Governance of flood risks in The Netherlands: interdisciplinary research into the role and meaning of risk perception

M.S. de Wit
TNO Built Environment and Geosciences, Delft University of Technology, Delft, The Netherlands

H. van der Most
Deltares, Delft, The Netherlands

J.M. Gutteling
University of Twente, Enschede, The Netherlands

Bočkarjova, M.
ITC-International Institute for Geo-information Science and Earth Observation, Enschede, The Netherlands

ABSTRACT: The policy on flood risk management in The Netherlands is in transition from a prevention-based approach towards a governance approach, which involves all elements of the safety chain. This implies that many more actors become involved, each with their own perception of the risks. This paper reports on an ongoing interdisciplinary research project, which studies the role of risk perceptions in the emerging governance approach. The project has four disciplinary research tracks in psychology, policy analysis, social economics and engineering, and strongly focuses on integration of these tracks. The paper elaborates on one of the main research questions of the project, i.e. on the ability of citizens to cope with floods by means of adequate preparation. The discussion on this issue illustrates the added value of the interdisciplinary approach. The paper concludes with an outlook on the development of an integrative framework, which intertwines all research tracks.

1 DEVELOPMENTS IN FLOOD RISK MANAGEMENT IN THE NETHERLANDS

The policy on flood risk management in The Netherlands has always focused on prevention. However during the last 5-10 years a debate has started to widen the scope of flood risk management, paying more attention to the consequences of flooding. The Dutch government is currently developing a new policy for flood risk management in the framework of 'Water Safety 21st Century'. This new policy will be based on three pillars:

- revision of the prevention policy, including an update of the standards for the protection against flooding for the various dike ring areas;
- more explicit attention tot the consequences of flooding in relation to spatial planning and the robustness of infrastructure;
- strengthening of the awareness of flood risk and promotion of a more water conscious behavior of citizens, companies, policy makers and administrators.

In addition, especially triggered by the flooding disaster in New Orleans (Katrina), the Dutch government has launched a campaign to better prepare for the situation that a flood actually does occur. This campaign focuses on the development of disaster management plans and actual exercises in disaster management including a nation wide exercise by the end of 2008. So, in a few years time the scope of flood risk management is being widened from solely working on prevention to paying attention to all links in the safety chain from pro-action till after-care.

The wider scope of flood risk management will have an impact on the position and role of the citizen. The citizen is expected to better prepare for the unfortunate event that a flood takes place, to take measures to mitigate the consequences of flooding, to evacuate or find shelter in an orderly way, etc.. Whether the citizen is able and motivated to adopt such a new role is yet unknown. Is the average citizen as active and self efficacious as the government would like him to be? And what options are there for the government to stimulate a more active and water conscious behavior of citizens?

A larger attention to the consequences of flooding and to disaster management also implies that, compared to the current situation, more and other parties will be actively involved in flood risk management. As a consequence institutional arrangements for flood risk management will need revision.

To summarize the Dutch government has initiated a complex transition process from solely risk prevention by authorities to a risk governance strategy in which also other stakeholders are involved such as the public and companies. To gain a better understanding of the determinants and dynamics of this transition process, it is important to take into account

different perspectives such as risk perception, risk communication and institutional setting.

2 PROMO-RESEARCH PROJECT

The PROmO-research project studies the role of perceptions in the emerging governance approach. The project runs from 2007-2009 within the framework of the Dutch knowledge impulse program 'Living with water'. PROmO is a Dutch acronym that stands for Perception and Risk Communication in the Governance of Flood Risks.

2.1 *Research questions*

The central theme in this project has been defined as: *what are the consequences of the current change in policy (from risk prevention to risk governance) for the public and the administration*? This theme is elaborated into four research questions:

1. How do citizens (and enterprises) perceive flood risks and what can and should be the role of these perceptions in policy and decision making processes?
2. What is the role of information, participation and risk awareness of citizens in decision making on flood risks and how could this be improved?
3. How can citizens (and enterprises) be made more aware of flood risks and how can their ability to cope with actual flooding be improved?
4. To which extent are citizens able and willing to take responsibility in the governance of flood risks?.

