

Legitimate Adaptive Flood Risk Governance Beyond the Dikes: the cases of Hamburg, Helsinki and Rotterdam

Individual case study reports



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1. Legitimate adaptive flood risk governance beyond the dikes: the case of Hamburg

1.1. Introduction to HafenCity, Hamburg

1.1.1. Hamburg and flood protection

The Free and Hanseatic City of Hamburg has the status of a “Bundesland”, which means it has the power to operate rather autonomously from the federal government in Germany. The Hamburg state administration consists of several ministries (Behörde), and the Behörde für Stadtentwicklung und Umwelt (BSU) has the official duty of care for flood protection in Hamburg, which it has delegated to the local authority of the Landesbetrieb Straßen, Brücken und Gewässer (LSBG)¹. The LSBG is responsible for the building, inspection and maintenance of the flood protection system consisting of dikes, sluices etc.² Hamburg lies in the estuary of the River Elbe. This estuary is not protected by a surge barrier so as to allow easy access of ships to the Port of Hamburg, and hence the city of Hamburg is sensitive to tide dynamics. A normal tide may cause differences of 3 to 4 meters in water levels up to a high tide water level of + 2.1 m NN (mean sea level). Hamburg occasionally experiences storm surges in the winter season, in which case the high tide water levels might increase up to + 5 to + 6 m NN. Since the major flood of 1962 (then with a peak of +5.70 m NN), which caused around 300 casualties and considerable material losses, the City has increased its flood protection levels through a major dike improvement program. With respect to climate change, the LSBG calculates with an additional 80 cm in the “Bemessungswasserstand” to take sea level rise into account (time horizon to the year 2100), soon to be upgraded from +7.30 m NN to + 8.10 m NN resulting from recent research on expected local sea level rise (Bürgerschaft, 2012, p. 8). Therefore a building program is currently in preparation to strengthen the dikes with another 80-100 cm to guarantee the necessary flood safety until 2050. This should also buy the City some time to decide on alternative flood protection strategies (such as a for instance a surge barrier or flood retention areas upstream) while allowing some flexibility (policy officer LSBG, 2012). An overall climate adaptation strategy for Hamburg has not (yet) been developed, but a climate adaptation action plan and monitoring program are being prepared by the BSU (expected to be published by the end of 2012) (policy officer BSU, 2012).

1.1.2. Flood risk governance for HafenCity

In 2000 the City decided to transform part of the former Harbour area into a new residential, office and retail area. A master plan was made for “HafenCity” with the aim to build an attractive living environment in the heart of the city closely connected to the water. Constructions began by the beginning of this century and are expected to last until around 2020/30. It is claimed to be one of Europe’s largest urban regeneration projects. The area lies in front of the main dike-line of Hamburg adjacent to the Elbe River (see fig. 1). Rather than building a dike around HafenCity, the City developed a mix of innovative strategies to manage flood risk. The main motivation for this was efficiency: building a dike would have meant a huge amount of public spending at the beginning without foreseeing the success of the development, and would have delayed the development of building plots. Alternatively the City decided to introduce the so-called “Warftenkonzept”, by building on elevated plots in front of the main dyke line with heights of +7.5 meters above NN, soon to be upgraded to + 8.30 meters NN for the new to be developed neighbourhoods resulting from new predictions for sea level rise (Bürgerschaft, 2012, p. 12)³. This meant that the area could be developed plot by plot, and that development could start straight away. All newly built infrastructure in HafenCity is elevated to allow access of the fire brigade during storm surges. In addition individual built-in flood resistance for buildings (‘Objektschutz’) was introduced, i.e. flood protection measures to individual buildings such as flood doors and walls, as well as the institutionalization of “Flutschutzgemeinschaften” among property owners and inhabitants of particular neighbourhoods in HafenCity (Schaerffer, 2012). They are responsible for flood preparedness, for timely alert during a flood event and for closing the mobile flood protection walls. While

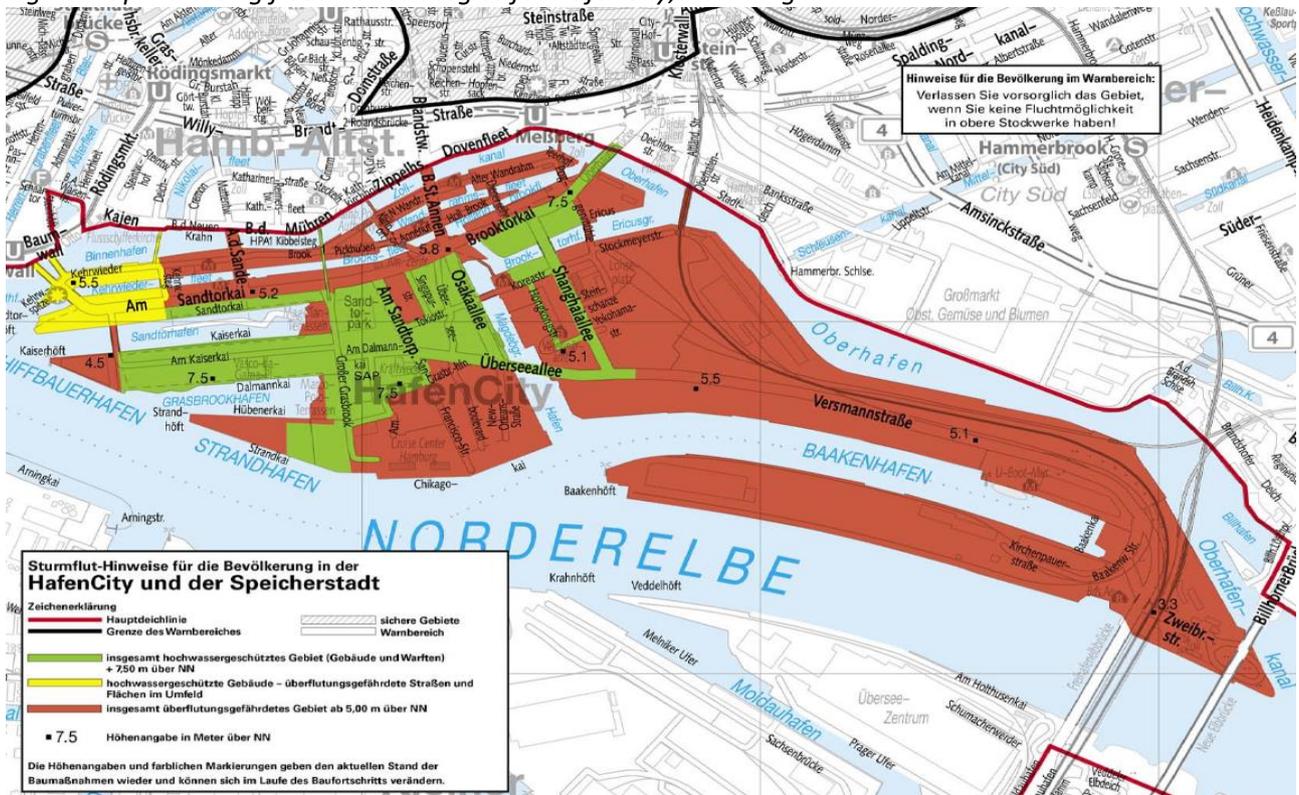
¹ LSBG is service provider for the Hamburg administration and attributed to the Behörde für Wirtschaft, Verkehr und Innovation.

² With the exception of the port area, where flood protection is a private responsibility based on different polder communities, and which is coordinated by the Hamburg Port Authority (HPA).

³In actual practice most building(entrance)s are built on a height of + 8 meters (Bürgerschaft, 2012, p. 12).

these civic communities are not unique in Hamburg, it is an innovative phenomenon for Germany (and for Europe for that matter).

Fig. 1: map indicating flood risk strategies for HafenCity, Hamburg



In November 2007 a considerable part of the first neighbourhood ('Am Sandtorkai') was flooded for several hours. It served as a real-life case for the testing of flood protection (a few flood doors did not function properly which led to some garages and storages spaces being flooded). The material damage that resulted from this flood was not covered by flood insurance (storm surges are excluded from insurance coverage).

1.2. Governance arrangement for HafenCity

The governance arrangement for AFRM in HafenCity can be characterized by a mix of public governance throughout the policy process and a considerable extent of private governance in the implementation stage, the latter mainly being enforced through legislation. Interactive governance is lacking, although some consultation and dialogue sessions have taken place (see under legitimacy). Technology-wise the chosen mix of flood risk strategies for HafenCity deviates from the traditionally dominant 'defense' paradigm. The governance has a few new elements; it allows for some private responsibility for flood risk delegated to property owners and citizens. Nevertheless, the governance arrangement is dominated by public hierarchical governance. We will now discuss the dimensions of the arrangement in more detail.

