approval, not for early advice. The contact usually takes place during the last stages of the planning process, for the mandatory review of proposed plans. The town indicates that the water assessment has further complicated and slowed down the plan-making process, and feels that the interference of the province and the water board in the plan-making process has increased. This interference is experienced by the city as a negative hindrance, rather than an opportunity to find creative solutions to water management problems.

The town does not usually consider water management issues in the choice of location for new projects, or in the spatial design of an area. The water assessment mainly leads to technical solutions such as more attention for water drainage systems and disconnection of rain water from the sewer system. According to the town, water issues do not have a structural role in the decision-making process and are not explicitly considered when developing spatial plans.

Performance of the water assessment
Because the city of Maasbracht does not consider the water assessment to be a very useful or valuable planning instrument, local planners are rather skeptical towards the whole process. There is some conformance to WB21 objectives (such as the three-step-strategy and mitigating possible negative effects on the water system) but with a focus on structural measures and these are largely discussed in the last planning stages rather than considered in earlier stages. These decisions are made from a convenience perspective, not because the city has well-substantiated the choice for these decisions. The water assessment does not form a part of day-to-day plan-making and consultation with the water board is perceived as a hindrance and is therefore postponed as much as possible. This means that in this case the performance of the water assessment is rather poor, although it still has led to the implementation of some structural mitigation measures that otherwise might not have been considered.

5.2.3 Arnhem

Arnhem is a city in the east of the Netherlands, along the Nederrijn River.

The water assessment and water paragraph
The water paragraph reviewed for this research is that of the zoning plan "*Bestemmingsplan Malburgen-Oost*", effective as of April 2007. The water paragraph starts with an overview of local

and regional policies regarding all kinds of water management issues. The key points of these policies are translated into six demands on new developments in the area, such as "developments in the area shall not influence ground water levels or ground water streams in a negative way" and "rain water shall be disconnected from the sewerage and infiltrated in the plan area". Next is a description of the current water system: surface water, ground water and rain water, and water quantity as well as water quality. The third part of the water paragraph explains possible bottlenecks where the demands on spatial quality might interfere with water issues, followed by solutions to these problems. These solutions are not only technical in nature, but also include land use solutions: increasing the percentage of the area reserved for water retention to 10%, and siting underground constructions such as parking garages at locations in the area where they will not interfere with ground water streams. The water paragraph further mentions that all remarks from the water board are accepted and included in the final plan.

The planning process
The city of Arnhem indicates that prior to the implementation of the water assessment procedure, the city was already very active in including water issues into the planning process, and sees water as one of the structuring elements in land use planning and one of the most important aspects in the spatial design of an area. The water assessment has formalized this process and further intensified the contacts with the water board. One of the most positive aspects of the water assessment, according to the city, is the consideration of water aspects in the earliest stages of the planning process. Furthermore, the more intensive contact the water board has with the cities in its area has helped the water board understand what type of demands or suggestions are reasonable and workable regarding a zoning plan. The city of Arnhem views the water assessment process as a cyclical process and uses it in all phases of plan-making.

Performance of the water assessment
The performance of the water assessment seems to be very good in Arnhem. There is a good conformance to the objectives of WB21: in the case of "*Malburgen-Oost*" the city had set specific goals regarding water system qualities that guided the development of the final plan. Not only structural but also non-structural mitigation measures are applied, integrating flood risk mitigation and land use planning. There is ample attention for the three-step strategy and for water retention in general. Water issues are considered from the earliest planning stages onward and water (and the water assessment) are well integrated into the planning process.

5.2.4 Water board "Roer en Overmaas"

Water board "Roer en Overmaas" is the primary water manager for the southern part of the province of Limburg. Since the implementation of the water assessment, the water board has seen an increase in land use plans received for review from about 30 per year to over 300 per year. Because plan-makers, depending on the occurring water issues in the plan area, have to submit their plan for review to several water managers (water board, province, directorate of PWWM) and every water manager writes a separate water advice -which sometimes proved to be ambiguous or even contradictory because every water manager only focuses on the water issues that are its responsibility-, water board Roer en Overmaas has established a "water assessment counter". From then on, the water board is the primary contact point for plan-makers. The water board discusses the proposed plan with the appropriate water managers and then writes one coherent water advice. The water board has a special team for this water assessment counter, and every city has a fixed contact person at the counter to ensure a consistent cooperation between the water board and municipalities.

The planning process
The water board tries to get involved in the local planning process as soon as possible, because it is in these early stages of spatial planning where the power of the water assessment lies. Unfortunately, some cities only submit their plans for a final review. The larger the project, the more likely the water board will be involved in the process at an early stage. Apparently, cities are not convinced of the possibilities to change the water system in small projects (negatively or positively).

The water board feels that many of the goals of the water assessment procedure are achieved. The water assessment provides for a thorough consideration of water aspects in spatial plans. Water issues now have a structural and explicit place in the decision-making process, although of course other interests such as economic issues are very important too for a city. Water aspects guide spatial developments far more often than before. The water assessment is perceived as useful in all three phases: choice of location, spatial design, and spatial management (but the main focus is on spatial design). The three-step strategy "retention/storage/carrying off" is widely applied and receives much attention in the spatial design process.

According to the water board, spatial decisions taken under the water assessment policy are essentially different than before. For example, the zoning plan for "*Ooldervesteˮ* (the development of a residential neighborhood in the Maas foreland near Roermond) would probably never have been approved in a water assessment procedure. When the project plans were developed, there was no mandatory water assessment yet, so although the water board had major objections to the plan, there was nothing they could legally do about it. So even though not all cities are equally active when it comes to the implementation of the principles of WB21 in their land use planning process, the water assessment does encourage wise decisions from a water management viewpoint, and guarantees a basic level of water related considerations because the water board now has a voice in the planning process.

Performance of the water assessment
The information gathered from water board "Roer en Overmaas" suggests that the water assessment performs quite well. Through the water assessment counter there is regular contact with city planners which allows for early involvement in the local planning process. The fact that the water board indicates that plans that were developed after the commencement of the water assessment are essentially different from before (in a most positive way) reveals that water management issues are now considered far more thoroughly than before. Although there are still some bottlenecks, such as the fact that many cities do not yet actively implement the water assessment procedure in small plans but mainly in larger plans, the water assessment has in general achieved many of its goals and objectives.

5.2.5 Water board "Groot Salland"

Water board "Groot Salland" is responsible for the water management in a part of the province of Overijssel, along the river IJssel.

The planning process
The water board experiences that the more complex a project is, the earlier in the planning process the water board is approached. Because large projects usually have a larger potential impact on the water system, it is important to be involved in these projects from the earliest stages: if water is not considered from the beginning, it often proves to be difficult to amend plans in a later stage, and in that case the final outcome of the plan is usually less positive. The water board feels that, although

the contact with municipalities has always been good, it has intensified considerably over the past years since the water assessment was first introduced. Much of the potential to reduce impacts on the water system lies with local governments; the water assessment does guarantee basic attention for water issues, but the degree to which a city involves water topics in their plan-making process depends on the city's motivation and willingness to undertake an extra effort to improve plan quality with regard to water. Although the final choices on spatial plans are not always optimal from the water board's point of view, water has gained ground with the implementation of the water assessment.

Performance of the water assessment
The experiences of water board "Groot Salland" largely match those of water board "Roer en Overmaas": the water assessment seems to perform reasonably. Although not all cities are as active as they could be in integrating the water assessment into the local planning process, water has won grounds since its implementation.

5.2.6 Province of Limburg

The province of Limburg is located in the South of the Netherlands. The province is partly bordered by the river Maas and has experienced considerable flooding in the 1990s.

The planning process
The province indicates that the efforts to really include water management issues into the local planning process vary greatly among cities. Some cities follow the advice from the water board or the province immediately and adapt their plan in order to achieve the best possible results, whereas other cities will only undertake the most basic measures necessary to obtain the province's approval for the plan. The water assessment and the water paragraph are a meaningful addition to the zoning plan, and increase the mitigation of negative effects on the water system, according to the province. It has also strengthened the cooperation among the different water managers in the area, and the province is hoping to also achieve a better cooperation with individual cities in the future. At the moment, the province it often not consulted in the earliest stages of the local planning process, while especially the first stages are very important in the water assessment process.

Performance of the water assessment
As with the institutions discussed before, the province of Limburg too indicates that local planners have moved in the right direction when it comes to the implementation of the water assessment. But there is still much to gain, such as an earlier consideration of water management issues in the local planning process. But in general, the performance of the water assessment is reasonable.

