Compram: A Policy-making Method for Prevention of Floods

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Keywords: complex societal problems, the Netherlands, floods, policy making, Compram

Abstract

Preventing large societal risks due to floods requires advanced, long-term planning. In the Netherlands there is a centuries-long tradition of preventing floods. Nevertheless, sometimes disasters happen. In the last decade the large rivers have flooded several times causing great economic costs. In order to prevent new economic disasters, the Dutch government initiated a plan for risk reduction. The plan basically returns the rivers some of their original space by providing areas for water storage in case the rivers' level rises so high threatening a dyke breach. Before the plan can be legally implemented the government must send their advice to several organizations. The plan's implementation, however, can be costly and lengthy, particularly in a country where every inch is used. Rather than forcing solutions, the Compram[1] method advises discussing possibilities for intervention with experts and citizens, by taking time to anticipate the societal reactions before implementing the interventions. In this paper, the plans of the Dutch government are described in relation to the causes of floods. We then indicate how Compram would manage this kind of societal problem, i.e. risk and prevention of river floods in the Netherlands.

1 Introduction

Water is a serious topic demanding attention throughout this new century. The discussion will be on too much, too little, and too dirty water (see World Water Conference, 2000). In this article the focus of the discussion is on too much water.

The Netherlands has a long history of flood prevention. A map illustrates clearly that almost one third of the country would be permanently or

[1] Compram stands for COMplex PRoblem Analysing Method

temporarily flooded without dykes and dunes to prevent the rivers and the sea from flooding the country (Wolters-Noordhoff, 1981, page 9).

The Rivers

The Netherlands is a delta of two large rivers, the Rhine and the Maas, located at the coast of the North Sea. The rivers have a water basin of a part of Western Europe. The Rhine has its origin in Switzerland on the north side of the Alps, flowing through Germany into the Netherlands, where it flows into the North Sea, part indirectly via flowing into the IJsselmeer (IJssel), the former Zuiderzee, and part directly via Rotterdam.

The river Maas carries the surplus of rainwater from the basin of a part of France and Belgium and flows through the Netherlands into the North Sea, also via Rotterdam. During the different seasons these rivers carry different amounts of water. The Rhine is a source for rainwater and snow melt, which makes high protection necessary during heavy rain fall or periods of snow melting. The level of the Rhine is the highest in early spring, while at the end of the summer the volume of water is the lowest.[2] The Maas also shows seasonal water differences. Using two types of dykes controls these regular differences in water volume: summer and winter dykes. Summer dykes are relatively low dykes, though they are high enough to guide the rivers and to prevent them from flooding. These dykes are situated relatively close together, leaving the river a relatively narrow space to flow. Winter dykes are higher and allow the river to flood a much wider channel, so that the volume of water the river can carry is almost doubled. The land between the summer and winter dykes is called the floodplains. In the summer, farmers graze cattle on this land .The winter dykes prevent the houses and towns behind the dyke from being flooded. In the Netherlands, all along the Rhine, dykes protect the land near the river. On the Maas, beginning in Nijmegen, dykes protect the river's last part in Netherlands.

Both wide rivers normally flow easily through green, lowland meadows. With constant maintenance and observation of the dykes normally all goes well. However, combinations of long-term heavy rain fall, or heavy rain with fast-melting snow can make the rivers swollen, causing the water level to rise so high that there is the danger of flooding.

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[2] In order to give an impression of the amount of water a river has to carry, this can be as high as 12.000 m3/sec, which means 12.000 liter water per second. It is the amount of water versus the speed, which, when too high or too fast creates the floods.

The Sea

Rivers flowing through the Netherlands from the south and east are just one cause of flooding. Also, Netherlands is generally below sea level, cities such as Delft, Rotterdam and Amsterdam are located below sea level and threatened by the North Sea (Wolters-Noordhoff, 1981, page 9). The major threat is in the West-South part of the Netherlands, in the province Zeeland. Here, there are no unbroken barriers of dunes to protect the lower land, where, in addition, the sea water level varies daily. There is a daily tide of six hours that creates a dramatic rise in water level of several meters. This difference in water level is so large due to the relatively small space between England and France in which large amounts of the water coming from the Atlantic Ocean is pushed through a relatively small canal into the North Sea (The Canal).

Also, the sea used to enter from the north side of the Netherlands threatening Amsterdam and the surrounding area with flooding. Sea floods are the most dangerous floods. However, during normal periods there is no danger of sea floods in the Netherlands. Although, a combination of high tide, full moon, of a western or northwestern inland storm can create flood threats, particularly in the vulnerable southwest part of the Netherlands (Zeeland), and (until 1932) in the heart of the Netherlands (Zuiderzee).

