

# Interreg



## 2 Seas Mers Zeeën

# STAR2Cs

### Routes to Resilience: Reducing climate risk through adaptive planning

European Regional Development Fund



Adaptation to climate change



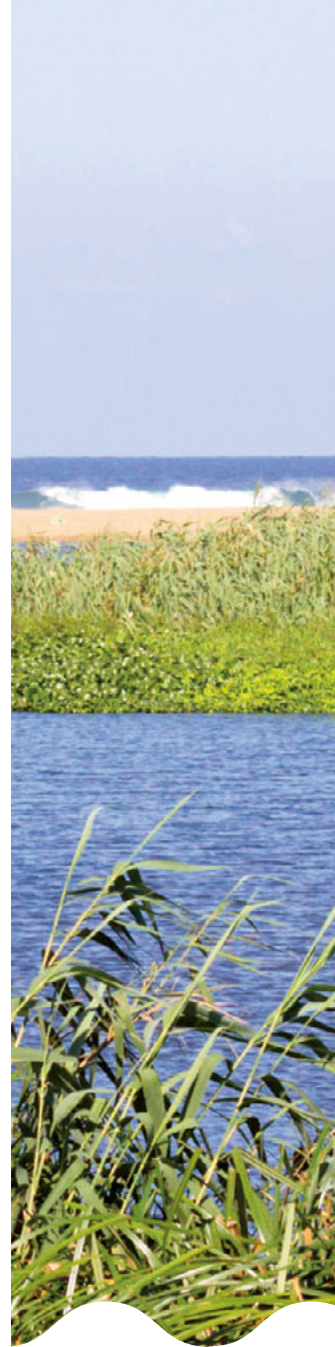
### Experiences of cross-border collaboration and innovation across the STAR2Cs partnership

Project partners:



**Routes to Resilience:  
Reducing climate risk  
through adaptive  
planning**

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Cover: Pegwell Bay, UK

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## Introduction

**O**ur climate is changing and the effects are becoming clear. Across Europe, floods, droughts, and heatwaves will become more frequent, severe and costly. The Short-Term Adaptation for Long-Term Resilience to Climate Change (STAR2Cs) project, part-funded by the European Regional Development Fund through the Interreg 2 Seas programme, has worked to build climate resilience that minimises the impacts of risk; takes advantage of opportunities; is flexible to uncertainties and changing circumstances; and provides wider benefit.

Through STAR2Cs, 8 organisations and over 2000 stakeholders have worked together to produce and pilot a revolutionary cross-border and evidence-based solution that supports the implementation of adaptation measures in challenging and uncertain environments. The STAR2Cs solution is comprised of a range of tools and products that support the development of adaptation pathways, assessment of stakeholder knowledge and engagement, and co-creation and long-term planning. These have been consolidated and summarised into one case-study methodology - Routes to Resilience: Reducing climate risk through adaptive planning.

The STAR2Cs solution has been adopted across the 2 Seas area and has led to increased stakeholder engagement and cocreation in decision-making; the development of short- and long-term adaptation pathways; and increased implementation of local adaptation measures. STAR2Cs has successfully demonstrated how investment can be combined with regular asset management to build resilience; assess the effectiveness of different adaptation measures and identify actions that should be taken now versus actions that can be taken later. In this way, no matter what the future looks like, our communities, economies and environment will continue to be great places to live, work and play.

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Kent County Council

## Implementing long-term adaptation

Climate change is already affecting Europe. Recent high temperatures, droughts, water shortages and increased rainfall have caused severe localised and regional impacts, which will become more frequent and severe throughout this century. The cost of damages from flooding alone in Europe is expected to reach €23.5bn by 2050. Responding to climate change is a pan-European issue, with traditional and unilateral approaches to risk management unlikely to adequately address future challenges.

### Encouraging long-term adaptation and overcoming the implementation gap

Given that the effects of climate change are already being felt, and will increase, there is a clear need to be proactive in reducing their impacts on our natural environment, communities, and economies. Interreg 2 Seas Member States have developed national adaptation strategies that identify a range of

actions. However, local authorities and regional agencies responsible for implementing them face challenges with engaging citizens, planners and decision-makers. In particular, there is insufficient understanding of the long-term costs and benefits of adaptation measures, and a lack of

relevant tools to support decision-making and funding for perceived 'future' investments. These barriers lead to a situation in which there is little appetite for, or ability to deliver local adaptation. The result is an 'implementation gap' between strategy and real, tangible change on the ground.

Top: Flooding in Yalding, Kent (2013)



### What is the answer?

The Short-Term Adaptation for Long-Term Resilience to Climate Change (STAR2Cs) project was developed to tackle this implementation gap. Interreg 2 Seas member states worked together to co-create the 'STAR2Cs Solution' by drawing on our diverse expertise, approaches and local experience in long-term planning.

The STAR2Cs cross-border solution is evidence-based and identifies a range of

different mechanisms to deliver cost-effective adaptation. It aims to increase stakeholder knowledge, enabling participation in 'future-proofed' decision-making, and demonstrate successes and cost-savings of integrated adaptation actions.

By providing a suite of tools, services and tried-and-tested pathways, the project supports wider application of adaptation solutions.

Our experience has shown that our 'STAR2Cs solution' is transferable across and within national boundaries, and gives organisations and communities the ability to deliver adaptation measures in the short-term. We are confident that project partners will continue to disseminate and embed the STAR2Cs solution into decision-making processes across the 2 Seas region.



Above: STAR2Cs Partners on the Maarkebeek site visit

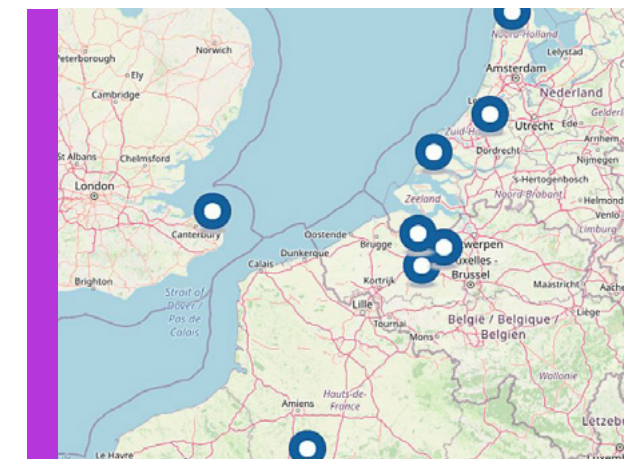


Figure: Map of the STAR2Cs pilot areas

Top: STAR2Cs Partners at the Initiation Meeting





Agence d'urbanisme des Vallées de l'Oise

## Spotlight on architecture

France is subject to natural hazards whose magnitude and damage continue to increase due to climate change. Flooding is considered to be the most significant of these, putting one-third of the population and an estimated 10 million jobs at risk<sup>1</sup>.

### Resilient territorial spatial planning for flood risk prevention - from resistance to resilience

France's long Atlantic and Mediterranean coastlines and extensive river network mean its urban areas are highly exposed to river, tidal, and groundwater flooding. These natural risks are exacerbated by anthropogenic risks, such as stormwater runoff and the failure of flood control infrastructure, caused by ongoing urban sprawl and increasing human activities.

To address these combined threats, the French government has introduced a series of risk prevention and management policies, which have evolved over several decades.

Flood prevention actions initially focused mainly on protection through control structures. These proved limited in terms of effectiveness and

resistance, and quickly gave way to new strategies based on risk recognition and resilience. New prevention tools were introduced, particularly following the implementation of the European Directive and its incorporation into French law in 2010 following the Grenelle II Act.

<sup>1</sup> Source : Ministry of Ecological Transition, France

Top: Oise Valley, France

## The consequences of climate change in the Oise Valley

The Oise Valley, located 35km north of Paris, is home to an urban and industrial network that has developed along streams and on areas at risk of flooding. Major flood events in 1993 and 1995 were the largest ever recorded in France, resulting in considerable loss of human life and significant material damage.

Following these historic disasters, the Flood Risk Prevention Plan

(Plan de Prévention du Risque d'Inondation) was developed to supervise urban development in flood-prone areas of the Oise Valley. This set out building regulations and spatial planning policies aimed at reducing risks and potential damage (direct and indirect) caused by flooding. However, accelerating climate change over the last 25 years means floods that were once described as 'exceptional' have become more frequent and abrupt.

