EVOKED

Enhancing the value of climate data

Deliverable 3

Capacity building material for the field trials

Work Package 3 – Co-Validate

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Project information

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EVOKED

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Summary

In Deliverable 3.1 (Deltares, 2019) the theoretical background, research questions, hypotheses (also summarized in Section 2 of this document) and overall method have been described. This deliverable focuses on the workflow in the field trials and provides capacity materials (templates) to carry out the research. The workflow and templates are meant to help to:

1. Select the climate service(s) that will be adapted for the EVOKED project;
2. Identify 'usability-gap(s)' between the information given by the climate service(s) and the information needs of the end-user(s);
3. Think about a new, improved information design (i.e. the way in which information is presented – for a more elaborate explanation on the concept we refer to Deliverbale 3.1 (Deltares, 2019) of the selected climate service(s) to help bridge the aforementioned 'usability-gap' through the way information is presented to the user of the climate service(s);
4. To test the new information design (as an experiment).

Finally, this document aims to create a coherent data management structure by using the same templates for each case study location. This enables both the cross-comparison between the case studies and the overall analysis regarding EVOKED-hypotheses.

Contents

Appendix

Appendix A - J

Review and reference page

1 Introduction of Deliverable 3.2

In Deliverable 3.1 (Deltares, 2019) the theoretical background, research questions, hypotheses (also summarized in Section 2 of this document) and overall method have been described. This deliverable focuses on the workflow in the field trials and provides capacity materials (templates) to carry out the research. The workflow and templates are meant to help to:

1. Select the climate service(s) that will be adapted for the EVOKED project;
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Finally, this document aims to create a coherent data management structure by using the same templates for each case study location. This enables both the cross-comparison between the case studies and the overall analysis regarding EVOKED-hypotheses.

2 Hypotheses

Central to EVOKED are the hypotheses that are formulated in Deliverable 3.1 (Deltares, 2019):

1a) A usability gap is present in the climate services that are used in the case studies.
1b) This usability gap is caused by a missing feedback loop from the end-users to the producers of the climate service.
2a) Living labs are beneficial environments to create this feedback loop between the producer and user of the climate service.
2b) Each of the organizational principles of the Living Lab as described in D1.1 (p.13) are necessary to establish this feedback loop successfully.
3a) Information designs connect the produced information to the end-user
3b) Information designs are a tool to help establish the feedback loops between the end-users and the producers of climate services.

Each of these hypotheses need to be tested individually to provide evidence for the overall line of reasoning as described in Deliverable 3.1. (Deltares, 2019). The verification, or falsification, will be done in field trials and the results will then be cross compared between the case studies. The workflow describes how these field trials can be carried out. The templates are capacity building material that support the EVOKED partners to carry out the field trial.

3 The workflow

Figure 3.1 presents an overview of the workflow. Deliverables 1.1 and 3.1 provided guidelines on how to set up the Living Lab. When the Living Lab is initiated, the participants set up one or more field trails. A field trial may be understood as an 'experiment' aiming at altering the information design of the selected climate service. Each Living Lab may include one or more field trials.

The first step in setting up a field trial is the selection of a climate service to work with. This selection should be based on an inventory of the potential climate change impacts in the region and an inventory of the existing climate services. The second step is the design and testing of a new information design. This new design should be based on an identified 'usability gap'. The usability gap of the service can be found through the analysis of its information design and by comparing this design with the information needs of the end-user(s). Based on an altered information design, the climate service can be improved to bridge the usability gap by, for example, adding information, or changing the way the information is presented. Whether the climate service is indeed improved should be 'measured' using a questionnaire which is covered by WP4. This survey will be discussed in further detail in in section 6.5. In the figure 3.1 the workflow of the field trials is described. The number in the workflow refers to the paragraphs in this document.

In the next sections, we will elaborate further on each of these steps and provide supporting templates that help each project partner to gather or provide the information needed for these steps.

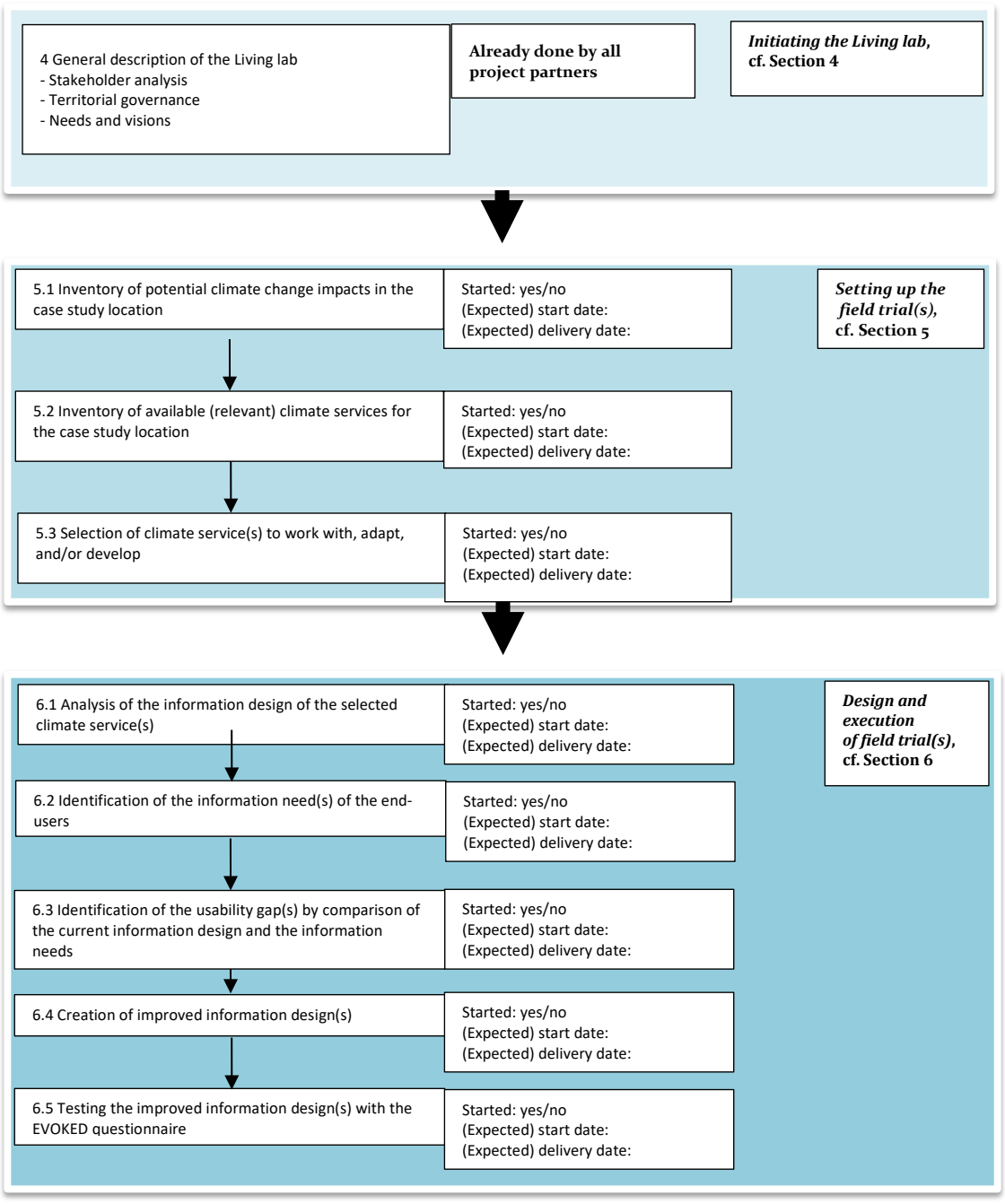

Figure 3.1: Workflow of the field trial(s).

4 Initiating the Living Lab

The first step presented in figure 3.1 is 'Initiating the Living Lab'. This step was done through scoping the general context of the case study area in relation to climate change; to identify the relevant local stakeholders as well as their needs; and to gain a general idea of the case study area. To this end Deliverable 1.1 (SGI, 2018) and its accompanying analyses (the stakeholders-; Territorial governance-; and Needs and visions analysis) have been filled out by the individual EVOKED project partners for the respective case study areas. These analyses serve to provide background information for the case study areas in which the field trials (section 5 & 6) take place, as well as a starting point for setting up these trials.

