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Reporting on flood risk perception in the Netherlands:  
An issue of time, place and measurement



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# Reporting on flood risk perception in the Netherlands: An issue of time, place and measurement

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## 1. INTRODUCTION

The Netherlands is often seen as world leader in flood management, with hundreds of years of experience in building flood defenses and maintaining – mostly – dry feet. Yet this image of the Dutch should not be taken for granted, nor should flood management be seen as a given ‘state of affairs’. Rather, approaches, policy and philosophy of managing the threat are evolving. In particular, the country is on the way of change in the last couple of decades in its flood management. A number of processes can be distinguished; the most important of which, in our opinion, is the revival of attention towards potential flood consequences that seemed to be forgotten during the victorious triumph of the Delta Works that were finished in 1997 with the completion of the Nieuwe Maeslantkering (for more information, see [www.deltawerken.com](http://www.deltawerken.com)).

Without diminishing the importance of engineering solutions to the ‘flood problem’ in the Netherlands (in the end thousands of km<sup>2</sup> behind the dikes are available for living – and flourishing – of the Dutch society), we should remark that indeed, the decades after the devastating flood of 1953 marked by technical solutions at an unprecedented scale have driven away the attention from the potential consequences of a flood. In addition, exactly this ‘strong’ approach has created a surprisingly firm belief among the public that “we are perfectly safe” against flooding, making the pictures of possible devastation gradually fade away (however, not among the people who have personally experienced a disaster, more on that in section ...).

There were a number of turning points in the recent Dutch water management record. For example, in the 1990’s things started to change. Probably, the first documented evidence of the beginning ‘revolution’ was the report of TAW (2000) “From overtopping probability to flooding probability” where attention is given to the whole system of flood protection

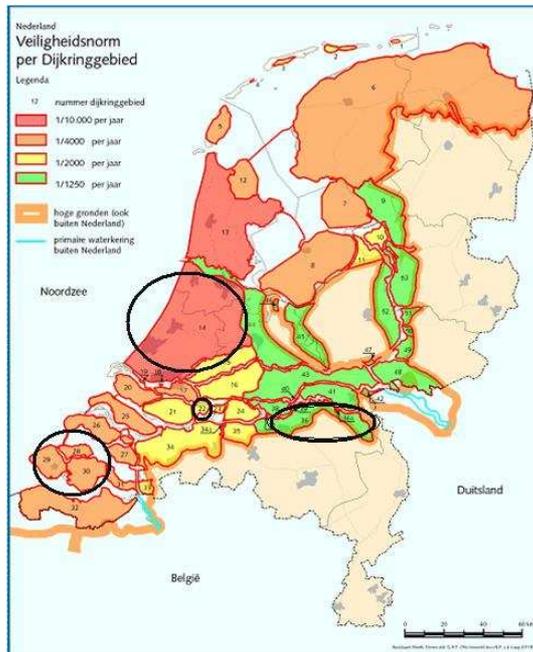
mechanisms in the light of possible failure, in addition to the dike overtopping due to high water levels. Then, RIVM (2004) with the report “Dutch Dikes and Risk Hikes” (Risico’s in bedijkte termen) and MVW (2005) with the report “Flood Risks and Safety in the Netherlands” (Veiligheid Nederland in Kaart, so called VNK-1) followed which explicitly drew more attention to the issue of flood safety and reintroduced the concept of risk in flood management as a product of probability and effect (for a concise outline see Bockarjova et al. 2009). Currently, we are observing an approach that renders risk management, when both the probability and the consequences of calamity are considered in decision-making. However, it is yet in its early phase, there are ongoing studies that attempt to identify and quantify the (relevant) consequences of a potential flood in the Netherlands (Bockarjova et al., 2007 and 2008; Eijgenraam, 2005; Ebregt et al., 2005; Jonkman et al, 2008, and others). Another issue that has become relevant in the context of flood risk management is flood risk perception.