Urbanisation and the increase in impermeable surfaces have made the region more vulnerable, with existing defence mechanisms becoming increasingly inadequate. Against this backdrop, the Ministries of Housing and the Environment ran the national workshop 'Renewed Territories Exposed to Risks' in 2014; the Compiègne-Creil region of the Oise Valley was selected for its particularly high flood risk.

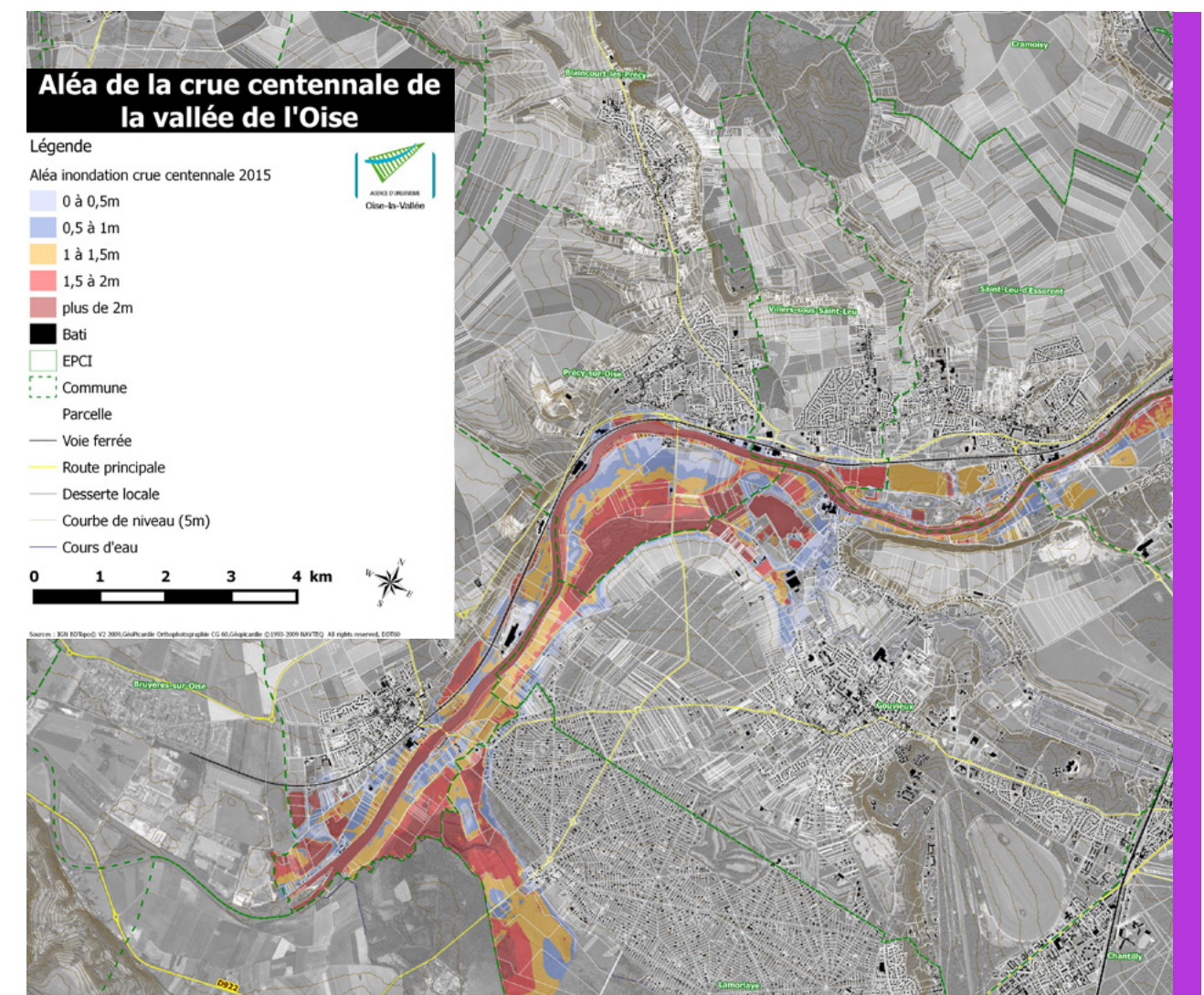


Figure: Flood hazard map of the Oise Valley



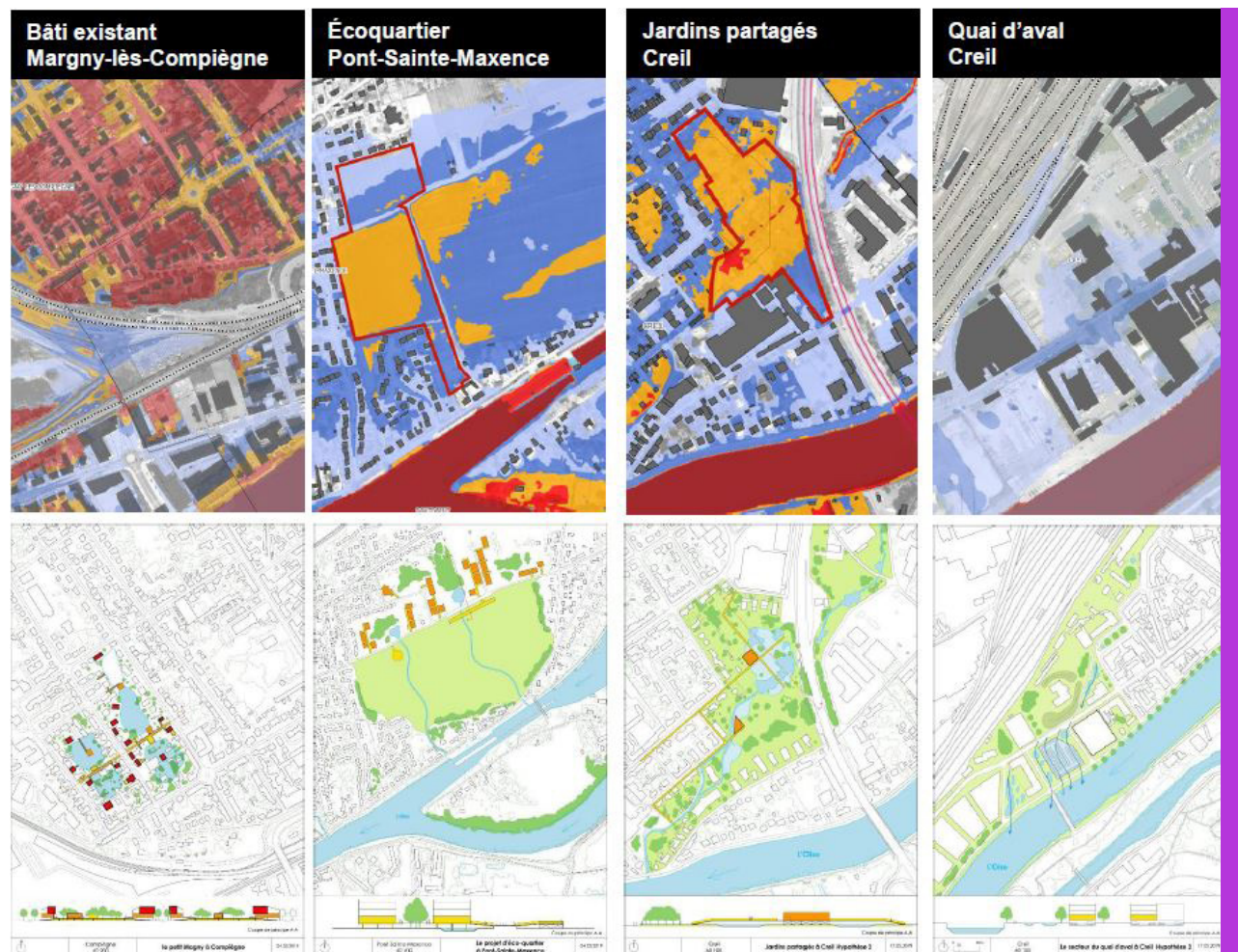


Figure: Flood hazard and spatial planning maps of sites in the Oise Valley

### The Oise Valley Urban Planning Agency - a local tool to promote resilient spatial planning

The Renewed Territories Exposed to Risks workshop was led by the firm OBRAS in collaboration with the Oise Valley Urban Planning Agency. It allowed regional government and the urban areas of Compiègne and Creil to work together on incorporating flood resilience into flood prevention and control guidelines. Several smaller local workshops, bringing together elected

officials and planning and development stakeholders, also took place.