5 Setting up the field trial

In this section, the steps needed for setting up the field trial(s) are explained (5.1 – 5.3 in figure 3.1). For each of the steps, the templates are provided. The foci of these steps are to: (a) gain a general understanding of the local challenges related to potential climate change impacts for each case study, (b) specify which topics (problems or opportunities) related to climate change adaptation that should be addressed in the field trial, and (c) which climate service(s) will be the main subject of development to address the hypotheses.

5.1 Inventory of potential climate change impacts in the case study area

The first step is to gain a general understanding of the potential climate change impacts that may play a role in the case study area. It is useful to be comprehensive in making your inventory list of climate change impacts. Based on this list, participants will be selecting what impacts to focus on. The Climate change impact Template (fig 5.1) should therefore be filled in by each project partner.

The empty template as well as a filled-in example template can be found in within this document in respectively Appendix A and B.

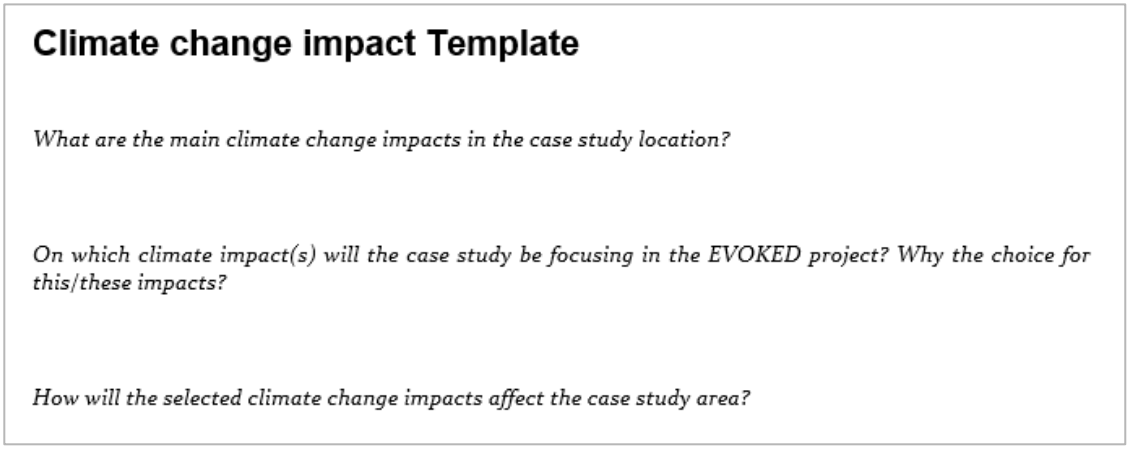

Figure 5.1: Template for Climate change impact.

5.2 Template of available climate services for the case study location

The 'current climate services' Template provides the project partner with an overview of and information on the current climate services available for end-users at a case study location (fig 5.2). The listed climate services can also serve as examples for the other project partners in the consortium of the ways in which information can be formatted and communicated to the users. Furthermore, it is important to note that all potential climate change impact categories are named in the template. However, not all categories need to be filled in, only the ones covered by available climate services. This template should be seen more as a quick scan than as in-depth research on available climate services.

Flooding from regional water system			
Name	**Keywords about focus (e.g. flood risk; consequences; etc.)**	**Information format**	**Internet link or reference**

Figure 5.2: Part of the template for available climate services in the case study location.

The empty template as well as a filled-in example template can be found in within this document in respectively Appendix C and D.

5.3 Selection of climate service(s) to work with, adapt, and/or develop

Based on the two inventories above (climate change impacts and available climate services), a selection can be made to determine which climate services will be (further) developed. Ideally this selection will be the result of a discussion among the Living Lab

participants, but practically this could also consist of a suggestion done by the responsible EVOKED partner, since they might have a complete overview of the project goals, the means, and the possibilities or restrictions of the climate service.

6 Design and execution of the field trial

The goal of the field trial(s) is to bridge the usability gap of the selected climate service(s). This section focuses on the identification of the usability gap for one of the selected problems previously identified and the corresponding climate service (Sections 6.1 - 6.3), creating a new information design (Section 6.4), and testing the adjusted climate service (Section 6.5). For the various steps, templates are developed. The usage of the templates will be explained by two examples of climate services: the first is a water inundation map; the second is a website with flood risks. These examples can be found in Appendix I.

6.1 Information design of the selected climate service

The first step towards bridging the usability gap is an analysis of the information design of the climate service. To do so, the climate service needs to be broken down into four different aspects:

- The intended audience of the climate service
- The purpose of the information
- The information that is given by the climate service
- The format in which the information is communicated

In figure 6.1 these four aspects are shown as well. These aspects will now be further explained.

Audience - The intended audience

Firstly, a climate service always has an audience. Often this audience is implicit. Making the intended audience explicit will give a first pointer towards potential usability-gaps between the provided information and the information needs of the end-users (e.g. the various target groups of the Living Lab participants). In the template, several audience groups are listed, such as municipality-officials, entrepreneurs, citizens, etc. The lists are not exhaustive and can be extended if necessary.

As will become clear by the examples, these different audience groups have different backgrounds, perspectives, and goals. Therefore, they have different information needs as well. In the first example, the intended audience of the climate service consists of municipal employees with a background in water management. The climate service of the second example is intended for citizens. The level of knowledge might be expected to be quite different for these two groups.

Information purpose - The purpose of information which is presented in the climate service

Secondly, a climate service always has a purpose. For example, it was made to inform, to change the way the intended audiences perceive problems, or to initiate action. The template also lists these various purposes, but again not in a way that is meant to be exhaustive: additional purposes are expected to be found. A usability gap can also be related to one of these purposes when, for example, the intended purpose of a climate service is to act, but the provided information does not enable the audience to do so.

In the first example, the purpose of the climate service is to inform the government officials about the effects of extreme precipitation. It can be argued that the service already includes to some extent the purpose of initiating action, since it shows so clearly the inundation locations and water depths requiring the potential need of (spatial) measures. However, it does not include specific information on how to act (i.e. measures the audience can take). In the second example, the purpose is not only to inform but also to raise awareness and maybe even to change risk perception as it shows the impact that a flooding from the main river system or the sea has at the selected location.

Information - The information itself that is given by the climate service to the user

The third aspect is that of the information itself. In the template a set of different types of information is listed: information about effects, impacts, costs or benefits, efficiency of measures, etc. The type of information is directly related to the purpose and to the audience.

In the first example, the actual information is the effects of extreme rainfall presented as inundation depths at a location (without probabilities). In the second example, the predicted flood levels in meter, in case of a flooding from either the main river system or the sea, for area codes that are searched for are given. Additionally, impact information (consequences) is also presented related to what this water level would mean in practice for citizens, e.g. no electricity, no internet, crowded roads due to evacuees.

Visual format - The format in which information is presented to the user

Finally, the format in which the information is presented should be considered. In the template there is a difference made between technical reports, maps, infographics, images, visualizations, etc., but others might be added.

In the first example, the information is plotted on a map (with hardly any explanation for the audience). In the second example, there is a dedicated website where the information is sorted specifically for the end-user's own area code. Additionally, extra information is given in the form of giving tips of what to do in case of a flood, as well as videos from people having experienced similar events (with a special focus on the 1953 Floods). Similar information can be brought across in many different formats.