5.2.7 Directorate for Public Works and Water Management

The Directorate for Public Works and Water Management has several regional offices whose task is, among others, to guide land use developments that could influence the water system of national waters. The river Maas is one of those waters and because many cities in Limburg are located along the Maas, urban development projects can impact upon the Maas water system. In these cases the directorate takes part in the water assessment as one of the water managers.

The planning process
As the water board and the province, the directorate too feels that the extent to which cities make better plans (with regard to water topics) is highly dependent on the city's ambition level with regard

to ‘green’ and ‘blue’ functions. In ambitious cities, water has since the introduction of the water assessment truly been included in all phases of land use planning, whereas in other cities the water assessment is mainly perceived as a bureaucratic burden. Unfortunately, there are few ambitious cities and the water assessment or the consideration of water issues in the planning process is rarely perceived as an opportunity rather than an obligation.

The directorate indicates that the Dutch name “*watertoets*” quite often causes confusion. There are still cities that think the water assessment is a ‘test’ a plan has to go through at the end of the planning process, whereas it is actually supposed to be a procedure covering the complete plan-making process. The directorate perceives the water assessment as most effective in spatial design matters. In location choices, water still receives little interest because these decisions are -more than spatial design- often political choices rather than plain planning decisions; economic or transportation issues are often considered to be of more importance that water management.

Since the introduction of the water assessment, the directorate feels that it is considered to be a full actor in water management topics, and the various water managers are now in closer contact than before (partly because of the water assessment counter that forces the institutions to cooperate and to attune their advices to the local governments).

Performance of the water assessment
The Directorate indicates that although there is not always conformance to all WB21 objectives and the emphasis is more on structural than non-structural measures, there is far more attention for water management issues throughout the whole planning process. But the outcomes of the water assessment greatly depend on a city’s ambition level which means that the overall performance of the water assessment is not (yet) as good as it could be.

5.3 Conclusions

As seen in chapter 3, a plan or policy performs if it is used in day-to-day decision-making as a reference framework by those addressed in the plan. That means that WB21 performs on the local level if it is used as a reference framework by local governments. The water assessment procedure is an instrument that aims to guarantee this consideration of WB21. Because the water assessment is mandatory, one might argue that it thereby automatically ensures the performance of WB21, but this is not quite true. Cities might perceive the water assessment purely as a bureaucratic burden, and might only do the minimum necessary to fulfil the standards required to have the plan approved by the province. But in that case, there would be no real performance of WB21: not the goals and objectives of WB21 would be used as a reference framework, but some legal issues stemming from the mandated water assessment procedure. However, the foregoing inventory of the experience of several institutions with the water assessment suggests that this is not the case here; even though some cities experience the water assessment as a bureaucratic burden, most cities do not just do the minimum required but actively seek to discuss different options with regard to water management options. This means that discussing the performance of the water assessment as a means to implement the objectives from WB21 is relevant and not redundant.

The first step in determining performance is to determine if the two prerequisites (chapter 3.2) are met. The first one is that decision-makers must be aware of plan statements relevant to them; the second is that decision-makers must accept these statements as part of their context of operations. The analyzed water paragraphs and the interviews with local government show that both prerequisites are met: local authorities know the key points of WB21 for local policies (they either

know them directly from WB21 or from the manuals and guidelines of the water assessment or from deliberations with the appropriate water managers), and because they do include a water paragraph in their local plans they obviously have accepted the policies as part of their context of operations (note that they do not have much choice as to do so, because a water paragraph is mandated for a plan to be approved by the province).

The next step is to determine if there is conformance to the plan's goals and intentions. Based on the water paragraphs of the cities studied, it can be concluded that there is indeed conformance to the goals and intentions of WB21. Especially the three-step approach of retention/storage/carrying off of water is used widely. Other objectives of WB21 are interpreted more freely by the cities, and the cities decide for themselves which statements they think are applicable to them, and which objectives they use as guidelines in the plan-making process. For example, the water system guides future spatial developments of some local plans (i.e. Componistenbuurt-Oost in Roermond), but not nearly in all plans studied. This means that cities apparently somehow decide which objectives of WB21 they want to use in their local plan-making process. Cities do obtain help in this matter from the water managers and from the manuals and guidelines on the water assessment and water paragraph.

The third step is to establish to what extent WB21 (and derived water assessment policies) is used as a reference framework in day-to-day decision-making at the local level. Based on the experiences of both local plan-makers and water managers, it is fair to say that the performance is 'reasonable'. WB21 and the water assessment policies are definitely used in the plan-making process. They have changed the planning process and claimed attention to water aspects in land use planning. However, water still does not have a very prominent place in the day-to-day business of plan-making in most cases. Some cities first make their plan, and then present it to the water manager for advice, which means that the basic aspects of the plan are already established before water issues are considered, thereby leading to a focus on structural mitigation measures (for example the implementation of specific types of drainage systems) rather than the consideration of non-structural land use solutions. Of course, non-structural measures are not always possible, but by placing the consideration of mitigation in the final stages of the planning process, the chances of finding creative non-structural solutions strongly diminish. We can conclude that although the performance of WB21 in general is quite reasonable because local authorities do use it as a reference framework, it has not (yet) fully succeeded in claiming attention for water issues throughout the complete planning process. The extent to which cities use the water assessment as a guide in the whole process strongly depends on the city's ambition levels with regard to 'green' or 'blue' functions. This might be a growth process; it might just take a few more years before local plan-makers are fully comfortable with the new interests that have claimed attention in the planning process. The water assessment procedure does seem to guarantee a basic level of attention to WB21 principles in every spatial plan, but the inclusion of these interests into the whole planning process is still far from optimal.

These findings correspond to the outcomes of a national evaluation of the implementation of the water assessment, which was carried out in 2006 by the Department of Public Works and Water Management. That evaluation too revealed that the overall implementation was reasonable, that the cooperation between plan-makers and water managers had improved, but that especially the early phases of the water assessment do not receive enough attention and that the use of the water assessment in location choices is low. They conclude that overall, the introduction of the water assessment has cleared the road for a more sustainable water management in the Netherlands.

6 The policy framework in California

6.1 Brief introduction to the planning system in California

In the United States of America, planning is a far more local matter than in the Netherlands. The primary authority of land use planning in the state of California rests with counties and cities. Cities are responsible for the spatial planning within the city limits; counties have the authority over the spatial development of communities in unincorporated county territory. Counties and cities have to adopt a 'General Plan': a comprehensive long-term plan for the development of the city. The general plan must periodically be reviewed and, if necessary, revised. Once a general plan is adopted, it is considered a legislative act (State of California 2004). The general plan contains objectives and policies on numerous topics, such as housing, transport, land use, conservation, and safety. The land use element of a general plan contains a land use map that shows the desired predominant land use for every part of the city. A city will also adopt a Zoning Ordinance, which contains a more detailed overview of permitted land uses for every parcel of land within the city. The zoning ordinance is based on the land use element of the general plan, and forms the basis for the granting or denial of building permissions.

6.2 Natural hazard mitigation in California

The federal government of the United States only deals with issues that are in the interest of the whole country; other issues are dealt with on a state or local level. Since natural disasters have the potential to cause immense losses, regulating natural hazard mitigation is one of the tasks of the federal government. This includes the provision of hazard information, provision of post-disaster relief, funding of mitigation projects, and encouraging lower levels of government to mitigate hazards. These tasks are carried out by the Federal Emergency Management Agency, or FEMA (Godschalk et al. 1999, Palm & Carroll 1998). Mitigation efforts and funding by FEMA mainly focus on floods and earthquakes. For other natural hazards, state and local governments are largely reliant on themselves. In practice this means that mitigation efforts for other natural hazards are the responsibility of local governments, since most state governments merely pursue FEMA standards (Geschwind 2002).

In 1995, FEMA launched the 'National Mitigation Strategy' that aims to "strengthen the partnership among all levels of government and the private sector and to empower all Americans to fulfill their responsibilities for ensuring safer communities" (FEMA 1997, p.1). The strategy has two goals (FEMA 1997, p. 1-2):

- "To substantially increase public awareness of natural hazard risk so that the public demands safer communities in which to live and work"
- "To significantly reduce the risk of loss of life, injury, economic costs, and destruction of natural and cultural resources that result from natural hazards"

For a long time, FEMA programs focused on structural mitigation rather than non-structural mitigation. This truly is a missed opportunity since structural mitigation is not always the ideal

solution. It is expensive and, more importantly, facilitates development in high-risk areas while those risks are, although somewhat decreased through structural mitigation, still present (Burby et al. 1999). Often it is more effective to reduce natural hazard risks through non-structural mitigation such as enhanced land use planning. This notion has grown in the federal government as well as FEMA after the Midwest floods of 1994. Since then, FEMA has launched several programs concerning non-structural mitigation (Godschalk et al. 1999). In 2000, FEMA introduced the Federal Hazard Mitigation Act. This act requires local governments to prepare natural hazard mitigation plans. Unfortunately, the act does not set any strong conditions to the contents of those plans and does not enforce a link between the natural hazard mitigation and other local plans such as the general plan (Godschalk et al. 2003).