The Rain

The Netherlands is a rainy country, which particularly threatens low-level areas, such as the two provinces North and South Holland that are located below sea level and on the coast-line. Originally this low-land contained many lakes. Because of the landwinning projects many lakes were, centuries ago, turned into land. These land winning projects are still going on. The latest project is building new land in Amsterdam on the water formerly of the IJsselmeer (IJburg). These new concurred lands, which are called polders, are very low lands, which have to be protected from flooding again by dykes. The polders have the form of a soup plate. The (rain) water from the lower polderland has to be frequently, artificially drained into the higher level of the surrounding canals. This is done by windmills,[3] and more recently by electronic drainage systems. The well-known Schiphol airport (near Amsterdam) is located in one of the former lakes, the Haarlemmermeer, which is now called the Haarlemmermeerpolder. Normally all goes well because water level in the polder is constantly observed and controlled. However, long periods of heavy rain can make the polder vulnerable to flooding, damaging goods and livestock.

[3] The windmills are now a famous tourist attraction.

2 Examples of Floods Disasters in the Netherlands

Sea Floods

Because of its enormous power sea floods are very spectacular and very dangerous. One of the well-known floods is the Sint Elisabeth flood of 1453. This sea flood in the southwestern part of the Netherlands penetrated hundreds of kilometers into the land, drowning people, small villages and cloisters. This flood created an area of water and land now known as the Biesbosch (a wetland). Five hundreds years later, on almost the same spot, a new disaster took place known as the flood disaster of 1953.[4]

Floods from the Zuiderzee into the Heart of the Netherlands

For many centuries the areas around the Zuiderzee flooded regularly. In the period from 1900 till the closing of the Zuiderzee in 1932, there were three major storm floods in 1906, 1911, and 1916 (Wolters-Noordhoff, 1981) .

River Floods

Throughout the Netherlands' history there have been reports of flooded rivers.[5] Some recent floods are those of the rivers Rhine and Maas in 1993 and 1995 (see DeTombe, 2000b). Fortunately, these floods caused no human casualties, because people and most of the livestrock were evacuated; however, the floods were costly because of the evacuation and the damage to houses and farms.

Rain Floods in Polders

Recent polder floods are the flooding of the Westlands Greenhouses near Delft, where farmers grow vegetables. The Greenhouses are built so close to each other that the rain has no opportunity to seep into the ground. Because the rain does not properly seep into the ground, the ditches must manage large amounts of water. When there is frequent rain the ditches flood. This area was flooded in September 1998 after weeks of continuous rain (NRC, September 1998).

3 How to Regard the Water Floods

The Netherlands has a long history of fighting floods. The country also has a long history of conquering new land, winning land from water, in the landwinning projects (polders). Regardless, no person can fight water by herself. The task requires a mutual effort to fight this natural enemy. Dealing with water in order to reach safety for all takes combined effort where many agents have to work together. This combined effort of public and private agents the basis for the so-called 'poldermodel.' The poldermodel is a way to

[4] In the Netherlands known as the 'watersnoodramp van 53'.

[5] See for instance the well known myth of Hans Brinkers, who put his finger in a hole in the dyke, preventing the dyke from breaking, while waiting for more adequate help to arrive.

manage all kinds of societal problems combining different agents, such as union, government and employers

4 Solutions for Sea Floods

For centuries solutions have been found for flooding problems. Some of the recent solutions against sea floods are:

Zuiderzee: Afsluitdijk

For years there was the danger from the Zuiderzee particularly the areas near Amsterdam. This threat is now reduced by the Afsluitdijk (1932), a huge dyke that shuts out the sea and tides. The dyke has changed the sea into a lake, changing the name from Zuiderzee (sea) to IJsselmeer (lake).

Zeeland: Deltaplan

The Deltaplan manages the risk of sea flooding (Van der Ham, 1999). This plan details the protection of the Netherlands southwest coast. This part, the province of Zeeland, has no natural barrier of dunes to protect the lower land from the sea. The Deltaplan is a combined plan that protects the coast and the estuaries[6] of the Rhine and Maas from flooding. The plan took a long time gaining acceptance. Only after the great flood disaster in 1953, did the plan become politically acceptable. The Deltaplan was invented and carried out by the government[7] and is regarded as very successful. The plan has been carried out step by step during the last 40 years.