1.2.1. Responsibilities

Table 1 gives an overview of the public and private responsibilities across the different stages of the policy process. Several findings can be drawn from this overview:

- Public responsibility for flood risk planning and implementation in HafenCity is dominant across all the stages of the policy process. The most important consideration for this public responsibility is to ensure sufficient protection against flooding. This consideration has been fueled by the past as well as the future. The remembrance of the 1962 flood event is still quite alive among Hamburg

authorities (also evidenced by the 50 year anniversary celebration of the flood in 2012), and floods must be prevented (but not at all costs, since a flood barrier in the Elbe is unacceptable due to the port activities!). The predicted sea level rise from climate change and its related uncertainty is promoting an additional safety margin in the 'Bemessungswasserstand'. Rule of law is another consideration for public responsibility: states in Germany have a duty of care to protect citizens from floods. After several major flood events in Germany in the 2000s the federal government has put renewed pressure on the States to perform this public duty. Another consideration specifically for HafenCity is fairness. The Hamburg authorities find that HafenCity should receive similar levels of protection as behind the dikes (LSBG, 2012; HC, 2006), and this can (best) be guaranteed by public responsibility for flood protection. Public responsibility also extends to flood risk communication, carried out by the Behörde für Inneres und Sport and the 7 boroughs (Bezirke). The City is very open about flood risk and its impacts, and puts considerable efforts into communication programs to citizens (leaflets, leaflet distribution, and internet (Katastrophenschutz, 2012). For HafenCity specifically quite some information material is available, which includes the statement that this part of the city is built in front of the major dike-line (BIS, 2010; LSBG 2012, pp. 24-27).

- Private responsibility is manifest in the implementation stage: by law property owners have to implement and finance adaptive flood risk measures. According to the 'Flutschutzverordnung-HafenCity' (HmbGVBI, 2002) investors/project developers are required to implement and finance the elevation of the building plots. They are also required to take additional flood protection measures (such as flood doors) and to reserve the ground floor for other activities than living/sleeping. Furthermore, property owners are also required to create Flutschutzgemeinschaften. In practice this is often outsourced to a security agency. A primary consideration for the public authorities to mandate these private responsibilities is efficiency: a considerable amount of the cost of flood risk management is thus borne by the private sector. Other important motivations for assigning these responsibilities to private actors are to create a kind of collective awareness for flood risk and to induce preparedness for actual flooding when it occurs.

1.2.2. Steering strategy

The steering strategy used, is predominantly hierarchical. In the Plan stage the local government authorities determined the agenda for flood risk governance in HafenCity, assessed the flood risks involved, and decided on what kind of targets should be achieved and which levels of residual risk should be acceptable. In the Do stage, the authorities decided upon the mix of flood risk measures to be taken for HafenCity. Although investors were not really consulted in these planning activities, HafenCity Hamburg GmbH, a 100% city owned development company for HafenCity, made sure they were quite involved in the actual implementation stage, and had considerable opportunity to give input on the details at the practical level. Market steering is limited to the outsourcing of the tasks of the Flutschutzgemeinschaften to security agencies. Network steering is lacking. The hierarchical steering strategy fits with the dominance of public responsibility: the consideration of securing equal protection levels for HafenCity was an important driver for the public authorities to keep flood risk governance under their own control. In the beginning there were also very practical reasons for not engaging stakeholders: the area was not inhabited, and the regeneration project was kept secret so that the City could buy the land prior to development.

Table 1: responsibilities for HafenCity, Hamburg

Policy stage	Roles per stage	Actors	Specifics
Public responsibilities			
Plan	Agenda-setting, initiation of policy for flood protection	Behörde für Stadtentwicklung und Umwelt (BSU)	BSU is the official Hamburg state authority with the duty of care for flood protection based on German federal law. The LSBG (see below) handles most of this responsibility in practice, but is not an official Behörde.
	Knowledge creation, risk assessments	Landesbetrieb Straßen, Brücken und Gewässer	This local government agency conducts regular research on climate change and expected sea level rise (LSBG, 2010).
	Target setting (norms for flood protection)	Landesbetrieb Straßen, Brücken und Gewässer (LSBG)	LSBG must secure sufficient levels of protection against storm surges and sea level rise. Sea level rise is taken into account as a serious factor that might increase the tidal activity of the Elbe.
Do	Strategy making: decision on a flood protection strategy for HafenCity and on policy instruments	Behörde für Stadtentwicklung und Umwelt (BSU)	Flood protection is legally secured via a specific "Flutschutzverordnung HafenCity" (HmbGVBlm 2002). The minimum height of the warft and the Objektschutz are also legally secured through a "Gesetz über den Bebauungsplan Hamburg" (building code for each HafenCity neighbourhood).
	Project coordination for HafenCity	HafenCity GmbH development company of the city (100% city owned)	HafenCity GmbH is the master developer of HafenCity. It is responsible for the planning for the implementation of the HafenCity developmen; acting as liaison between the local government and investors/developers.
	Climate proofing of the urban infrastructure of HafenCity	HafenCity GmbH development company of the city (100% city owned)	Implementation/financing of measures for the flood proofing of urban infrastructure including elevated evacuation routes (public spaces are allowed to be flooded during storm surges)
Check	Monitoring of flood protection measures to buildings (Objektschutz)	Behörde für Stadtentwicklung und Umwelt (BSU)	In order to secure sufficient levels of flood protection buildings are checked at the design stage (building permission), and at completion (building approval).
Maintenance	Risk communication	Behörde für Inneres und Sport (BIS) and the boroughs (Bezirk Mitte for HafenCity)	Ongoing risk communication to citizens about flood risk and warning during a flood event, ensuring that inhabitants are continuously aware of flood risk, and the responsibilities they have to prepare for and act upon flood events (e.g. BIS; 2010, BIS, 2012);
	Flood preparedness: disaster coordination, evacuation planning and emergency management		Ensuring that evacuations run smoothly in case of a flood event to avoid casualties and material damage.
Private responsibilities			
Do	Designing for, and implementation and financing of the elevation of their land parcel, as well as adaptive measures to their building(s)	Investors/developers/ property owners	The costs for flood protection on plot and building levels are borne by the private sector. Investors have some freedom to design adaptive measures to their buildings according to their needs and preferences.
Maintenance	Flood preparedness and damage control for private property: Yearly check of the functioning of adaptive building measures (flood doors); in case of a flood: closing of the doors and warning of the inhabitants	Flutschutzgemeinschaft (community of property owners that deals with flood protection on a collective basis)	The responsibilities of the Flutschutzgemeinschaft are legally secured in §§5-6 of the "Flutschutzverordnung HafenCity" (HmbGVBlm 2002). Each Gemeinschaft has a Flutschutzbeauftragte. This position is performed on a voluntary basis, but is accepted since it involves little work. Many property owners outsource this responsibility collectively per building to specialized agencies.
	Recovery of flood damage	Owners/inhabitants	Inhabitants are responsible for repairing the flood damage.

1.2.3. Policy instruments

Legal instruments tend to dominate in the governance arrangement. A specific local law was created for the flood protection of HafenCity (HmbGVBI, 2002), which stipulates the responsibilities of the property owners for 1) creating Flutschutzgemeinschaften and the assignment of Flutschutzbeauftragten, 2) conforming to the building regulations, such as elevated height of 7.5 meters, and flood protection measures to the buildings. Each neighbourhood of HafenCity also has a "Bebauungsplan" (Building Code), which regulates adjustments to buildings for flood protection purposes. Next to legal instruments the City also employs communication instruments. In particular the flood risk communication program to citizens is quite substantial. The City does not utilize any economic instruments for the promotion of private flood protection for HafenCity.⁴ Again, this is in line with the fact that the consideration of securing equal flood protection made authorities wanting to control flood risk governance for HafenCity.

1.3. Legitimacy of the HafenCity arrangement

1.3.1. Input legitimacy

Input legitimacy was analyzed by studying the extent to which all interests at stake are equally represented, with particular attention to representation the weak interest of flood safety for present and future generations, and to the avoidance of dominant socio-economic interests. In the planning stage public authorities determined the decision-making process without private stakeholders being directly represented in this process. In this early stage of project development in the 1990s the different interests were indirectly represented through ratification of important decisions for HafenCity in the Senate and Bürgerschaft (parliament). For instance, a special committee for urban development within the parliament, comprising of representatives of all political parties, has been formed (HC, 2012). This committee has approved all strategic decisions for HafenCity, such as for instance the Masterplan and zoning plans for HafenCity (Politician, 2012). Public officials have seriously taken the interest of flood safety for HafenCity into account. This has resulted in parity safety levels for HafenCity compared to the rest of Hamburg. Potential investors/project developers were excluded in the early stages to avoid speculation with land. Nowadays, through the HafenCity Hamburg GmbH their interests are taken into account, most notably in the implementation stage (planning, design and realization of buildings). Residents or civil society groups in Hamburg were not involved in decisions on the flood protection of HafenCity, other than through their political representation in the Bürgerschaft. In these days there were no residents to consult. Now that the first neighbourhoods are inhabited, the first residents' community networks have also been created. Netzwerk HafenCity e.V. (<http://www.netzwerk-hafencity.de/>) is a legal entity who elect their representatives among their members. The HafenCity GmbH consults them from time to time in operational matters. Nevertheless, the interests of investors seem to be better represented through HafenCity GmbH. To conclude, the weak interest of water safety is well represented. A minor issue is that investors (short-term economic interests) are perhaps better represented through HafenCity GmbH than residents. We therefore characterize the input legitimacy as medium.

1.3.2. Throughput legitimacy

Throughput legitimacy was analyzed by studying the extent of stakeholders' access to and influence on the decision-making process, as well as the extent of open and organized deliberation among stakeholders. The picture that emerges from the interviews is that the decision-making process for the development of the flood protection strategy for HafenCity was and still is entirely in the hands of the public administration (in particular the BSU and LSBG) who deliberate on behalf of society. The most strategic decisions are ultimately ratified through the political system of the Senate and Bürgerschaft: the Senate develops a 'Drucksache' (a proposal for a decision on a particular topic from the public administration)⁵, which is then ratified in the Bürgerschaft. There was/is no involvement of private stakeholders in decision-making in the Plan stage. Nevertheless, investors/project developers are quite heavily involved in the actual implementation of the

⁴ The city does have a subsidy program for the harbour area to promote private flood protection, coordinated by the HPA.