2.2 *Research tracks*

The research is carried out in four disciplinary research tracks, involving three universities, two institutes for applied research, a consultancy firm and a government agency:

- A policy analysis track, focusing on the institutional settings and their implications. Main disciplinary research questions are: (i) which policy-arrangements are required for a risk-based governance of flood risks?; and (ii) which changes are possible or desirable in the distribution of responsibilities between the authorities and citizens?
- A socio-psychological track, targeting risk perception and risk communication. The main research questions in this track are: (i) which determinants primarily determine flood risk perceptions in The Netherlands?; (ii) what is the influence of risk perception on citizens individual ability to cope with floods and on their intentions to take mitigating measures?; and (iii) how can information on risk perceptions help to improve risk communication? To address these questions, large-scale internet surveys will be carried out.
- A socio-economical track, addressing the role of risk perceptions in connection to risk valuation. This track primarily addresses the questions: can risk perceptions be quantified and expressed in monetary terms?; and what is the willingness to pay of individuals to better control flood risks? This track also makes use of substantial surveys.
- A technical track, aiming to compile and interpret the technical/physical knowledge on flood risks in The Netherlands. Main questions: how large are the flood risks in the various areas surrounded by dikes (dike-rings)?; and which (technical) measures can be taken to mitigate flood risks? The research activities in this track are relatively modest; the focus is on compilation and interpretation of existing data and knowledge to support case study work of the other tracks.

2.3 *Interdisciplinary approach*

The research questions do not match the research tracks one-to-one. To adequately answer the research questions, an interdisciplinary approach is needed. This is not a trivial undertaking, especially as both social and natural sciences are involved. A number of barriers may impede truly interdisciplinary research, including differences in scientific concepts and methods as well as a lack of societal steering in the research process (De Boer et al., 2006).

To cope with these potential pitfalls, an integration track was added to the four disciplinary research tracks. This integration track involves:

- Execution of case studies;
- Organization of integrating workshops
- Development of an integrative framework

These activities are outlined in the following subsections.

2.4 *Case studies*

All four research tracks in the project carry out their research in three selected dike-ring areas, the case-studies of interest (see also Figure 1).
These dike-ring areas are

- Walcheren (dike ring 29), a coastal area);
- Eiland van Dordrecht (dike ring 22), an urban area, partly outside the dikes located within a tidal river zone; and
- Land van Heusden/De Maaskant (dike ring 36), located alongside a major river

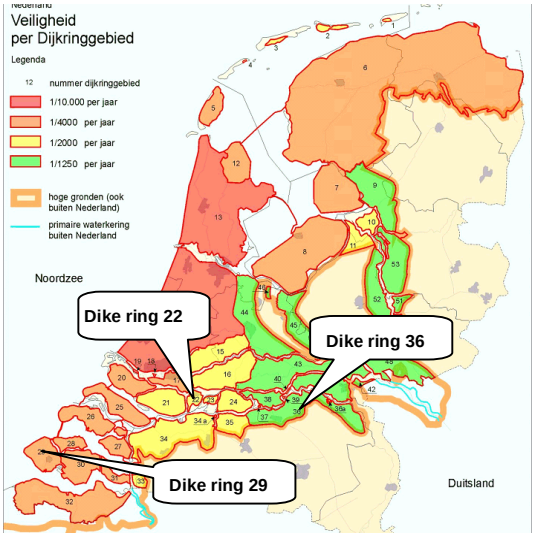


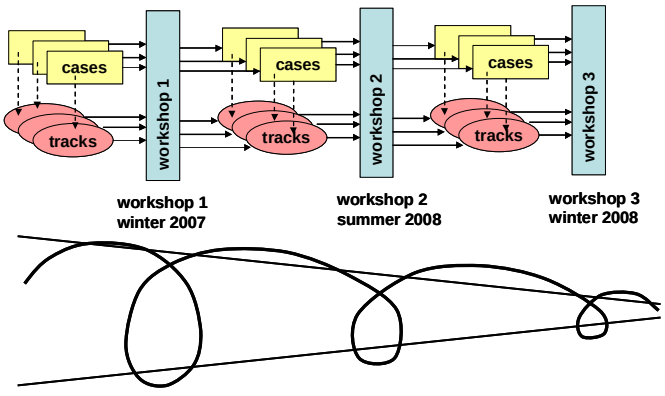
Figure 1 Locations of the case study areas in The Netherlands

The case studies were selected to be different in a variety of aspects that play a role in risk governance, e.g. hydraulic, cultural, socio-economic and administrative characteristics. Targeting the research on these common areas facilitates the interaction both between the research tracks and with the societal partners in these areas.