## 2. FLOOD RISK PERCEPTION

In situation when decisions of flood protection are taken based not only on technical calculations that should ensure that the dikes are high and strong enough to prevent flood – as 100% safety from natural hazards does not exist – flood perception and valuation are crucial for policy acceptance and enforcement. An example of a solution that has proven to need public acceptance is the appointment of flood retention areas (so called ‘noodoverloopgebieden’) that can be inundated in cases of threatening water levels in the rivers to spare other areas which would bare much higher damages and/or human victims. In a number of cases when such areas were selected, public reacted furiously protesting against a possibility that their homes might intentionally be flooded (van Dinther, 2004; as well as Ververs and Klijn, 2004) (even) for the sake of others. These incidents have served as indicators that certain instruments of flood management beyond the familiar practice of building and enforcing the dikes first need to deserve public acceptance before they get implemented. However, the acceptance of these measures though advocated by experts should start with the realization of danger, that is, the threat of flooding among the public. This example of flood retention areas brings the discrepancy between the views of the experts / government and the public on the issue of flood to the fore. It is here that risk perception enters the stage. Basically, what we see is that exactly due to these differences in flood risk perceptions among different groups (here, experts / government and the general public) that conflict has emerged. This means that until the new measures of flood water retention were about to be introduced this discrepancy in perceptions existed, but yet remained latent. At the moment it is clear, and a number of explorative studies has already shown that (among others, MVW-MBZ, 2007 and 2008), that public perception of flood risk in the Netherlands needs to be thoroughly examined. Not only because little was known about it, but also because the public should become more aware of the threats posed by flooding in the Netherlands, should consider flood risk explicitly in their decision-making.

In this contribution we shall rather concentrate on two particular issues of flood risk perception: time and place. We shall first present the general picture of flood risk perception profile in the Netherlands. Second, we shall look whether differences exist between two measurements that have taken place before and after the publication of the recent Delta Committee Report (2 September 2008) where the vision on the long-term challenges and possible solutions in flood protection were presented. Because the Report has received wide

publicity and has drawn attention to the (forgotten?) issue of flood safety we are hypothesize that it has had an impact on risk perception variables, and in particular on risk awareness.



Our third aspiration is to explore the differences in perception between four regions in the Netherlands. The selected areas are the so-called dike-ring areas (DR): Land van Heusden / de Maaskant (DR36) south of the river Meuse, 3 islands in Zeeland (DR 28, 29 and 30), a major part of the province Zuid Holland (DR14) on the coast and the Island of Dordrecht (DR22) which is threatened by floods as from the sea as from the river. These areas also differ in the level of flood protection – the legally set standards for dike overtopping probability that vary from 1 in 10.000 years for Zuid Holland to 1 in 1.250 years for dike-ring 36. Here, our hypothesis is that various natural conditions, such as location near the river or coast, as well as (recent) experience with flood and / or evacuation might trigger the formation of various views on the danger that floods are posing (significant, yet very low, correlation

between own experience with either flood, water nuisance or evacuation and the dummy for Zeeland (8,4%) and between experience and the dummy for Zuid Holland (-9,2%) were detected; both from two-tailed tests at 1% level).

### 3. THE SURVEY

We make use of a questionnaire that was set out in September – October 2008 among about 1400 Dutch households spread in the 4 selected areas (see Table 2). The pre-measurement has taken place on 2 and 3 September (before 2pm) before the publication of the Delta Committee Report (number of respondents 249 relatively evenly split among the 4 regions). Almost a quarter of the respondents (314 out of 1411) have had earlier experience with a flood, water nuisance or evacuation (see Table 1A and 1B); this proportion varies slightly among the regions. About 11% of respondents are rural residents; gender division is fairly equal: 47.5% males and 52.5% females.

Perception indicators are essentially index variables (except for Likelihood which is an indicator of perceived likelihood of a flood in the coming 50 years in the place of residence and Worry which is an indicator of concern about a fatal outcome as a result of flooding) constructed on a 11-point scale from 0 to 10 as follows: Vulnerability (5 items, Cronbach's alpha = 0.881), Severity (5 items, Cronbach's alpha = 0.743), Subjective Knowledge (3 items, Cronbach's alpha = 0.530). Due to the public good character of flood safety we have also included a trust measure, Trust in Government (4 items, Cronbach's alpha = 0.827) as a related perception indicator. See Appendix I for the description of constituent items.

#### 4. GENERAL RESULTS

Let us first reflect on the level of flood perception variables. The means for six main variables are found in the last column of Table 1B. We may notice at once that Vulnerability and Severity indicators are relatively high, with means 5.53 and 4.83. These are, respectively, just somewhat above and below the middle of the scale. This is, however, consistent with earlier findings from other studies on flood risk perception in the Netherlands. For example, Terpstra and Gutteling (2008) report a value of 3.46 for the severity of consequences measured on the 5-point scale. The perception of the likelihood of a flood in the place of residence in the coming 50 years lies also rather high with the mean of 4.40. Yet again, this result is in line with Terpstra and Gutteling (2008) as well as with Terpstra (2008). In both of the referred studies researchers have asked for an estimate of the likelihood of a flooding in the coming 10 years measured on the 5-point scale. Thus, the former reports mean perceived likelihood of 2.26, while the latter reports 1.83. Comparison of these results to our mean of 4.40 (on the 11-point scale) for the possibility of a flood in the coming 50 years, does not witness a discrepancy in stated overestimation of flood likelihood; provided the stated time frame is longer in our questionnaire, this can even be seen as a qualitatively moderate estimate.