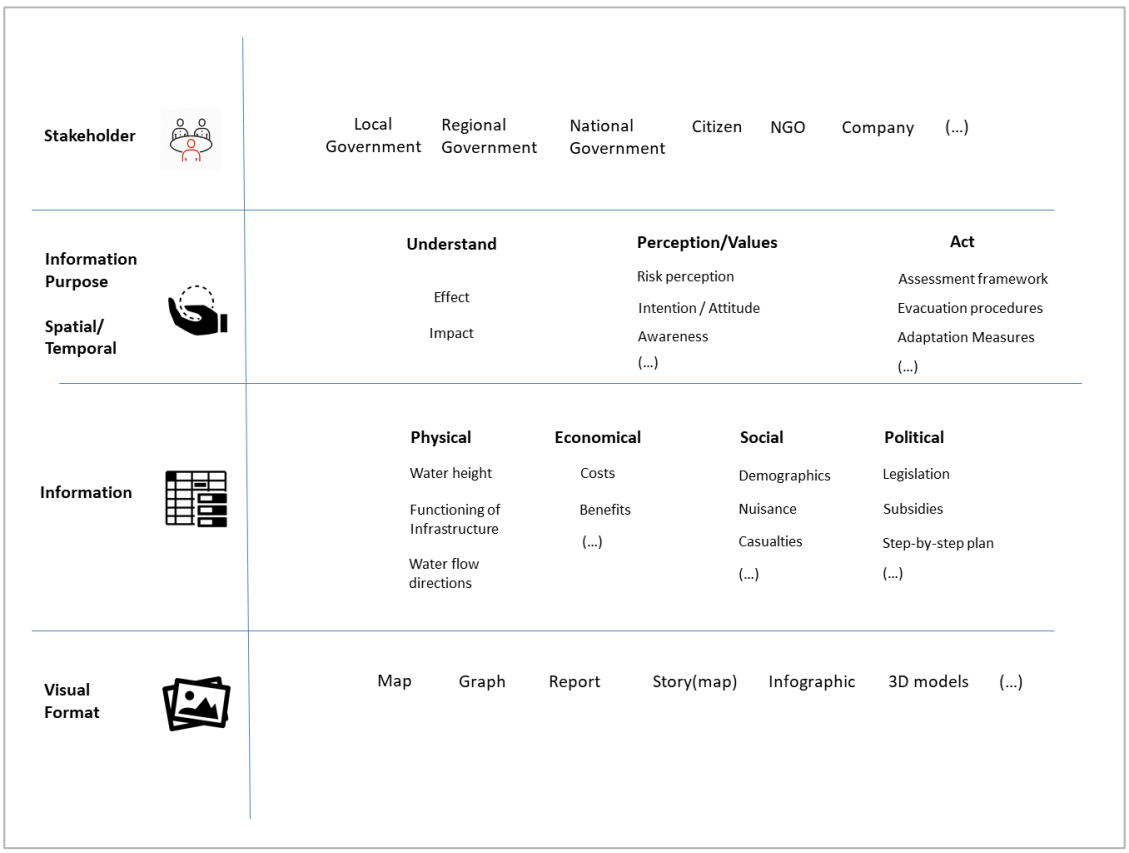

Figure 6.1: The template for the analysis of climate services on their information design (Adapted from Raaphorst et al., 2018).

The empty template as well as a filled-in example template can be found in within this document in respectively Appendix E and F.

6.2 Templates: End-users & Information needs

The second step is to identify the information needs of the end-user, so the usability gap between the selected end-user and the climate service can be identified. This starts with establishing for which end-user the climate service will need be altered. This choice should ideally be made by the Living Lab participants, but the Evoked-partners can make suggestions as well. End-users could be selected because of their (formal) responsibilities, or possible contributions to potential solutions. We created a template which is displayed in figure 6.2.

In the Dutch cases, the information needs of the selected end-users have been identified through interviews with relevant stakeholders. These interviews were focused on the information needs, which formats they are used to (and have experiences with) and the possible purpose of such a climate service by relevant end-users. A helpful strategy could be to show the actual climate service to the end-user and to 1) ask them what they can do with the climate service as it is, and 2) ask them what they would like to have

included in the climate service as well. The interview guide (in English) that was used in the Dutch cases is provided to serve as a template for potential interviews that need to be done in the case studies of other partners.

Stakeholder	Public/private/civic	Relevant climate impacts	Relevance to climate impact	Required information

Figure 6.2: The template for relevant end-users in the field trial.

The empty template as well as a filled-in example template can be found in within this document in respectively Appendix G and H. Additionally, a base version of the interview guide can be found in Appendix E.

6.3 Identification of the usability gaps by comparison of the current information design and the information needs

For the identification of the usability gaps, the information needs of the end users (result of section 6.2) can be laid next to the analysis of the climate service(s) that is/are selected. In this way it can be identified where potential usability gaps are located.

For instance, in the first example, one of the stakeholders required additional information about the accessibility of roads during a pluvial flooding. This is a clear usability-gap: there is a type of information missing (impacts on the availability of roads due to inundation) that would help the end-user to go and talk to emergency services (audience) to inform them or create awareness (purpose).

6.4 Template: Creation of an improved information design

With the now identified usability gap(s), the next challenge is to create an improved information design (based on another version of figure 6.1 version being adapted by the project partner) that bridges the usability gaps.

In the field trial(s), most climate services are focused on understanding climate change impacts in the region, and are presented in the form of risk maps, graphs or reports, aimed at informing local or regional government officials. Much less seen climate services are those focusing on: the underlying ethical values of climate change; authorizing people to act; using other information carriers than maps, graphs and reports; other audiences such as residents and entrepreneurs.

Combining the needs (Section 6.2) and the availability of climate services (Section 5.2/ Section 6.1) helps to identify the usability gap. For instance, one of the identified stakeholder groups are laymen residents, but the existing climate service consists of risk maps designed for trained government officials. This climate information should be reframed, both in terms of its message and its visual expression, to reach another audience, in this case the laymen residents.

For each selected Climate Service, the field trial conducts one or more (iterative) information design experiments.

Guiding questions that could be of help during the creation process are:

- Do we need to reach another audience with the climate service?
- Does the information need to have a different purpose?
- Do we need to adjust the (climate) information in the climate service?
- Do we need to change the information carrier (for example from map to infographic, or more a narrative – such as a scenario)?

By experimenting with different components of the information designs the 'most useful frame' can be found. For example:

- One experiment might be to adjust the design of the information on the map; e.g., it might be more useful to project the potential impact (in term of costs) per household, instead of risk of being flooded.
- Another experiment could be the altering of the information carrier by using illustrated narratives of personal experiences of the effects of climate change instead of a map. The fact that we are using the narratives of WP2 as a field trial in appropriate cases (reference), could already be an experiment. But then it is important to address how they are experienced by the end-users.
- For example, in the Hoogeveen case, the addition of color codes to the roads depending on the water height added insight in which roads are accessible in the case of pluvial flooding. With this, emergency services can see immediately which (alternate) route they need to take to go to places in Hoogeveen in case of a flood.

6.5 Template: Testing the improved information design

The last task in the execution of the field trial is to test the improved information design using the questionnaire that was made as part for WP4 (NGI, 2019). This needs to be done in collaboration with your stakeholders. Feedback can be given through dialogue with the users or by using the questionnaire that is provided as an empty template. Important to note here is that a few adjustments need to be made by the project partners when using the questionnaire:

- Translate questionnaire to their native language

- Add personalized data to the survey (e.g. contact information / logo of partner, etc.)

If the improvement of the climate service helps to bridge a usability gap, it should lead to higher scores in the questionnaire results compared to measurements done in initial meetings. This monitoring technique can also be used for the cross-case comparison within EVOKED.

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Appendix A

Empty template – Potential climate change impacts in case study area

What are the main climate change impacts in the case study location?

On which climate impact(s) will the case study be focusing in the EVOKED project? Why the choice for this/these impacts?

How will the selected climate change impacts affect the case study area?

Appendix B

Filled in example template – Potential climate change impacts in case study area

Contents

B1 What are the main climate change impacts in the case study location?

The first climate change impact is extreme precipitation. This can lead to both pluvial flooding in mostly urban areas, as well as flooding from the regional water system. Additionally, drought can also occur as well in the area. Finally, heat waves can happen, which can lead to heat stress (PBL, 2013)

On which climate impact(s) will the case study be focusing in the EVOKED project? Why the choice for this/these impacts?

The case study in the Fluvius region will focus on all four topics. This is because the upcoming 'stresstest'-analysis will be used as field trial for the EVOKED project by Deltares. As this analysis addresses all four topics, therefore these climate change impacts will be focused upon as well.

B2 In which way do the chosen climate change impact(s) impact the case study area?

- Pluvial flooding can lead to water on the streets which can disrupt traffic. Additionally, water can also enter buildings and basements which may lead to damage of property. This has happened for example a few times in the past in Hoogeveen (e.g. Hoogeveensche Krant, 2017).
- Flooding from the regional water system is more severe than pluvial flooding as it involves river floods. This can happen because water overtops a dike, or that the dike breaches. This can lead to societal disruption in the case study area or even casualties. In the past (1998) this happened almost in Meppel (RTV Drenthe, 2008).
- As the Fluvial case region also has a rural character it has an impact on agricultural yields. Additionally, also surface water quality can be affected as well. Furthermore, this can also lead to a decrease of drinking water as well. Finally, a decrease in groundwater levels during droughts can also lead to soil subsidence (Didde, 2018).
- Heat waves can lead to higher temperatures in urban areas (urban heat island effect). This can lead to overheating in humans which in turn can lead to negative health impacts. As such, heat waves can lead to casualties amongst vulnerable societal groups (e.g. elderly, children, sick people) (National Weather Service, n.d.).