⁵ In October 2012 a Drucksache was made to increase the reserve for sea level rise to 80 cm, and to strengthen the dikes with appr. 1 meter accordingly (Bürgerschaft, 2012).

flood protection strategies. This is facilitated by the HafenCity Hamburg GmbH, which organizes regular meetings with investors. It has developed a special contract system in which the investor and HafenCity GmbH go through an intensive co-working process. Initially only a letter of intent is made (the so-called 'Anhandgabe'). During this initial phase the developer can study the feasibility of the project without actual commitment to buying the plot and without having to finance it. In turn the developer has to fulfill a number of planning steps for the design of the building set by the HafenCity Hamburg GmbH. Only if all planning steps are adequately addressed (incl. the design of flood protection measures) and building permission is granted by the BSU, will the land be sold to the investor so that the actual development can start. Residents are involved to some extent by the HafenCity GmbH in practical matters (such as the creation of new street names) through the community network "Netzwerk HafenCity e.V.", and they are also part of the jury for design competitions of new buildings in HafenCity. Some public discussions took place regarding the update of the master plan for the Eastern development of HafenCity with heavy delegations from citizens, but some respondents suggested that public officials may find it difficult to put citizens' input to use (due to their limited understanding of complex information; moreover residents are more concerned with everyday nuisance than strategic issues). The above shows that participation of non-state actors in decisions regarding flood risk governance for HafenCity is therefore more elaborate for investors (who have influence on the Do stage, a stage that matters to them) than for residents.

Real deliberation between local authorities and private actors hardly occurs, except at the operational level between the HafenCity GmbH and investors. Nevertheless, in 2011 HafenCity Hamburg GmbH organized a series of stakeholder workshops related to urban development and flood protection in light of climate change, in cooperation with the Internationale Bauausstellung (IBA), a 100% city-owned organization created for the promotion of innovative urban designs in Hamburg-Wilhelmsburg. Under the theme of 'Cities and Climate Change' these workshops stimulated a dialogue on adaptation to flood risk from climate change (HC, 2011). One workshop concentrated on the concept of "Mitwachsen", for which HafenCity was taken as a case study. This workshop was attended by professional experts (urban designers, architects), researchers, public officials and interested inhabitants of Hamburg through a system of open access. Based on this workshop a hypothetic and visionary design for a second level of evacuation routes on the top of the buildings was developed by the experts (HC, 2011, pp. 74-85). This design was received with mixed feelings by some stakeholders, and politicians are reluctant to take this concept forward. We conclude that the throughput legitimacy is low to medium: relatively low for residents, and medium for investors.

1.3.3. Output legitimacy

Output legitimacy was analyzed according to the extent of stakeholders' acceptance of the division of responsibilities between the public and private sectors as well as with the allocation of flood risk. Based on the feedback from respondents, who represent the various public and private stakeholder groups, the arrangement has been very well received. For instance, when asked how and why respondents would want to change the existing arrangement of responsibilities, people indicated they were very satisfied and did not have any significant alterations in mind. Respondents find it reasonable that flood protection should be left with public professionals to deal with, and the flood risks are well accepted. Private actors accept their private responsibilities for taking flood risk measures, and for the tasks of the Flutschutzgemeinschaften. These responsibilities are clear and well-known in advance; it is part of the deal when you want to build/live in HafenCity. As one respondent put it "you don't have a choice if you want to invest in HafenCity" (Investor, 2012). The public authorities also put considerable effort in maintaining high awareness levels among citizens of flood risks and their own responsibilities in dealing with flood risks. The output legitimacy can therefore be rated as high.

1.3.4. Conclusions on legitimacy

Legitimacy is predominantly attained through a high output legitimacy and not so much through input and throughput legitimacy. The lower levels of input and throughput legitimacy reflect the indirect representative democracy model of interest representation via the Senate and Parliament, and are in line with the dominance of public responsibilities found in the arrangement. All major decisions regarding HafenCity are ratified by elected representatives from all political parties. Acceptance of the arrangement among the key private stakeholders that were interviewed is high, indicating towards a high level of societal support. There also appears to be societal support for the fact that the costs of flood protection for HafenCity are (mostly) borne by those who have the privilege of living (and working) in close proximity to the water rather than the tax payers in general (Politician, 2012). Responsibilities among public and private actors are clearly delineated and communicated, resulting in a clear accountability structure. This also promotes the acceptance of the arrangement: a private actor can decide whether to accept his/her own responsibilities for flood risk governance or not. Nevertheless, while in the early stages of the HafenCity project more indirect forms of representation could be justified also for practical reasons (no residents to engage and avoidance of land speculation by investors), a future legitimacy challenge could lie in employing more direct forms of participation and deliberation with the residents that now occupy the first neighbourhoods. This might be conditional for the legitimacy in light of the progressive adaptation of elevation levels in line with new sea level predictions, which might result in different levels of residual flood risk and therefore inequities among the old and new neighbourhoods of HafenCity.

References

- BIS (2010). Sturmflut. Hinweise für die Bevölkerung in der Elbniederung. Merkblatt für die HafenCity und die Speicherstadt. Behörde für Inneres und Sport. September 2010. Retrieved on May 5th, 2012 <http://www.hamburg.de/contentblob/3425472/data/sturmflut-download-merkblatt-hafencity.pdf>.
- Bürgerschaft (2012). Mitteilung des Senats an die Bürgerschaft. Hochwasserschutz für Hamburg. Drucksache 20/5561, 16 October 2012.
- HC (2006). HafenCity Hamburg. Der Masterplan. HafenCity Hamburg. Retrieved on May 5th, 2012.
- http://www.hafencity.com/upload/files/files/z_en_broschueren_19_Masterplan_end.pdf.
- HC (2012). Essentials Quarters Projects. HafenCity Hamburg. Retrieved on May 5th, 2012 http://www.hafencity.com/upload/files/files/Projekte_englisch_Maerz_2012.pdf.
- HmbGVBI, 2002. Verordnung zum Schutz vor Sturmfluten im Gebiet der HafenCity (Flutschutzverordnung-HafenCity) Vom 18. Juni 2002.
- HC (2011). Dokumentation zum HafenCity/IBA LABOR. Stadtküste Hamburg. Herausforderung Stadtentwicklung und Hochwasserschutz. Retrieved on May 15th, 2012 http://epub.sub.uni-hamburg.de/epub/volltexte/2012/15480/pdf/LABOR_Dokumentation_Stadtkueste.pdf.
- Katastrophenschutz (2012). Retrieved on May 10th, 2012 www.Katastrophenschutz.Hamburg.de.
- LSBG (2012). Sturmflutschutz in Hamburg. Berichte des Landesbetriebes Strassen, Brücken und Gewässer Nr. 10/12. Retrieved on May 10th, 2012 <http://lsbg.hamburg.de/contentblob/3281680/data/sturmflut-in-hamburg-1.pdf>.
- LSBG (2010). Untersuchungen zur Meeresspiegelentwicklung (veröffentlicht in „Die Küste“, Heft 76, 2010. Landesbetrieb Straßen, Brücken und Gewässer, Juni 2010.
- Schaerffer, M. (2012). Küstenschutz. Zwischen staatlichem Verantwortungsmonopol und zivilgesellschaftlicher Selbstregulierung. In: Scharing, Julia; Mitterdorfer (Hg.): DoKoNaRa 2011. 5. In. DoktorandInnenkolleg Nachhaltige Raumentwicklung `Verantwortung für die Region`. Innsbruck university press: Innsbruck, pages 163-176.

2. Legitimate adaptive flood risk governance beyond the dikes: the case of Helsinki

2.1. Introduction to Kalasatama, Helsinki

2.1.1. Helsinki and flood protection

Historically flood management in Finland has focused on inland flooding, for which responsibilities are clearly specified in various Finnish statutes (URC, 2007). Flood protection is the responsibility of the Ministry of Agriculture and Forestry, while the 13 ELY regional environment centers are responsible for the promotion and coordination of flood risk management on the ground (Kurkela et al., 2008). These centers work closely together with the municipalities and rescue services. It is expected that they will also take on a coordination role for coastal flooding in the near future. In recent years coastal flooding has appeared as a new issue on the radar screen. Due to the ice age parts of Finland have risen, which has largely compensated for sea level rise in coastal areas. However, this phenomenon has slowed down for Helsinki⁶. The main risk of flooding in Helsinki comes from the sea; in 2005 Helsinki experienced a flood event due to an all-time high record sea level (Kurkela et al., 2008). The Helsinki-Espoo coast line has been identified as one of 21 nationally significant flood risk areas in Finland (FEI, 2011). The Finnish Meteorological Institute is responsible for monitoring and predicting sea levels along the Finnish coast, and alerts the rescue services in case of high sea levels. Based on their measurements, the Finnish Meteorological Institute recommends minimum building heights for new developments per region along the coast lines, based on a probability norm of 1/200 years flooding. Although this minimum building height is not legally mandated, municipalities do follow this recommendation in practice. The current minimum building height for Helsinki is set by Finnish Meteorological Institute at 2.71 meters above mean sea level (N₆₀ +2,60)⁷. The municipality of Helsinki has also surveyed flood risks along its own coastline, and has set a minimum building height of +3.00 meters accordingly⁸. This applies for all its new developments: after the harbor has been moved to the east, several former harbor areas close to the city centre are being transformed into residential areas, one of which being Kalasatama. Helsinki is also the first municipality to have crafted a flood strategy for coastal flooding (HCP, 2008), which stipulates the responsibilities of the different city authorities for flood risk management. In 2010 the Mayor of Helsinki established a flood working group, led by the City Planning, consisting of various departments including the Finnish Environment Institute. This working group monitors the actions specified in the flood strategy. Finland was the first European country to have issued a national adaptation strategy in 2005 (Biesbroek et al., 2010). The city of Helsinki has also issued a Climate Change Adaptation Strategy in 2012 (HSY, 2012). This document reconfirms the minimum building height to be implemented by the city planning department for new developments such as Kalasatama.