What we can basically report is overestimation of the likelihood of flooding in the place of residence in the coming 50 years (a sort of quantification of the previous qualitative question). While factual probabilities of dike overtopping in the four regions lie between 0.5% and 4% for the coming 50 years<sup>1</sup>, reported individual estimates of flood likelihood average 20.39% for the respondents with the provided threshold of 5%; and 23.68% for the respondents with the threshold of 10% (essentially, in the open-ended question we asked for the estimation of flood probability, respectively, to be below or above 5% or 10%). The difference between these means of individual likelihood estimations is also significant at 10% level (t-statistic = -1.952). Estimated likelihood of flood differs by region, which could be expected, and which also corresponds with reality. A surprising finding is that this estimated likelihood is the lowest in the Land van Heusden (mean = 15.92%) against all other regions (mean for Zuid Holland is 21.33%; Zeeland – 23.39% and Dordrecht – 24.33%)<sup>2</sup>. While research is still ongoing regarding the calculation of precise probabilities of flooding in each dike ring (as we have already noted in footnote 1), available studies thus far (WL|Delft Hydraulics, 2007) agree on the fact that the probability of flooding in a dike ring on the riverside such as Land van Heusden is much higher than that on the coast, as for example in Zuid Holland. This clearly points at a misperception of flooding probability that we find among the respondent from various regions.

Our next perception variable is Worry, and its mean for the whole sample is 2.50. This is corroborated by Terpstra (2008) who reports a relatively higher score for “onrust” (1.83 on a 5-point scale); as well as implicitly by MVW&MBZ (2007) who refer to NIPO (2006) reporting that about 23% of respondents are afraid of floods. However, while our estimate falls somewhat lower, it is important to notice that we measure only concern about dying in a flood, not a general concern about flooding. Notably, the relatively high means for perceived likelihood, severity and vulnerability contrast with the moderate mean for perceived worry in our sample. A possible explanation for that might be a somewhat high indicator of trust in government (mean of 5.94) in our sample suggesting reliance upon collective arrangements

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<sup>1</sup> Probability of flooding may be (much) higher than the probability of dike overtopping depending on the failure mechanisms taken into the calculations. Yet, currently available calculations are only of indicative character – see for example WL|Delft Hydraulics (2007).

<sup>2</sup> Significant at 1% level from the one-way ANOVA analysis (F = 7.334).

for flood safety. Indeed, trust in authorities with respect to flood safety (sample average 6.19) is significantly higher than trust in Dutch government in general (sample average 5.29). further, we may notice that trust in government altogether counterweighs worry: the significant correlation of -8.9% (2-tailed test at 1% level) indicates that trust in authorities with respect to safeguarding flood defenses may be washing away the concerns of the public about the potential flood danger. Alternatively, following Raaijmakers et al. (2008), relatively low measured level of worry in combination with high levels of awareness and preparedness (the latter can be assumed to be present in this case) may be an evidence of what the authors call the state of 'control'. The direct implication of low level of worry in this framework (idem) would be a low need for further risk reduction activities.

We do not find subjective knowledge, as reported by recent studies, to play a role of a 'pain soother' while its mean has also passed the middle of the scale at 5.66. For example Kellstedt et al. (2008) regarding the attitudes towards climate change, find that more informed respondents show less concern for global warming as the fact that individuals think they know enough about flooding (independently of whether this is objectively true or not) may have a sedative effect on the entire picture of individual risk perception. For our sample, the correlation between worry and the first item in the subjective knowledge (see Appendix I), which is basically the self-reported individual knowledgeability, is yet positive, which does not support the Kellstedt et al. hypothesis.

### *1.1. Effects of socio-economic factors on risk perception*

There are some differences in flood risk perception among various groups of respondents; we shall reflect upon the most relevant ones here. It is of interest to see that personal characteristics of respondents are not the dominating determinants for significant differences in perception variables (see Tables 1B and 3). Gender does not play a role for any of the variables; also not on the regional level. Age determines differences for severity, subjective knowledge and trust in government. For Severity of consequences (at 5% level:  $F=3.401$  for contrasts between young and middle-aged respondents), where groups of 18-34 versus group 35-64 year olds are identified. Also significant differences at 1% level are found for young vs older respondents for subjective knowledge and even more so for trust in government, where both perception indexes are significantly higher for older population.

For respondents with various education levels differences are found for vulnerability index, as well as for severity, worry and trust in government (significant at 1% level). Here, whereas vulnerability, severity and worry are decreasing as the education level increases (for the group with HBO education and higher against all other respondents), trust in government is in turn growing as the education level rises (for the group with HBO education and higher against (high)school graduates.