In order to help local communities and to provide an overview of possible natural hazard risks, FEMA has developed HAZUS, a free-of-charge software tool released in 1997 that can assist local governments in the risk assessment procedure. Up to then, local governments frequently economized on the risk assessment procedures in the hazard planning process because a good assessment can be costly and requires specialist knowledge. Since a thorough risk assessment is crucial, the quality of hazard mitigation plans suffered from the lack of funds and knowledge among local officials (Burby et al. 1999, Milheizler & Schneider 1997). HAZUS now provides a complete natural hazard loss estimation methodology; it takes into account physical damage, economic losses, and social impacts of natural disasters. It allows for combined assessments of multiple hazards. Earthquake, hurricane and flood risks can be calculated directly with the software, and it is possible to combine this information with that of other hazards (FEMA 2004).

The main task of state governments in natural hazard issues is to share the costs of disaster recovery and to regulate mitigation efforts. State governments are obliged to draft a state multi-hazard mitigation plan in which they describe their policies for hazard mitigation. The mitigation itself mainly takes place at the local level (Palm & Carroll 1998, FEMA 1997). States can establish mandates to regulate local mitigation efforts. The State of California Multi-Hazard Mitigation Plan has four goals (OES 2004):

- to save lives and reduce injuries,
- to avoid damage to property,
- to protect the environment, and
- to promote hazard mitigation as an integrated policy.

The last one is of most relevance to this research, which focuses on mitigation as an integrated part of land use planning at the local level. The goals of the plan are accompanied by numerous objectives, such as 'to increase the understanding of the importance of mitigation', 'to discourage development in high-risk areas' and 'to provide state and local agencies with updated information about hazards, vulnerabilities, and mitigation measures' (OES 2004). Berke et al. (1996) have made researches into natural hazard mitigation mandates of several states. Concerning California State mandates on natural hazard mitigation, they conclude that these lack the authority necessary to enforce a strict observance of the mandate. Drafts of hazard mitigation plans have to be approved by the Governor's Office of Planning and Research, but in practice a plan is hardly ever rejected no matter what the contents are, and there are few measures the State can take if local governments do not comply with the rules. Though the goals of the State of California Multi-Hazard Mitigation Plan are strong, they may not fully ooze through to the local level due to a lack of authority (Berke et al. 1996).

The state has also adopted several acts that prevent development of the most hazardous areas: areas directly on the surface traces of known active faults. There are several of these acts, for different fault systems, for example the Alquist-Priolo Earthquake Fault Zoning Act (government code section 2621

et seq.). This is a form of non-structural mitigation, but mostly because these areas are simply too hazardous to be inhabited. It is especially in less critically dangerous areas where there truly is a choice between structural and non-structural mitigation.

6.3 The safety element

Even though the State of California Multi-Hazard Mitigation Plan may not be as effective as it could be, the state still has other tools to encourage non-structural mitigation of natural hazards. In California, each city or county has to adopt a General Plan: a comprehensive long-term plan for the development of the city or county. The State of California mandates all local governments to include hazard mitigation in their local plan, in the form of a so called 'Safety element' in the General Plan. By bringing together hazard mitigation and land use planning, it is believed that this way plan makers are encouraged to consider hazard mitigation in the land use planning process, thereby stimulating non-structural mitigation measures. The objective of the safety element is the protection of the community from any unreasonable risks associated with the effects of:

- seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche and dam failure,
- slope instability leading to mudslides and landslides,
- subsidence, liquefaction, […] and other geologic hazards,
- flooding, and
- wild land and urban fires.

A general plan must be reviewed by the Division of Mines and Geology and by the Department of Conservation of the State of California, and amended if necessary, before it can be officially adopted. The Division of Mines and Geology reviews the plan on geological hazards such as earthquakes, landslides or subsidence, while the Department of Conservation assesses it on water issues such as flooding, and loss of natural habitats.

Structural mitigation measures such as state building design codes for new developments in earthquake-prone areas are very strict and provide specific rules and regulations so that buildings are designed to resist a disaster up to a certain magnitude. When it comes to non-structural mitigation however, cities and counties have much more freedom in deciding what level of risk they find acceptable at a given location with a given land use allocation, which is illustrated by the word 'unreasonable' in the safety element objective. This now makes it quite difficult to decide which developments should be allowed in a hazard prone area and which should not, as opposed to the Dutch water assessment which clearly aims to maintain a neutral or even positive balance on the account of the water system. Local authorities will have to weigh all risks, assets and liabilities of a proposed plan and then determine which risks they consider acceptable. The Department of Conservation and the Division of Mining and Geology do not have any means to prohibit development in a potentially dangerous location as long as the developments do not break any of the state building regulations and as the local authorities have argued their decisions in a reasonable way. Is that a problem? It does not have to be. Both state departments, along with FEMA's HAZUS software, can provide any locality with thorough and comprehensive information on all natural hazards in a certain area. Because of this, it can be assumed that local plan makers have all information necessary to make an informed decision. But on the other hand, how can one make a truly informed decision when there are so many other interests that have to be taken into account? Because a wrong decision can cause dangerous situations and potentially cause great losses, one could argue that the expert's opinion should have a greater influence on the planning process. Just a little bit more guidance by experts at departments might prove very helpful since non-structural

mitigation is a rather new concept for many plan makers. The state departments involved generously offer help to local plan makers struggling with their safety element, but this is only optional. Not every city or county will decide to ask for help or even realize that they might need help. Chapter 7 will further examine the decision making process concerning general plans and safety elements.

The implementation of a safety element in the general plan largely meets the criteria for good quality natural hazard mitigation planning as established in chapter 2:

- Natural hazard mitigation has to be considered simultaneously with land use planning, but this early consideration is not as explicit as in the water assessment procedure in the Netherlands.
- Natural hazard mitigation is embedded in a comprehensive plan, connecting mitigation with other disciplines such as land use.
- Regular consultation among government institutions is advised, but not obligatory. It is up to the local planning department to contact the State Department of Mining and Geology or the State Department of Water Resources to deliberate on seismic safety or flood mitigation issues. Because a hazard assessment is an obligatory part of the safety element, and these state departments offer detailed hazard information to local plan-makers, and because a general plan must be approved by the Department of Mining and Geology, it is to be expected that this regular consultation does take place in practice, even though it is not a mandatory part of the planning procedure.
- Because the general plan has to be updated on a regular basis, this also provides for the safety element to be reviewed and revised regularly.

6.4 Communication of the safety element

The communication of the safety element is quite different than that of the Dutch water assessment. The prerequisites for a safety element are set down in government code section 65302-g. This government code does merely provide minimum standards for the safety element; it is the legal framework of the safety element.

The Governor's Office of Planning and Research provides several manuals with guidelines that can be of help when implementing the safety element in the general plan. The "General Plan Guidelines" give a detailed overview of all government codes applicable when drawing up a general plan, and point out relevant issues worth considering. For example, the chapter on the safety element begins with a summary of relevant laws and regulations that are applicable if the plan area is subject to a natural hazard risk, it then points to government institutions that can be of help during the hazard assessment phase and with the mitigation of the threats, and ends with an overview of relevant issues worth considering while drafting a safety element (for example: determining peakload water supply requirements in areas with a high risk of wildfires, or determining what constitutes an 'acceptable risk') (State of California 2003). Other state departments have also drafted guidelines, but these are not specifically designed for use in a safety element, but are more general in nature. For example, the State Mining and Geology Boards "Guidelines for evaluating and mitigating seismic hazards in California" provides extensive information on all types of seismic hazard mitigation, ranging from land use decisions to building design (State Mining and Geology Board 1997).

The State Department of Conservation and the State Department of Water Resources offer a wide array of hazard assessment tools that can be used in the hazard assessment phase of drafting a general plan with a safety element. The Department of Conservation has an on-line accessible library of amongst others seismic hazard maps, a geological inventory covering the entire state, and estimated

future earthquake losses. The Department of Water Resources offers, for example, information on flood management and climate data. Both departments form a vast centre of knowledge on natural hazards and natural hazard mitigation.