References

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Appendix C

Empty template – Current available climate services in case study area

Flooding from regional water system			
Name	**Keywords about focus (e.g. flood risk; consequences; etc.)**	**Information format**	**Internet link or reference**
(Extreme) precipitation			
Name	**Keywords about focus (e.g. water height; accesability; etc.)**	**Information format**	**Internet link or reference**
Drought			
Name	**Keywords about focus (e.g. water shortage; affected sector etc.)**	**Information format**	**Internet link or reference**
Heat stress			
Name	**Keywords about focus (e.g. temperature; affected stakeholders; etc.)**	**Information format**	**Internet link or reference**

Appendix D

Filled in example template – Current available climate services in case study area

Flooding from regional water system			
Name	**Keywords about focus (e.g. flood risk; consequences; etc.)**	**Information format**	**Internet link or reference**
Nationale Klimaateffectatlas	Flood height when primary flood defenses are breached	Map	www.klimaateffectatlas.nl/nl
	Flood height when regional flood defenses are breached	Map	
	Flood height for areas outside of diked areas	Map	
	Flood risk of areas in 2050 (for experiencing flood heights of >0; >20; >50; >200cm)	Map	
	Dry areas in case of flooding	Map	
(Extreme) precipitation			
Name	**Keywords about focus (e.g. water height; accessibility; etc.)**	**Information format**	**Internet link or reference**
WDOD Klimaateffectatlas	Water height during precipitation event;	Map	https://wdodelta.klimaateffectatlas.net
	Accessibility of roads for normal traffic / emergency services	Map	
	Waterflow directions	Map	
Nationale Klimaateffectatlas	- Water height during precipitation event (T=100; T=1000)	Map	www.klimaateffectatlas.nl/nl
	Highest average groundwater level	Map	
	Number of days with an total precipitation level of >15;25 mm.	Map	

	Yearly precipitation amount	Map	
	Percentage of hardened surface in a neighborhood	Map	
	Percentage of surface water in a neighborhood	Map	
	Risk of soil compaction	Map	
Drought			
Name	**Keywords about focus (e.g. water shortage; affected sector etc.)**	**Information format**	**Internet link or reference**
Nationale Klimaateffectatlas	Surface water shortage for a normal / extreme dry year	Map	www.klimaateffectatlas.nl/nl
	Average lowest groundwater level	Map	
	Risk of experiencing drought stress	Map	
	Potential precipitation shortage (T=10; Average)	Map	
	Normal amount of precipitation during summer in mm	Map	
	Soil subsidence 2016-2050	Map	
	Wildfire risk	Map	
Heat stress			
Name	**Keywords about focus (e.g. temperature; affected stakeholders; etc.)**	**Information format**	**Internet link or reference**
WDOD klimaateffectatlas	Temperature in relation to surrounding areas	Map	https://wdodelta.klimaateffectatlas.net
	Heat stress due to warm nights	Map	www.klimaateffectatlas.nl/nl

Nationale Klimaateffectatlas	Amount of warm/summer/tropical days a year (>20 °C;>25 °C;>30 °C)	Map	
	Amount of subsequent summer days streak (>25 °C)		
	Urban heat island effect	Map	
	Location of movable bridges	Map	
	Percentage of hardened surface in a neighborhood	Map	
	Percentage of green space in a neighborhood	Map	
	Percentage of elderly people (+65 years) in a neighborhood	Map	

Appendix E

Interview guide that can be used to collect information about information needs and climate service use by selected end-users

Introduction

<case specific>
But should include:

- Context in which interview is held
- Explanation of what the EVOKED project entails
- Goal of the interview

Questions:

1. In how far are you confronted or involved with the impacts of climate change in your daily work? If so, could you describe the impacts you are confronted with and what the causes of these are?
2. How would you describe the current and future challenges surrounding climate change impacts (roughly!) for both your day-to-day practices and your organization?
3. How important and urgent are these climate change impacts for your organization? Could you describe how this is/isn't the case for the different layers in your organization? (board, policy, on the workflood, in projects).
4. Which information do you already have that is relevant to the earlier named climate change impacts in terms of understanding and dealing with the impact? In which format is this information presented? (e.g. models, documents, maps, images)
5. Does the form in which the current information make the information understandable? If not, why is this the case?
6. Which information do you still need regarding climate change impacts? Which information is missing?
7. In which form would this information need to be presented? (e.g. data, images, stories, maps, etc.)
8. What is seen by your own organization as their responsibility when it comes the climate change impacts?
9. Which other stakeholders also carry responsibility when it comes to the impacts of climate change? What are your expectations of what these other stakeholders need to do, or can mean for your organization? (See table 1 in appendix).
10. Is your organization capable of bearing the earlier mentioned responsibilities? (question 8) If not, what is needed to improve this? Would a better or improved information supply play a positive role for this?
11. Which other relevant stakeholders should we interview according to you?
12. Are there any other things that haven't been touched upon during the interview but that could be of interest?

Thank you very much and thank you for your time! You will receive a report of the interview.
<Above sentence can be adjusted if deemed necessary>

Appendix F

Empty template – Information relevant end-users and their needs

Stakeholder	Public/private/civic	Relevant climate impacts	Relevance to climate impact	Required information

Appendix G

Filled in example template – Relevant information end-users and their needs

Stakeholder	Public/private/civic	Relevant climate impacts for stakeholder	Relevance to climate impact	Information needs collected from interview
Municipalities in the Fluvius region	Public	Extreme precipitation; drought; heat stress	Dutch municipalities carry legal responsibility for the spatial planning of public areas. As such, they have a large impact in the climate adaptiveness of urban areas through the spatial design of these areas (e.g. have enough green spaces and water retention areas). Additionally, they also carry responsibility for proper functioning of the sewer system, which affects the impact of precipitation in urban areas.	- Impact of climate impacts in terms of damage and priority - Missing information about climate impacts in rural areas - Wish expressed to provide data via GIS - More information needed that is suitable for politicians (e.g. experiences from citizens or images/video)
Water board Drents Overijsselse Delta	Public	Extreme precipitation; drought	Dutch water boards carry a legal responsibility for the management of (urban) surface water bodies. This entails both quality and quantity aspects. As such, there	Idem

			needs to be enough water retention capacity for both rainy times and drought. Furthermore, they also are responsible for the management of regional flood defenses that may be affected by drought during the summer and need to be strong enough to withstand higher water levels in the winter/spring due to an increase in precipitation.	
Province of Drenthe	Public	Extreme precipitation; drought	The Dutch Provinces have responsibility for the strategic spatial development of the province. Additionally, they are also responsible for the management of the provincial water (both quality and quantity). As spatial planning decisions affect the resilience of areas against climate change impacts, this partner is important to see what the	Idem

			strategic needs are for climate services.	
LTO (agriculture interest organization)	Civic	Extreme precipitation; drought	The Fluvius-region is also home to agriculture that may be affected by climate change (e.g. overabundance or shortage of rain may lead to reduced crop yields). The LTO is an agriculture interest organization who stand for the interests of the farmers in this aspect. This links to the use of water during drought or drainage of land to reduce water in the ground. As such, they may have different needs than for example nature organizations.	- More information is needed about the water system and subsoil in regard to the impact this has on climate change impacts and risks. - More information needed on the standards that are set by the government in regard to adaptation measures that can be taken.
Housing corporation(s)	Can be public or private	Extreme precipitation; drought; heat stress	It is well known that private properties in urban areas also affect the impact of climate change (e.g. increased percentage of hardened surfaces). Within urban areas, a lot of houses are property of	- To what degree will climate change impacts be a problem for this group. And if so, where are measures needed? - What are other housing corporations doing in terms of climate