Income appears to be another factor that determines the differences in perception variables. Vulnerability to flood is reported to be clearly higher with the low-income group (1<sup>st</sup> to 4<sup>th</sup> deciles) against the middle and high-income groups (respectively, 5<sup>th</sup> to 7<sup>th</sup>, and 8<sup>th</sup> to 10<sup>th</sup> deciles). Next, in terms of Worry income groups have even more explicit perceptions: all three groups differ between each other; and the higher the income, the lower the worry level. On the contrary, trust index increases together with income, as it does with education level and age.

Rural vs urban place residence makes a difference for worry, and severity and trust indices. Urban inhabitants are estimating the consequences of a potential flooding in the place of residence as less severe relative to rural inhabitants (respective means 4.80 vs 5.13, significant at 1% level); urban residents are showing also less concern about dying in a flood event (on average scoring 2.49 vs 2.82, respectively). At the same time urban residents are having more faith in authorities relative to respondents from rural areas (respective means 5.97 vs 5.69, significant at 10%).

Finally, by far and large, prior experience with flooding, water nuisance or evacuations proves to score the highest in the number of significant hits. The differences between the groups of respondents with and without such experience are significant at 1% level for nearly every flood risk perception variable except for worry (see Table 1B). Thus, respondents with prior experience of (near)flooding are estimating the likelihood of a flood in their place of residence higher than those without such experience (respective group means for likelihood are 4.73 vs 4.30); these respondents also consider themselves more knowledgeable about flooding issues than those without prior experience (respective group means for subjective knowledge are 5.99 vs 5.56). Also, the group with personal flood or evacuation experience deem themselves and their environment more vulnerable to a flooding event compared to the other group (respective group means for vulnerability are 5.76 vs 5.47), as well as the consequences of a calamity more severe (respective group means for severity are 5.76 vs 5.47). Finally, while in general it's considered that government has well dealt with the last (near)flooding events, respondents with experience of such incidents put less trust in government (5.58) relative to respondents without direct prior experience (6.04); yet, authorities should by no means be considered discredited - the averages for both groups for trust index lie above the middle of the scale.

In the following sections we will continue with discussion of differences between the two measurements, as well as between and within the regions.

### *1.2. Effects of policy announcement*

Taking a closer look at the data from the questionnaire we may say that in fact what can be referred to as a 'policy announcement effect' is barely present. Checking for differences in perception variable means, only the means for subjective knowledge differ significantly at 1% level between the pre- and post-measurements. The mean has decreased respectively from 5.89 to 5.60 for the whole sample possibly indicating that presentation of the Delta Committee report has triggered the following 'updating' of awareness among the public about flood threat. Essentially, following the questions that make up the subjective knowledge index, this reported awareness is all about the idea that respondents have about their general knowledgeability of flood danger, about personal relevance of this information, and the willingness to learn more about the flood threat and flood prevention. The presented report, seemingly, should have made respondents think they do not know as much about flooding as they thought they did; this information is not that relevant for them; or that they became less eager to learn more about floods and protection from floods, as the report itself has provided such a learning opportunity. Moreover, while of Delta Committee states that flood risk is to increase due to climate change, and thus (in some cases even drastic) measures are suggested, its main message is pacifying. Globally, the implication is that at present the country is safe; a possibility for the increase in flood threat is put in long-term perspective, which at the same time can be counteracted by timely investments in flood protection.

Also the impact of the vision of the so-called new Delta Committee on the future of Dutch flood management remains limited on the regional level, too: only respondents in the river area Land van Heusden / de Maaskant (DR36) and the coastal area Zuid Holland (DR14) were affected by the presentation of the Committee's Report (see Table 4). Worry has decreased in dike ring 14 from 2.95 to 2.32 which testifies for a 'pacifying' effect of the Report on the residents of the well-protected coastal area. Another significant change in mean (at 5% level) is found for subjective knowledge in Land van Heusden which is in line with the general trend found for the whole sample. Self-reported awareness here has decreased (from 5.78 to 5.32), possibly as an evidence of new insights in flood risk that respondents has gained from the report.<sup>3</sup>

As subjective knowledge appeared to be the only variable with significant differences in the whole sample among the measurements, and worry only in one of the regions, this suggests that perceptions – as we have measured them in this study – are on average relatively stable as on the regional, as on the country levels.