All in all, we can say that even though the safety element aims to give hazard mitigation a place in the land use planning process, the guidelines and other information provided to local plan-makers mainly focus on technical plan contents rather than on the process of finding creative solutions to the problem. There are no colorful brochures or attractive websites stimulating local governments to consider hazard mitigation in a creative way, but that does not mean that there is not enough information available to help plan-makers to make informed decisions on hazard mitigation and land use issues. Information on the policies and support in integrating natural hazard mitigation in the general plan are available, which means that the internal criteria for plan performance as established by De Lange, Mastop and Faludi (Lange & Mastop 1997, Faludi 2000) are met. The next chapter will evaluate the performance of the safety element in local planning practice.

7 The performance of the safety element

7.1 Case: California's safety element

California is infamous for its natural disaster potential. The mass media often choose California as a location for making disaster-movies, and with good reason. Many cities in California are located in an area of high seismic activity, high flood risk, and a high risk of wildfires. On January 17, 1994, the city of Los Angeles was struck by a 6.7 magnitude earthquake. The losses exceeded $30 billion. It is estimated that within the next century, the greater Los Angeles area might experience an earthquake of even greater magnitude, not unlike the one that hit San Francisco in 1906 that, with a magnitude of 8.2, caused 3000 deaths, destroyed 28,000 buildings and made 350,000 people homeless (Palm & Carroll 1998). If a similar earthquake would happen today in one of California's densely populated areas, losses would be dramatic. Floods, landslides and wildfires have a lesser potential, but they can still cause great losses. Davis (1998) therefore mockingly describes the city of Los Angeles as "apocalypse theme park". However, research by Palm and Carroll (1998) provides evidence that California's population greatly underestimates the risks of such events and that the mitigation efforts of local governments vary greatly.

Figure 7.1: The municipalities in California that take part in this research.

In order to stimulate local governments to consider natural hazard mitigation in the land use planning process, municipalities are obliged to include a safety element in the city's general plan. The goal is not just to mitigate natural hazard risk (which could be done through a separate mitigation process), but also to include it in a comprehensive planning process, allowing for the different disciplines to interact and to consider the consequences of a land use planning decision on hazard mitigation. The safety element can therefore be seen as a decision-supporting planning instrument: it should encourage plan-makers to give natural hazard mitigation a place in land use planning, thereby following the preference of the state of California and of the federal government to mitigate natural hazards through non-structural mitigation measures wherever possible.

In order to evaluate the performance of the safety element, many cities in California were approached, asking them for their cooperation in this research. Five cities were willing to answer questions on the decision making process when drafting a general plan and/or a safety element, and their general plans were studied. It proved to be impossible to retrieve other documents that could

possibly shed a light on the decision-making process: internal memos and reports of council meetings regarding the development or updating of a general plan were either unavailable to the public, or only available as a hard-copy to read in the city archives which because of geographical distance was impossible within the scope of this research. That means that the amount of information is limited, but in the end the decision-makers themselves form a valuable source of inside information because they know the ins and outs of day-to-day planning in their city. These planners can explain why certain decisions were made, how the planning process passes off in their city and how they deal with the safety element requirements. The State Department of Mining and Geology and the State Department of Water Resources were approached too, but unfortunately they were not willing to provide any information. This is regrettable, because the hazard and planning experts at these departments might have a different view of the planning process and the way municipalities deal with natural hazard mitigation.

Table 7.1 and figure 7.1 show the cities that form the basis of the case study. These cities and their natural hazard mitigation efforts will be further discussed in the upcoming sections.

City	County	Pop. (2003)*	Natural hazards
Anaheim	Orange County	332,361	Seismic, flood, wildfire, landslide
Burbank	Los Angeles County	103,359	Seismic, flood, wildfire, landslide
Fairfield	Solano County	102,762	Seismic, flood, wildfire, landslide
Irvine	Orange County	170,561	Seismic, flood, wildfire, landslide
Redwood City	San Mateo County	73,472	Seismic, flood

*Table 7.1: Blue-print planning (*US Census Bureau 2007)*

7.2 Research findings

In this section, the findings of the case study will be discussed. For every city, there is a description of the safety element as a part of the general plan (in order to evaluate conformance to state guidelines), a description of the planning process as obtained from employees of the local planning department, and a brief evaluation of the performance of the local safety element (a more extensive discussion of the performance of the safety element will follow in section 7.3). It is important to realize that the information on the planning process is retrieved from employees of the planning departments of the cities. This information might be biased or incomplete (especially when a longer period of time has passed since the last general plan update it is unlikely that the employees will remember exactly how the planning process went and why certain decisions were made). When interpreting this information, one should keep in mind that the gathered information is not necessarily 100% correct, but it is the only information available for this research. It is to be expected that when the information of several cities is combined, it can provide a general overview of the application of the safety element instrument in the plan-making process.

The information gathered is evaluated based on the criteria for plan performance found in chapter 3, combined with the intentions of the safety element as seen in chapter 6: the conformance to the policy goals, statements and intentions (such as integrating natural hazard mitigation into land use planning policies, and discouraging development in high-risk areas) and the application of the policy in day-to-day decision-making (such as early consideration of natural hazard issues, consultation with state departments during the planning process, and a thorough reasoning of natural hazard mitigation options in land use decisions).

7.2.1 Anaheim

Anaheim is a large city in Orange County, in the South of California. The general plan was entirely updated in 2004, including the safety element and the land use element. The city of Anaheim does not have a separate hazard mitigation plan, which means that all natural hazard mitigation efforts are described in the safety element of the general plan.

The general plan
Anaheim's general plan is quite specific when it comes to desired developments, but unfortunately it does not reveal the arguments that were used to come to these objectives. That makes it difficult to find out what the role of natural hazard threats was in making these decisions. The land use element only speaks of the present situation and desired developments; there are no references to the findings of the safety element or to natural hazards.

The safety element contains detailed maps providing information on all natural hazards that occur in Anaheim, followed by a short list of goals and policies regarding each hazard. The goals are not very specific in nature, for example (goal 2.1): "Protect the lives and property of residents, business owners, and visitors from the hazards of urban and wildland fires". The policies designed to achieve the goals are somewhat specific, focusing on structural mitigation measures. Only in the part on flood risk mitigation, two policies related to land use planning can be found: to "provide appropriate land use regulations […] for areas subject to flooding", and to "encourage new development to maintain […] existing natural streams". However, none of these policies is further specified, not in the safety element nor on the land use element. And although the maps in the safety element provide information on 100-year flood zones and 500-year flood zones, there are no specific policies concerning these zones.

The planning process
The planning department of Anaheim rates the priority of natural hazards, compared to other problems, as 'medium'. The safety element is considered a meaningful part of the General Plan "because land use decisions need to be made in the context of potential natural hazards", as an employee stated. However, it was also stated that if there was no obligation to include a safety element in the general plan, there would probably be far less attention to natural hazard mitigation. This suggests that the main goal of the safety element as an instrument to include natural hazard mitigation in land use planning is achieved in this city: there is attention for mitigation in the land use planning process that would not be there if the safety element was not a mandatory part of the general plan.

While updating the safety element in 2003 and 2004, there was intensive contact with several state departments throughout the plan-making process, from the first preparations up to the final review. This contact was perceived as being helpful and responding to the city's needs. Natural hazard mitigation policies were developed cooperatively with local and state agencies whenever necessary. Regarding the planning process, Anaheim's planning department indicates that natural hazard mitigation is considered in all phases, from location choices to spatial design and management. The extent to which non-structural mitigation is considered varies per hazard: flood, landslide and wildfire risks can vary considerably throughout the city. These hazards are therefore more suitable for non-structural mitigation and the planning department indicates that the siting of land uses is influenced by the conclusions of the safety element, thereby avoiding or reducing hazards. For seismic hazards, the solutions are usually sought in structural mitigation measures such as building design codes. The city indicates that even though the safety element brings the attention to natural hazards, it may not always keep new developments out of hazardous areas, simply because there are

many other interests the city must take into account. But in these cases the safety element does guarantee that potential risks are at least sufficiently mitigated through other mitigation measures. This is exactly what the safety element is supposed to do: it does not claim sole attention to natural hazard issues, but guarantees that natural hazards and their mitigation are considered in the planning process, allowing the plan-makers to make wise decisions based on the specific local situation and interests.

Performance of safety element
The safety element appears to perform reasonably in Anaheim. The goals and policies on natural hazard mitigation are not very specific or detailed. The mitigation of flood hazard is integrated into land use planning policies; for other hazards the focus is still on structural mitigation. In general, there is some conformance to the objectives of state mandates on the safety element. Unfortunately the plan documents do not contain any explanation on the choices made, but there is an early consideration of natural hazard issues and a regular consultation with state departments throughout the planning process, which means that natural hazard mitigation is considered in day-to-day planning.