2.5 *Workshops*

As the researchers in the various research tracks have quite different backgrounds, ranging from natural sciences to social sciences, it is imperative to get to understand each other's jargon, concepts and research methodologies. This is a process, which started in the proposal stage of the project, but requires further maturation in the stages where the research actually is being done, data become available and conclusions are being formulated. To accommodate this process, a series of workshops have been planned throughout the project. This is schematically shown in Figure 2.

Figure 2 workshops facilitating the integration process.



2.6 *Development of an integrative framework*

During the first integrative workshop in November 2007, a start was made with the development of an integrative framework. This framework aims to:

- support the development of a common terminology;
- increase the mutual understanding between the research tracks;
- function as a vehicle to link the research in the four disciplinary domains; and
- facilitate the integration of the results from the individual research tracks into policy-relevant insights and answers.

The framework is still under development. Section 4 describes its emerging contours.

3 CITIZENS' ABILITY TO COPE WITH A FLOOD

In this paper, we will focus on the third research question of the PROmO-project 'how can citizens be made more aware of flood risks and how can their ability to cope with actual flooding be improved?' At first we will address this issue from an institutional perspective. Subsequently, a social-psychological view will be added, to conclude, again with the institutional implications. The discussion will illustrate the necessity of and perspectives on the connection of the research tracks.

3.1 *Institutional perspective*

To analyze the transition in flood risk management from an institutional point of view, the analytical model from Williamson is used (Williamson, 1998). Institutions are defined in this model as 'the humanly devised constraints that structure political, economic and social interactions' (North, 1991). Williamson's model, developed in the context of institutional economics, shows that these institutions can be meaningfully structured into four levels, as illustrated in Figure 3. The levels in the figure are interconnected by arrows. The downward arrows indicate that the lower layer is influenced, either constrained or facilitated, by the layers above. The upward arrows illustrate that developments in the lower layers may also affect the higher layers, e.g. by means of deliberate attempts of actors, policy makers and politicians to alter the institutions.

The top layer, being the most deeply embedded, embraces the ‘informal institutions’, like customs, mores and traditions. These institutions develop typically over long timescales and may be considered as static in this context.

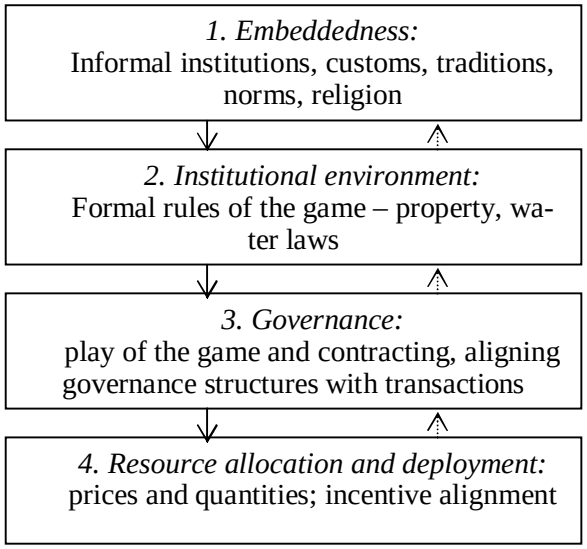


Figure 3 Four layers of analysis according to Williamson (1998).

At the second level we find the formal institutions, or the 'rules of the game', which are generally the result of politics. These rules concern most notably laws, property rights and responsibilities of government agencies.