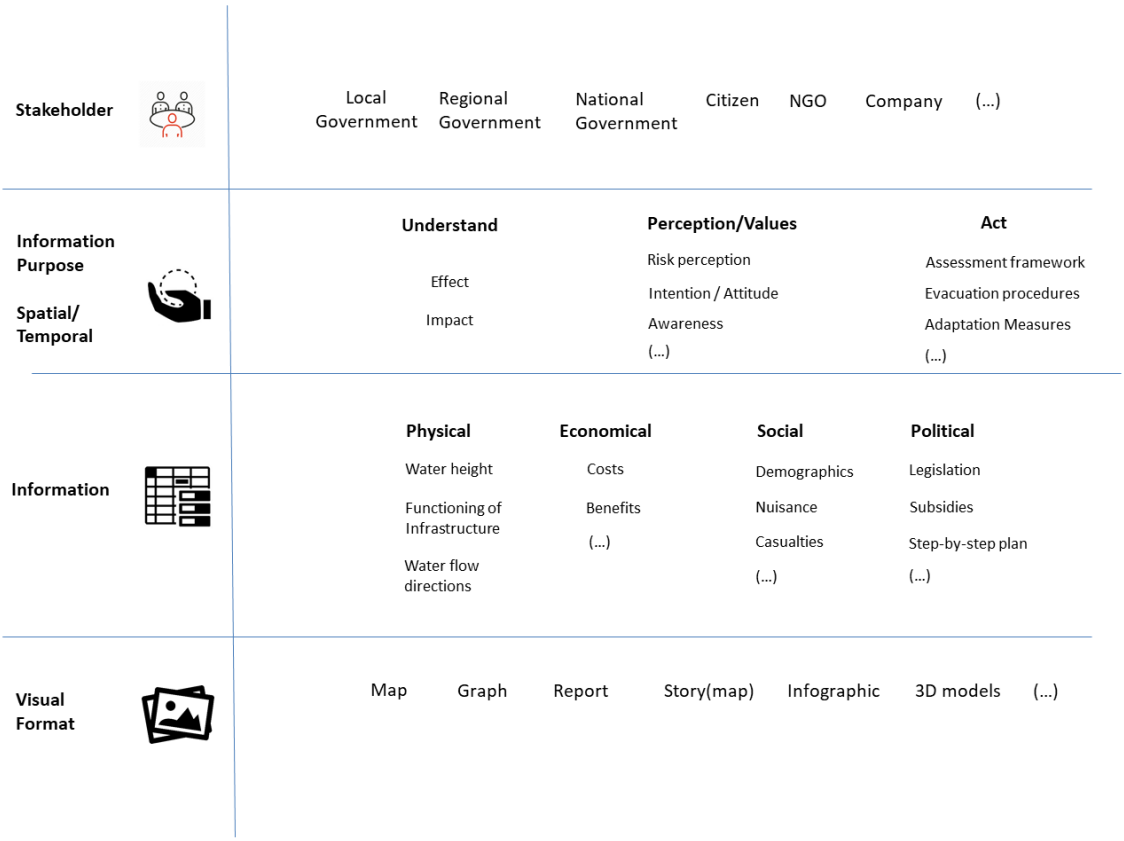
			housing corporations who rent out these houses. As such, they are primarily responsible for the development of climate adaptive measures on these properties. Therefore, it is good to understand their needs so that they can act accordingly.	adaptation measures?
NMF (nature interest organization)	Civic	Drought	In rural areas in the Netherlands, besides agriculture nature is also an important function that has its own needs and experiences regarding climate change. As the drought from 2018 showed that nature is especially heavily affected by this climate impact, the needs of this stakeholder are important to consider. Especially, as these may collide with agricultural ones.	- What has been the impact of the 2018 drought on nature and biodiversity in the Province of Drenthe?
WMD (drinking water company)	Public	Drought	The WMD provides drinking water to the Fluvius-region.	- How will the drinking water demand

			During drought water shortages can potentially occur that may threaten the delivery of water. Therefore, it is good to understand how the WMD stands towards climate change as they provide a vital function to society.	develop in the future? - What are potential opportunities to combine nature development and strategic water storage?
Tennet (energy distributer)	Public	Drought	Just as WMD provides drinking water, Tennet distributes energy to Dutch houses. As such, it is also a vital function it is important to understand how they are affected by climate change.	- Not interviewed
Safety region Drenthe	Public	Extreme precipitation	The Safety Region Drenthe is a collaboration between different governmental actors and emergency services that focusses on disaster management (e.g. public order or flooding). As regional or pluvial flooding may occur which in turn can affect emergency	- What will be the role of the Safety region in regard to climate change adaptation? - What is the impact of flooding from the water system? - Where is vital infrastructure located that may be affected during a flood event? -

			services, evacuation plans etc. it is good to understand what information the Safety Region needs in order to prepare adequately.	

Appendix H

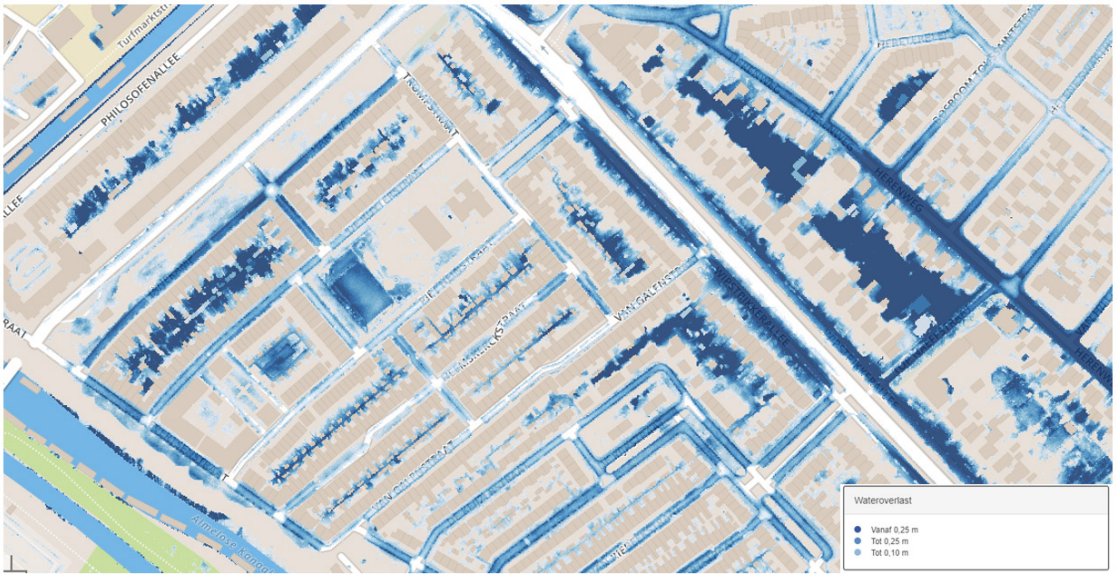
Filled in example template – Relevant information end-users and their needs



PowerPoint file can be found here:
https://www.dropbox.com/s/7601s059w4xb2f1/Climate%20Information%20Design%20Visual%20Template_Empty_V2.pptx?dl=0

Appendix I

Filled in example template – Information design of selected climate service



Local Government | Regional Government | National Government | Citizen | NGO | Company | (...)

Stakeholder

Understand Effect | Perception/Values | Act

Information Purpose

Spatial/ Temporal

Physical Water height | Economical | Social | Political

Information

Map | Graph | Report | Story(map) | Infographic | 3D models | (...)

Visual Format

Appendix J

Two examples of the analysis of the information design of a climate service

Contents

J1 Example 1: Climate Stress Test

The climate stress test consists of a model that calculates the water nuisance in the scenario of extreme precipitation based on a digital elevation model and land use data (Figure X.1).

- Step 6.1. Analysis of current available relevant climate service in information design template.