7.2.2 Burbank

Burbank is a medium-sized city in the south of California. It is located in the greater Los Angeles area between the city of Los Angeles and the San Gabriel Mountains. Burbank's general plan was last renewed in 1988. The safety element was updated in 1997, and the land use element and several other elements are currently in the process of updating. The city of Burbank has a separate hazard mitigation plan in the form of a "Multi-hazard Emergency Operations Plan", but this plan is not relevant to this research because it focuses on emergency response in case of a disaster. Pre-disaster mitigation policies are established in the safety element of the general plan.

The general plan
The current general plan of Burbank, dating from 1988, is only available in the city library, which made it impossible to review this plan. In 1997, the safety element was updated and this element was available for research. The safety element is an extensive document of over 150 pages that provides detailed information on the natural and man-made hazards that threaten Burbank. For every hazard there is a comprehensive risk assessment (accompanied by numerous maps), followed by policies on hazard mitigation as well as hazard response in case of emergency. Most mitigation policies concern technical solutions such as building codes for seismic safety, and social mitigation programs such as disaster insurance and hazard awareness. However, there are some land use related policies too. For example, policy P5 aims to encourage the siting of critical facilities (such as hospitals and schools) in low-risk zones.

There already is a draft available of the land use element of the new general plan of Burbank (note that it is only a draft and not the final plan yet). There is no reference to the safety element at all. The goals of the land use element are very specific and are accompanied by texts that explain the arguments behind the policies. The goals and policies are mostly aimed at improving the social well-being of the population of Burbank. Policies address the type of neighborhoods desired and the spatial organization and interconnectedness of those neighborhoods over the city. There are several policies that refer to reducing the impact of the city on the natural habitat surrounding the city, but there are no policies concerning the effects the natural world can have on the city. In other words: the land use element is not in the least connected to the safety element or to hazard mitigation in general.

The planning process
Natural hazard mitigation has a high priority in Burbank. The safety element is considered a meaningful part of the general plan because "[natural hazard mitigation] has implications for land use policies, the distribution of land uses, and densities". On the other hand, the city also indicates that if there was no obligation for a safety element, there would still be as much attention to natural hazard mitigation. In other words: if the State of California did not mandate the inclusion of a safety element the city would still develop a natural hazard mitigation plan in close connection to the land use plan. This indicates that it is not so much the safety element that is perceived as meaningful, but natural hazard mitigation in itself. If this were true for all cities (if it is true at all; it might very well be that if the state's attention to natural hazard mitigation would flaw, the city's attention to the problem would eventually diminish too), the state mandated safety element would be redundant.

The city of Burbank perceives the assistance provided by the state departments as helpful, and indicates that help is available upon request throughout the whole planning process. The land use element and the safety element are closely related, and Burbank states that natural hazard issues from the safety element are taken into account in land use planning (although it does not show from the planning documents), both in location choices as in the spatial design of a location. The freedom cities have in defining acceptable risks and making final choices is much appreciated by Burbank; because local governments traditionally always have had great autonomy they do not want to give up any of these rights. Local governments feel that decisions regarding the safety and well-being of their residents should always be in the hands of the local authorities. The safety element is perceived as 'useful' the way it is, and the plan-makers at Burbank feel that if the state would put any more pressure on local governments or take any autonomy away from the cities, it would have a contrary effect because cities would probably perceive the policies as an 'obligation' and would only do whatever is strictly necessary, while the present situation encourages them to actively search for the best possible solution for all parties involved.

Performance of safety element
The conformance of the safety element to state mandates is quite good. The safety element is very detailed and specific and all goals and objectives are based on a thorough hazard assessment, but the emphasis is still on structural mitigation measures. The safety element mandates are used as a guideline in the decision-making process: natural hazard mitigation is considered early in the planning process, and state departments are consulted whenever necessary. Unfortunately the land use element and the safety element do not appear to be linked in any way, and there is no discussion of natural hazard mitigation issues in the land use element. In general, the performance of the safety element in Burbank is reasonable.

7.2.3 Fairfield

Fairfield is a medium-sized city in Solano County, in the Bay area. The city is located about halfway between San Francisco and Sacramento. Fairfield's general plan stems from 2004 when it underwent a total revision. The safety element in the general plan is the city's only natural hazard mitigation plan, there is no separate local mitigation plan.

The general plan
The land use element of Fairfield's general plan focuses on the desired future development of the city. The goals is to create 'viable neighborhoods' through objectives such as 'enhancing the desired character of the city' and 'achieving a pattern of development that reinforces the city's desired image' (City of Fairfield 2004, p.LU2). The policy programs attached to these goals and objectives are quite

detailed in nature. The land use element does not refer to natural hazard mitigation and/or to the safety element.

The safety element starts with an introduction explaining that it is closely connected to the land use element because the hazards addressed in the safety element provide constraints on future developments. The element's goal is to "minimize the public's exposure to harmful impacts caused by hazards […]" (City of Fairfield 2004, p.HS2). The element does not contain much information on the hazards themselves or a hazard assessment, but mainly consists of objectives and policies. Most policies in the safety element focus on structural mitigation or on hazard awareness, but there are also some statements that refer to non-structural natural hazard mitigation, such as:

- "No critical structures […] shall be located in areas of high ground failure potential" (policy HS2.1)
- "Development is discouraged on slopes in excess of twenty percent and/or unstable soils" (policy HS2.4)
- "Development that interferes with channel capacity […] shall not be allowed" (policy HS3.5)
- "Maximum residential density for […] high wildfire risk areas shall be one dwelling unit per five acres […]" (policy HS4.4)

The element does not further explain how these policies are integrated into the land use plan maps.

The planning process

Although natural hazard mitigation is awarded a low priority by the city, the safety element is considered to be a meaningful part of the general plan because of the close relationship between land use planning and natural hazards in California, and it provides guidance to the city in reviewing and approving development projects. Planners at Fairfield indicate that without a mandatory safety element there would probably still be much attention to natural hazard mitigation in the local planning process.

Fairfield does not often consult state departments for assistance and deliberation, but the city does take part in the Association of Bay Area Governments (ABAG). ABAG is the primary source of information for cities in the area when it comes to planning and hazard mitigation (and many other issues). This contact is quite intensive whereas the state departments are only consulted for basic hazard information. Fairfield indicates that natural hazard mitigation is considered in all phases of city planning, but in most cases natural hazard considerations do not influence location choices. Only critically dangerous areas (for example fault lines) are avoided, other hazards are usually mitigated on-site, which means that there is a preference for structural rather than non-structural mitigation. In most cases, the natural hazards do not influence land use decisions. Still, Fairfield considers the land use element and the safety element to be strongly connected. The city appreciates the liberty to define which risks are 'unreasonable', and indicates that more detailed state mandates would probably be either too specific to reflect local conditions, or too general to provide meaningful directions. Determining acceptable risks must be defined by each community and is mainly a political decision based on community goals and objectives, according to Fairfield.

Performance of safety element

Although there is no direct referral between the land use element and the safety element, the latter one contains several policies that demonstrate that natural hazard mitigation is in fact integrated in land use planning, which means that there is some conformance to state mandates regarding the safety element. The safety element does guarantee the consideration of hazard mitigation issues in day-to-day planning but location choices are hardly ever influenced by natural hazard issues which means hazard mitigation is not truly considered in all phases of planning; state departments are hardly ever consulted; and there is no clear argumentation on land use decisions available in the

documents that discusses natural hazard mitigation options. Overall, we can say that in Fairfield, the safety element performs reasonably.

7.2.4 Irvine

Irvine is a medium-sized city in Orange County, in the South of California. Irvine's general plan underwent a comprehensive update in 2000, and the land use element is currently being updated again. The safety element not only deals with natural hazard, but also with aircraft hazard from John Wayne Airport. There is a separate element dealing with seismic hazards, because the city of Irvine feels that seismic risks are too high to be mitigated in the same element as other, less common, hazards in the city. There is no separate hazard mitigation plan, making the general plan the base for all mitigation efforts.

The general plan

Irvine's land use element starts with the element's goal: to "promote land use patterns which maintain safe residential neighborhoods […]". The first sentence of the element already indicates that safety is one of the major concerns in land use policy. The objectives and policies in the land use element are not very specific, but they do explain how the city deals with new developments that might create 'land use conflicts', with regard to hazards or other issues. The element indicates that the ultimate decisions on land use are not made in this general plan, but development proposals will be reviewed based on the ideas of the general plan, and in this review stage one should be able to explain how possible negative effects will be mitigated. Or, as policy A6i states: "Ensure that sensitive uses are allowed in areas with identified hazards only if the hazard has been adequately analyzed and mitigated" (City of Irvine 2000, p.A16).