Governance is at the third level of the model, dealing with the 'play of the game'. At this level the actual incentive structures are established that govern the interactions between actors at the lowest level. Subsidies, taxes, public-private agreements, contracts, insurances, etc. are found at this level.

The lowest level, finally, concerns actors' short-term operational decisions and behavior, driven by their interests and goals, while constrained or facilitated by the existing institutions in the higher layers.

If we use this model to analyze the current institutional setting of flood risk management in The Netherlands, the following picture emerges (see e.g. Broekhans & Correljé, 2008).

The Netherlands have a long tradition of land reclamation and defending the land from the water. Hence the 'conquering-of-the-water' perspective on flood risk management is thoroughly embedded in society. This is a typical example of an informal institution in the top layer of Williamson's model, i.e. a paradigm with a strong persistence.

The formal institutions in the second layer are fully consistent. The pertaining laws on flood risk management predominantly regulate the design and maintenance of measures to prevent the occurrence of flooding. Virtually no formal regulations exist with respect to mitigating measures in the other elements of the safety chain, such as pro-action or preparation. Flood risk management is considered to be the responsibility of the national government, with executive roles delegated to the regional governmental levels.

The constraints, imposed by the formal institutions at the second level, leave only little opportunities or incentives for decisions at the lower two levels, i.e. the governance level and the operational level. Indeed, these levels have at present no role of importance for citizens.

The current policy developments in The Netherlands, aim at a shift at various institutional levels. First, the government challenges the paradigm of fighting the water by adopting a more adaptive flood risk management approach, which creates room for water. Moreover, a flood management policy is under development, which gives attention to *all* elements in the safety chain, i.e. not only prevention, but also pro-action, preparation, response and after-care. This widening of the scope will result in the involvement of many more actors in flood risk management, e.g. local authorities, enterprises, insurance companies, emergency services and citizens. It is likely that many of the interactions between these actors will take place at the governance and the operational level in terms of Williamson's model. This would be consistent with the shift in the Dutch government's steering philosophy from 'taking care of'' towards 'facilitating that'. In other words, the governance and operational layers will probably become much richer than they are today.

Improvement of the ability of citizens to cope with floods includes: (i) by better preparation for a flood, (ii) more adequate response in case of a flood and (iii) better after-care after the flood. In this paper, we'll address the preparation stage. In this context, we break down the question into a number of sub-questions:

1. How do citizens currently cope with flood risks, and what is their potential coping capability?
2. How can citizen's coping strategies be aligned with the coping/management strategies of other actors, in particular the government?
3. Which institutional arrangement(s) would best facilitate this?

3.2 *How do citizens cope with flood risk?*

This question is addressed in the socio-psychological research track. Final results are not available yet, but we will present the approach and first results from a pilot study. The socio-psychological research aims to get insight in how citizens deal with preparations for floods, the main determinants of that process, and the possibilities to stimulate citizens to improve their preparations.

Many models are available in the literature (e.g. Bočkarjova et al., 2008) which try to capture the (intention to take) preparative action of individuals.