### 1.3. Regional differences in flood risk perception

Whereas such socio-demographic dimensions as age, education or income prove to matter only to some extent in highlighting differences in flood risk perception, regional dimension does so a lot. We may thus report on differences *between* the regions in perception for each of our measured variables (see Table 3). For the likelihood indicator, all regions differ significantly between each other except for Zeeland and Zuid Holland ( $F = 21.581$ , significant at 1%). The highest perceived likelihood of a flood in own environment is in Dordrecht (5.09), the lowest is in Land van Heusden (3.80), with means for Zeeland and Zuid Holland lying just around the total sample average (see also Table 2). Respondents in Land van Heusden / de Maaskant also show the lowest indicators of vulnerability, severity, worry and subjective knowledge, and the highest of trust in government of all regions. For vulnerability indicator, dike ring 36 distinguishes itself from all other areas (mean 5.10). In terms of severity of flood consequences, Land van Heusden and Zeeland are at the extremes (with respective means of 4.27 and 5.34), while Zuid Holland and Dordrecht are settled about the sample average. Just the same pattern is observed with the worry and awareness indicators in terms of rating of the means between the regions. Regarding trust in government, the means align in the opposite direction, namely, with Zeeland at the bottom of the list (mean 5.76) and Land van Heusden on top of it (6.07), which also appear to be the only post-hoc significant differences ( $F = 2.535$ , at 5% level).

An observation of relative magnitudes of perception variables between the regions points at a pattern between trust and the rest of flood risk perception indicators, a sort of relative perception profile. For example, as we also discussed in the previous paragraph, Land van Heusden / de Maaskant is scoring the lowest among all the regions in Vulnerability through Subjective knowledge; and the highest in Trust in government. At the same time, just the

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<sup>3</sup> Taking a closer look at the two measurements, we have checked for differences in perception variables within the experience and non-experience groups. While perception remained stable for respondents with prior personal flood or evacuation experience; significant difference of 5.81 vs 5.51 (on 5% level;  $F=2.561$ ,  $df=284$ ) in subjective knowledge means was detected for respondents without prior calamity experience. This suggests that what we call 'updating of knowledge' has taken place only within the no-experience group, which is most likely also responsible for the differences in the entire sample means for self-reported awareness between the two measurements.

opposite pattern is observed with Zeeland, which scores the highest in the first 5 variables, and the lowest in trust. From this, we may suggest that in areas where trust in authorities is relatively high (Land van Heusden and Zuid Holland), perception variables are about the average (Zuid Holland) or low in relative terms (Land van Heusden / de Maaskant). At the same time, whereas reliance on government is relatively low (Zeeland) or moderate (Dordrecht), flood risk perception is consequently high through the most indicators. Such inverse association between trust and the level of concern is also corroborated by Uslaner (2007). Thus, our observations point, first, at the relative importance of trust in determination of regional risk profiles; and, second, at the direct relationship between trust in authorities and perceived safety.

Next, we go one level lower and take a look at the differences in flood risk perception *within* the regions (see Table 4). We may see that (near)flooding or evacuation experience is clearly a factor that is responsible for most of within-regional differences in flood risk perception. Individual prior experience plays a major role in the areas where (or in the vicinity of which) recent (near)flooding or evacuation events took place, which is also to be expected intuitively, – in particular, Zeeland, and somewhat less so in Land van Heusden and in Dordrecht. Thus, we detect a significantly higher means for the Likelihood, Vulnerability and Severity indexes for the experience-group relative to non-experience group in dike-ring 36. Subjective knowledge is also estimated to be significantly higher by the respondents with prior flood experience in Land van Heusden and Zeeland (both at 1% level) relative to those without such experience. Interestingly, respective absolute values of means for self-reported awareness lie higher in Zeeland (where the major flood calamity of 1953 took place) than in dike-ring 36. Next, respondents with water calamity-related experience also on average report lower trust in government, which is the case in Zeeland and Dordrecht (and not in Land van Heusden, however), possibly indicating a loss of trust as a result of ‘failure’ to prevent a calamity, or less adequate than expected action upon the calamity. Notably, the means for reliance upon the authorities of both sub-groups in Zeeland are (just) below the overall sample average of 5.94. Another probably somewhat counterintuitive result is attributed to Worry, which is lower for respondents with prior water calamity-related experience in dike-ring 36 (1.79 against 2.35). In this case, probably, the respondents have learnt from their experience that a flooding might not be that severe in terms of fatal outcomes, and therefore are less concerned about that. As it intuitively could be expected, experience is not a significant factor in triggering differences in perception variables for the respondents in Zuid Holland – the area without a recent flooding history, and with the highest flood protection standard.

Finally, policy announcement effect of the Delta Committee worked for the Worry and Subjective knowledge indexes in Land van Heusden / de Maaskant and Zuid Holland, on which we have already reported in the previous section.

