

WATER

From generic probabilities to localized risk in the Dutch flood management

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The assessment of flooding risks with hydrologic and civil engineering criteria will be replaced by an organic management and multilevel governance arrangement. The securing of public values becomes an issue.

Populations established on river deltas commonly face flooding risks. For centuries, in the Netherlands, risk management was primarily based on dike enhancement, taming the rivers between ever higher dikes and keeping the sea out. The Dutch defence against flood risks was traditionally institutionalized in hierarchical structures, based on strict rules and pre-established singular indicators and norms (Wesselink et al. 2007).

The Dutch government became conscious of the fact that technical measures, like higher dikes, would no longer be sufficient to prevent flood damages. It was facing the 'near flooding' events in the 1990s, resistance of stakeholders against the harmful effects of dike enhancement on cultural and landscape values and acknowledging the consequences of climate change, a rising sea level and subsidence. More versatile ways of dealing with the threats of flooding were to be considered.

Early 2006 the Ministry of Transport and Water Management announced a paradigm shift 'from managing the water and keeping it out', to 'anticipating and adapting to the movement of water'. This new steering philosophy involves a transformation of the traditional approach, based on controlling the probability of flooding events, towards a risk based approach, taking into consideration the values protected and the interested parties. Instead of technological assessment of hydrological and civil engineering factors, the new approach will draw strongly on organic management or governance.

Institutions for water management

The new policy arrangements should anticipate aspects like the perception of vulnerabil-

ity and risk, public awareness and involvement, culture, reshuffled responsibilities and power relations. Oliver Williamson (1998) provides a useful conceptual framework for analyzing such issues. The essence of this approach argues that the behaviour of actors is shaped by a set of socially constructed institutions. It distinguishes four layers of analysis (see Fig. 1).

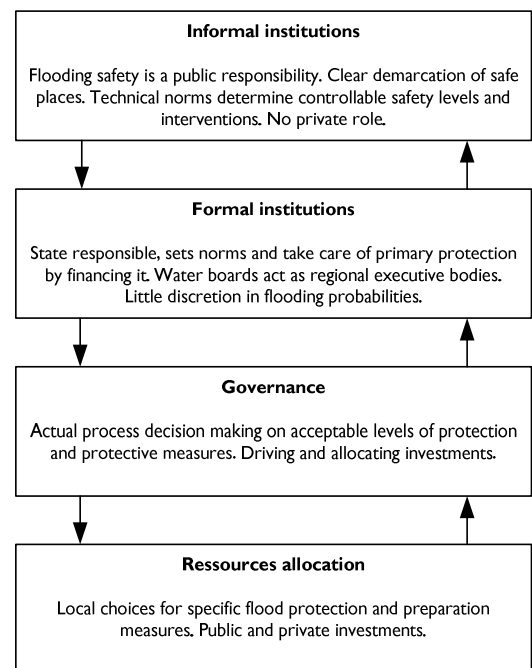
The top layer embraces relatively deeply embedded and static informal institutions, like cultures, customs, traditions, norms and religion that are relatively independent of specific actors. Main elements in this layer are local beliefs about the vulnerability in respect of flooding and historically developed practices of evaluating the options for protection, their effectiveness and costs. Intriguingly the awareness of much of the Dutch population is quite limited in this respect, as a consequence of the prevailing tradition to organize flood protection in a rather centralized way.

A fairly technical, depoliticized engineering approach has emerged in the nineteenth century; it has effectively neutralized flooding issues from the local and national political debate. In the 1950s the disastrous flooding of Zeeland, a province made of islands located in the south-west of the Netherlands, became the main driver for probability based framework that defined the prospective chances of flooding in several regions of the country.

Keeping the dikes up to a specific strength became the main instrument to achieve these calculated flooding probabilities. Essentially the whole process of decision-making took place at a large distance from the inhabitants and the main message transmitted to the population was that the state would take care of flood protection.