2.1.2. Flood risk management for Kalasatama, Helsinki

The Kalasatama area is a former industrial/harbor area to the East of the city center, which is being transformed into a new 175 hectares residential area over the next 25 years. Its coastline lies directly on two bays of the Baltic Sea. A masterplan has been made, and detailed plans are being developed per neighbourhood. Constructions have started for the first neighbourhood in the Southern part, and the first residents have moved in over the last few months. Figure 1 shows the current ground levels along the coast of the center of Helsinki. Only the darker green areas conform to the minimum building height of 2.60 m. as set by Finnish Meteorological Institute. At the moment large parts of the Kalasatama district (indicated by the circle on the map) lie below the recommended height. Therefore the minimum building height for Kalasatama is set at + 3 meters as an overall flood prevention measure.

⁶ Land is estimated to rise in Helsinki 3.8 mm/year.

⁷ N60 is a national elevation level. MW in Helsinki is now N60 -0,11.

⁸ This is more or less the floor level and that's why it is higher than the actual recommendation.

Fig. 1: ground level heights for Helsinki central area (source URC, 2007)

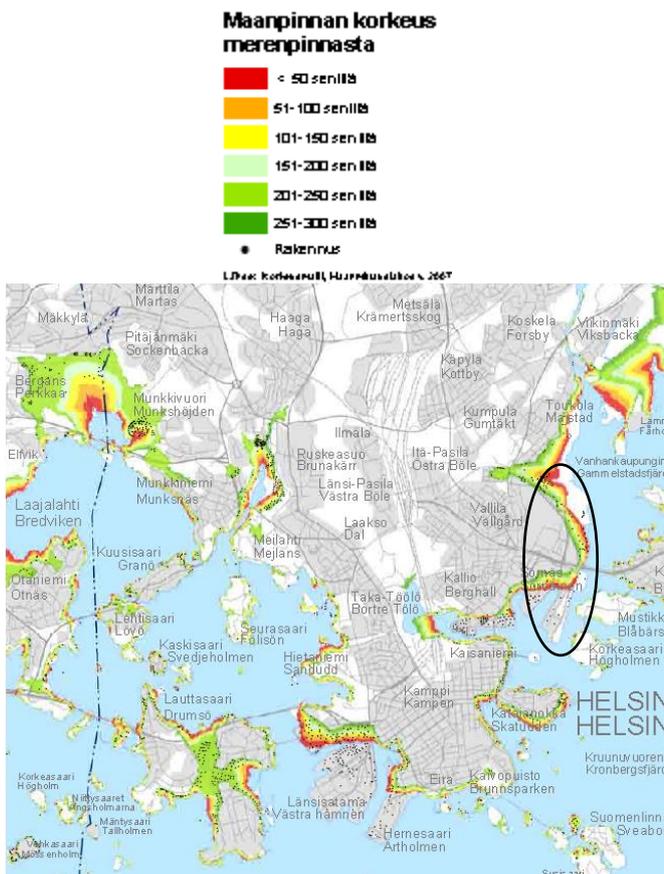
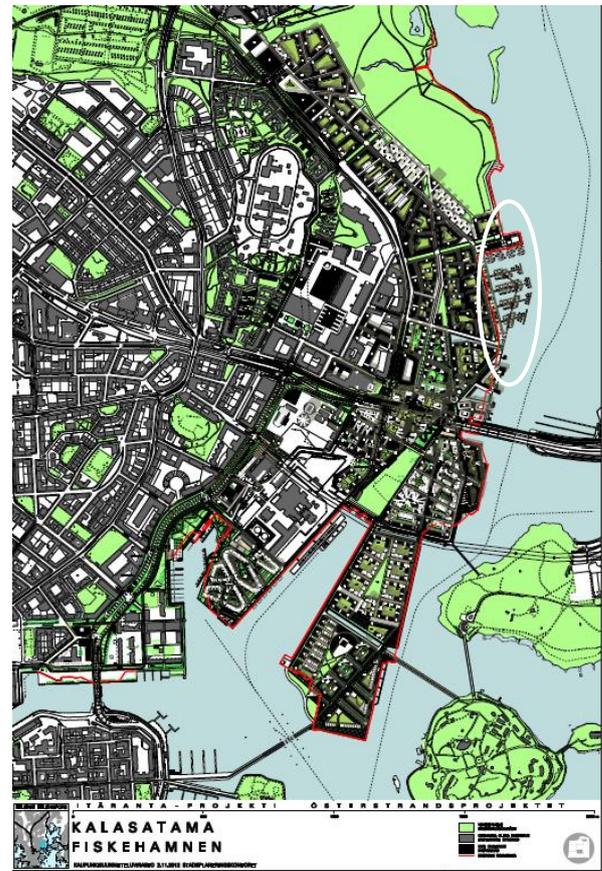


Fig. 2: map of Kalasatama (source: City Planning Department)



A small district of 40 floating houses will be built in the Northern part as a pilot project, estimated to be started by 2016. Flood risk management for Kalasatama is thus enacted through a traditional prevention measure (land elevation) and an innovative adaptive measure (floating houses). Although these floating houses represent an innovative form of adaptive building, they are mainly planned to bring variety in the types of residences in Kalasatama. The floating houses are located on a relatively calm bay and indicated in the circle of figure 2, which is a stylized map of the total Kalasatama district. Following a competition organized by the City Planning and Real Estate Departments, two developers were selected for the actual development of this floating district. Each takes care of about half of the district. These developers have obtained a 5-year exclusive right of development from the City Real Estate Department so as to protect their investments into this new technology. The rent for the water plots has been discussed (similar rent per square meter for the floor area as on land). According to the developers they intend to build normal houses with similar price levels as on the mainland of Kalasatama (so not for the happy few).

Picture of floating houses district



2.2. Governance arrangement for Kalasatama

The governance arrangement for Kalasatama is characterized by a combination of public and private governance: public governance for the re-development project as a whole including its future flood protection, and private governance for the development and implementation of the floating houses district. Public governance is rather dominant, both related to flood protection (as prescribed in the flood risk strategy) and to the re-development of Kalasatama more generally. The city owns the land in Kalasatama. Both the land that is rented, and the land that is sold should be built according to specification. For the floating houses the water plots are also rented. Thus the City Planning and Real Estate Departments as well as the Economic and Planning Centre keep strong control over the development process of Kalasatama. There is no real interactive governance for flood protection, notwithstanding the good cooperation between the City Planning Department and the two developers of the floating houses district. There is a clear separation of responsibilities demarcating what the city should do/finance as well as the two developers. We will now discuss the governance arrangement in more detail.

2.2.1. Responsibilities

Table 1 gives an overview of the public and private responsibilities for adaptive flood risk governance. The status of Kalasatama to date is that the Plan stage has been finalized, and the implementation has just begun. The responsibilities for the Check and Maintenance stages are based on current ways of working for redevelopment projects in Helsinki. We find that:

- Public responsibilities are dominant and witnessed in every stage of the policy process. Most roles are exclusively taken on by various municipal authorities, with the exception of some roles regarding the floating houses district. One observation is that the city of Helsinki does not (yet) take on responsibility for flood risk communication. The authorities take on these responsibilities in order to stay in control of the development of Kalasatama. The implementation of the minimum building height stems from the recommendation of the Finnish Meteorological Institute. However, the City itself has decided to raise the building levels for new developments even further (from 2.60 to 3 meters) to deal with the uncertainty of future sea level rise. In that sense securing sufficient levels of adaptation appears to be an important consideration for taking on and maintaining public responsibility for flood risk management.
- For the floating houses district private responsibilities materialize in the Plan and Do stages of the policy process. A developer approached City Planning with the idea to build floating houses in Kalasatama. City Planning became excited and managed to convince the city administration and politicians of its value in terms of innovative and diverse building styles. Since the city has no prior experience with and know-how of floating building constructions, City Planning decided to leave the responsibility for the designing, engineering and construction with the two selected developers. City Planning did approve the overall design plan for this district. The Public Works department will build all the infrastructure (electricity, water, sewage etc.) needed for the floating district up to the shore line. This department will also build a quay/retention wall, and take care of some dredging work (since the water level beneath the floating houses is too shallow and the soil might be contaminated). The two developers are responsible for the floating infrastructure on/under water. They also carry full responsibility for the safety of the houses, and they bear the risk of flooding. The detailed plan for this district has also been inspected and approved by the City Rescue Department after a lot of discussion on technical matters with the developers. The houses will be able to adjust to the sea level through an anchor system, and the two developers will invest in floating wave breakers with which they will simultaneously build a small marina for boats.
- In Finland private property owners carry a responsibility for flood damage control: according to the Finnish Rescue Act property owners have a duty of care to be prepared for and take precautionary measures to prevent damage to their properties (Kurkela et al., 2008). The Helsinki Flood Risk Strategy endorses this: the city takes responsibility for timely information provision in case of a flood event, but does not participate in the flood protection of private property (HCP 2008, p. 28, par. 5.5.9).