At the end of the land use element, there is a list of objectives that relate to other general plan elements, such as the safety element or the seismic element. Even though the land use element is not very detailed and therefore does not provide much opportunity to mitigate natural hazards through non-structural mitigation, this direct reference to the seismic and the safety element indicates that the city acknowledges the importance of natural hazard mitigation in land use decisions, and encourages non-structural mitigation if applicable.

Both the seismic and the safety element start with an introduction that states that "both elements should be considered together in identifying the location and type of development permitted in the city […]" (City of Irvine 2000, p.D-1 and J-1). Both elements are rather short and do not provide many specific goals and objectives, but they do form the basis for decisions further in the land use planning process. Policy J-1 of the safety element indicates that the type and intensity of development in areas associates with potential hazards should be regulated. The seismic element does not contain any policies directed at land use planning alternatives, but it does refer to the land use element, indicating that seismic hazards should be considered in the land use planning process.

The planning process

Natural hazard mitigation has a high priority in Irvine's planning activities and the city feels that it is very important to have long-term, comprehensive goals, policies and implementation measures for hazard management. The safety element and the seismic element are perceived as meaningful elements that truly belong in the general plan, thereby ensuring the connection with land use and other relevant issues. If the city was not obligated to include a safety element in the general plan, they would probably still incorporate it, because "safety is a significant focus for the city of Irvine", according to a member of the city's planning department.

Since no current staff members of Irvine's planning department worked there during the general plan update in 2000, there is no information available on the consultation of state departments and the cooperation with those and other government institutions during the updating process. The department does indicate that natural hazard issues are taken into account in all phases of planning, from the earliest planning stages of choosing a location to spatial design and spatial management. Especially flood zones and seismic and soil issues often function as a constraint for certain developments in those areas. Every development proposal must be reviewed with the contents of the safety element and the seismic element in mind; the goal is to "minimize the danger to life and property from man-made and natural hazards". The safety and seismic element and the land use element are closely linked. The land use element contains specific policies that refer to protecting the health and safety of the community, and the safety element contains policies that should regulate the type and intensity of development in areas associated with potential hazards. Although non-structural mitigation is preferred, this is not always possible. In that case one must demonstrate that the proposed mitigation measures are sufficient before a development application is granted.

Performance of safety element
The city of Irvine succeeded in integrating natural hazard mitigation into land use planning. There is a clear reference between the three elements and the emphasis is on non-structural mitigation whenever possible. This means that there is a high conformance to state mandates regarding the safety element. The safety element and the seismic element ensure consideration of natural hazards throughout the planning process and the elements form the basis for the future evaluation of new plan proposals. The state departments are consulted regularly, and in land use decisions possible consequences regarding hazard issues should be well-reasoned. All in all, this means that the performance of the safety element in Irvine is excellent. However, one should keep in mind that, as opposed to other cities, the city of Irvine does not have a very detailed general plan: it does not contain specific development plans but merely forms the basis for further planning actions. But if those further actions are indeed carried out as explained in the general plan and by city planners, the safety element performs very well.

7.2.5 Redwood City

Redwood City is a city in San Mateo-County in the Bay Area, south of San Francisco. The last comprehensive general plan update stems from 1990, and the city is currently in the process of completely updating its general plan. The safety element deals with seismic hazards and flood risks, the only significant hazards the city experiences.

The general plan
Redwood City is currently updating its general plan. There are no draft documents available yet. Redwood's present general plan is very short. The safety element for example contains only four pages and the land use element six pages. The land use element has as its main goal to "integrate a range of land uses to ensure that Redwood City is a desirable place to live". The element does not consider any natural hazards in its discussion of alternative land uses, but refers to the safety element.

The safety element is very brief too, but refers to a county-wide safety element from San Mateo County, drafted in 1975. Although a county-wide safety element sounds very reasonable, one may wonder if a 15-year-old plan (the county element dates from 1975, the city element from 1990) is still up-to-date enough to address all applicable issues. The Redwood City safety element is general in nature, explaining which hazards the city is subject to, and stating that the community should be

protected from these hazards. Policy S-14 of the safety element states that levees that protect residential communities should be upgraded to protect against a 100-year flood. Although the author finds it quite remarkable that apparently the levees -not even the ones protecting residential areas- were not designed to withstand a 100-year flood, it is good to see such a specific goal in a safety element, because many cities do not go any further than stating that they 'encourage a safe environment', leaving aside what a safe environment is or how it should be achieved. Redwood City here clarifies what standards they want to achieve in flood risk mitigation, which provides a concrete base for further actions. If there were more of this type of objectives, it might be a very powerful safety element, but unfortunately the element is too brief to contain many detailed policies.

The planning process

The city regards the safety element as an important part of the general plan because it ensures the consideration of mitigation issues in other policy topics. The city also points out that including the safety element in the general plan has a downside too: if one would like to update the safety element or add new information to it, staff has to prepare a General Plan Amendment (including public hearings and review by the planning commission and the city council). It is logical that any modification in the general plan has to go through this procedure to protect all interests, but staff indicate that progressing insights into natural hazard mitigation and/or a changing physical situation can give cause for amending the safety element more often, but the General Plan Amendment procedure forms a serious impediment.

Although the city is currently in the process of updating its safety element, it has not yet requested any assistance from or deliberation with state departments. Staff indicates that state departments are only consulted towards the end of the plan-making process, for review of the plan. The city does cooperate closely with regional and state offices when it comes to emergency planning, but not so much in the mitigation phase of hazard management. The planning department feels that if there was no obligation to include a safety element in the general plan, the general plan would probably not contain any hazard mitigation policies. Staff feels that the city is subject to high natural hazard risks regardless of mitigation efforts or a safety element, and openly indicates that this perception probably leads to a far from optimal implementation of the safety element in the planning process. It is of course true that hazard mitigation can never completely remove all risks, but by accepting this fact as a license to do nothing at all, the city might very well pass over opportunities to provide for a somewhat safer environment. Mitigation research clearly points out that mitigation is meaningful and usually cost-effective in the long run (see chapter 2). Natural hazards are not considered in location choices in Redwood City, only in the development phase with building design codes et cetera. The city feels that the safety element and the land use element are hardly connected at all, and focuses on emergency response rather than hazard mitigation. Redwood City appreciates the flexibility in state guidelines considering the safety element, giving Redwood City the opportunity to deal with natural hazard mitigation in a way that suits the city.

Performance of safety element

There is little conformance of Redwood City's safety element to the state objectives. Natural hazard mitigation is not at all integrated into land use planning policies, and there are no policies that discourage the development of high-risk areas. The city only uses structural mitigation measures. The safety element is not used in day-to-day decision-making; natural hazards are not considered in the land use planning process and there is no consultation with state departments at all. This means that the performance of the safety element in Redwood City is very poor, but it must be said that the current general plan is very old; it might be that the updated general plan will contain more policies on natural hazard mitigation through land use planning.

7.3 Conclusions

As seen in chapter 2, defining clear and concrete goals helps to achieve high quality mitigation plans. Unfortunately, clear policies and objectives appear to be rare in local safety elements. The policies are usually quite general and do not set any specific standards for the safety level a city tries to achieve. Since in most cities the safety element in the general plan is the only natural hazard mitigation plan, there are no other possibilities to specify desired mitigation measures.

The first step in evaluating plan performance is to determine if the two prerequisites (chapter 3.2) are met. The safety element meets both prerequisites. Because local governments all include a safety element in their general plan, we can state that decision-makers are aware of plan statements relevant to them, and they accept them as part of their operational context. Since a safety element is an obligatory part of the general plan, cities do not have much choice but to accept state policies and implement a safety policy in the general plan. The efforts they undertake to do so provide information on the extent to which the safety element truly performs.

The next step is to determine if there is conformance to the plan's goals and intentions. The main objective of the safety element policy is the protection of the community from any unreasonable risks associated with natural hazards. Cities rarely specify what they consider to be 'unreasonable risks' which makes it hard to evaluate if the city's safety element helps protecting the community from it. Because the objectives and policies of most safety elements are rather general in nature, they easily correspond to the state's goal to protect the community. This means that there is conformance to the state's plans and policies: the cities follow the same principles as that state in this matter.