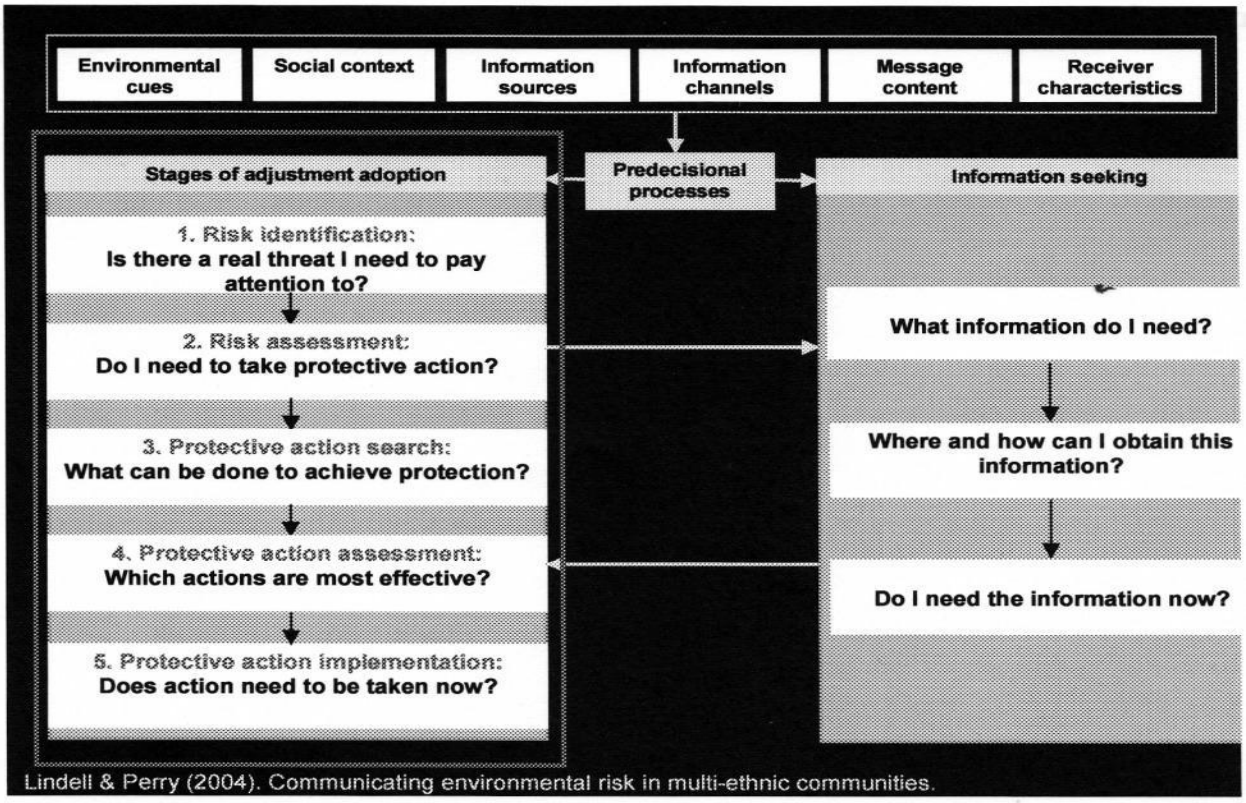


Figure 4 Graphical impression of the Protective Action Decision Model by Lindell & Perry (2004)

These models relate the intention to take action to e.g. the properties of the risk, the perception of the risk, aspects of the societal and cultural context, elements of the individual context, risk attitude, and (perceived) benefits.

In the socio-psychological research track the PADM-model (Protective Action Decision Model (Lindell & Perry, 2004) has been adopted. An excerpt from this model is graphically shown in Figure 4. The PADM-model helps analyzing how people decide to prepare for a flood event, and more specifically, what issues are addressed in making such decision. The PADM-model distinguishes two types of variables:

- efficacy-attributes: preparations can be useful as they increase the individual safety during a flood, increase the safety of others (family, friends, neighbors etc.), mitigate potential damage, or may also generate benefits in other circumstances than a flood.
- resource requirements: preparations take time and effort, skills and sometimes assistance from others.

The first category (efficacy attributes) are positive attributes (pro's): benefits of taking action. The second category (resources) relates to the costs (con's). Both pro's and con's can play a role, but the extent to which individuals use these attributes in their decisions, can vary from one individual to another. In addition to these attributes, an individual's risk perception plays an important role. Someone may have a positive attitude towards preparations, but if his or her perception of the risk is low, the motivation to take action will also be limited.

Internet questionnaires, based on the PADM-model, will be distributed among a large sample of inhabitants of the three case-study areas. The questionnaires state a number of preparative actions which respondents are asked to evaluate on the basis of the positive and negative attributes mentioned before. Additionally, risk perception is measured as well as the level of trust in the government and the water management agencies. Also questions have been added on the awareness of the physical environment (e.g. if people frequently visit the dykes do they also think more often of floods?). The questionnaires were designed with input from municipalities, provinces, water boards and safety regions.

Once the results will become available, structural equation modeling (SEM) will be applied to get a more quantitative insight in the relations between the intention to take action, and the potential explanatory variables that were elicited in the questionnaire.

