EVOKED

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Enhancing the value of climate data - translating risk and uncertainty utilizing a living labs approach

Field Trials for testing climates services

The main objective of the Field Trials has been to bring into practice the key aspects of EVOKED: the focus on climate services, the Living Labs approach, and the information design framework (Figure 1) for the selected climate services for each of the EVOKED case study sites. To this end, steps for the Field Trials has been developed to structure the data that has been collected in the case studies as well as to draw lessons and conclusions based on a case comparison (Deltares, 2020). The final objective of this is "a systematic evaluation of the climate information designs and thus of the communicative qualities of currently used climate services; insight into the different information needs, perceptions of risk and uncertainty, and the responsibilities and roles of different stakeholder groups; a set of visualization principles and visualization strategies for stakeholder specific climate services" (Deltares, 2019).

Preliminary results and case comparisons. Almost all case study sites have completed their Field Trials or are in the final phases of testing whether improvements made to the climate services have had a positive contribution. For the Field Trials most research organization partners have opted to have a more advisory role within the Living Labs at the case study sites to provide advice to the development process between the end-users and third-party developers. The case of Flensburg is the exception in this regard as the University of Kiel has also been active in developing the climate service incorporating input from the end-users.

In addition to slight differences in the approaches, there have also been differences in the climate services that have been developed. For example, three of the cases (the city of Flensburg in Germany, Arvika municipality/Värmland county in Sweden, the Fluvius region in the Netherlands) opted for the development of a story map. For the case of Larvik municipality in Norway, a climate adaptation checklist is being developed, and for the region of Northeast Brabant in the Netherlands, the climate service was an infographic showing the potential consequences of climate change impacts for sectors within the region. Within the story maps we can discern additional differences. Firstly, the Flensburg version is focused on raising awareness of citizens about the impact that sea level rise has regarding storm surge flooding. Secondly, the Arvika/Värmland version was developed as a solution to collect and streamline the large amount of climate information that is available to local and regional stakeholders. Finally, the Fluvius story map aims at providing information to regional and local stakeholders with insight in the potential impact of climate impacts for the region. These differences reflect the how the co-design processes have led to different improved climate services that are now more tailored to the stakeholders' climate needs.

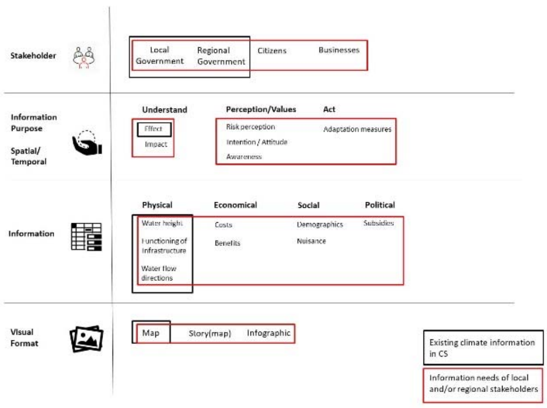

Figure 1. A filled-in Climate Information Design Framework for a climate service showing the information presented by the climate service and the information needs from a hypothetical end-user. Boxes that do not overlap indicate potential usability gaps that might be present and need further investigation.

Climate Information Design Framework. An important tool in providing advice in all cases has been the use of the Climate Information Design Framework (Figure 1), which helps to deconstruct the climate service and to pinpoint what needs to be changed. As, such it can be stated that this framework contributes to the development of a feedback-loop between the end-users and the developers serving as a way for communicate shortcomings ('usability gaps' as defined by Lemos et al., 2012) in the original climate services in relation to the climate information needs of the stakeholders. The variety of different climate services that have been developed with this framework indicate that the process is open and not biased towards certain choices.

Story Living Lab principles. When EVOKED began in 2017, the first activity focused on developing EVOKED's definition of Living Labs. To this end, a set of key principles were identified to guide how the Living Labs were to be practiced at the different case study sites. These principles included: continuity, openness, realism, influence, value, and sustainability (SGI, 2018). After two years of developing the climate services in the Living Labs, it is useful to reflect on the relevance of these principles with regard to their ability to establish a feedback loop between the end-users and the producers in the Field Trials. Preliminary results from the case study sites indicate that realism, value, and sustainability are not that useful towards this specific goal of a feedback loop to develop climate services.

Realism focusses on engaging the most relevant stakeholders for information needed to develop the climate services as presented in Raaphorst et al. (2020). While, a good principle for setting up a Living Lab, it does not contribute towards the goal of establishing this feedback loop. The principle of value focusses on the benefits a climate service can provide to the end-users regarding the information that it presents. In practice, value is more comparable with the concept of usability gaps as the presence of such gaps lowers the value a climate service will have for the end user(s). Finally, the concept of sustainability focusses on the overall environmental sustainability of the design process (e.g. do stakeholders have to travel for meetings). As such, this aspect does not touch upon the establishment of the feedback loop and therefore is not considered to contribute to this end.

On the other hand, the principle of continuity within a Living Lab focusses on the use of existing networks, building trust and long-term learning as output for the living lab. This setting allows stakeholders to better learn from each other and to create an atmosphere in which it is easier to give feedback to producers of climate services. A similar outcome can also be seen for the principle of openness as it creates an atmosphere among the involved parties to be open about the process and to also discuss more negative experiences and aspects that might not be clear or usable (usability gaps). Finally, the principle of influence focusses on ensuring that stakeholders can contribute to the development of climate services and setting up clear communication channels. This clearly supports the idea of developing a feedback loop to the developers as the end-users are engaged and co-design the climate services that they subsequently will use.