The last step is to evaluate to what extent local plan-makers use state goals and objectives concerning hazard mitigation in the day-to-day decision-making process. By mandating local authorities to include a safety element in the general plan, it is hoped that natural hazard mitigation will be considered in the land use planning process, allowing for non-structural solutions wherever possible. With the findings of section 7.2 in mind, we must conclude that the extent to which local governments use the safety element or its findings as a reference framework in the land use planning process is far from optimal. In some general plans, there is no connection at all between the safety element and the land use element. Is seems as tough those municipalities consider them as two completely separated items that do not have any influence on each other. The safety element explains what hazards occur in the area and explains the use of structural mitigation measures available, while the land use plan merely sketches the desired development of the community regardless of underlying conditions that could possibly impact the functioning of the community at certain locations. In other words: the land use element only focuses on spatial arguments for certain developments, and when these land use decisions are made and one is going to develop an area, the safety element provides guidelines on how to mitigate any possible hazard through technical solutions.

Some cities, such as Irvine, have a different approach and acknowledge that natural hazard issues can strongly influence the community's well-being. The city puts forward a clear connection between the land use element and the safety element, which is good, but because the general plan is not very specific, it does not enable the consideration of natural hazard mitigation in overall land use planning issues. Individual building applications will be reviewed on the basis of both elements, but this will probably lead to structural mitigation measures rather than non-structural mitigation measures since a building application usually concerns a specific location. The city must then decide if the proposed development is suitable for this location, and if not, what mitigation measures are necessary. This means that mitigation is considered in the final stages of plan-making, while the earliest stages allow

for consideration of natural hazard issues in the choice of an appropriate location. This problem is visible in all cities analyzed for this research: the land use element and land use maps do not really consider natural hazard mitigation, and if it is considered in a later stage many mitigation alternatives are no longer available.

However, this is inherent to the Californian planning system. Cities receive much freedom in determining their goals and objectives. It is up to local governments to decide what risks are acceptable, and which land use developments are desired. Structural mitigation expenses are for project developers, not for the city, so why worry about non-structural mitigation in the land use planning process when structural measures have the same financial result for the city yet the city has more freedom in allocating land uses to areas according to the city's vision rather than hazard zones? Cities much appreciate the freedom they have and any interference by state government policies is perceived as a downright nuisance. But this strategy just might lead to sub-optimal solutions because a focus on structural mitigation measures has quite a few negative side-effects, as seen in chapter 2.

Some of the interviewed city planners indicated that if there was no obligation to prepare a safety element, they would still implement a similar element in their general plan because safety is such an important issue. It can be expected that cities would indeed develop policies to provide a safe environment to the community, but it is very well possible that the focus of their attention would be on structural mitigation even more than is the case now. Planners prefer to do what they do best: make city plans that provide for a nice community. Safety issues might be considered only further in the planning process, leading to technical solutions rather than land use alternatives. Chapter 2 explained that non-structural mitigation alternatives usually need some specific encouragement because otherwise natural hazard mitigation is only one of many interests, and since structural mitigation has been the standard for decades, it might well be outweighed by other interests that already have a stronger basis in land use planning discussion.

8 Conclusions and recommendations

8.1 Introduction

In this final chapter, the questions that formed the basis of this study can be answered, on the basis of the findings of chapters 2 to 7. These research questions will be answered in the second section. It is now also possible to draw conclusions on the main research question:

> *How well do the policies formulated by the Dutch and the Californian governments perform in encouraging local governments to consider flood risk, or natural hazard risk in general, when drafting local land use plans?*

This question will be answered in the third section, explaining the factors that were found to influence the degree of performance. The final sections will elaborate on carrying out plan performance research, and suggestions for additional research that might improve our understanding of plan performance in general, and the effectiveness of the Dutch water assessment and the Californian safety element in particular.

8.2 Research questions

This section will summarize the answers to the research questions from the first chapter.

1. Which viewpoints on the relationship between the natural environment and the built environment have influenced recent changes in the natural hazard mitigation policy field?

The emphasis in natural hazard mitigation has long been on structural mitigation measures, for example technical solutions to increase the resilience of buildings to withstand earthquakes. More or less parallel to the rise of the concept of 'sustainability', the emphasis in natural hazard mitigation shifted to the creation of 'hazard-resilient communities' and the like. The focus was no longer on technical measures to withstand the forces of nature, but to decrease a community's susceptibility to the hazard. Flood risk mitigation in the Netherlands and natural hazard mitigation in California slowly became the terrain of land use planning too, promoting the use of non-structural mitigation measures (i.e. to adapt land use to the occurring hazards) whenever possible.

2. What is performance of land use policies and how can it be determined?

Performance is a means to evaluate the effectiveness of a plan or policy that is strategic in nature, has a long term of execution, operates in a complex administrative context, and gives the addressees a certain freedom to decide in balancing the interests of the plan or policy with other interests. Such a plan or policy performs well if it is used in day-to-day decision-making as a reference framework by those addressed in the plan. In order to determine the performance of a plan or policy, one first has to establish if the plan is adequately communicated towards the addressees, then find out if there is conformance to policy goals, statements and intentions, and finally determine if the plan is used in the decision-making process as intended.

3. Which laws, policies and regulations influence local land use decisions concerning flood risk management in the Netherlands?

Since 2003, municipalities have had to include a water paragraph in their local land use plan. This paragraph should be the product of a so called water assessment: a constant line of attention for water management issues throughout the planning process. The water assessment procedure is based on the national Water Policy for the 21st Century. This policy encourages the consideration of water issues with a focus on non-structural mitigation measures (i.e. to let the water system guide spatial developments rather than the other way round) and aims to never let new developments have a negative impact on the water system: negative side effects should either be avoided or compensated, and water management problems should be solved at the source of their origin as much as possible, not elsewhere.

4. How well does the policy framework (from question 3) perform in local land use planning in the Netherlands?

Overall, the performance of the water assessment is reasonable. It does encourage local planners to consider water management issues in the spatial planning process, but water does not always get enough attention in the earliest phases of the planning process. This reduces the chance of finding creative land use solutions, but the water assessment does guarantee a basic level of mitigation for negative impacts of new developments. The extent to which the water assessment is implemented throughout the whole planning process, and the efforts a city puts into achieving the best possible solution concerning water management strongly depends on the city's ambitions.

5. Which laws, policies and regulations influence local land use decisions concerning natural hazard risk management in California?

Californian state government code section 65302-g mandates local governments to include a safety element in their general plan, in order to mitigate any natural hazards a city might be subject to in connection to the desired urban developments from the land use element. The state encourages the implementation of non-structural mitigation measures, for which a link with local land use planning is necessary. The state of California offers detailed hazard information and offers assistance to local planning departments, but the implementation of the safety element is fully up to the cities. They only have to meet a few basic criteria to have their general plan (including the safety element) approved by the state; cities have considerable freedom in implementing the safety element in a way that suits the city.

6. How well does the policy framework (from question 5) perform in local land use planning in California?

The performance of the safety element can be considered as 'reasonable'. Although the safety element usually provides for mitigation measures, the policies are generally vague and primarily focus on structural mitigation. In most cities, there is no clear connection between the safety element and the land use element; they are seen as two separate elements that do not influence each other. The safety element guarantees a basic level of attention for hazard mitigation efforts, but any extra efforts depend on the individual city's ambitions.

8.3 The performance of decision-supporting planning instruments

In both countries, the performance of the studied decision-supporting planning instruments is reasonable. There is conformance to the basic mandatory aspects of the policies, but this is inherent to the instruments: municipalities must include a water paragraph or a safety element in their local plans in order for the plan to be approved and adopted. There is some conformance to other aspects

of the original plans; for example, in the Netherlands the three-step approach of retention, storage, and carrying off of water receives much attention.

This study shows that the extent to which the policies are used as a reference framework in the day-to-day decision-making process varies greatly and seems to be mainly dependent on the cities' ambition. But what determines a city's ambition to implement the water assessment or safety element in a progressive way? Some cities put more emphasis on 'green' or 'blue' land use functions and profile themselves as having great interest in the natural environment, which might explain their attention for water management issues. Maybe a city's ambition is also dependent on the expertise and enthusiasm of the individual employees at the planning department. In that case, the performance of a policy would be a gamble since the outcomes would totally depend upon a handful of individuals. Although the efforts of individual planners are important in defining a local plan (for they are the ones who draft land use alternatives and attach a spatial vision to political statements), there are of course many other variables that determine the success or failure of a plan. Politicians define the primary direction a city ought to develop in and ultimately balance one interest against another, experts at water boards or state departments have the power to show local planners the importance of mitigation measures and provide assistance to develop better alternatives, and state, national and provincial governments have the power to demand better plans because they are the ones who finally either approve or reject a proposed land use local plan. Because the whole decision-making process is so complex, it is virtually impossible to determine the exact influence of every actor, but by acknowledging that all these chains in the local planning process influence the final plan, higher level governments could adjust their policies and accompanying communication tools to reach all actors.