The internet surveys will be held in April 2008. Consequently no results can be presented yet. Instead, a few results are presented from a pilot study that was carried out in a coastal area of Friesland, located in the north of the Netherlands (Terpstra & Gutteling, 2008).

In accordance with prior expectations, the respondents generally showed low perceptions of flood risk Moreover, the majority of the respondents regarded the government primarily responsible for protection of their possessions against potential flood damage.

In contrast, with respect to attributed responsibility for disaster preparedness, half of the respondents viewed disaster preparedness as an equally distributed responsibility between themselves and the government. To increase the level of participation of the Dutch public in risk management, risk communication could be an effective instrument, but the citizens 'low 'sense of urgency' in terms of risk perception may reduce the responsiveness to risk communication. This will be a central topic in the PROmO-study.

The results of the socio-psychological research give clues on how to stimulate and facilitate the intentions of individuals to prepare for flood risks. One of the instruments that will be studied in PROmO in more detail is risk communication: how can risk communication be used to effectively influence risk perception and thereby intentions to be better prepared (Baan, 2008).

3.3 *How can citizen's coping strategies be aligned with the coping/management strategies of other actors, most notably the government?*

If individuals prepare for floods, they acquire information, knowledge and skills that will help them to better cope with floods. Governments and emergency teams may therefore have to deal with a different, potentially more diverse population in terms of ability to cope. For disaster management to be effective, it is essential to have a dialog on the preparations on either side as well as to match the expectations with respect to each other.

Perhaps even more crucial is the question of distribution of responsibilities. In the current situation the government is fully responsible for flood risk management. An aim of the government is to increase the citizen's ability to cope with flood risks, i.e. to give him a role in the risk management. Does this also imply a transfer of responsibilities? The potential difficulties are illustrated by the following questions (Van den Brand, 2005):

- is it a basic right to be rescued by the government in the event of a flood?
- can citizens be held responsible to inform themselves about the flood risk in their environment, and to take protective action?
- can citizens be held responsible to warn and alarm others in case of a potential flood, and when does this obligation replace the official warnings from the government?

If responsibilities are to be transferred to the citizens, what are the skills they need to be able to take on these responsibilities? Who is responsible for those who do not have these skills?

In the current political debate on other safety-related issues, such as fire safety and safety in relation to hazardous materials, the communitarian point of view prevails. Preparation of citizens is considered as an act of participation. The government aims to stimulate and facilitate activities of citizens as a part of the governmental care for safety. If the government is responsible, the question arises: what are the incentives for the citizen?

3.4 *Which institutional arrangement(s) would best facilitate this?*

Increasing the ability to cope with floods is considered as a form of public participation in government policy, and requires mutual communication and agreements to be effective. In Williamson's model these are located at the governance level. In design of, decisions about and implementation of institutions at this level citizens can participate in various ways. The various forms of public participation in government policy are schematized in a participation ladder by Pröpper & Steenbeek (1998).

The current mode of government operation can be described as a non-interactive, open-authoritarian style. The government aims to get information about citizens' behavior, attitudes and beliefs by surveys and inquiries. The obtained information is used to adequately target information and (risk) communication.

According to Rosenthal et al. (2002) governments and emergency services do not succeed to live up to expectations of the public in cases of a disaster, and in fact impede citizen initiatives. This could possibly be overcome by adopting a more participative approach. An example is the participative development of an evacuation plan for a specific area or district (Van den Brand, 2005), where the government specifies the required capacity of transport and shelter resources, clarifying that their own capacity is insufficient. Inhabitants can then mobilize their own resources. A bonus of this approach is that local knowledge is easily obtained from inhabitants (which people require help, who do not have their own transport, etc.). In this example the government operates in an interactive, collaborative style, aimed at joint decision making with citizens.

The issue of citizen participation is closely related to research question 2 in PROmO. This question will be further addressed in the institutional research track.