## 5. CONCLUSIONS

In this contribution we have reported on our findings of flood risk perception in the Netherlands using a large-scale survey held in the fall of 2008 among about 1400 households in four regions (so-called dike-rings) differing in flood safety standards and geographical characteristics. The perception was measured by means of 4 index variables, Vulnerability,

Severity, Subjective Knowledge and Trust in government; and two variables Likelihood and Worry,. The scores of constructed indexes reported here are in line with the findings of other recent studies, which pleads for the relative validity of our results. We find, in particular, that the absolute level of public concern (worry) about floods is not as high as, for example perceived flood Likelihood, Vulnerability and Severity. Trust in government, which is quite substantial, may be suggested here to dampen worry. This becomes in particular visible when examining regional perception profiles, where relatively high trust scores follow low or moderate perception indicators (for example, as is the case with dike-rings Land van Heusden / de Maaskant and Zuid Holland); or relatively high perception indexes precede low or moderate trust scores (like in Dordrecht and Zeeland).

Socio-economic individual characteristics of respondents (such as age, education, income or gender) are found to have a reasonable influence on perception variables, where education captures the most of age and income effects. Roughly speaking, less educated respondents (as do lower-income group) see themselves as more vulnerable and are in general more concerned about flood threat relative to their more educated counterparts (and, respectively, higher-income group). Higher-educated (HBO and higher), as well as younger respondents perceive flood risk on average as less severe than respondents with less education and older respondents. Middle – and older group identify themselves, however, as more knowledgeable relative to youngsters. Trust in government, on the other hand, is on average significantly higher as for 65-plusers, as for respondents with a higher education level and the well-off respondents (both middle- and high-income groups).

Most differences in sample subgroups on flood perception are furthermore determined by prior (near)flood experience and the regional dimension. Respondents with such experience overestimate the likelihood of a flood in their direct environment, consider themselves and the society more vulnerable to a calamity, and see a possible flooding as more severe relative to respondents without prior calamity experience. “Experience”-respondents also deem themselves more knowledgeable about floods and put less confidence in authorities compared to their counterparts.

What we call ‘policy announcement effect’ has proved to be far from prominent; we suggest that it has only acted mostly as a knowledge updating event for the general public (with the most impact in the riverside region Land van Heusden), which yet favours our initial hypothesis. Other regional differences related to policy announcement are the change in Worry indicator in Zuid Holland downwards suggesting a pacifying effect of the report in the well-protected coastal area.

Finally, we have found numerous differences in flood risk perception based on location. In this way, place of residence acted as a major determinant of disparities in all perception indicators, as well as trust in authorities. Major within-regional differences turned out to be attributed to individual (near)flood experience (or the lack thereof) for all of the measured perception indicators. We may conclude that the regions with most homogeneous perceptions is Dordrecht and Zuid Holland (for the former, only experience has lead to differences in subgroup means; for the latter – the measurement factor); Land van Heusden / de Maaskant can be considered to be the most heterogeneous. It is the area that has distinguished perception pattern from other regions in almost every respect. Income, age and education factors proved to reveal similar within-regional disparities as they do on the sample level.

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## APPENDIX I.

### Construction of scale variables

LIKELIHOOD (11 point scale; 0 = zal zeker niet gebeuren; 10 = zal zeker gebeuren); mean = 4.40

Hoe waarschijnlijk denkt u dat er zich in de komende 50 jaar een overstroming in uw woonomgeving voordoet?

VULNERABILITY (5 items on a 11 point scale, 0 = helemaal niet kwetsbaar; 10 = heel kwetsbaar)

Cronbach's alpha = 0.881; mean = 5.53

Hoe kwetsbaar is volgens u...

...de Nederlandse samenleving als geheel voor een overstroming?

... de Nederlandse samenleving voor grote materiële schade als gevolg van een overstroming?

... de Nederlandse samenleving voor een overstroming met honderden of zelfs duizenden dodelijke slachtoffers?

Hoe kwetsbaar voelt u zich als u er aan denkt dat...

... u en uw gezin materiële schade kunnen lijden als gevolg van een overstroming?

... u en uw gezin slachtoffer, eventueel dodelijk slachtoffer kunnen worden van een overstroming?

SEVERITY (5 items on a 11 point scale, 0 = helemaal niet ernstig / geen schade; 10 = heel ernstig / rampzalige gevolgen; or 0 = geen vertrouwen; 10 = vol vertrouwen) Cronbach's alpha = 0.743; mean = 4.83

Hoe ernstig denkt u dat de gevolgen van een overstroming voor de Nederlandse samenleving als geheel zullen zijn?

Hoe ernstig denkt u dat de gevolgen van een overstroming voor uw woonomgeving zullen zijn?

Hoe ernstig denkt u dat de gevolgen van een overstroming voor u en uw gezin zullen zijn?