The Oise Valley Urban Planning Agency has also been involved in flood-related climate change adaptation. Its interdisciplinary approach to regional development challenges makes it an important advisor and mediator alongside local stakeholders for clearer

understanding of risks in planning policies.

Participating in the STAR2Cs project allows it to scale up local concerns to the European level. The project also enables it to bring together local stakeholders to design concrete regional resilience solutions that have applications in areas with similar risk profiles.

### Urban resilience - potential solutions through STAR2Cs

For its local STAR2Cs pilot, the Oise Valley Urban Planning Agency analysed resilience in three different contexts: (1) on a 'small' scale by applying it to buildings and the urban environment; (2) on a 'large' scale by assessing the vulnerability of roads and utilities; and (3) 'multiscalar' approaches to ensure coherence of interventions at the level of the entire drainage basin, and to foster solidarity between higher and lower zones.

The first part of the study, carried out in 2019, focused on resilient spatial planning. In collaboration with local authorities and Eric Daniel-Lacombe, an architectural specialist in spatial planning for flood-prone areas, the Agency proposed case studies in nine sites across the Oise Valley. The analysis made clear that practical solutions to develop novel forms of urban resilience emerge through dialogue and cooperation.

The study also highlighted the importance of specific regional factors when building resilience; for example, buildings where architectural solutions can be most effectively applied without major difficulties. However, interventions at the individual building/plot level are limited as responses to systemic, regional vulnerabilities: the block (or neighbourhood) scale seems more appropriate in terms of policy focus. At this level, it is possible to develop synergies between built units and thus enhance the resilience of the wider block or neighbourhood.

The 'large' scale, corresponding to the whole valley, represents another level of complexity. It encompasses the entire urban system, where the interconnection of diverse stakeholders and activities is at the very core of the territory's vulnerability. At this level,

all stakeholders must work together to accomplish concrete, coherent and complementary solutions.

Through STAR2Cs, the Agency has taken a first step in an extended, valley-level consultation. Through analysis of transport, utilities and infrastructure networks, the Agency has produced a series of vulnerability maps. The results should be debated with other stakeholders to achieve a shared knowledge of vulnerabilities. Eventually, this effort aims to raise awareness of common weaknesses, develop a collective memory, and share tools designed for regional resilience. However, it should be noted that reducing the region's vulnerability depends on stakeholders' commitment, and their effective organisation within spatial planning processes.



Figure: Examples of resilient design and infrastructure





Gemeente Capelle aan den IJssel

## Provoking politicians

**W**hen the STAR2CS project began, there were still doubts across Europe about climate change and the need to take local action. Many, were unconvinced by climate science, and unwilling to pay it much attention. They believed that measures to mitigate or adapt to climate change would be costly and negatively affect economic growth and prosperity - beliefs echoed by large sectors of society. This made it difficult to implement policies and actions to deal with climate change, especially when such measures typically require a perspective far beyond the time-span of electoral cycles. However, over the last four years, much has changed.

Those provoking politicians - encouraging decision makers to adopt long-term solutions

Across Europe, public opinion on climate change and its impacts has shifted enormously. Although some still deny anthropogenic climate change, or downplay the magnitude of its impacts, they are an ever-dwindling minority. Now, many political parties

locally, regionally and nationally acknowledge the importance of tackling climate change, respecting the Paris Agreement and fulfilling obligations to reduce CO2 emissions. With people increasingly linking drought, extreme weather, hotter summers

and warmer winters to climate change, politicians can no longer ignore the issue, or subordinate it to short-term economic growth priorities. This has opened up new political spaces where climate issues are debated and acted upon, which the STAR2Cs project

Top: Consultation event in Capelle aan den IJssel

partners have played an important role in creating, influencing and expanding. Through networks of local and national partners, they are increasingly able to disseminate their knowledge and expertise to a wider audience.

Crucially, they can also reach decision-makers who are increasingly willing (or required) to take climate adaptation action. Politicians are under increasing pressure both from above, through international climate agreements, and below, from the citizens they represent.

The question of whether action is necessary is essentially settled: what increasingly concerns politicians now is knowing which actions to take. They want to see a direct link between a given measure and its results. They are worried about the impacts of climate change on their own constituencies, and

the potential consequences of not fulfilling their Paris Agreement obligations. However, most are not climate experts. The STAR2Cs partners have increasingly realised the importance of using clear visual and interactive material to help these decision-makers understand the challenges we face and possible solutions.

Interactive tools and workshops have helped partners design solutions alongside decision-makers, and assess the impact of countermeasures compared to the costs. Keeping politicians in the loop is crucial for discussing and re-evaluating plans and ideas. If they are engaged, they will more readily support adaptation plans. Through targeted and tailored engagement, politicians and decision-makers responsible for water management are more committed, willing and able to play a significant role in co-creating adaptation measures.

As a result, sustainable water management can be better integrated into long-term planning.

Politicians now see the reality of climate change and the importance of taking long-term actions. However, they now present a new, albeit positive, challenge in that they are less easily convinced that our proposals will produce the results we need to achieve. They are often concerned about getting value for money, given other important and competing objectives, and increasingly worried about their ability to meet Paris Agreement targets. However, the political current is now moving in the right direction. We must continue to develop effective strategies to engage politicians; something the STAR2Cs partnership has helped to do through learning from each others' experiences.



Above: The Hollandsche IJssel River, the Netherlands





De Vlaamse Waterweg NV

## Room for Water Dender Valley

**The strategic plan 'Room for Water: Dender Valley' aims to reduce flood risk, increase resilience and guide future developments in the area. It also looks beyond risk reduction, promoting actions that bring wider environmental and socioeconomic benefits.**

### The Dender Valley's strategic plan 'Room for Water'

Room for Water is an integrated, cross-sectoral development strategy, reflecting the complex social, ecological and hydrological interdependencies within the Dender Valley. Watercourse managers alone cannot solve the flooding problem; it requires the involvement and active input of numerous

stakeholders, including local authorities, civil society and citizens.

Given the spatial complexity of the flooding problem in the Dender Valley, three partners - De Vlaamse Waterweg nv, the Flemish Department of the Environment and the Province of East Flanders - have joined forces to

create and implement the plan. Through workshops, consultation with residents, design research and supporting model instruments, we explored the challenges, opportunities and possible building blocks we can use to develop alternatives within an integrated approach.