3.5 *Reflection*

An intriguing question is whether an increasing ability to cope with floods, i.e. the increased focus on preparation, should be considered as an alternative to the existing prevention-based approach, or as an addition. Indeed, the political debate on this issue shows that it is tempting for politicians and governmental authorities to consider an increased public ability to cope with flood (risk) as a substitute for

government care, enabling a further downsizing of the role and investments of the government.

However, effectively facilitating the ability of citizens to cope with flood risk requires that the government gives back-up and engages in new activities to interact with and adapt to the preparative activities deployed by citizens. According to Denckers (1993) effective support of citizen preparation by the government will most likely increase government capacity and investments, in stead of reducing it.

Moreover, the extent to which preventive government care could legitimately be substituted by increased preparative actions is difficult to determine. As it has been argued in this paper, the question which level of protective action can reasonably or potentially be expected from individuals, and the effectiveness of these actions in case of an actual flood disaster, remains adamant.

4 OUTLOOK

In the previous section we focused on one of the central research questions in the PROmO-project, which made clear that the intertwining of two research tracks had an added value and made the discussion match the scope of the question. To address the full width of the PROmO-research field, an interdisciplinary approach is required, which involves all four research tracks. To facilitate such an approach, a start has been made to develop an integrative framework. In this section we will give an outlook on the further development of this framework.

It is envisioned that the integrative framework starts from Williamson's model, which was already introduced in Section 3.1. This model makes transparent how the various institutional layers and the associated actors influence each other. It lacks a specific risk perspective, however. Such a perspective could help to analyze the considerations of the various actors with respect to risk, which influence their attitudes, negotiations, choices and behavior, primarily at the governance and operational levels. As risk, more specifically flood risk is at the very heart of this project, it was considered useful to enhance Williamson's analytical model with a component that specifically addresses the governance of risks.

4.1 *Risk Governance Framework*

The Risk Governance Framework, developed by the International Risk Governance Council (Renn, 2005), has been selected as a promising candidate. This framework is graphically summarized in Figure 5. It consists of four building blocks, viz. framing, appraisal, judgment and management of risk. These blocks can be recognized as common elements of a large variety of strategies and approaches to cope with risk, either on the government level or at the level of enterprises or individual citizens. Indeed, many of the models on individual behavior to cope with risk, mentioned in Section 3.2, can readily be fit into this model. Hence, in this study on coping with flood risks, involving the perspectives of various actors and their interactions, this model is potentially useful element in the integration of the research tracks in PROmO.

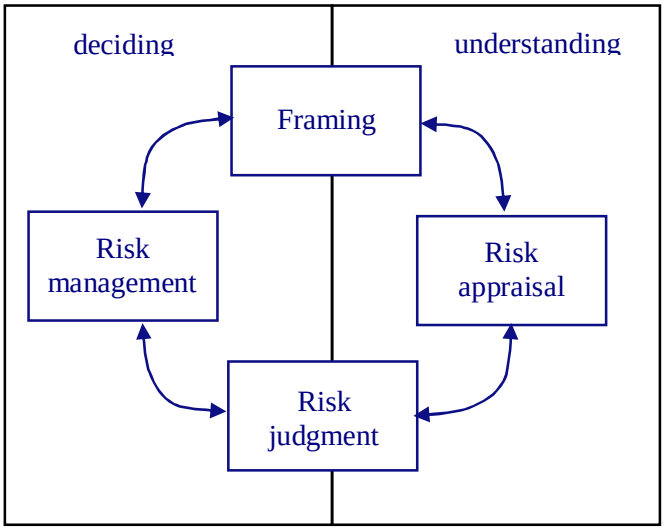


Figure 5 Schematic view of the Risk Governance Framework developed by the IRGC.

The Framing element (Renn refers to this element as Pre-assessment) of the framework involves the problem 'definition', i.e. the clarification of the various perspectives on risk among the different stakeholders, listing of the issues and dilemma's to be addressed, and assessment of the scope and limits of the analysis. Within the context of PROmO, where we focus on citizens and administrators, this would e.g. concern issues of the opinions on their (potential) role in flood risk management, prior experience with floods, trust in the government and water management and relation with other issues.

The Risk appraisal element consists of two elements, one related to the physical risk characteristics, the other to issues of risk perception and concern.