5 Increasing Risk of River Floods

However the Deltaplan was not the last task of the government. The floods of 1993 and 1995 raised awareness that rivers were not protected enough. There are several reasons for the more severe and frequent river floods.

Interventions in the past

In the past, approximately before 1850, the wide, large rivers still had their huge natural space that could be used when large amounts of water had to be carried quickly. Then, the rivers meandered and had wide floodplans. Increasingly, the river gave away land to houses, industry, and traffic. In addition to being a water carrier, the river also traffics ships. To stimulate river transportation, straightening the curves to shorten the road between towns regulated the riverbeds. When land was needed, the forelands were used for home construction. Thus, the forelands could no longer be used as a

[6] An estuary is a river mouth.

[7] The government that takes care of these water protecting tasks is The Department of Public Works, a Department of the Ministry of Transport, Public Works and Water Management, that is in charge of transport, infrastructure and water management (Verkeer en Waterstaat).

flood reserve. Due to the human intervention smaller rivers have to carry more water.

Climate Changes:
On top of the already decreased space allowed to the rivers, the sea level is expected to rise due to climate changes. These changes also cause more rain to fall, especially in winter when the water in the Rhine already carries an enormous amount of melted mountain snow.

6 Solutions for River Floods

Enlarging the dykes
How to prevent these frequent river floods? Enlarging the dykes was an possible solution. The government carried out a so-called Deltaplan for Rivers (Ministerie van Verkeer en Waterstaat (2000), planning to enlarge dykes where possible. However, the government soon realized that enlarging dykes was not enough to prevent the rivers from flooding. Enlarging dykes has its limits. Since housing was often near dykes, there remains limitations on the structure's height. Further, dykes are often built on weak land, limiting the extent that they can be enlarged.

Meandering
Confronted with these problems the Dutch government responded with a new twofold preventative plan for future floods. First, return most of the river's former space. This advice is described in plans: 'Advies Ruimte voor de Rivieren[8]' (Bestuurlijke Begeleidingsgroep Ruimte voor Rijntakken, 2000), and 'Advies Integrale Verkenning Beneden Rivieren',[9] (Bestuurlijke Begeleidingsgroep Integrale Verkenning Benedenrivieren, 2000). The plan restores the river's original space by derregulation, forbidding the of floodlands for housing, and, where possible, allowing the river the possibility to meander. In order to prevent polder floods, for instance, in the Westlands near Delft, the rain should have the possibility to seep into the ground before flowing into the ditches. Concerning the too crowded areas with greenhouses in the Westland, some of these greenhoues had to be removed to give the rain the opportunity to reach the ground before directly streaming into the ditches. Otherwise the artificial drainage has not enough capacity to keep the greenhouses dry.

Flooding
However, since almost all the land is in use, this plan will not be enough to prevent the rivers from flooding when for instance, more then 12.000 m3/sec water is streaming into the land (Rhine, Lobith). Thus, more needs to be done. The second idea is to allow the river to flood only when necessary, once every10 to 25 years, into areas that are already in use, being special

[8] Translated this means: Give the rivers more space.
[9] Translated this means: A combined search at the last track of the rivers.

directed so-called 'disaster' areas. To lessen the economic damage the selected areas should be of low economic value. Now the idea of polder, the former lakes, comes into the picture. The polders can be relatively easy returned into lakes, thus acquiring enormous amounts of water in a very short time.

7 Governmental Politics

How and by whom are these plans for flood regulation been made? The plans 'Advies Ruimte voor de Rivieren'[10] (Bestuurlijke Begeleidingsgroep Ruimte voor Rijntakken, 2000), and 'Advies Integrale Verkenning Beneden Rivieren,'[11] (Bestuurlijke Begeleidingsgroep Integrale Verkenning Benedenrivieren, 2000) are made by a small group of water experts, invited by the department to find a solution. The 'Disaster plan'[12] (Ruimte voor de rivier. Ministerie van Verkeer en Waterstaat (2000) is made by the employees of the department. A small group of experts thoroughly discussed the problem of flooding rivers and came up with solutions they hope are acceptable. Then this advice is send to other advisory boards and will then be send to the government and parliament in order to get them legally accepted in a democratic way. There will be many procedures that citizens can object and appeal to. In addition, compensation will be given to people whose property is going to be used. After a while this will lead to an acceptable plan in which the solution(s) can be implemented. However, both plans, especially the 'Disaster plan' (Ministerie van Verkeer en Waterstaat, 2000) do offer a new approach to the flooding problem. Instead of preventing the floods, the river is allowed to flood, when it is impossible to prevent flooding with other means. Instead of waiting were the river chooses to flood, special flooding places are indicated. These areas, although normally used for something else, such as a cattle farm, may be used for flooding, after a deliberate breach of the dyke, to decrease the danger of flooding where the damage would be larger.