Top: The Dender River, Flanders

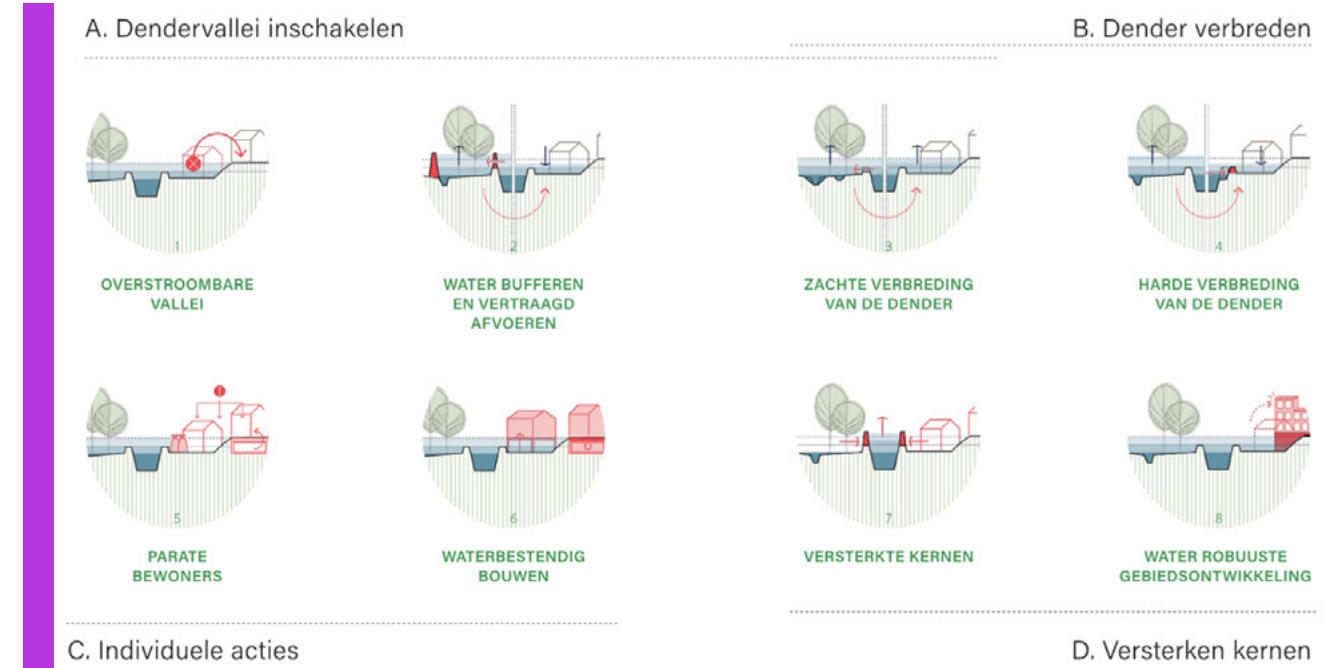


Figure: The eight building blocks for integrated resilience

### The process approach

The process approach for creating the strategic plan is based on research-by-design, co-creation, openness, and consultation. We hope to foster high-quality engagement to reduce flood risk with maximum stakeholder support and wider societal, economic, and environmental benefits. As a first step, we set out the strategic plan's mission and goals in several, measurable objectives we called

ambitions. To realise them, we proposed eight concepts of possible measures, or building blocks. These were based on the findings from our earlier exploratory phase, work sessions, stakeholder discussions, design research and surface-water modelling.

During the first half of 2021, we will use these building blocks to create various alternatives to meet the strategic plan's goals.

From Autumn 2021, we will assess these alternatives to evaluate their contribution to reducing flood risk and creating social, economic and environmental added value. This will lead to a proposal in 2022 for a preferred alternative to be submitted to the Flemish government. Following approval, and with partner and stakeholder collaboration, we can start to prepare and implement the measures.

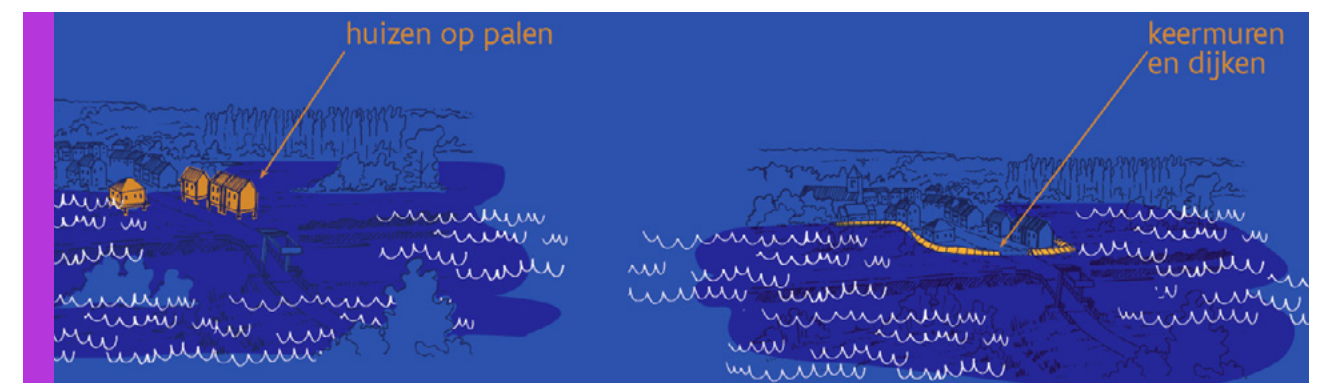


Figure: Examples of resilience measures





Kent County Council

## The Adaptation Catalyst

The Adaptation Catalyst is a decision support tool designed to aid professionals in delivering local action to adapt to climate change. Through a dynamic adaptation pathways approach, it provides insights on how best to implement adaptation measures through incremental, integrated actions, within the uncertainty that climate change presents.

A tool for visualising different possible futures

Designed for both experts and non-experts, the tool can help to demonstrate:

- How/if adaptation can be combined with regular asset management works
- Choices between different types and packages of adaptation measures (e.g. green or grey)
- Actions that must be taken today, and those for the future
- Drawbacks of not taking actions to adapt to climate change



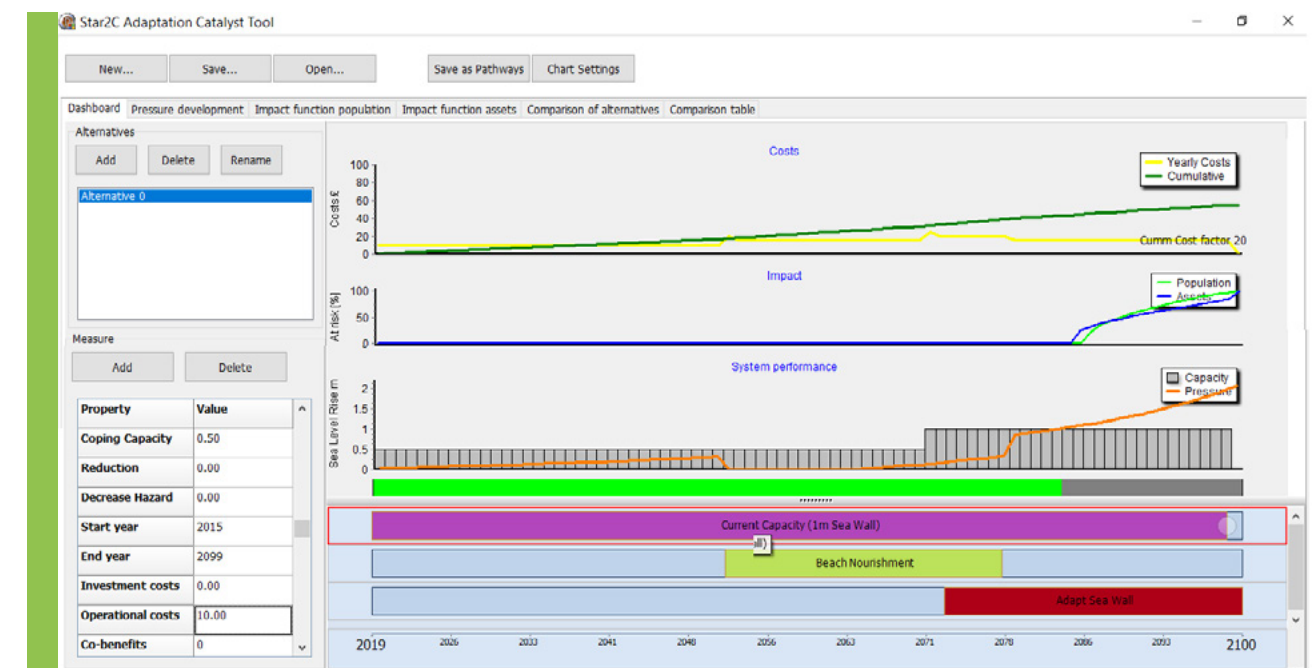
Above: Thames Barrier in London, UK

Top: King's Stairs in Margate, UK

The tool allows users to visualise the effectiveness of different adaptation measures (for example increasing the height of a sea wall) over time and shows the tipping points beyond which measures will no longer be effective. It is widely applicable across a range of different scenarios and climate risks including specific climate variable, sector, adaptation

type/action, spatial scale, and data precision (exact figures or a relative scale). A key feature of the tool is its ability to be tailored to different users depending on levels of knowledge. The tool is not restricted to experts and can be used as part of a storytelling process to start conversations on climate change adaptation without the need to gather large amounts of data. On

the other hand, it can also be used by technical experts who hold specific data to develop accurate adaptation pathways and model options. Interest in and use of the tool is high and ever increasing across the 2 Seas region, as users continue to recognise the value it can bring to often challenging discussions around adaptation actions and possible climate futures.