The third block addresses the judgment of the risk as being acceptable or not, e.g. in terms of risk being an incentive to consider mitigating actions.

Risk management, the fourth element, involves issues as making an inventory of possible mitigating actions, assessment of these actions in terms of pro's and con's, deciding on a management strategy and the implementation of it.

It is important to note that the framework is not describing a linear or sequential process of subsequent stages, it rather constitutes an 'agenda' for the various issues that come to play in developing or changing a risk governance or coping approach.

4.2 *Confluence into an integrative framework*

One of the main aims of the integrative framework is to facilitate that the central research questions are jointly addressed by the individual research tracks and, in the end, to formulate integral answers to these questions on the basis of the research results. To that end, the elements presented in the previous subsections, should function as a united framework, which fits the central research questions.

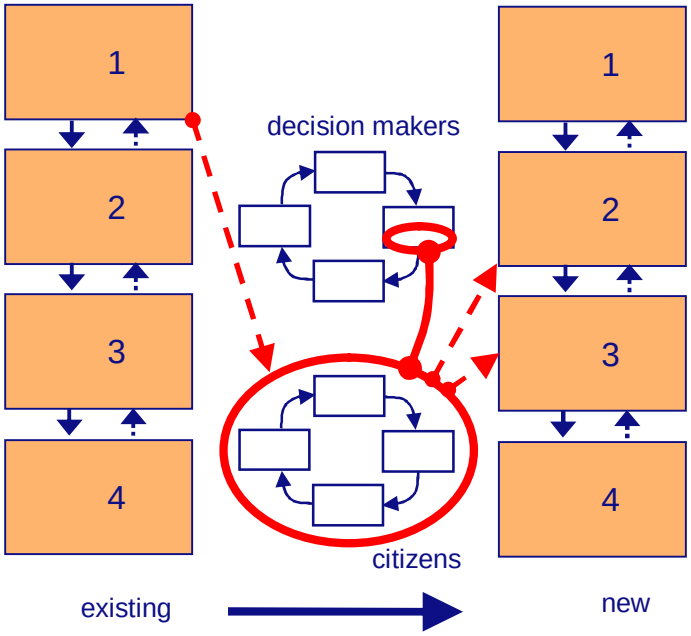


Figure 6 Graphical illustration of the combined integrative framework

Figure 6 shows a graphical illustration of this combined framework. It basically depicts the transition from the existing situation to a new situation of flood risk governance. Both the new and the future situation are represented by their institutional structures in terms of Williamson's layered model. For the sake of convenience, only the numbers of the layers have been retained in the figure. In the transition process, the various actors and stakeholders make new considerations and decisions, in constant interaction, which are influenced by (changes in) their framing, appraisal, and judgment of flood risk, and their options to manage it. These aspects are the basic elements of the IRGC Risk Governance Framework. Hence, in Figure 6 this framework is positioned as a process element between the existing and the new situation of flood risk governance.

Figure 6 is more specifically tailored to the first central research question of the PROmO-project, which states (see section 2):

How do citizens (and enterprises) perceive flood risks and what can and should be the role of these perceptions in policy and decision making processes?

From the viewpoint of the decision or policy maker, the perception of citizens could be considered as a component of concern assessment, which, in terms of the Risk Governance Framework, is an aspect of Risk appraisal (indicated by the small ellipse in the Figure). This perception, however, from the viewpoint of the citizen, concerns his total perspective on dealing with flood risks, i.e. his framing, appraisal, judgment and management potential. This is indicated by the larger ellipse. In this way, the framework provides a context for the analysis of the question on the role of perception in decision making, i.e the relation between the two 'ellipses' (arrow in Figure). The figure also shows the (potential) influence of informal institutions on risk perceptions and the potential implications of these perceptions for the future institutional setting (dotted lines), which are examples of relationships that are under analysis in PROmO.

The other central research questions can be positioned into the framework in a similar way. In this way we hope to develop the framework into a powerful instrument to serve as a roadmap in finding interdisciplinary answers to the central research questions underlying the PROmO-project.

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