The second level involves the formal rules of the game, most notably with respect to property rights and responsibilities of government agencies, including the shape of the policy and the position and approach of judiciary and government bureaucracy. For example the Dutch Constitution (art. 21) maintains that the state has to take care of the habitability of the country, providing the state with the responsibility to carry out water man-

Fig. 1 | Adaptation of Oliver Williamson's model to analyse economic institutional arrangements in water management



agement and flood protection. It also contains sector-specific institutions to deal with flooding risks. It is useful to distinguish generic and specific institutions, because not only the new approach in Dutch water management, but also the European Union water and flooding directives, will have an impact on both types of institutions. There are shifting notions about the balance between central and local decision making, more exactly the role of the state versus those of provinces, water boards and municipalities.

The underlying thought in the Netherlands is that not all regions are in need of the same level of flood protection.

The third layer is the governance layer, where the play of the game occurs. Here we find the incentive structures that govern the transactions between actors at the lowest level. This also involves the choice to provide flooding protection in a particular public-private relationship. Essentially, this layer did include the administrative mechanism by which risk assessments for the flooding of specific parts of the dyke system were 'automatically' translated into investments for improvement. Whereas the risk based criteria were fairly straightforward, in actual practice, budgetary restrictions and local peculiarities in spatial planning turned this play into a situation of negotiation, involving local interests and public authorities.

The bottom layer is where actual resource allocation and investments in flooding protection take place, given the limited room left when the rules of the above layers are applied. Dykes were either or not built and enhanced. Provinces and municipalities adjusted spatial planning. Currently new options are being considered, ranging from the idea that civilians should prepare their houses to deal with flood occurrences, as areas will become less protected. In the latter case, refuges and escape paths and the support of emergency services become crucial.

Local impact, governance and flooding disasters

The foreseen changes in flood management will have important implications and introduce tensions within and between institutional layers. In an interactive process of negotiation, discovery and social learning, local and

national policy makers, civil servants, experts and water managers are contemplating alternative arrangements to prevent and to react on potential flooding. In line with the present rules of the game, the responsibility is taken up by the central government. Most practitioners perceive the redistribution of responsibilities and the effort to enhance public efficiency as more regionally differentiated water management. The underlying thought is that not all regions are in need of the same level of protection, as should be shown by cost-benefit analysis.

At the bottom layer of the scheme above, the daily operations of local water managers, the notion of risk instead of probability will link flood prevention to crisis management practices. The new approach towards flooding will be related to the generic management of hazards of major industrial accidents and external safety issues. A new set of rules has to be developed to engage local and regional water authorities in the so-called safety chain, including activities and cooperation geared towards pro-action, prevention, preparation, repression and recovery. This perspective has materialized in a *Risicokaart*, a national map that provide information about location of possible risks. Flooding, however, will often affect vital infrastructures, like electricity, water supply, telecommunications and transport. This interrelatedness makes the operational management of flooding crises more complex.

Moreover spatial and hydrological flood characteristics have a major impact on the organization and allocation of crisis management efforts. Thus they differ from major accidents that do not involve water. Local conditions have to be taken into account for the limitation of damage, as a primary concern of governance, and for the management of emergency operations, including escape routes and plans, safe places, and the provision of emergency services, energy, hospitals, etc.

Finally, unlike the current approach, the new policy context assumes decision making on measures for flood prevention and damage control by property developers, construction firms and house owners. This perspective assumes a far more detailed and economically defined assessment of local risk and protection levels than the current practices. Moreover many uncertainties have to be dealt with. An example is the question as to what extent the several local interventions in water flows will interact and affect the eventual risk of a site.

Differentiation, valuation and information

Today, at the level of the governance layer, public tasks are still defined in terms of dike heights and strengths. The perspective on the efficiency of current policy practices and the affordability of water management might change when the risks and values of certain areas become known. The introduction of efficiency considerations requires the development of new principles and rules for the evaluation and valuation of local flood risk.

Moreover, in the current perspective on safety, the protection of the land outside the dikes is not a public task. Counter to intuition, these unprotected areas will relatively soon be accessible again after being flooded. Consequently material and immaterial damage and recovery costs have to be calculated differently. Recovery and revitalization of inundated areas is not in the scope of water management, flood protection and crisis management today. The question is whether or how this issue should be included in the valuation debate and related to a differentiation of risks between areas.