Table 1: responsibilities for Kalasatama, Helsinki

Policy stage	Roles per stage	Actors	Specifics
Public responsibilities			
Plan	Agenda-setting, initiation of policy for flood protection in Helsinki	City Planning Department	Helsinki is the first city in Finland to have crafted a flood risk strategy, with help of the consultancy of Ramboll. City Planning is responsible for flood risk planning in the built environment and has initiated the development of the strategy.
	Knowledge creation, risk assessments, development of flood risk maps	Regional and national authorities	Many research programs (national, EU, Baltic region) have taken place to assess climate effects and its impacts on Finnish society at various scales/sectors. The 13 regional ELY centres are responsible for developing flood risk maps. The Finnish Marine Institute measures sea levels on continuous basis.
	Target setting (norms for flood protection)	Finnish Meteorological Institute/ City Planning Department	FMI makes recommendations for minimum building heights for new developments across various regions in Finland. Helsinki City Planning has set the building heights at a slightly higher level for Kalasatama and related waterfront regeneration projects.
Do	Strategy making: decision on a flood protection strategy for Kalasatama and on policy	City Planning Department	Minimum building height is regulated through the planning permission/building regulation process.
	Coordination of all work regarding the development of Kalasatama	City Economic & Planning Centre	One specific project manager for Kalasatama coordinates all activities of the different city departments, and is one of the main contacts for constructors/developers.
	Implementation/financing of land elevation of Kalasatama, incl public space. For the floating houses: building/financing up to the shore line.	City Public Works Department	The city takes care of land elevation and charges the costs on to the developers through the rent/land prices. The infrastructure for the floating houses is built until the shore line, incl. the quay/retaining wall.
Check	Monitoring of minimum building heights; monitoring requirements of buildings, and of floating houses	Building regulation department, rescue department	Detailed plans per building are checked, as well as inspection upon completion. Special attention was given to the floating houses in order to secure access of emergency services to these houses.
Maintenance	Flood preparedness: disaster coordination, evacuation planning and emergency management	City of Helsinki Rescue Department	So far there is no risk communication to citizens. According to one respondent the city of Helsinki is preparing a flood risk communication leaflet. Current status is unknown.
Private responsibilities			
Plan	Agenda-setting for floating houses	Developers	The idea for floating houses was first presented to the city by potential developers.
Do	Designing, engineering for, and implementation and financing of the floating houses	2 selected developers: Marina Housing and JMV-Research	The developers have the expertise to build floating constructions and anchor systems. They are responsible for the flood protection of these houses, as well as for the infrastructure on/under the water (access roads, water, sewage, electricity etc)
Do	Flood damage control	Owners/inhabitants of buildings	According to the Rescue Act 468 (2003) owners of buildings are responsible for preventing hazards and should be prepared to undertake rescue measures and draw up an emergency plan to the best of their abilities (Kurkela et al., 2008).
Maintenance	Recovery of flood damage	Owners/inhabitants of buildings	Damage from sea flooding is not compensated by the National Government. Compensation for damage from inland flooding will end in 2012 and be replaced by an insurance system

- The Finnish government does not compensate flood damage from rising sea water, and inland flood damage compensation will terminate by the end of 2013. From 2014 onwards flood damage must be insured through accident insurance companies⁹ (Helsingin Sanomat, 2012), thus pushing some responsibility for flood risk to the private sector. In that respect it is rather remarkable that the city has not yet taken action on pro-active flood risk communication to citizens, since this might be much needed if citizens themselves are to carry this responsibility.

2.2.2. Steering strategy

In line with a dominant public responsibility, flood protection in Kalasatama (and elsewhere in Helsinki) is steered hierarchically: the city stays in control. The control for re-development projects like Kalasatama is regulated by land-ownership and through spatial planning procedures: the city owns the land, and rents (most of) its land (which is elevated by Public Works prior to construction) to constructors, who build according to the specifications of local/spatial plans and detailed plans for specific neighbourhoods developed by City Planning. This steering strategy is also applied to the floating houses district of Kalasatama, albeit with more freedom for the developers. Nevertheless, City Planning has decided on the location of the floating district, and City Real Estate has provided some design specifications for these houses (prescriptions for energy efficiency, the shape of the houses, for the inclusion of roof terraces etc.).

2.2.3. Policy instruments

Landownership as well as the spatial planning process and its related procedures and documents (masterplan, local plan, detailed plan per building) are the instruments used by City Planning to steer flood protection in Kalasatama. This corresponds with the dominant public responsibility and the hierarchical steering strategy described above. Furthermore, the City Real Estate Department has made a contract with the two developers separately regarding the responsibilities, related costs, and the exclusive right of development of floating houses until mid-2016.

2.3. Legitimacy of the Kalasatama governance arrangement

2.3.1. Input legitimacy

Input legitimacy was analyzed by studying the extent to which all interests at stake are equally represented, with particular attention to the representation of the weak interest of present and future flood safety. In Helsinki throughout the policy process the various interests at stake are indirectly represented through officials from various public authorities, who act in the interest of society. Furthermore, public decisions are always ratified by elected representatives. Each city department has its own Council Committee. These committees form a representation of the parties in the Council. The City Planning Committee (9 members) discusses all spatial plans (from master plans to detailed building plans) that the City Planning department develops, and it is able to give its opinion on these plans. The committee prepares decisions for the City Council. It has a NO GO veto power, although 50% consensus is needed to change plans and this does not happen very often. The Council also has a City Board, comprising of chosen members from the Council. This City Board also approves all spatial plans. And finally the Council ultimately ratifies most spatial plans. In practice this means that the plans for the Kalasatama redevelopment project have been ratified by the City Council. Generally there is a high political support for projects like Kalasatama, given the shortage of housing in Helsinki. Moreover, Kalasatama is a derelict industrial area and nobody really objects since there is no loss of green space or nature area. The floating houses were received with some mixed feelings (is it safe, are they built for the happy few?), but also valued for their innovative character. The floating district pilot project was ratified in all three tiers of interest representation (Committees, City Board and Council). Recently the City Real Estate Committee approved the exclusivity contracts for the two developers. Specifically with respect to the floating houses district the interests of the developers are more directly represented, but the extent is determined by the City, and is mostly restricted to the Do stage.

⁹ Insurance companies are going to in general cover damages if the return period of a flood incident is 1/50 years or lower. Some companies already has this policy, hopefully all will have in 2014.

The flood safety for present and future residents of Kalasatama is seriously taken into account, given the minimum building height (which is above the level recommended by the Finnish Meteorological Institute). The risk of sea flooding appears to be substantiated by research (Johansson et al., 2011). Nevertheless, the issue of flood risk from sea level rise remains somewhat controversial. Some respondents indicated that there is some skepticism regarding climate change and its uncertainties in sea level rise predictions both in the city administration and on the political side. For instance, the Helsinki Flood Strategy was approved by the City Planning Committee, but with the note that the sea level rise estimate is very uncertain. The majority of the committee is quite skeptical in light of the costs involved in raising safety levels through land elevation. On the other hand, the environment department in Helsinki finds +3 meters elevation to be still on the low side. We conclude that input legitimacy is medium, given the fact that there is some ambiguity in the representation of the matter of water safety.

2.3.2. Throughput legitimacy

Throughput legitimacy was analyzed by studying the extent of stakeholders' access to and influence on the decision-making process, as well as the extent of open and organized deliberation among stakeholders. In the Plan stage the decision-making is entirely in the hands of officials from various public authorities. The two project developers for floating houses only have some influence in the Do stage: they do indicate that they have sufficient influence on the detailed planning, simultaneously indicating that City Planning is very powerful. The Economic and Planning Centre coordinates all work around Kalasatama, and is a main liaison between these departments and the developers. It organizes regular meetings with the developers so that the developers have one point of contact and stay informed. Participation by residents takes place in a formal way (following what is legally prescribed): citizens have a right to give their opinion through public hearings, exhibitions or the internet. City Planning determines how this input is used. In any case citizens' comments on Kalasatama were related to high-rise building, the quality and types of houses, parking etc., but not to flood protection matters. In any case, there were only few comments since Kalasatama does not yet have many residents.

Deliberation among public and private stakeholders does not really occur. Most deliberation takes place among the different city departments. Several respondents reported that the city administration itself is rather compartmentalized, and that each department tends to adhere to its own narrow perspective. The Helsinki Flood Strategy is one of the first policy documents that was crafted with input from various departments (with the help of a consultancy firm who induced communication between departments). The ELY centre for the Uusima region (to which Helsinki belongs) is able to influence decisions because it supervises all land use planning, and needs to be consulted on flood safety matters to check whether the FMI recommendations are met. It has checked and approved the Kalasatama spatial plans, as well as the detailed plan for the floating houses district. Based on the above we rate the throughput legitimacy as rather low.

2.3.3. Output legitimacy

Output legitimacy was analyzed according to the extent of stakeholders' acceptance of the division of responsibilities between the public and private sectors as well as with the allocation of flood risk. Generally the interviewed public and private actors were quite satisfied with the responsibility divisions. All find it logical that public officials are responsible for flood risk governance since they are the professionals who are trusted for their expertise. The flood safety is generally regarded as sufficient. Some respondents pointed out that there should be more discussion about flood risk, e.g. whether the current standard (+3 meters) is good enough, and which alternative measures would be feasible besides land elevation. Alternative flood risk measures are not yet really considered (discussions in Finland on more adaptive strategies have just begun). We therefore rate the output legitimacy as medium to high.