8 Differences and Similarities of the Schiphol Case and the River Flood Case

Endless discussions

What kind of trouble is to be expected? Are the same endless discussions as in the Schiphol case to be expected?

In the recent discussion of enlarging the Schiphol Airport, the discussion provoked at least ten years of discussion. This was costly to the government, and largely benefited the advisory bureaus. The discussion, which is actually

[10] Translated this means: Give the rivers more space.
[11] Translated this means: A combined search at the last track of the rivers.
[12] In Dutch also known as 'Calamiteiten plan'

not quite finished, resulted in a pile of unread reports, standing nearly two meters high.

At first glance the flood plans look very promising. This seems to be a perfect solution for the river floods. However, at the same time many expect trouble from this plan. Nevertheless, the plan is suddenly presented by the government directly from the experts and made an actuality by the media. In a democracy these plans have to be accepted by the people. The first reaction is that these plans look good, but not in my back yard. Citizens will certainly not accept without compensation that their property is being flooded to protect other areas from the same flooding. Announcing this plan to the media, of course, provoked instant emotional reactions. Thus, The same kind of endless discussion is to be expected again, as with the airport plans. The government mentioned the opportunities for public comment, expropriation procedures etc. Yet action groups are undoubtedly forming now to protect their goods and to protest against other decisions. Advisory bureaus just finished discussing Schiphol eagerly await this new assignment, and are perhaps studying the new flooding plans already.

Directly discussing a solution in stead of first discussing the problem in both cases

In the Schiphol case, as was the case in the building the new high-speed railroad (HSL) (see DeTombe, 1997), a solution was directly discussed. In the case of Schiphol these solutions were the following: extending the airport capacity by building new lanes on Schiphol airport, the fifth lane, or having a second airport elsewhere. In the HSL case, the discussion focused on exactly which towns the railroad should be situated. In both cases a solution is discussed without knowing the exact problem (see Van der Riet, 1998; Rooze, 1998). In the HSL case, this discussion lead to constant changing the railroad plans, and finally, due to rather silly interventions, the Dutch were confronted with a railroad that was actually unwanted and needless. No one really knew the reasons why this railroad had to be built. In addition, the Dutch were confronted with the costs of the new railway, impacting local train services important for commuters. Without discussing the necessity of an intervention or alternatives to intervention in detail, which include the possibilities of opportunities for public comment, expropriation procedure, possible changes and amendments, resulted in very expensive tunnels to maintain the environment. These kinds of expensive agreements could have been avoided easily had the problem handling process been performed differently. The government ended up with expensive plans nobody actually wanted. However, the same problems may occur with the new plans to manage river flooding.

Emotions play an important role in both cases

In the Schiphol case, the discussion of the solution (the fifth lane) was mostly concentrated on the issue of increasing noise pollution due to lane extension

and increasing flight frequency. All other dangers, like healthcare dangers of kerosene output, dangers of crashes, increasing road traffic, etc, did not get much attention. This focus on noise pollution was not only because people living nearby complained often of noise pollution, but also because the argument was 'easy' to fight. The noise could be 'measured' and in the Schiphol case could easily be forbidden. Thus, an emotional argument generally played a very important role in the discussion of the extension of airport capacity. In the river flood case, emotions will probably also play an important role. Emotions against the solution: allowing the river to flood. For generations people fought the water to protect themselves and their goods. Now suddenly this approach changes and the river is allowed to flood.

Same kind of agents, however view points are changed
In the Schiphol case, because of too much noise and kerosene pollution, and increasing danger for the people living near the airport, there was a strong objection from environmental action groups against the plans of the government. In the river flood case, the chances are that the environmentalists are not against the plans, but are in favor of the new plans: giving the river back its natural environment. Here the formal economic parties probably will oppose the plans. These parties, however, supported the plans of enlarging Schiphol.

The definition of the problem
An important difference between both cases is that in Schiphol, the actual reason for enlarging was never really proven. The same can be said for the HSL case (high-speed railroad), the reasons for a special railroad was never proven either. However, in the case of the river floods the need is undoubtedly proven for preventing floods. Here the problem is clearly indicated, before the solution was found. However, a better discussion of the problem could have resulted in more creative solutions.