The Adaptation Catalyst dashboard. To download the tool and use in your own region visit: <https://publicwiki.deltares.nl/display/AP/Adaptation+Catalyst>

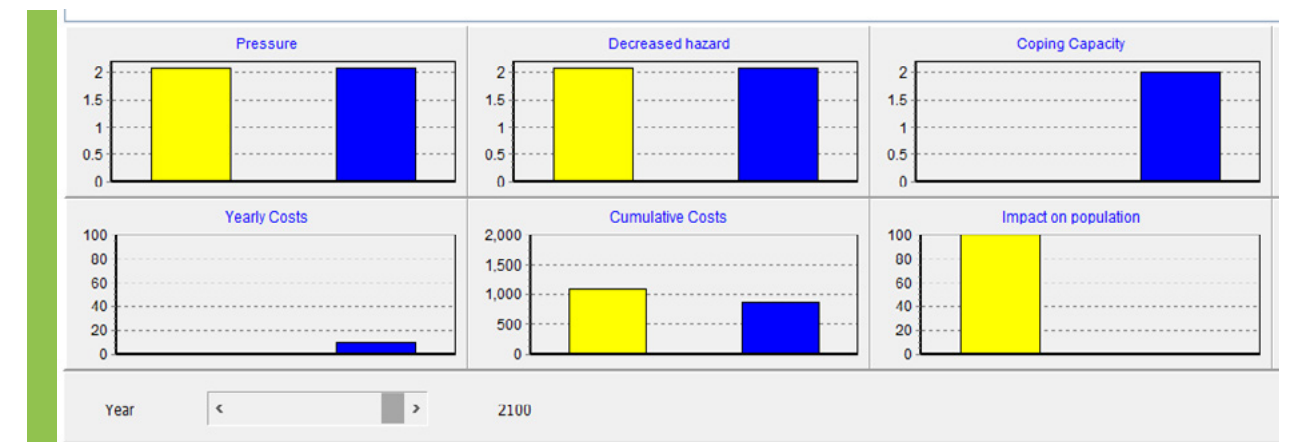


Figure: The Adaptation Catalyst scenario comparison



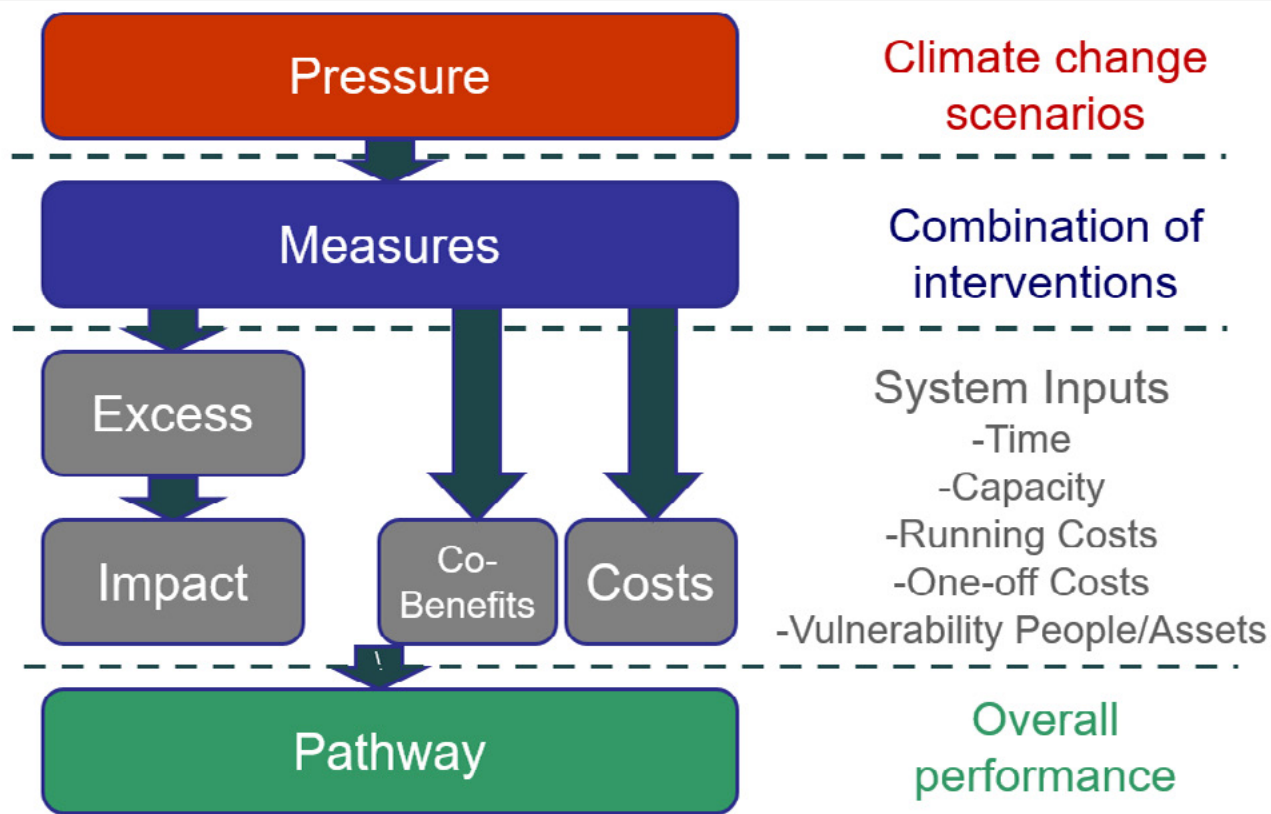


Figure: Conceptual model of how the Adaptation Catalyst works

### Using the Adaptation Catalyst for long-term planning

Being a great technical innovation is not in itself enough to make a climate initiative successful. It needs to be internalised in both asset managers' portfolios and in the policy-making process.

Many climate initiatives fail because they do not adequately consider the circumstances asset managers face when designing new projects. At the same time, asset managers themselves may

not take into account the political realities of policy-making.

Policy-makers will not automatically adopt even a good technical solution; it has to make sense on a policy-making level. In many cases, great ideas are overlooked in favour of cheaper, less effective actions simply because they are not framed correctly. Politicians with numerous decisions to make often choose cheaper, short-term

options because they have not considered the long-term costs.

Working with Marco Hoogvliet from Deltares, we developed the Adaptation Catalyst as a way of encouraging policy-makers to systematically incorporate and compare lifecycle costs of different courses of action in long-term climate planning.

In this case, the Adaptation Catalyst shows that climate dynamics will affect the region soon if no action is taken (current situation). Business-as-usual (for example, re-raising soils) is just enough to cope, at a cumulative cost of 124 million Euros by 2085.

However, the lightweight materials option (Bufferblocks) has both a much greater adaptive capacity and is less expensive in the long-

run (just 76.5 million Euros) owing to its lower maintenance costs and longer lifespan.

Using this method, we can demonstrate to decision-makers that using Bufferblocks (discussed in more details on page 16) is actually cheaper in the long-run - plus, there are other co-benefits from using these materials.

We believe the Adaptation Catalyst can help politicians,

policy-makers and financial officers better understand the long-term consequences of their decisions and reshape how the 'bottom line' is interpreted over a longer period.

### 1: Increase Coping Capacity

### 2: Decrease Sensitivity (Vulnerability)

### 3: Decrease Hazard



Figure: Conceptual model of the types of adaptation integrated into the Adaptation Catalyst





Gemeente Capelle aan den IJssel

## Bufferblocks

In August 2020, five colleagues from the Municipality of Capelle aan den IJssel visited Waterstraat at the Delft University of Technology. This is a new 'experimental living lab' where government bodies, entrepreneurs and knowledge institutions are working together to develop practical solutions to climate adaptation. We were looking for workable flooding solutions that addressed long-term resilience in our region.

### Why our municipality chose new technology

The idea was to find inspiration for a new project in the Arica area of Capelle aan den IJssel, which became our pilot for STAR2Cs. The problems in the municipality are complex.

The soil is like a sponge and subsides, so needs to be raised every 10-30 years so inhabitants can get into their doors and garages.