2.3.4. Conclusion on legitimacy

The legitimacy of the governance arrangement is predominantly attained through a relatively high level of output legitimacy, with lower levels of input and in particular throughput legitimacy. This legitimation corresponds with a system of indirect interest representation through democratic institutions and naturally fits with the predominant public hierarchical arrangement for Kalasatama. Societal interests are weighted by public officials, and their decisions are heavily scrutinized by a strong system of control by elected representatives. And in those instances where there is a mix of public and private responsibilities, such as in the development and implementation of the floating houses district, these are clearly delineated so that each knows upfront which role to fulfill. A potential legitimacy issue for the arrangement might lie in the fact that private responsibilities for flood damage control and recovery of damage are (being) transferred to citizens, while on the other hand citizens are not yet adequately informed about that responsibility nor about the measures they can take to prevent or remediate damage. A positive exemption in Finland is the flood preparation guide developed for a region in South-West Finland (Kympe, 2012). Another issue is the apparent controversy around flood risk from sea level rise. This might lead to a weakening of the interest of flood safety in favour of more pressing political issues in the near future. On the other hand flood risk management planning is under preparation in line with the EU Floods Directive, which aims to pay continuous attention to flood risks in the future.

References

- Biesbroek, G.R., Swart, R.J., Carter, T.R., Cowan, C., Henrichs, T., Mela, H., Morecroft, M.D., & Rey, D. (2010). Europe Adapts To Climate Change: Comparing National Adaptation Strategies. *Global Environmental Change* 20, pp. 440-450.
- FEI (2011). <http://www.ymparisto.fi/default.asp?contentid=384024&lan=en&clan=en> (retrieved on 22-11-2012).
- HCP (2008). Helsingin kaupungin tulvastrategia. The city of Helsinki flood strategy. Helsinki City Planning department. <http://www.ramboll.fi/>. Issued December 2008.
- Helsingin Sanomat (2012). No more state compensation for flood damage after 2013. Flood waters receding in Ostrobothnia. Helsingin Sanomat International Edition. October 9th, 2012. Retrieved November 22nd, 2012 from <http://www.hs.fi/english/article/No+more+state+compensation+for+flood+damage+after+2013/1329104907653>.
- HSY (2012). Helsinki Metropolitan Area Climate Change Adaptation Strategy. Helsinki Region Environmental Services Authority. Issued April 2012.
- Johansson, M., K. Kahma and H. Pellikka (2011). Sea level scenarios and extreme events on the Finnish coast. *VTT Tiedotteita - Valtion Teknillinen Tutkimuskeskus* (2571) , 570-578.
- Kurkela, L., T. Hellenberg and P. Visuri (2008). *Countering the impacts of climate change*. Report.
- Kympe (2012). Kympe Kymenlaakson Pelastuslaitos Pientalon Tulvaturvallisuusopas. Retrieved November 26th, 2012 from http://www.kympe.fi/images/stories/PDF/kympe_tulvaopas_2012_web.pdf
- URC (2007). Uudenmaan rannikkoalueiden yleispiirteinen tulvakartta. Uusima Regional Council.
- Yrjölä T. and J. Viinanen (2012). Keinoja ilmastonmuutokseen sopeutumiseksi Helsingin kaupungissa (Ways to adapt to climate change for the City of Helsinki). City of Helsinki Environment Publications 2/2012.

3. Legitimate adaptive flood risk governance beyond the dikes: the case of Rotterdam

3.1. Introduction to Heijplaat, Rotterdam

3.1.1. Rotterdam and flood protection

In line with the shift from flood prevention to flood risk management, the Dutch government has recently introduced the new concept of 'multilayered safety' ("Meerlaagse veiligheid"). Flood risk management is divided into 3 layers: 1) prevention measures to reduce the probability of floods, 2) spatial measures to prevent or reduce the impacts of floods, and 3) temporary measures related to evacuation and crisis management (NWP, 2009; see figure 1).

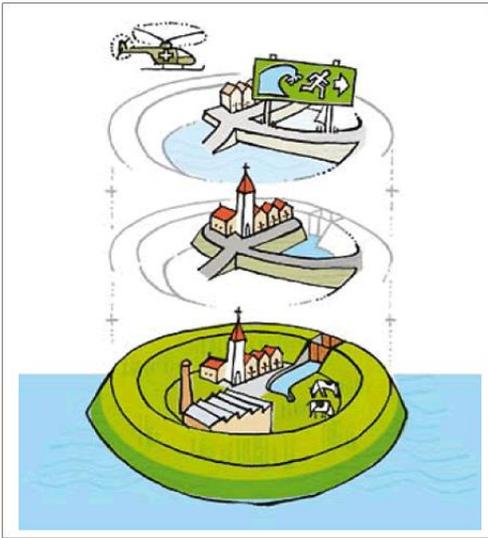


Fig. 1: concept of multilayered safety (NWP, 2009)

Responsibilities for flood protection in The Netherlands are clearly defined, and rest exclusively with the public sector through the ministerial executive agency of Rijkswaterstaat and the 27 regional water boards. However, these public bodies are not responsible for the water safety of areas that lie outside of the major dike lines and dike rings. For these areas Rijkswaterstaat only provides yearly predictions on water levels, upon which local authorities determine the minimum building heights ('uitgiftepeil') for developments in these areas. Current policy by the municipality of Rotterdam (the director of water management) is following the norm set for un-embanked areas in Rotterdam, which is a safety level of min. 1:4,000 to max. 1:10,000 years. This safety norm is the same as the areas behind the dikes and corresponds with a water level of 3,90 m + NAP (mean sea level). Land above this level is regarded as 'safe'. Because of its vulnerable location in a low-lying delta, Rotterdam is protected from storm surges by a barrier in the river Meuse ('Maeslantkering'). This barrier also provides protection for the 40,000 people currently living in the un-embanked parts of Rotterdam. The municipality of Rotterdam is a frontrunner in terms of climate adaptation policy and implementation (Mees and Driessen, 2011). It has the ambition to become '100% climate proof' by 2025 (RCP, 2010). 'Adaptive building' is one out of five main themes of the Rotterdam Adaptation Strategy, and is regarded as a key strategy to deal with the consequences of flood impacts in un-embanked areas (RCP, 2010). As part of the large regeneration project 'Stadshavens Rotterdam' (Stadshavens, 2008), the district of Heijplaat has been nominated as a first pilot project to gain know-how and experience on adaptive building in un-embanked areas in Rotterdam by applying multilayered safety (Collegebesluit, maart 2011).

3.1.2. Flood risk management for Heijplaat, Rotterdam

The city district of Heijplaat consists of a 'village' which was created around 1920 for the employees of the former shipyard RDM adjacent to the Muese. When the shipyard went bankrupt in the mid-1990s, the village remained in the midst of harbour activities. The village has an average building height of 2,80 to 3.50 meters above NAP (the lowest parts are around 1 meter below the minimum safe water level of 3.90 meters, see

figure 2). This means that the current flood probability is calculated at an occurrence of 1:5 years, versus a probability of 1:4,000 years as minimum set for un-embanked areas.

Fig. 2: map indicating flood probabilities for Heijplaat

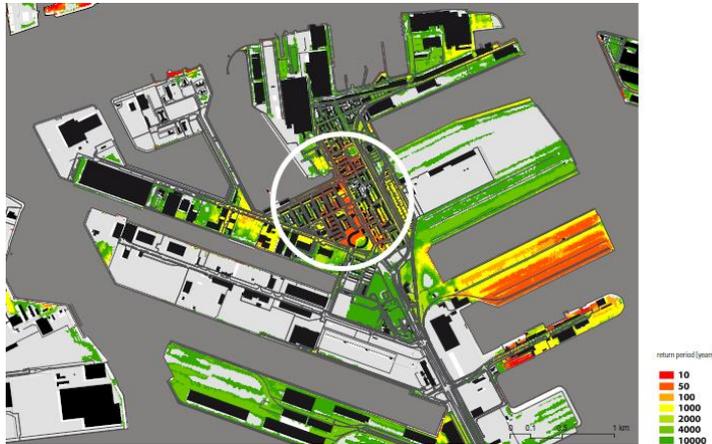
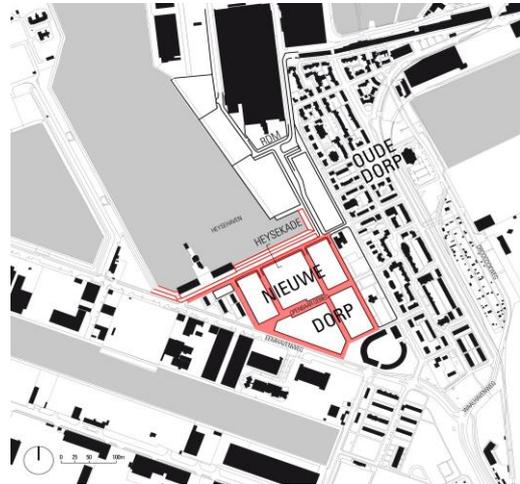


Fig. 3: old versus new villages in Heijplaat



The most deteriorated part of the village has been planned for re-development starting from 2013, also referred to as the “new village” vis-à-vis the part that is planned to remain as is, and referred to as the “old village” (see figure 3). The re-development is used as a window of opportunity for raising the water safety level (as part of the ambition to create a ‘Sustainable Heijplaat’ which aims to integrate various socio-economic and environmental goals) (Kokx and Spit, 2012). For cost-efficiency reasons the complete embankment of the village was a no-go. Raising the building height for the new village to 3.90 meters was not considered for reasons of fairness. It would create differences of flood safety with the old village. Instead a mix of flood prevention, mitigation and recovery measures has been decided upon in line with the new national strategy of multilayered safety. These entail protecting the area against a water level of +3.40 m NAP by building a partial levy of 3.60 meters (0,20 m height reservation for wave action) functioning as a boulevard at the Heijsekade (see figure 3). This levy will reduce the probability of flooding from the current 1:5 to a probability of 1:250 years. This considerable improvement with factor 50 will apply to the whole district, so both the new and the old village. Second, the application of adaptive designs to the building plots and buildings in the new village could bring the probability level from 1:250 years in the range of up to 1:4,000 years (improvement of factor 16). This was set as a target, and it is up to the property-owner (i.e. the housing association) and residents to choose those adaptive measures (inside or outside of the buildings) most suitable to their purposes to cover the remaining risk corresponding with safety levels between 1:250 and 1:4000. Risk communication to residents is introduced as the third layer of flood risk management.