To sum up this contribution, the field trials have shown that the ideas developed in EVOKED have helped to develop climate services that are better connected to the information needs of the end-users.

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Development of Martineåsen in Larvik municipality, the Norwegian case study site

Improving the knowledge base is essential for meeting the visions of Larvik as the city has ambitious goals of urban development for a 1.5% annual growth and influx of residents. To support meeting this goal, the city of Larvik is conducting a feasibility study to assess the development of Martineåsen (Figure 2), an area of 200 hectares situated about 1 km from the city centre. The aim is to create a new neighbourhood at Martineåsen that will have social and environmental qualities that attract resourceful people of all ages including families (Larvik kommune, 2013; 2015).

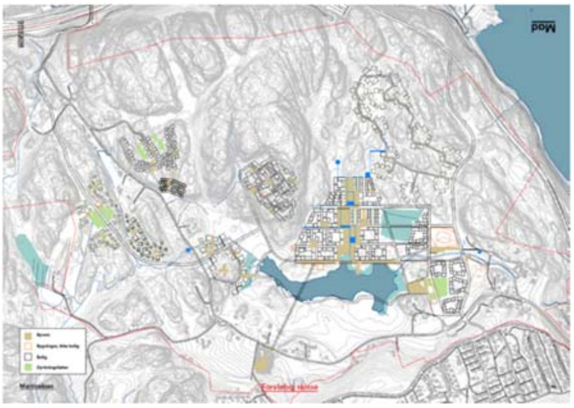

Figure 2. Feasibility study to visualize how the Martineåsen area of Larvik can develop within the natural forest area (MAD architects, 2019).

Climate adaptation needs and visions. Key objectives to achieve this vision include a focus on building residential areas and homes that are innovative and green as well as a focus on being sensitive to climate change. One challenge in building these homes is the landscape of Martineåsen which is hilly and quite varied with tall deciduous trees as well as pine and heath forests. A small lake, Kleivertjønn, is located centrally in the area. There are also several bogs which is a type of wetland that accumulates peat. These physical qualities represent important blue-green infrastructure that provide both opportunities and challenges that must be considered in the comprehensive development of the area. Furthermore, the development of infrastructure and outdoor spaces must be designed to have the capacity to accommodate for climate change and to ensure public safety.

Climate impacts. For Martineåsen, climate risks that were identified as most important were related to flooding and the area's current capacity to hold and infiltrate large volumes of water in the event of extreme rainfall. An illustration of this buffering capacity is shown in Figure 3 for the city of Larvik. This figure is based on digitally mapping the terrain and calculating the volume of water that can potentially be stored within natural depressions. Although an estimate, it provides an indication of flood potential as water will most likely follow drainage pathways along the terrain under intense precipitation (NGI ,2016). Development of this area will result in changes in the landscape and all changes that influence the runoff of surface water must be thoroughly examined in order to not increase risks to areas downhill of Martineåsen (NGI, 2016).

Co-design of a relevant climate service. These current climate services are perceived as useful. However, since the case study site focusses on the development of a new area, the municipality is interested in exploring a climate service that could function as a planning tool to select interventions and specify requirements prior to building. Relevant stakeholders for such a tool could include landowners, building developers and contractors as well as politicians.

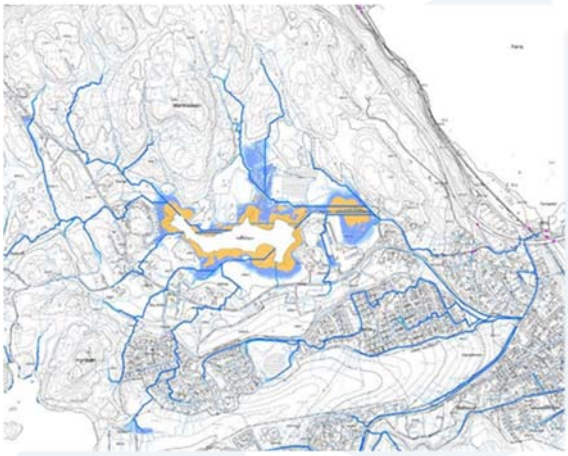

Figure 3. Potential water ways and water accumulation in natural landscape depressions in Larvik, including Martineåsen (Larvik municipality).

The first version of the climate service for building developers and contractors with a potential interest in the development of Martineåsen in Larvik municipality was presented as either i) the "blue green factor" tool for blue-green infrastructure interventions included in building development projects, or ii) a checklist table of selected sub-categories from the BREEAM Communities assessment method for integrating sustainable design in the planning of new communities.

Figure 4. Photo during the break-out group discussion during the first Field Trial for co-design of a climate service for climate adaptation in development projects.

Creation of an improved climate service. Based on the discussions with the building developers and contractors during the first Field Trial, the climate service is being revised with the second version that is inspired by the

BREEAM Communities sub-categories that incorporates additional aspects for climate adaptation as well as climate mitigation. This "*Klimameny*" (Climate menu) will be presented to the same group of stakeholders in a workshop that is being planned for the autumn of 2020.

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Partners: end-users and research organizations

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