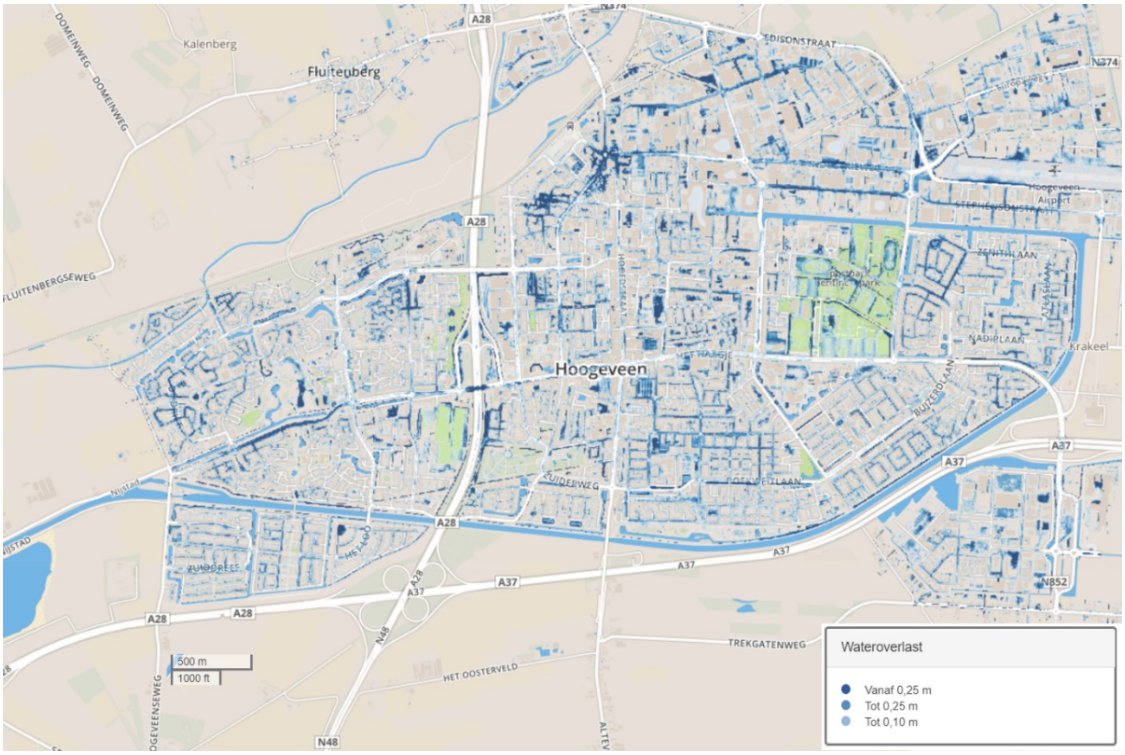


Figure X.1: Example of climate stress test for the municipality of Hoogeveen (https://wdodelta.klimaatatlas.net/).

The initial Climate Service serves the local government as stakeholder. Its purpose is to understand the direct effects of extreme precipitation, i.e. water nuisance.

The template for Climate Information Design (CID) can be filled in like it is done in the example of Figure X.2.

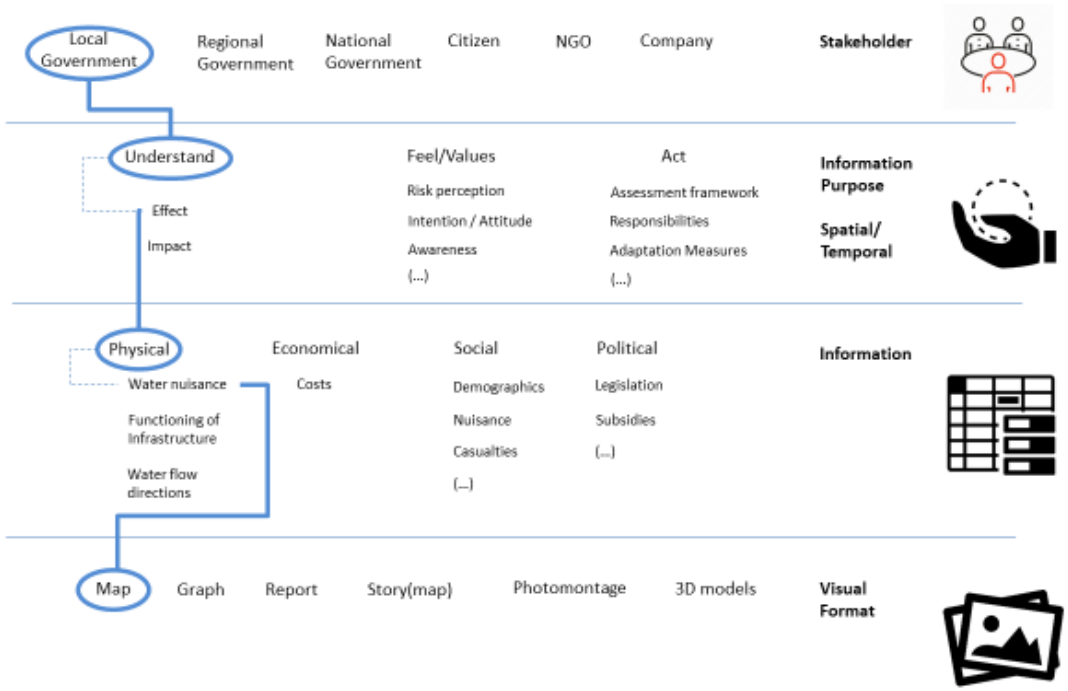


Figure X.2: Example of CID template for the initial climate service of Figure 1.

- Step 6.3. Comparison between available relevant climate service and needs of stakeholders.

The stakeholder would like to know the impact of these effects – the water nuisance - on the functionality and availability of the city's infrastructure.

- Step 6.3. Identify usability gap(s).

The usability gap consists of the lack of particular information, i.e. the functioning of infrastructure.

- Step 6.4. Creation of improved information design.

To close this usability gap, the relevant information needs to be added to the climate information design (see Figure X.3).

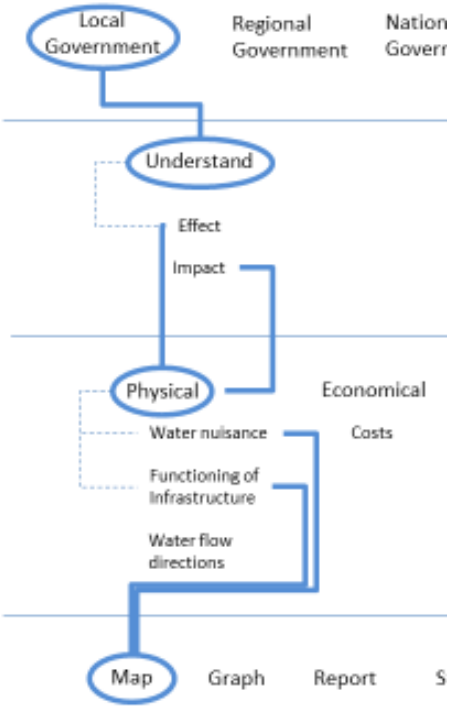


Figure X.3: Example of modified CID based on usability gap.

- Step 6.4; 6.5. Produce and test improved information design of climate service in Living Lab case study.