3.2. Governance arrangement for Heijplaat

The governance arrangement for Heijplaat is characterized by a mix of hierarchical, interactive and private governance in different stages of the policy process. Interactive governance is quite dominant, in particular in the Plan and Do stages. Since 2010 intensive collaboration has taken place between the key public and private stakeholders in an effort to establish a common agenda. After several years of discussion and debate in several stakeholder forums a public-private partnership was formed, which has recently been ratified via a legally binding contractual agreement for the re-development of Heijplaat. This so-called SOK2 (“Samenwerkingsovereenkomst 2”) contract was signed on November 9th, 2012 by all involved parties including a residents association (SOK2, 2012; AP, 2012b). By Dutch standards the governance arrangement currently unfolding is quite unique, since it allows for public-private and private responsibilities for flood risk management. We will now discuss the governance arrangement in more detail.

3.2.1. Responsibilities

Table 1 provides an overview of public, joint public-private and private responsibilities. The status of the Heijplaat pilot to date is that the Plan stage has just been finalized. This means that the divisions of responsibilities for the Do, Check and Maintenance stages are based on the assignment of responsibilities as documented in the contractual agreement and on the expectations of respondents as to their future responsibilities (and not on real life as is the case with HafenCity, Hamburg). We find that:

- Public responsibilities are witnessed in every stage of the policy process. Notwithstanding the transfer of some responsibilities to the private sector, several local authorities remain involved in the flood risk governance of Heijplaat. Their most salient roles are the conducting of risk assessments to inform policy, the target setting of flood probability norms, and the financing, implementation and maintenance of the partial levy by the water management department; and the monitoring of adaptive building during the planning permission process by the urban planning department. A new responsibility for the local authorities is risk communication to residents. Up to now this has not been done, but it is deemed rather critical since not all residents of Heijplaat seem to be fully aware of the fact that they live in an un-embanked area, and of their own responsibilities in flood risk management (in line with the findings of De Boer et al., 2011). Risk communication will also be quite important since there will be no specific evacuation plan for Heijplaat. To fulfill this new role an overall risk communication plan will be drawn in the next months for all un-embanked areas in Rotterdam, which will also be used for Heijplaat. The major consideration for the local authorities to take on these responsibilities is to secure sufficient levels of adaptation action. Legally speaking there is no duty of care for public authorities for water safety in front of the dikes, but authorities need to make citizens aware of risks. Moreover, the city of Rotterdam feels a moral duty for water safety because the area is being re-developed at the initiative of and endorsement from the municipality.
- Public-private responsibilities are witnessed in the Plan and Do stages of the policy process. The public-private partnership was crucial in getting Heijplaat on the political radar screen. There was talk of re-development since more than 10 years, and residents were getting quite disillusioned with the local authorities and the housing association for not being able to come to an agreement and get things going. In 2010 the public and private stakeholders agreed on intensive collaboration and deliberation in order to find a common agenda for Heijplaat. In 2011 the partnership managed to get commitment from the Mayor and Alderman to start a pilot for adaptive building on Heijplaat, as part of a larger sustainability agenda. This was the first time that conformation to the minimum building height was up for discussion. The partnership was crucial in exploring, proposing and getting commitment for alternative strategies for flood protection. It has managed to translate its ambitions into a contractual agreement. This agreement is accompanied by a separate policy document on adaptive building, commonly referred to as “Nota Adaptief Bouwen” (NAB, 2012; AP 2012a), which stipulates all responsibilities by the parties involved, including the financial obligations. The agreement also foresees an important responsibility for the partnership in the coordination of the implementation of the activities under the agreement. The main consideration for assuming joint responsibilities is legitimacy, so as to grant those parties that are taking on responsibility a chance to influence the decision-making process, and to encourage wide endorsement of the arrangement.
- Under the SOK2 contract private responsibilities are agreed to materialize in the Do and Maintenance stages of the policy process. The housing association owns most property in Heijplaat, and is responsible for ensuring that all new developments are built adaptively with the aim to reach a probability of 1/4,000 years (parity with the situation behind the dikes). Since they will outsource the development to project developers or individuals who wish to build on a plot, they will use a clause in the purchase agreement (‘kettingsbeding’) to make this legally binding. The future residents are responsible for taking measures in the interior of the buildings (e.g. by using tiles instead of wood on the floor, by using the ground level for storage purposes, by putting electricity sockets on a higher level etc.).

Table 1: responsibilities for Heijplaat, Rotterdam

Policy stage		Actors	Specifics
Public responsibilities			
Plan	Knowledge creation, risk assessments	City of Rotterdam (departments of Stadsontwikkeling en Stadsbeheer)	Modelling of climate scenarios; CBAs of flood management options; assessing the risks/costs of material damage, immaterial damage (societal disruption, loss of life)
	Target setting (norms for flood protection)		Setting water safety norms for areas outside of the major dike lines
	Initiation of policy for water safety in general		Developing a Rotterdam-wide strategy for areas outside of the dikes
Do	Implementation/financing of flood prevention measures		Building a small levy at the Heijsekade, and flood-proofing the vital infrastructure and public space in Heijplaat
	Evacuation routes and plans		This is not planned specifically for Heijplaat. Vertical evacuation is the preferred action, in light of the relatively superficial flooding of the area (no risk of lives)
Check	Assessment framework for adaptive building		Development of an assessment framework for the safeguarding of water safety measures of Heijplaat in existing urban planning procedures; identifying key check moments
	Monitoring of adaptation measures		Checking adaptive building measures during planning permission process
Maintenance	Risk communication		Informing inhabitants and house owners about the risks, and the potential measures to limit damage from water intrusion, recover from damage, and about evacuation routes
	Maintenance of public flood risk measures		Maintenance of the levy, and of the water proofing measures of the vital infrastructure and public space
Public-private responsibilities			
Plan	Agenda setting	SOK partnership	Informing governors and officers about the need to develop an alternative flood risk strategy
	Initiation of policy for the water safety of Heijplaat		Initiating discussions on the application of multiple strategies for dealing with flood risk
	Risk judgments		Discussing the risks of various flood risk strategies
	Checking and discussing options to manage risks		Discussing the options, and their feasibility in terms of costs, benefits, and risks
Do	Strategy making: decision on flood protection strategy and policy instrument selection	SOK partnership	Decision on the mix of flood strategies and proposing to the governors for final approval. Development of a contractual agreement (SOK) to legally ground responsibilities and financial obligations; deciding on the use of a legal instrument (kettlingbeding) to guarantee the implementation of adaptive measures to buildings and lots
	Planning and coordination of the implementation		Overseeing the implementation of actions agreed in the SOK; implementation plan early 2013
Private responsibilities			
Do	Ensuring the implementation of adaptive designs to the lots and to the buildings	Housing association	Developing a legal instrument (kettlingbeding) which obliges project developers/house owners to implement adaptive measures
Do	Implementation/financing of adaptive measures related to the interior of the buildings	Inhabitants	Taking measures for damage control in case of floods
Check	Monitoring of adaptive measures to houses on a continuous basis	Housing association	The housing association is responsible for the adequate transfer of the legal instrument (kettlingbeding) from one owner to the other
Maintenance	Flood damage control	Inhabitants	Owners/inhabitants of private property are responsible for taking precautionary measures to avoid/limit damage during a flood event
	Recovery of damage inside the house	Inhabitants	Inhabitants are responsible for repairing the flood damage

3.2.2. Steering strategy

The Heijplaat case shows a mix of steering strategies. Hierarchical steering is used by the local authorities for setting the standards for water safety. Steering through policy networks is quite dominant for most of the decision-making, in particular regarding decisions on the selection of flood risk strategies and the accompanying responsibilities and financial obligations as well as the policy instruments used to achieve this. Some market steering is visible in the organization of adaptive building between the property owners and (future) residents. It is left to the market how the performance target for water safety (between 1:250 and 1:4,000 years) is met. This mix of steering strategies naturally fits with the division of responsibilities: the dominance of network steering fits with the dominance of public-private responsibilities in the Plan and Do stages.