9 Using the Compram Method to Manage the River Flood Plan Economically and Effeciently

One may wonder if there is a better way to handle these kinds of problems. A more elegant, more fruitful way, with better results. Here, the social scientific community encounters complex problems (DeTombe, 1999a). Problems involving many, each with their own limited perspective, in which the knowledge and the data of the problem are not complete and where the solutions often have a great impact and social costs. All three cases indicated, the HSL, the Schiphol and the River Flood can be considered as complex societal problems. How to handle these kind of problems more optimally is described in the Compram method[13] (DeTombe, 1994, 1999b, 2000b). To

[13] Compram is a method specially developed to handle these kind of complex problems. How the method looks like is already published in extension in

illustrate in what way the River Flood problem could have been handled, we focus on the main issues in the Compram method.

The Compram method is a guided and structured way of managing societal problems. The method differentiates six steps in the problem handling process. The method recognizes that in all these processes knowledge, power, and emotion play an important role. The problem handling process is mainly a multigroup process guided by a facilitator, mediating the problems conditions. The method prescribes an integral approach that includes all aspects and agents in the earliest stages of the problem working toward a mutually acceptable solution.
The method emphasize defining the problem before seeking a solution, this prevents handling the wrong problem (Dunn, 1997). Also, To prevent favoring one of the agents, these kind of governmental problems should first be analyzed by a group of experts. This is also done in the River Flood case. However not completely according to the guidelines of the Compram method.

Step 1. The Compram guidelines prescribes that in the first step, experts involved in the problem should be invited to discuss the problem with each other to define the problem. Then, the next step draws connections between the problem and agents to determine an appropriate intervention. In the River Flood case this would not only been the special water experts but also e.g. an expert in biology, in hydrology, an expert on freight shipping, an economist, an agriculture expert, a legal practitioner and an expert in psychology.

These experts will discuss which agents are involved (the organized and unorganized groups), and what power they have. In this discussion the experts from different domains stimulate each other to define the problem in a creative way, for instance, not only defining the problem in the way of a surplus of water in winter time, but combine this with the expected shortage of water in the summer time.

Step 2. In the Compram method, the problem handling process continues by inviting all the agents to give their view on the problem. Agents like freight representatives, farmers, industries located on the riverbed, environmentalists, water lobby groups etc. All these groups give their own viewpoint, indicating what handling space they have, and what kind of solution they will support or prevent.

Step 3. In this step, the experts and representatives of agents will discuss possible solutions. Their views and possible interventions will be compared. This might lead to combining solutions, e.g. the surplus and the shortage of water.

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many publications. Here we like to concentrate on the main lines of the method.

Step 4. Before advancing intervention strategies into the media, a careful search must be done to see what kind of societal reactions can be expected. This prevents all kind of unnecessary 'wildwest' reactions. This way alternatives can be carefully compared. Not only the sec alternatives can be compared, but also the presumed societal reactions can be included, which might make it clear that some interventions are far more expensive, than assumed like the HSL case. In order to be able to make a real comparison of all the alternatives, societal reactions that are expected as opportunities for public comment, or expropriation procedures and illegal procedures should be included in the weight of the alternatives, or otherwise avoided beforehand.

Step 5 of the Compram method is a careful guiding of the implementation according to the strategies of the problem-handling group.

Step 6 is evaluating the interventions, regarding also the new developments in the problem. This might lead to starting the problem handling process again, now with a changed problem.

At first view, the Compram method seems to cost more time and money than the rather 'easy-made-plans' of the government advisory. However, a clear problem-handling process makes plans more acceptable, with less obstruction to implementation of intervention. Here some kind of comparison can be made with developing software projects. In these kind of projects it is well known that effort in beginning of the project pays off at the end. Changing a mistake in the beginning costs much less than revising the mistake later. Here, the common advice to think first before acting is the norm. The Compram method is not a panacea; however, handling a complex societal problem according to the Compram method provides better social interaction and generates productive alternatives.

10 Conclusions

The Schiphol and the HSL case showed that just discussing solutions, without a determination of the problem seems an adequate way to manage problems. However, addressing a social problem this way often ends poorly, without in a mess of not very good combined interventions concluded in different, often incomparable reports. This way of acting leaves many agents uneasy, recognizing wasted effort and money (Boskma & Herweijer, 1988; Siddiqui, 1998). There are better more transparent ways to handle these kinds of problems. The Compram method is a method that offers a structured, clear, sequential way of problem management. A way of problem management that addresses actual problems and people with their own feelings and agendas. Also recognizing the subtlety of hidden agendas emotionally charged arguments, and substantial power differences within the problem handling process.

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