In hoeverre vertrouwt u er op dat het wel goed zal gaan met u en uw gezin in het geval van een overstroming? (reverse scale)

In hoeverre vertrouwt u er op dat het wel goed zal gaan met de Nederlandse samenleving als geheel in het geval van een overstroming? (reverse scale)

WORRY (11 point scale, 0 = helemaal niet mee eens; 10 = helemaal mee eens); mean = 2.50

Ik maak me meer zorgen om dood te gaan door een overstroming dan door andere gebeurtenissen.

SUBJECTIVE KNOWLEDGE (3 items on a 11 point scale, 0 = helemaal niet geïnformeerd / niet belangrijk / niet mee eens; 10 = heel goed geïnformeerd / heel erg belangrijk / helemaal mee eens)

Cronbach's alpha = 0.530; mean = 5.66

Hoe goed denkt u dat u geïnformeerd bent over overstromingen en overstromingsgevaar?

In hoeverre vindt u de informatie en kennis over overstromingen die u hebt voor u persoonlijk van belang?

Ik wil heel graag meer te weten komen over het verband tussen het overstromingsgevaar en het nemen van voorzorgsmaatregelen ter bescherming tegen overstromingen.

TRUST IN GOVERNMENT (4 items on a 11 point scale, 0 = helemaal niet mee eens / geen vertrouwen; 10 = helemaal mee eens / vol vertrouwen) Cronbach's alpha = 0.827; mean = 5.94

Ik denk dat de overheid mij informeert als de overstromingsrisico's in mijn woonplaats sterk veranderen.

In hoeverre vertrouwt u de overheid voor wat betreft bescherming tegen overstromingen in Nederland?

Denkt u dat de overheid het altijd goed heeft gedaan wat betreft bescherming tegen overstromingen in Nederland?

In hoeverre vertrouwt u de Nederlandse overheid in het algemeen?

Table 1A. Number of respondents within factor groups

<b>FACTORS</b>	<b>MEASUREMENT</b>		<b>EXPERIENCE WITH (NEAR) FLOOD</b>		<b>RURAL / URBAN INHABITANTS</b>		<b>GENDER</b>	
<b>N RESPONDENTS</b>	Pre-measurement	249	Yes	314	Rural	158	Males	670
	Post-measurement	1162	No	1097	Urban	1229	Females	741
<b>TOTAL</b>		1411		1411		1387		1411

Table 1B. Significant differences in variable means within factors (t-tests).

<b>FACTORS</b>	<b>PRE- / POST-MEASUREMENT</b>	<b>EXPERIENCE WITH (NEAR) FLOOD (YES / NO)</b>	<b>RURAL / URBAN INHABITANTS</b>	<b>GENDER (MALE / FEMALE)</b>	<b>SAMPLE TOTAL MEAN (STD)</b>
<b>LIKELIHOOD</b>	4.45 / 4.39 (2.069 / 2.179)	4.73 / 4.30 (2.148 / 2.154)*	4.27 / 4.41 (1.979 / 2.176)	4.30 / 4.49 (2.157 / 2.159)	<b>4.40</b> <b>(2.159)</b>
<b>VULNERABILITY</b>	5.44 / 5.55 (1.745 / 1.861)	5.76 / 5.47 (1.855 / 1.832)*	5.58 / 5.52 (1.762 / 1.857)	5.50 / 5.56 (1.855 / 1.828)	<b>5.53</b> <b>(1.841)</b>
<b>SEVERITY</b>	4.85 / 4.83 (1.408 / 1.448)	5.04 / 4.77 (1.375 / 1.454)*	5.13 / 4.80 (1.384 / 1.442)*	4.81 / 4.85 (1.409 / 1.470)	<b>4.83</b> <b>(1.441)</b>
<b>WORRY</b>	2.60 / 2.48 (2.147 / 2.154)	2.44 / 2.52 (2.233 / 2.129)	2.82 / 2.47 (1.988 / 2.176)**	2.50 / 2.50 (2.188 / 2.121)	<b>2.50</b> <b>(2.152)</b>
<b>SUBJECTIVE KNOWLEDGE</b>	5.89 / 5.60 (1.429 / 1.583)*	5.99 / 5.56 (1.544 / 1.553)*	5.78 / 5.64 (1.662 / 1.552)	5.67 / 5.65 (1.557 / 1.564)	<b>5.66</b> <b>(1.560)</b>
<b>TRUST IN GOVERNMENT</b>	5.93 / 5.94 (1.632 / 1.690)	5.58 / 6.04 (1.780 / 1.637)*	5.69 / 5.97 (1.676 / 1.682)***	5.93 / 5.94 (1.631 / 1.723)	<b>5.94</b> <b>(1.680)</b>

\*, \*\*, \*\*\* variable means (standard deviations in parenthesis) - significant differences within factors at 1%, 5% or 10% level.