3.2.3. Policy instruments

Again, a mix of instruments is used in line with the mix of responsibilities and steering strategies. The most prominent instrument is the contractual agreement of the public-private partnership. However, the local authorities have used (or plan to use) several instruments. First, they have mandated the legal clause (“kettingbeding”) so that future property owners/residents keep the obligation to meet the 1/4,000 year standard with adaptive building measures. And second, they are in the process of developing communicative instruments for risk communication to residents. In addition to adaptive measures taken by residents it is being considered and explored if remaining risks can be covered by insurance type arrangements to cover the damage of water intrusion to houses. Flood insurance is still not considered in the Netherlands.

3.3. Legitimacy of the Heijplaat governance arrangement

3.3.1. Input legitimacy

Input legitimacy was analyzed by studying the extent to which all interests at stake are equally represented, with particular attention to representation of the weak interest of flood safety for present and future generations, and to the avoidance of dominant socio-economic interests. Indirect representation of interests materialized through the ratification of the contractual agreement and the separate policy document on Adaptive Building by the Major and Aldermen. Nevertheless, representation of interests happens predominantly directly: three different direct collaboration forums have been developed in which the key stakeholders are represented. The organization of the collaboration between stakeholders is laid down in the SOK2 contract. The most important forum is the ‘program group Heijplaat’ (‘programmagroep’), a group of professionals from all stakeholders. Here the daily management of the project resides, with the key responsibility to negotiate and propose key decisions, to coordinate the implementation of the contractual agreement, and to effectuate participation of residents. The ‘consultation platform’ (‘platform overleg’) contains decision-makers (directors) of all stakeholders, and is the decision-making and controlling body of the contractual agreement. The ‘consultation group’ (‘Heijplaat Vitaal’) contains professionals of the key stakeholders as well as residents. These residents consist of residents from the residents association, as well as residents who have joined on a voluntary basis out of concern for the development of their village. It is the forum to inform residents about the plans of the program group and about the progress of activities. This consultation group is chaired by an independent consultant, who represents the residents in the program group. It can be deduced that all key professional stakeholders have ample representation in the three forums. The residents, as affected party, are directly represented in one forum, and indirectly represented in the major forum of the program group although this consultant enjoys a high trust level from the residents. The weak interest of water safety was integrated relatively late in the Heijplaat re-development project. This is because the municipalities in The Netherlands have only recently become involved in water safety issues (water safety has always been a key responsibility of the national government). Although the safety levels will improve considerably for both the old and the new village, there is a considerable chance that the old village will have a considerably lower safety level compared to the new village and the rest of Rotterdam. Based on the above, we rate the input legitimacy as medium.

3.3.2. Throughput legitimacy

Throughput legitimacy was analyzed by studying the participation in terms of the extent of stakeholders' access to and influence on the decision-making process, as well as the extent of open and organized deliberation among stakeholders. In terms of participation, the three forums mentioned in the previous paragraph ensure access to the decision-making process of all professional stakeholders in the Plan and Do stages, albeit with a more limited access for residents based on their partial direct representation. The influence of professional stakeholders is rated high by respondents. Some critical remarks were made regarding the limited influence of the water management department in the final details of the decisions on adaptive building. This reflects the major controversy related to a progressive and a more conservative view in the Heijplaat pilot project on adaptive building, which to some extent originates from the relatively late consideration of water safety in the re-development of Heijplaat. One camp is fed up with all the discussions and delays of the project and wants to move on as quickly as possible, in particular given the windows of opportunity and milestones that can be met by moving fast. The other camp would like to see more prudence in the decision-making process, in particular with respect to the costs, benefits, responsibilities and residual risks of the different options for adaptive building. The influence of residents is quite high in the forum in which they are directly represented, i.e. the consultation group. In the contractual agreement this consultation group has been granted the roles of controlling and advising (SOK2, 2012, p. 9, translated from Dutch). The influence of residents is materialized, for instance, in their ability to give feedback on the contractual agreement and to propose alternative solutions. In several instances (mainly during Heijplaat Vitaal meetings) the input of residents has led to changes to the contractual agreement, and for instance in an alternative routing and design of one of main roads. Nevertheless, the decision whether and in what manner to incorporate the input of the residents depends on the judgment by the professionals in the program group. In terms of deliberation, the respondents share the view that the opportunities to have open debates are frequent and well-organized (throughout the three forums). Discussions are generally viewed as constructive, despite of the controversy of efficiency (speed) versus prudence. Based on the above we rate the throughput legitimacy as medium to high.

3.3.3. Output legitimacy

Output legitimacy was analyzed according to the extent of stakeholders' acceptance of the division of responsibilities between the public and private sectors as well as of the allocation of flood risk. At this stage of the Heijplaat pilot project the contractual agreement (SOK2) and its accompanying responsibilities are seen as the major outcome. Most stakeholders are quite satisfied with this outcome. However, a few have made remarks with respect to the division of responsibilities. The municipality would have liked to involve the water board in the (financial) responsibilities, but the water board has refused to do so based on the fact that they hold no responsibilities for un-embanked areas according to Dutch law. The municipal water management department has concerns with the responsibilities for flood risk management that are delegated to house owners/residents. Their concern is that the municipality does not yet have any experience with risk communication, and how to gain and *maintain* awareness of residents at an adequate level. Furthermore, the municipality does not yet have a clear view of the costs involved in communication and in maintaining the levy. This concern might be justified given the fact that not all residents are fully aware that they live in an un-embanked area (those interested/involved in the Heijplaat development are aware). Nevertheless, most residents do not consider flood risk an urgent issue (the last superficial flooding in Heijplaat occurred 60 years ago) compared to other more pressing socio-economic issues (such as the level of social facilities in the village). So, the residents are happy with the content of the contractual agreement in general and with the extent of residual flood risk, but they are not necessarily giving much consideration to the flood risk governance of the village (representative of residents organization, 2012). Based on the above we rate the output legitimacy as medium to high.

3.3.4. Conclusion on legitimacy

Overall, the medium to high levels of input, throughput and output legitimacy appear to reflect the mix of governance arrangements identified for Heijplaat. The higher extent of throughput legitimacy in particular, reflects the dominance of interactive governance in the Plan stage. The representation and participation of residents is a point of careful attention, reflected in the ambitions of the professional stakeholders who try to involve them as much as possible. Its importance is also shown in the contractual agreement, which stipulates that “residents are to be involved with the shaping of ideas, development and implementation of all plans related to the development of Heijplaat by participating in the consultation group” (SOK2, 2012, p. 8, translated from Dutch). A clear definition and communication of responsibilities for AFRG, as laid down in the agreement and in the policy document on adaptive building, has helped to attain legitimacy and accountability for the governance arrangement. A challenge in the near future lies in the establishment of an open and transparent flood risk communication to residents, both existing and future, since this will help residents to take on those responsibilities that are assigned to them (Kokx and Spit, 2012). The study of De Boer et al. (2012) indicates that awareness of flood risk among residents leads to increased intentions to take action. Another challenge lies in the differences in protection levels between the old and new village after implementation of the SOK2, potentially leading to future inequities in flood damages (Kokx and Spit, 2012) even though the flood protection of the old village is considerably improved by a factor 50. This might mean that in particular the residents of the old village need to get actively involved in taking precautionary measures. In addition to clear communication, public authorities could stimulate retrofitting programs for adaptive building measures to existing houses, for instance through subsidies. A large regional Delta program for the Rotterdam-Rijnmond region is currently running, which is meant to further analyze the vulnerability of existing built areas in light of climate change. This means that the water safety situation for the old village will be re-considered in the near future.

References

- AP (2012a). Agendapost voor de vergadering van het college van Burgemeester en Wethouders van Rotterdam op dinsdag 16 oktober 2012. Principebesluit aanpak meerlaagse veiligheid buitendijkse klimaatadaptatie Heijplaat.
- AP (2012b). Agendapost voor de vergadering van het college van Burgemeester en Wethouders van Rotterdam op dinsdag 2 oktober 2012. Samenwerkingsovereenkomst Gebiedsontwikkeling Heijplaat.
- De Boer, J., Botzen, W. & Terpstra, T. (2012). Percepties van burgers over binnen- en buitendijks wonen. Kennis voor Klimaat Rapport KvK/045/2012.
- Kokx, A. and Spit, T. (2012). Increasing the Adaptive Capacity in Unembanked Neighborhoods? An Exploration into Stakeholder Support for Adaptive Measures in Rotterdam, the Netherlands. *American Journal of Climate Change* 1(4), 181-193. DOI: 10.4236/ajcc.2012.14015
- NWP (2009). Nationaal Waterplan 2009-2015. Rijksoverheid, 22 december 2009. Retrieved on March 9th, 2012 <http://www.rijksoverheid.nl/documenten-en-publicaties/rapporten/2009/12/01/nationaal-waterplan-2009-2015%5B2%5D.html>.
- NAB (2012). Agendapost voor de vergadering van het college van Burgemeester en Wethouders van Rotterdam op: 02-10-2012.
- RCP, 2010. Rotterdam Climate Proof. Adaptation Programme 2010. Available from: http://www.rotterdamclimateinitiative.nl/documents/RCP/English/RCP_ENG_def.pdf.
- SOK2 (2012). Samenwerkingsovereenkomst Gebiedsontwikkeling Heijplaat. Retrieved on October 29th, 2012 <http://www.stadshavensrotterdam.nl/files/Files/Samenwerkingsovereenkomst%20Heijplaat/DEF%20-%20SOK%20-%20Heijplaat%20-%2029%20oktober%202012.pdf>.
- Stadshavens (2008). Stadshavens Rotterdam. 1600 ha Creating on the Edge. vijf strategieën voor duurzame gebiedsontwikkeling. Stadshavens Rotterdam.