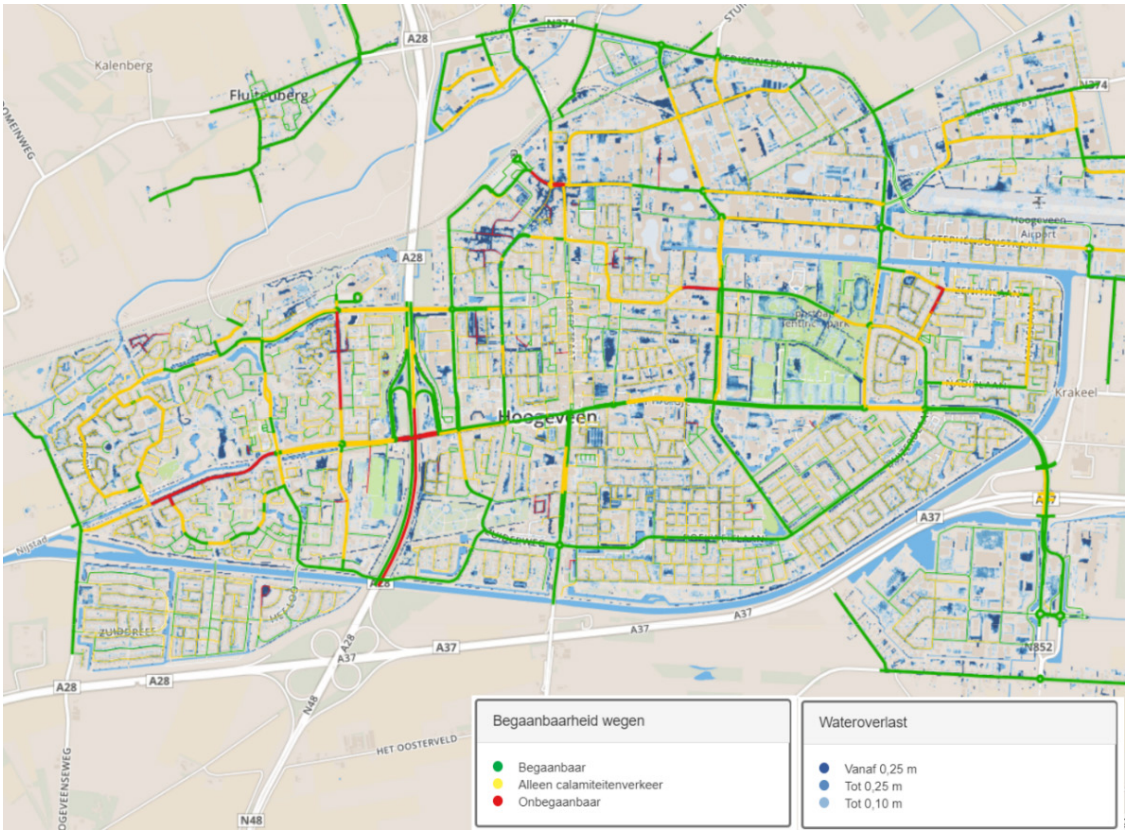


Figure X.4: Example of the climate stress test that includes the availability of infrastructure. (https://wdodelta.klimaatatlas.net/)

If the Living Lab process allows, further iterations can be made in the improvement of the information design of the climate service. For example, further consequences can be compiled that can contribute to an increased awareness of negative climate scenarios now that the impact of the water nuisance on the infrastructure is known. For example, the diminished accessibility of infrastructure has an impact on the response time of emergency services. It would be beneficial if the climate service could show that the inaccessibility of major roads has negative consequences for the routing of emergency vehicles. This requires an additional chance in the information design: additional information is added about the alternative routes from the city hospital to a particular location (Figures X.5 and X.6).

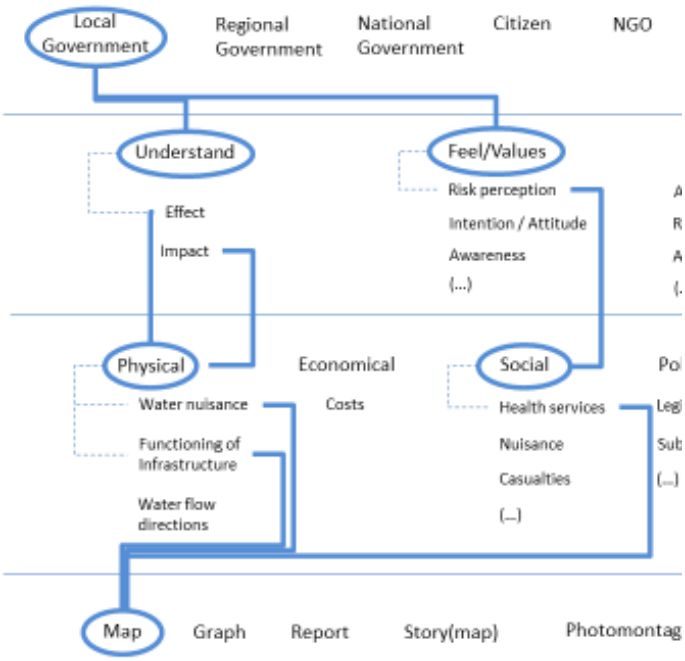


Figure X.5: Example of a further modified CID based on usability gap.

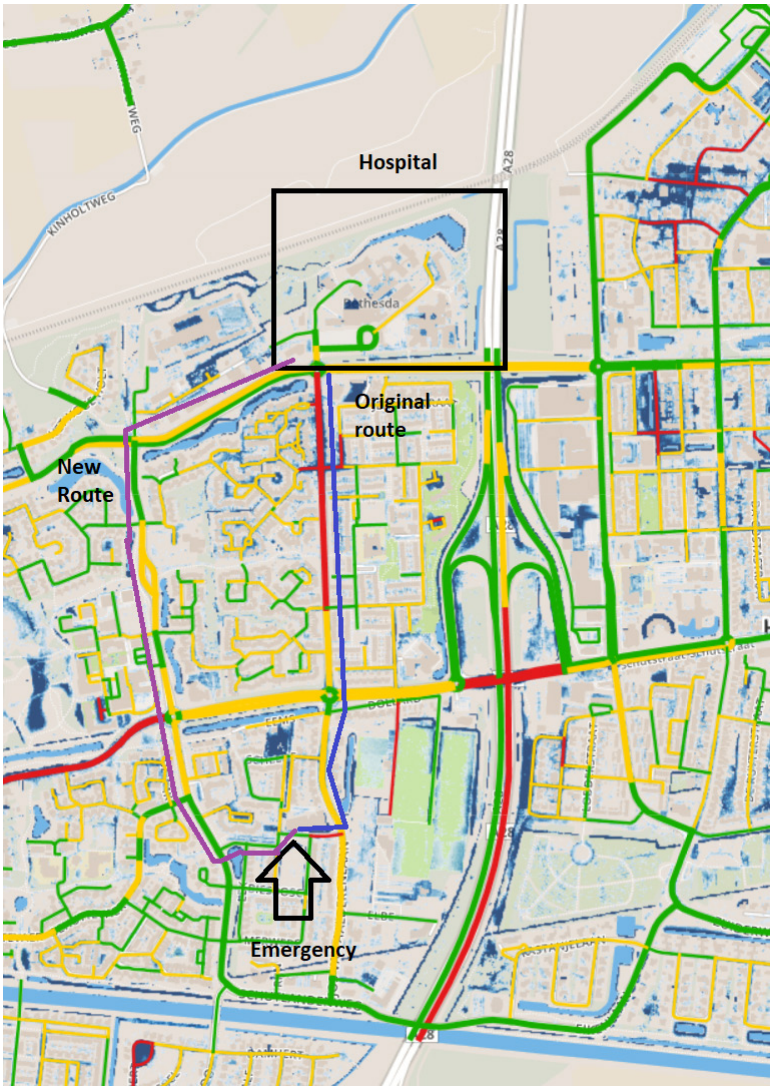


Figure X.6: Example of the climate stress test that includes the impact of water nuisance on the routing of emergency vehicles. (Adapted from: https://wdodelta.klimaatatlas.net/)

J2 Example 2: Flood check for citizens.

- Step 6.1. Analysis of current available relevant climate service in information design template.

The flood check for citizens (Figures X.7 and X.8) is produced by the national government, aimed at local inhabitants, to give inhabitants a better understanding of how a potential flood would impact their houses. The flood check is multimodal, i.e. it combines several visual formats, and it shows the flood in terms of water elevation expressed per meter, and the chance such a flood would occur in the lifetime of an inhabitant.

Figure X.7. Flood check for citizens website.

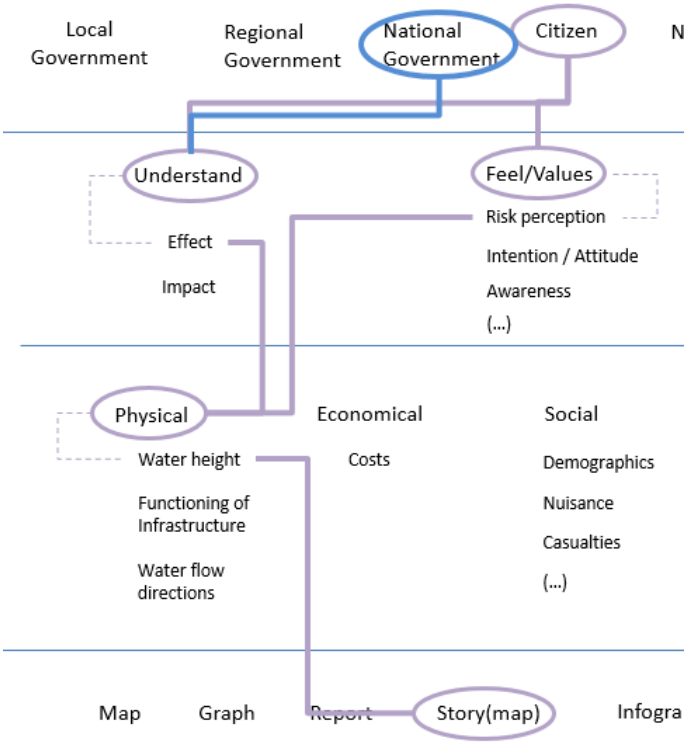


Figure X.8: Example of CID template for the initial climate service of Figure IX.7.