Table 2. Variable means per region. #

	ZUID HOLLAND	ZEELAND	DORDRECHT	LAND VAN HEUSDEN / DE MAASKANT	ENTIRE SAMPLE
LIKELIHOOD	4.25	4.55	5.09	3.80	<b>4.40</b>
VULNERABILITY	5.52	5.78	5.76	5.10	<b>5.53</b>
SEVERITY	4.80	5.34	4.90	4.27	<b>4.83</b>
WORRY	2.34	2.71	2.62	2.24	<b>2.44</b>
SUBJECTIVE KNOWLEDGE	5.56	5.91	5.75	5.40	<b>5.66</b>
TRUST IN GOVERNMENT	6.01	5.76	5.93	6.07	<b>5.94</b>

# significant differences in variable means between regions are reported in Table 4.

Table 3. Significant differences in variable means within socio-economic factors (one-way ANOVAs).

<b>FACTORS VARIABLES</b>	<b>AGE</b>	<b>EDUCATION</b>	<b>INCOME</b>	<b>REGIONS</b>
<b>LIKELIHOOD</b>	-	-	-	(F=21.581)* Post-hoc: All regions between each other except between Zeeland and Zuid Holland**
<b>VULNERABILITY</b>	-	(F=5.859)* Post-hoc: HBO and higher vs the rest**	(F=3.814)** Post-hoc: Low income group vs medium income group**	(F=10.946)* Post-hoc: Land vH / dM vs all other regions**
<b>SEVERITY</b>	(F=3.401)** Post-hoc: group 18-34 vs group 35- 64**	(F=6.515)* Post-hoc: HBO and higher vs the rest **	-	(F=37.212)* Post-hoc: All regions between each other except between Dordrecht and Zuid Holland**
<b>WORRY</b>	-	(F=25.291)* Post-hoc: HBO and higher vs the rest**	(F=17.005)* Post-hoc: Low income vs medium income vs high income group**	(F=3.188)** Post-hoc: Land vH / dM vs Zeeland **

...

Table 3. Significant differences in variable means within socio-economic factors (one-way ANOVAs) continued.

...

<b>FACTORS VARIABLES<sup>†</sup></b>	<b>AGE</b>	<b>EDUCATION</b>	<b>INCOME</b>	<b>REGIONS</b>
<b>SUBJECTIVE KNOWLEDGE</b>	(F=12.023)* Post-hoc: # group 18-34 vs group 35-64 and 65 and older**	-	-	(F=7.418)* Post-hoc: Land vH / dM vs Dordrecht and Zeeland ** Zuid Holland vs Zeeland **
<b>TRUST IN GOVERNMENT</b>	(F=3.772)** Post-hoc: group 35-64 vs group 65 and older**	(F=8.040)* Post-hoc: HBO and higher vs (high)school education**	(F=5.744)* Post-hoc: Low income group vs the rest**	(F=2.535)** Post-hoc: Land vH / dM vs Zeeland **

\*, \*\*, \*\*\* significant differences in variable means within factors at respectively 1%, 5% or 10% level.

# No significant differences in subjective knowledge means between the groups of 35-64 and 65 and older.

Table 4. Significant differences in variable means within the regions by factors (results of t-tests).

<b>FACTORS</b>	<b>PRE- / POST-MEASUREMENT</b>	<b>EXPERIENCE WITH (NEAR) FLOOD (YES / NO)</b>
<b>VARIABLES</b>		
<b>LIKELIHOOD</b>	-	Land vH / dM 4.64 / 3.59 (t = 3.719)*
<b>VULNERABILITY</b>	-	Land vH / dM 5.69 / 4.94 (t = 3.348)*
<b>SEVERITY</b>	-	Land vH / dM 4.58 / 4.19 (t = 2.300)**
<b>WORRY</b>	Zuid Holland 2.95 / 2.32 (t = 1.980)**	Land vH / dM 1.79 / 2.35 (t = -2.158)**
<b>SUBJECTIVE KNOWLEDGE</b>	Land vH / dM 5.78 / 5.32 (t = 2.486)**	Zeeland 6.29 / 5.76 (t = 2.977)* Land vH / dM 5.90 / 5.28 (t = 3.038)*
<b>TRUST IN GOVERNMENT</b>	-	Zeeland 5.36 / 5.91 (t = -3.056)* Dordrecht 5.40 / 6.10 (t = -2.822)*

\*, \*\*, \*\*\* variable means (with t-statistic in parenthesis) - significant differences within regions by factors at respectively 1%, 5% or 10% level.