Using soil is the cheapest

way to do this in the short run. However, soil is heavier than the layers underneath, so using it simply speeds up the compaction process; the more soil is added, the heavier the top layer becomes and the more often it requires raising again.

In the long run, therefore, soil is actually more expensive: lighter materials are better.

The area is below sea level, and the groundwater needs to be high in order to combat subsidence. This is a challenge since the area is also prone to heat stress and drought.

However, during heavy rain, water needs to be held in the area so it does not all go to the drainage/outlet pool (boezem) at once. This is difficult to manage with the groundwater level just 50cm below the surface.

Top: **Bufferblocks being installed**

At Waterstraat, we first saw a presentation of the Bufferblocks and were impressed. These provided everything we needed as a water storage solution for flood management, but with one major disadvantage: they were made of concrete, not the lightweight material we required.

However, the Bufferblocks offered so many positive solutions for our pilot area that we investigated the possibilities further and concluded:

- We did not need a deep top layer of Bufferblocks, making their potential use cheaper and lighter.
- Traditional box systems are made of plastic which, though lightweight, cannot support heavy traffic and needs a deep layer of drainage sand on top – something we could not accommodate in the Arica area of Capelle aan den IJssel.
- In contrast, the concrete Bufferblocks are strong enough for big trucks to drive over, making them suitable to use in a normal street. Furthermore, concrete does not weather like plastic and is less harmful to the groundwater.
- The large openings in the concrete are excellent for water retention (266 litres per square metre).
- The blocks can be cleaned with our normal sewer equipment.
- The blocks generate less stress on the boezem system in heavy rainfall. Water is trapped faster and retained in the area for longer.
- Following calculations, the Bufferblocks were surprisingly lightweight at 950kg/m<sup>3</sup> – actually lighter than some 'lightweight' filling material.



We decided to place the Bufferblocks in a typical neighbourhood street, where they do their job, without being seen. They are easy and cost-effective to install and maintain, and we expect them to perform better than sand and lightweight materials over time, making them cheaper per year than traditional solutions. This is, of course, the objective of the STAR2Cs project: to finding robust, cost-effective, short-term adaptation solutions that can outperform traditional methods. After all, the Stone Age ended not because we ran out of stones, but because we found better solutions!

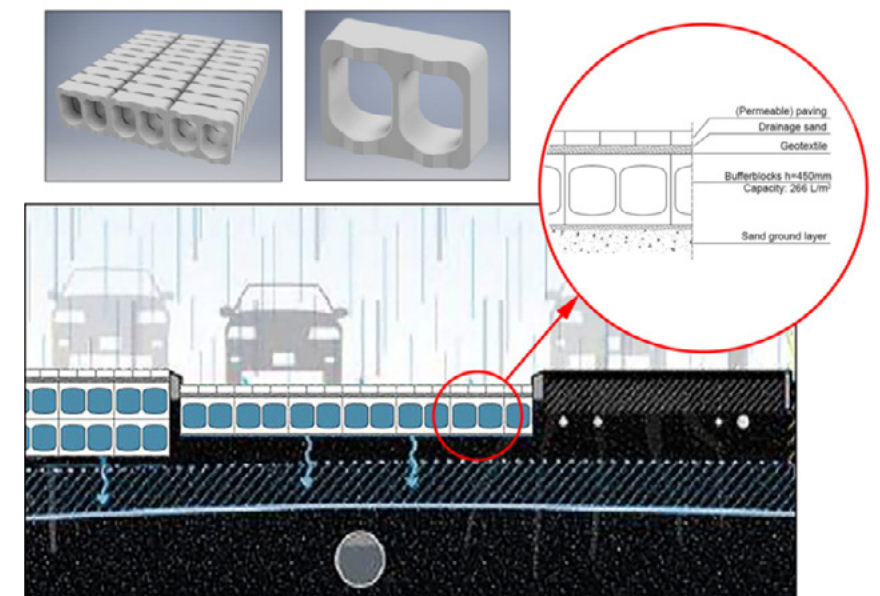
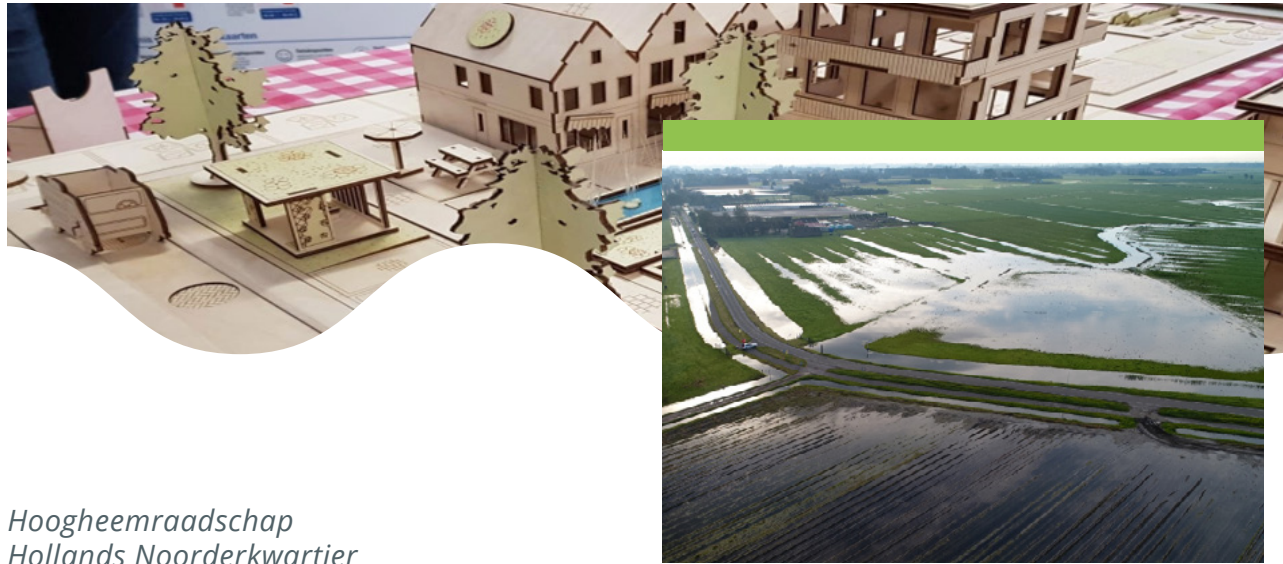


Figure: **Bufferblocks cross-section**

Top: **Water Street sign**





Hoogheemraadschap  
Hollands Noorderkwartier

## 3Di-modelling

**H**oogheemraadschap Hollands Noorderkwartier (HHNK) is the regional authority for water management in North Holland. It is constantly working to create and maintain a water system able to retain, store and transport excess rainwater out of polders<sup>2</sup>. The water system of tomorrow, however, faces increasing challenges from climate change and urbanization. These require adaptive solutions in both the water system and the design of public space.

### Simulating hydrodynamics

Within the STAR2Cs project, HHNK has worked on a new three-step 3Di-modelling approach that provides insights into future flood vulnerability, and tests potential solutions.

Firstly, a 3Di hydrological model<sup>3</sup> is built using data

on water channels, pumps, weirs and culverts from HHNK and public sources. This is assimilated into a 1D model that simulates water flow through the system. Spatial data on land use, elevation, groundwater, friction, and infiltration are added in a separate, but

integrated 2D model that simulates surface water flow.

In the second step, the model simulates 18 different climate scenarios, based on rainfall event duration (two hours or two days), chance of

<sup>2</sup>Source Low-lying tracts of land enclosed by dykes that form an artificial hydrological entity.

<sup>3</sup>Source 3Di is a hydrodynamic simulation of pluvial, fluvial and coastal floods. The name 3Di refers to the integration (i) of a one-dimensional (1D) model and two-dimensional (2D) model. For more information see <https://3diwatermanagement.com/>

Top: **A field in North Holland**

occurrence (every 10, 100, or 1000 years) and initial groundwater level (low, average or high). The simulation results are aggregated to produce flood maps; input from land use maps and damage curves predict flood vulnerability and potential impacts.