The conclusion that much of a city's efforts depend on the local ambition level is not necessarily a negative one. One of the essential qualities of a decision-supporting planning instrument is that it does not impose any specific objectives onto local plans, but only mandates the plan-makers to at least consider those objectives in the decision-making process as a full alternative, leaving the final decision to the city. But, considering the conclusions of chapters 5 and 7, we can conclude that in some cases, a city's ambition does not only guide the final decisions when it comes to choosing development alternatives, but also influences the extent to which natural hazard issues are considered in earlier phases of the planning process. This might lead to a process where natural hazard mitigation options are not considered at all when drafting alternatives and deliberating on interests of importance. In that case, a low ambition towards hazard mitigation is in fact a negative aspect in the plan-making process because it does not allow for a fully fledged balancing of all interests. One of the tasks of the decision-supporting planning instruments studied for this research is to guarantee a basic level of attention for mitigation issues throughout the planning process to prevent the above from happening, but especially in California it does not really succeed. Some cities do not link land use to natural hazard mitigation, preventing even the slightest consideration of hazard mitigation issues in the land use planning process. This does not necessarily lead to unsafe situations because state building codes will ensure that developments will be mitigated through structural measures, but it does exclude non-structural mitigation alternatives since these usually need to be considered in the earliest stages of the planning process.

Maybe stricter rules on the connection between the safety element and the land use element might correct this problem; like Dutch cities are obliged to elaborate in the water paragraph on the decisions they made and the arguments that were decisive, a similar obligation in California might encourage municipalities to consider the outcomes of the safety element when drafting the land use plan. Although Californian cities highly value their freedom and generally distrust every extra rule or obligation that comes from the state planning department, this adaptation would not restrict the

cities in their freedom to make final decisions, it would only encourage them to make decisions based on full information.

The cooperation with other institutions (for example a Dutch water board or the Californian State Department for Mining and Geology) is much stronger in the Netherlands. Although not all cities in the Netherlands consult the water board or other water managers in the earliest planning stages many still do so, whereas early consultation is very rare in California. In California, state departments are usually consulted only for hazard information (not hazard mitigation advice) and for plan review, whereas Dutch cities quite regularly get in touch with the water board for advice on mitigation. It is difficult to establish what causes this difference. One could think that maybe Dutch water boards are more approachable than Californian state departments, yet Californian cities indicate that the contact with state departments is good and that advice and assistance are available upon request. Apparently, the cities simply do not consider themselves to be in need of advice or assistance in the early stages of land use planning. In the Netherlands, early consultation with water boards is included in the official step-by-step schedule of the water assessment procedure. Although non-compliance to the schedule does not have any direct legal consequences, it might just stimulate local governments to follow the schedule and arrange for early meetings with the water board as prescribed by the water assessment procedure.

Another cause for the presence or absence of attention to the problem in the early planning stages might have something to do with the urgency the city experiences regarding the problem. A city that fully understands why it is so important to consider natural hazard mitigation early in the planning process might be more inclined to consider it early in the local land use planning process. The water paragraphs of the cities studied in this research indicated that the cities very well understand why flood risk mitigation is an issue of importance in the land use planning process (even though it still was not always included in the earliest planning stage, i.e. choice of location). In the communication of the water assessment procedure, Dutch cities have received all kinds of attractive and easy-to-read documents explaining the importance of flood risk mitigation, the problems of current water management (in particular with regard to future climate change), and many examples of creative solutions combining flood risk mitigation with a high spatial quality. The cities have indicated to use these documents and guidelines in the water assessment procedure, which means they are regularly reminded of the importance of the whole process.

Summarizing, this study has revealed several internal factors influencing plan performance, and an external factor. As explained before, this external factor (i.e. a city's ambition level) is probably the most important one. Note that, due to the limited scope of this research, these factors have not been examined extensively enough to be absolutely sure of their role in performance. The next section will further elaborate on performance research.

Factors influencing the performance of a decision-supporting plan instrument, such as the water assessment in the Netherlands and the safety element in California:

- Factors internal to the plan:
    - provide for regular consultation with experts on the subject, such as water boards or geological department,
    - obligation to elaborate on arguments that determined the final local land use plan,
    - convince the addressees of the plan of its importance and relevance, and
    - offer good-practise examples that can be used as inspiration to find creative solutions.

- Factors external to the plan:
    - the ambition level of the addressee of the plan.

Two of the internal factors correspond with the factors found by other researchers as established in chapter 3. The obligation to elaborate on arguments more or less corresponds with the criteria that the policy must give significant assistance in operational decisions; they both emphasize the operational use in the decision-making process. Convincing the addressees of the plan of its importance and relevance corresponds with the criteria that the recipient must judge the plans as of continuing relevance. The other two factors might very well be specific to the natural hazard field: the regular consultation with experts since making a well-substantiated decision requires detailed hazard knowledge that otherwise might not be available to local planners, and the good-practise examples since integrating non-structural hazard mitigation into land use planning requires local planners to consider subjects they otherwise might not have considered at all and that are not (yet) a generally accepted part of land use planning which means that local planners might need some extra encouragement before they dare to explore creative solutions. The importance of the external factor, a city's ambition level, corresponds to the findings of Bukkems (1989) and Verwijmeren (2001). Talen (1997) argued that there are no external factors known that can influence the degree of success of a plan. This research, together with those of Bukkems and Verwijmeren, suggests that a high ambition level of the addressees of the plan might in fact be one of those external success factors.

However, one should realise that this factor is not solely external: an attractive plan with exciting good-practise examples, combined with a thorough communication of the plan's importance might influence a city's willingness to try their best at meeting the plan's goals and objectives. But since all cities in this research (per country) have received the same plan and the same communication of the policies, we can conclude that the ambition level of the city still plays a large role, even if it can be influenced by the attractiveness of the plan itself: there are considerable differences among the cities when it comes to their willingness to embrace the water assessment of safety element policy as an important part of land use planning, which has its origins in the city's ambition level.

8.4 Recommendations on further research

Looking back on the activities undertaken for this research project, the most striking observation is that it proved to be very difficult to obtain all relevant information regarding the decision-making process. Cities would not reveal internal memos on the subject, city council meeting reports did not contain information on the decisions made in that meeting, and the final plans did not contain much information on the arguments used to get to this plan. It may be that if a research focuses on only one city, the researcher would, by spending more time with that city, obtain a better relationship with the decision-makers which might encourage them to reveal more information.

In interviews, the interviewees sometimes contradicted themselves, or could not remember the exact reasons for a decision made earlier. Because it proves to be so difficult to unravel the decision-making process, it might be interesting to follow such a process real-time (over the course of years, if necessary). In that way, one could determine more precisely the use of a policy in the decision-making process, the influence of different actors (planners, politicians, and experts) and the use of references (examples of good-practise, step-by-step guidelines et cetera). This would probably provide much inside information on the performance of plans and policies, yet it would also be a very time-consuming type of research.

In the Netherlands, the water assessment procedure is perceived more as a bureaucratic burden than the safety element in California. It would be interesting to find out if this difference will decrease over the next years, when Dutch cities may feel more comfortable with the use of the water assessment. For many cities, the water assessment is a rather new concept, and they still have to explore how they want to implement this new instrument in their day-to-day decision-making process. In California, the safety element is accepted as a natural part of the general plan; maybe the results in the Netherlands would be quite different in a few years time too.

It might also be interesting to evaluate how the results of this research, on the performance of decision-supporting planning instruments, relate to the performance of other types of plans, policies and instruments. If the performance of different plan types was known, that could shed a light on the usefulness of specific plan types. This then could lead to better plan-making in the future, providing for plans that are truly used as a reference framework in the day-to-day decision-making process.

In general, the findings of this research largely correspond with the criteria that influence performance as established by other researchers. The existing theories on plan performance proved to be useful and matching the reality of planning practise. However, performance research usually focuses on factors that are internal to a plan, rather than external factors such as a city's ambition level. It would be interesting to find out more about the relationship between plan performance and external factors, since these seem to play a large role in the success or failure of a plan. That way, new theories on plan performance might offer highly useful guidelines to authorities on influencing local governments to create an environment that allows for plans to perform. After all, that is what a plan is supposed to do: work, through guiding developments in the real world according to the planners' vision as well as local circumstances, in order to create better spaces.

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