- Step 6.3. Comparison between available relevant climate service and needs of stakeholders.

In the example of the flood check for citizens it would also be desirable if the target group would also know in what type of scenario they should either stay or evacuate.

- Step 6.3. Identify usability gap(s).

The usability gap consists of information about the impact of the flood in relation to safety.

- Step 6.4. Creation of improved information design.

In this example another component is added to the flood check for citizens that shows the different options people would have to improve the safety of their houses, or what kind of evacuation plans they could make use of (Figure X.9).

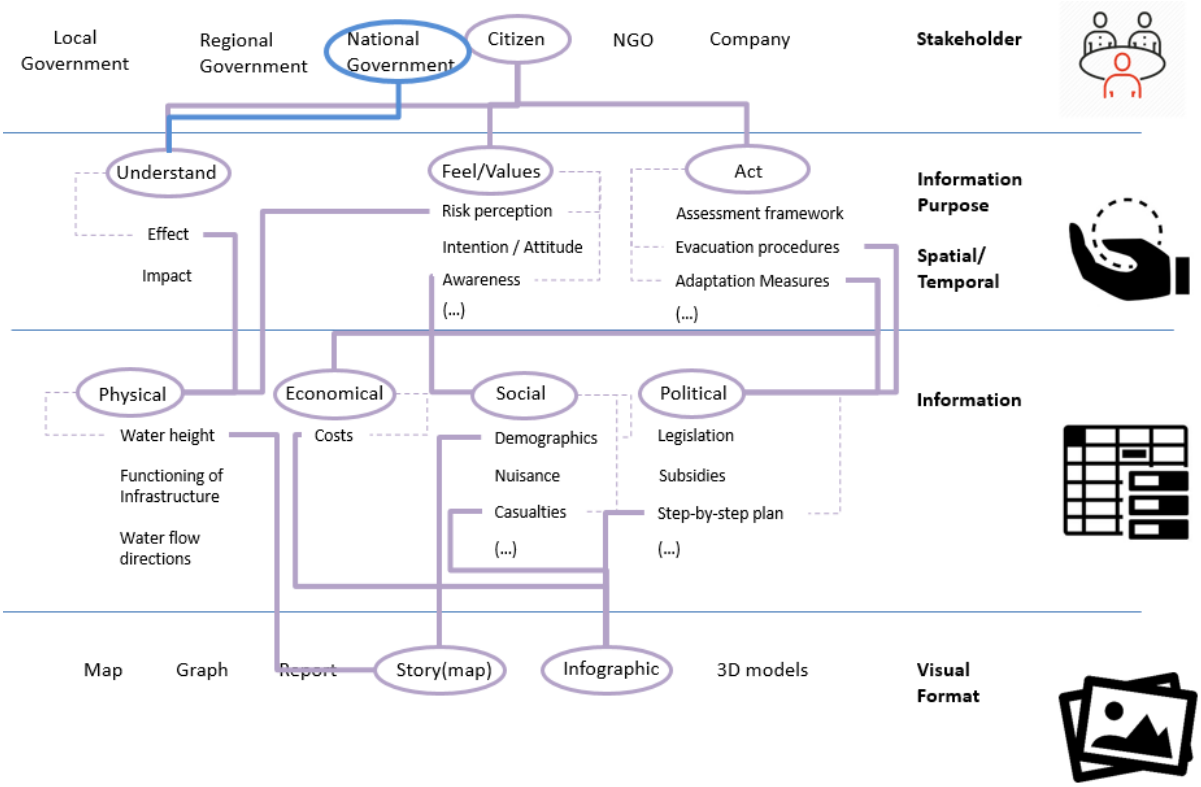


Figure X.9: Example of modified CID based on the usability gap.

- Step 6.4; 6.5. Produce and test improved information design of climate service in Living Lab case study (Figure X.10).

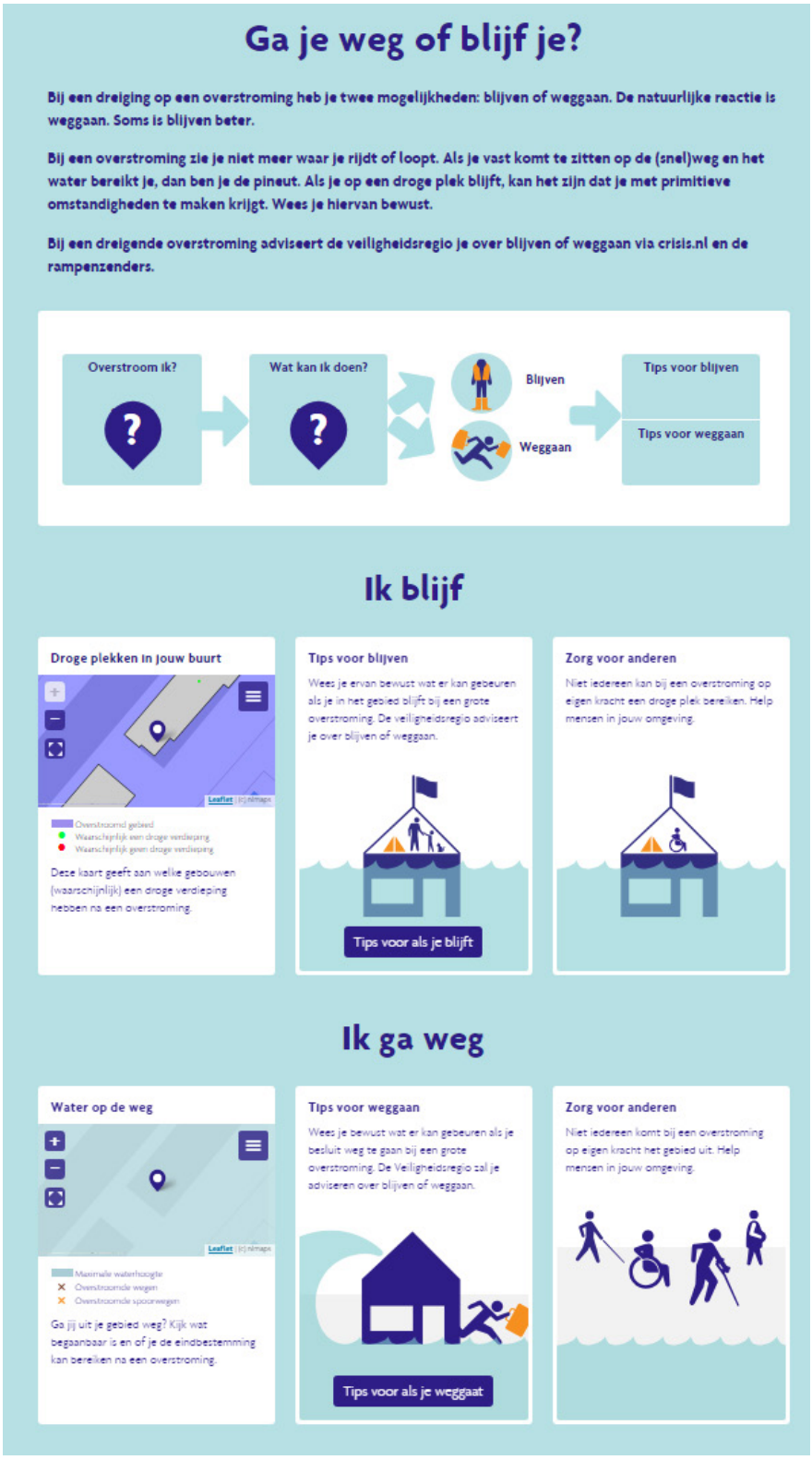


Figure X.10 Example of improved climate service based on the modified CID.

Further iterations can be made. For example, by emphasizing the impact of a flood in space and time by showing documentaries of international flood events and flood model scenarios.

To emphasize the real dangers of flood events an even further iteration would be to show personal stories of citizens that survived the historically iconic flood disaster of 1953 in the Netherlands.

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