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In the new perspective, it can be expected that the governance layer will become much more important and complex. The codes, rules and decisions are to be negotiated and established between the Ministry of Transport and Water Management, the Water Boards, provinces, municipalities and other regional authorities. Agents' behaviour in this layer will be strongly influenced by safety indicators and political sensitivities. It will introduce a chain of options in safety management, including prevention and rescue management by many different organizations with separate tasks and responsibilities.

The new arrangements proposed reflect the increasingly widespread conviction that new arrangements should provide incentives to civilians and businesses to assume their responsibilities. An important new element will be the development of public-private financing mechanisms for flood prevention and preparedness, in the light of economic and social differentiation between functions and areas, and the degree to which safety or risk on

flooding is considered optimal.

A fragmented institutional environment

In the formal institutional layer, in the infrastructures sectors, governments are pulling away from ownership and management. The central government tends towards a role of overseeing and coordinating the processes of decision-making and operation of systems and services. The responsibility for safety and risk management will be reallocated among a larger set of actors, many with competing goals and interests and diverging and often conflicting public values like security and privacy.

Citizen's perceptions of flooding risks do become more relevant in the new steering context.

A fairly practical issue at the formal institutional level is that the borders of circular dyke systems, enclosing an area with a specific level of protection, are spatially incongruent to the institutional working spheres of the public authorities involved, that is the municipalities, the water boards, general disaster management and the provinces. In combination with the organizational complexity of networked flood protection in the safety chain approach, this implies that there will be overlapping and uncovered domains of action

The historically grown public values regarding flood protection and the associated institutions regarding management and funding were unilaterally accepted throughout the country, including the higher parts. The new approach will draw local political and economic interests into the definition and operationalization of 'public values', introducing the possibility to establish trade-offs with other public values. Yet, in the end, the central government will be held accountable,

formally or informally, for the consequences of any floods and for failing flood protection.

So the parallel transition in the water policy and in the steering philosophy causes a discrepancy between a fuzzy safety problem at the operational and governance level and strictly defined public institutional responsibility. And, eventually, whereas public policy is now 'making sure that the Netherlands' citizens protect themselves against flooding', it does not really alter the message that national and local politicians prefer to send; 'that it is safe all over the place'. Indeed the suggestion that citizens have to prepare themselves for a flooding experience is much harder to sell.

Tension between the individual and the public

So far the new approach has materialized in a public campaign to enhance the public consciousness in respect of flooding risk and a debate about the public role in this respect. Yet, without any floods taking place, it is hard to convince the general public and policy makers to take part in the public debate. In this debate, arguments about the individual interest in flood prevention and the public responsibility are often mixed up. Although the protected values may look the same, they have a different weight in particular, regional, local and individual contexts. Private values, in turn, can not be aggregated upwards consistently. Water gives individuals a sense of freedom and joy. Everyone is attracted by beautiful accessible waterfronts. But their safety is a collective concern. This raises the question of the authority's expectations regarding citizen behaviour.

The new flood protection philosophy implies that both the technological problem definition and the governance become more complex. In governance, crisis management, infrastructure maintenance, preparedness and flooding control should meet. Yet actors will

have to cope with a fuzzy problem definition, interpreting it from their own perspectives and context. The governance layer will become much more important and complex, as policy-makers and private actors involved will have to select from a variety of policy arrangements available, to compose their approach. The operational layer, meanwhile, is becoming much more dispersed, because of the involvement of a large amount of new actors, with specific experiences and interests and many alternative ways to articulate those. The politicians' attention for citizens' perceptions, however, should allow them to keep track of the institutional context in which they are operating. A clear focus on perceptions, interests, power and dependencies will support institutional actors in securing public values in a meaningful and accepted way. Citizens' perceptions of flooding risks do become more relevant in the new steering context; not as a perception to be 'adjusted' in the short term, but as a powerful social force to take into account.

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