The final step involves creating a new model incorporating different potential measures. Comparing the potential damage under the old and new models allows a cost-benefit assessment to be

made for each intervention. Over the past three years, HHNK has used this approach to create 3Di models for 57 separate polder systems, generating 1,028 climate scenarios and evaluating over 250 potential measures. Each model can be used to run live simulations which help assess failure mechanisms or potential solutions with partners. The models are especially useful to municipalities in assessing the efficiency of blue and green infrastructure to increase urban flood resilience.

The process has been automated to such an extent that new models and simulations can be created and run rapidly from our own systems. This allows HHNK to be versatile in testing new measures, adding sewage system and other data from partners, adapting to new climate scenarios and testing for different kinds of scenarios, such as a dyke breach. It also allows HHNK to shift the focus from the management of data quality to in-depth analyses to better understand our

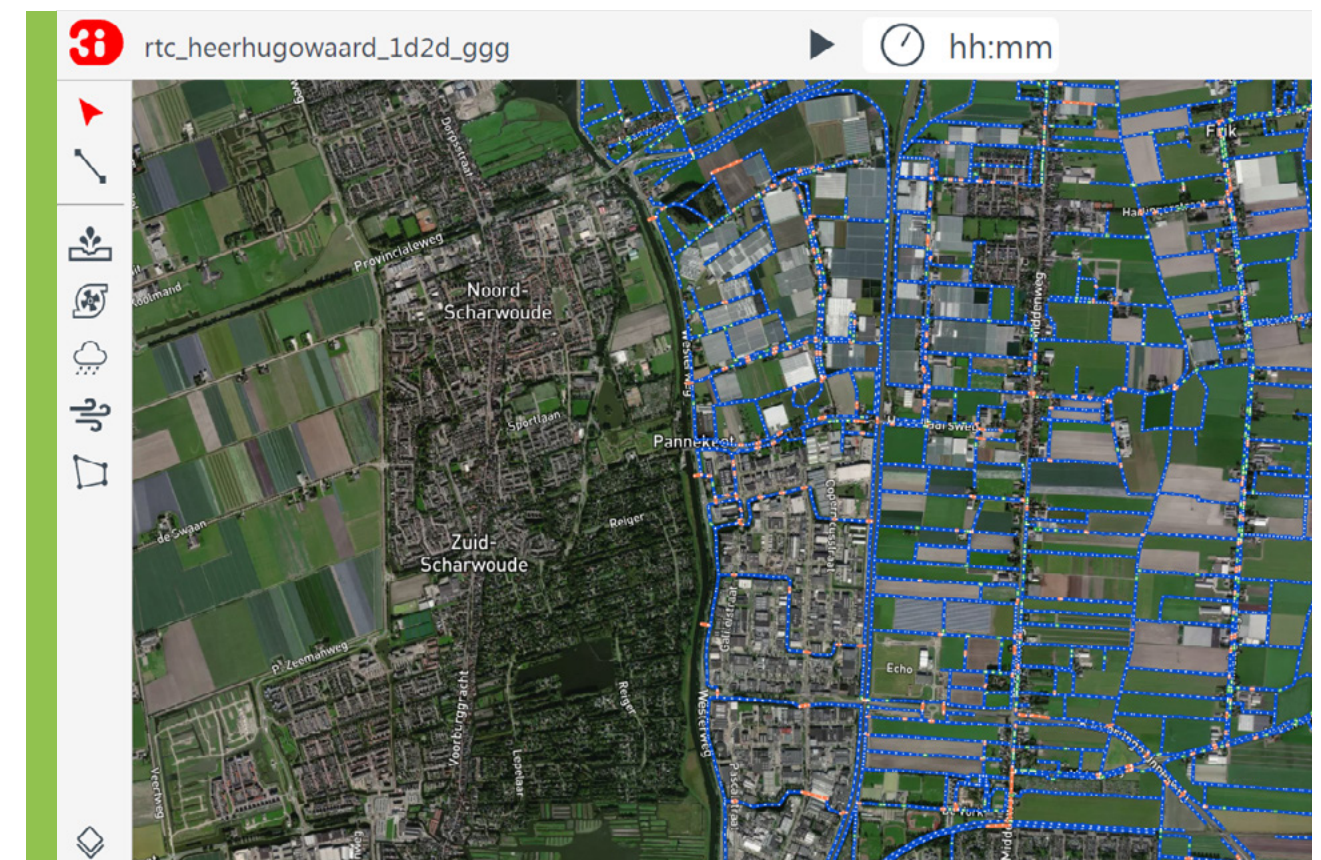


Figure: **The 3Di model in action**





Vlaamse Milieumaatschappij

## The Flood Test

**T**he Zwalm river basin, in the Belgian province of East Flanders, is prone to flooding. The costs and damages are predicted to rise due to climate change. While not the largest river in Belgium, this area provided a great opportunity to explore an individualised solution approach for local citizens.

### Obstacles to persuading citizens to invest in household flood measures

People living in flood-prone areas are not powerless and have various means to prevent water damage to their properties. These options, however, are not always widely known about, or easily affordable. Since 2015, the Flanders Environment Agency (VMM) has explored different ways to support households across different pilot zones in Flanders.

We found few citizens in the pilot area had the expertise to determine the costs of

adapting their homes to prevent flood damage. However, fewer residents than expected took up the offer of a free cost assessment and/or followed up by investing in their homes. We wanted to know why, and what we could do about it.

In the past we had worked with municipalities that, following our advice, provided subsidies for citizens to make flood adjustments to their homes. Was this still an effective

strategy, or did we need to change our approach? To find out, we commissioned a study to see whether the combination of advice with the prospect of a subsidy was the main motivation for people to adapt their homes.

The results were surprising. Three-quarters of those who received advice implemented changes to their home within four years.

Top: **Flood door**

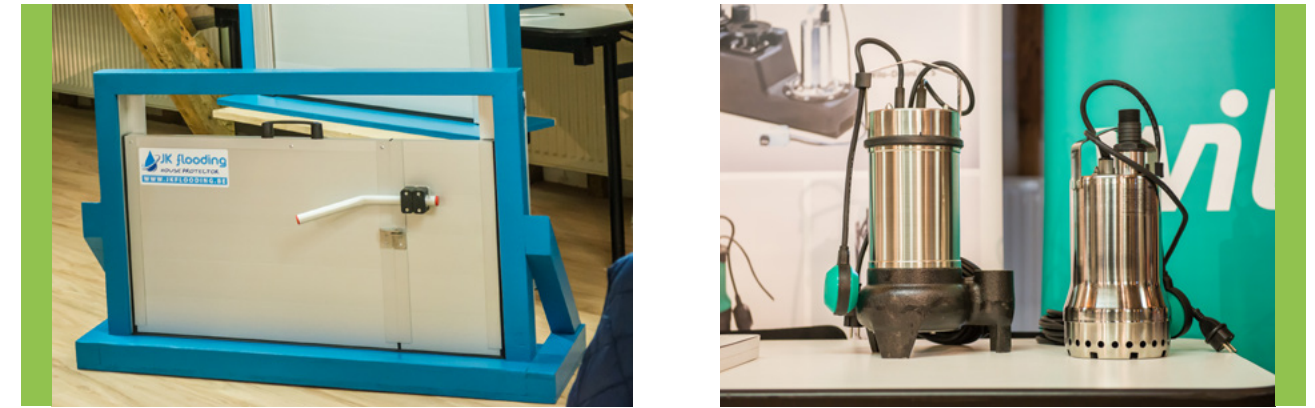


Figure: **Property flood resilience measures**

However, the prime motivator was not the prospect of a subsidy, but rather an increasing risk of flooding. We also revealed a lack of public awareness regarding home adaptation possibilities and needs, before being provided with tailored advice. Put simply, those who had experienced flood damage in the past were more alive to the potential dangers.

These results convinced municipalities in the Zwalm river basin that rather than focusing on subsidies in their public outreach, the

money could be better spent on other flood mitigation measures.

As a result of the study, VMM modified its approach for encouraging people to make flood adaptations to their homes. Knowing that public awareness was a motivating factor, we created a website ([www.zwalmbeek.riviercontract.be](http://www.zwalmbeek.riviercontract.be)) with an online test for people to check whether their homes were or would be in danger of flooding given climate change projections. Over 800 people completed the test:

more than 85% wanted more information on what they could do to prevent flood damage to their homes.

As water managers, we should not assume that people living in flood-prone areas are fully aware of the threats they face. Our experience shows the best way to start engaging and convincing them is to talk to them about the risks of water damage to their property, now and in the future.



Figure: **Raising public flood risk awareness with the <https://zwalmbeek.riviercontract.be/>**





Provincie Oost Vlaanderen

## Stakeholder analysis

In STAR2Cs, we developed a tool to help project planners identify key stakeholders, then develop a targeted level of participation for them, from informing and consulting, through advising and co-creating to co-decision-making. The tool does not decide for you or replace you; it supports your project team when thinking about and planning stakeholder engagement.

A targeted participation strategy in the Province of East Flanders

At the start of our pilot Zwalmbeek River project, our project team discussed the role of citizens in creating a river contract. We realised from the outset that we wanted them significantly involved but struggled to decide whether this should be at the level of advice, co-creation or even co-decision (for example, giving them a seat on the project steering committee). This struggle was where the idea for the tool came about.

Stake (personal or professional)	Expertise added value	Expertise crucial or formally needed	Key role in implementation of the final plan	Should co-finance the final plan
<i>The person or organisation has a stake in this project, i.e. is affected by the implementation of the actions of the final plan.</i>	<i>The stakeholder's expertise provides added value for the development of the plan.</i>	<i>The stakeholder's expertise is crucial or even formally obliged for the development of the plan.</i>	<i>Stakeholder is responsible for the implementation of actions of the final plan, i.e. as a "project manager", rather than as an individual actor who needs to execute specific actions.</i>	<i>Stakeholder should co-finance (a substantial amount of) the actions of the final plan</i>

Figure: Stakeholder analysis tab of the tool

By evaluating stakeholders' expertise, roles and financing within the project we saw we would need to differentiate between specific stakeholder groups. For example, for citizens in high-risk areas, the river contract would have real impact, since it could make the difference between being flooded or not. They would probably also need to contribute to

Top: Stakeholder meeting in Flanders

the solutions, perhaps by investing in flood protection for their buildings and participating in an early warning system. Conversely, citizens at no risk of flooding would not feel the impact of the river contract so directly. At the same time, they would also benefit from actions that, as well as of reducing flood risks, contribute to the quality of public space or new recreational possibilities. While they would not need to invest in protecting their homes, they could be part of the solution by enhancing their properties' infiltration capacity.

The tool gave us enough guidance to decide on the actual participation level we wanted with different categories of citizens. It showed the minimum participation level for citizens with no flood risk would be to actively inform them of the project. Citizens at high risk of flood, on the other hand, would need to be engaged at the level of 'advise' as a minimum when thinking about the river contract's development.

However, as the project continued, we realised we could not protect certain flood-prone areas with large-scale measures such as controlled flooding zones. Although individual protection measures are important in all flood-risk areas, they would become crucial in these specific locations. The question also arose as to whether some of these houses could or should be maintained in the long term. In this situation, the role of individual citizens becomes incredibly important, both in terms of the impact upon them and in the implementation, and possible financing, of protection measures. Applying the tool again for this specific 'sub-project', the recommended participation level increased to 'co-create and - depending on the answer to the financing question - even to 'co-decide'.

Participation level	Description	Examples of possible methods / instruments
<b>Inform</b>	<i>The stakeholder is informed on the proceedings of the process.</i>	<i>Website, newsletter, brochure, one-way communication tools</i>
<b>Consult</b>	<i>The stakeholder is informed on the proceedings of the process and can phrase his concerns with respect to the project. The project team will take his concerns into account, but does not guarantee that they will be met.</i>	<i>Interactive part of the website, information market, public site visits/walks, world café</i>
<b>Advise</b>	<i>The stakeholder is asked for his advice on the project. The project team will take this advice into account and guarantees to communicate a motivated decision with respect to his advice.</i>	<i>(In)formal request for advice (e.g. bilateral meeting, telephone call, e-mail request), online stakeholder survey</i>
<b>Co-create</b>	<i>The stakeholder is invited to actively work on the development of the plan together with the project team and other stakeholders.</i>	<i>Stakeholder workshops, bilateral meetings</i>
<b>Co-decide</b>	<i>The stakeholder can steer the process of the development of the plan, i.e. the stakeholder has a "vote" in the decision process concerning contents and/or budget of the plan.</i>	<i>Member of steering committee</i>

Figure: Stakeholder participation levels with descriptions and example methods/instruments

This example shows that the stakeholder analysis tool can be part of an iterative and dynamic process of stakeholder management. The role of stakeholders can change during the different phases of the project, and also vary with respect to different sub-projects within a complex project.





Hoogheemraadschap  
Hollands Noorderkwartier

## Policy work and water management

**W**ithin the STAR2Cs project, Hoogheemraadschap Hollands Noorderkwartier (HhNK) has worked on better understanding flood risks related to climate change. Through stakeholder engagement with new tools (see article on 3Di modelling) we have learned the different roles stakeholders can play in reducing the impact of climate change. We have also assessed the contribution that our organisation and government policies can make to address flood risk at a local or regional scale. We have identified three universal principles or ideas we believe should be considered when reviewing local and regional flood risk policies, especially in the light of climate change.

Stakeholder roles change depending on the extremity of the event

As long as water infrastructure is designed for a specific event, water managers can channel excess water out of the system. However, when an event surpasses these design limits, the

focus turns from flood risk prevention to flood risk control. Our flood simulations show that in many Dutch polders, it is cheaper, and safer, to allow certain areas to flood than to invest in ever-larger

infrastructure. Flood risk control must therefore focus more on spatial planning, with planners and water managers working more closely together. In preparation for an extreme event, spatial planners

Top: **Flooding in North Holland**

can, for example, assign areas that are allowed to flood, then communicate with relevant stakeholders (property owners, farmers, insurance companies and others) and organise fair

compensation. Water managers can prepare the necessary infrastructure to facilitate controlled flooding. Changes in flood preparation planning also affect roles during and

after the event. To properly organise new forms of collaboration, contingency plans and planning should include clear conditions under which roles change, and in what ways.



In extreme events the sphere of influence of human action is reduced

There are limits to the extent to which people and infrastructure can be protected. Flood risk policy should therefore define, as accurately as possible, the accepted level of risk and how that risk is managed.

As well as measures to reduce risk, they also need to set out how to control and accept a certain level of risk when normal limits are surpassed. For example, when water cannot be transported out of a city

quickly enough, it should be stored in places where it causes minimal danger and damage. If designated zones are allowed to flood temporarily, buildings and infrastructure can be adapted accordingly.

Managing extreme flood risk means that we need to find new ways of working together

With improved understanding of temporal and geographical dimensions of risk, it can be reduced by being managed and distributed among stakeholders. This requires new agreements/

contracts, particularly between high economic value (often urban) areas and lower economic value (often rural) areas. When conscious choices are made to manage risk, clear and open communication

between involved parties is essential. Stakeholders that confront increased risk should be compensated by stakeholders for whom the risk is reduced.

Top: **Flood and water management exhibition**





Provincie Oost Vlaanderen,  
Vlaamse Milieumaatschappij

## Two River Contracts

**T**he Flemish Environment Agency and the Province of East-Flanders are jointly coordinating a pilot project in the Zwalmbeek river catchment in East Flanders. It aims to co-create a 'river contract' with a broad range of stakeholders, containing commitments to collaboratively define and implement concrete actions to reduce flood risks in the short and long term. These actions may vary in scale from small, such as stewardship for a specific stream by an individual, to substantial; for example, a water manager developing a new controlled flooding zone. A key guiding principle is that all stakeholders themselves, be they citizens, farmers, NGOs, water managers or government authorities, will define the actions they are willing to commit to.

### Lessons learned in two river contracts in Flanders

To encourage effective implementation of the river contract, we have invested considerable time and effort in the co-creation process. This is based on the conviction that only when stakeholders, including citizens and politicians, are fully aware of the

problem will they be willing to think seriously about solutions - and, ultimately, commit to actions. The latter is crucial given that effective multi-layered water security, encompassing prevention, protection and preparedness, is based on shared responsibilities.

We formed a steering committee of local, provincial, and regional authorities to manage the project, and help develop a sense of ownership right from the start. We also regularly presented updates to all the city councils involved, having learned the

Top: Signed River Contract for the Zwalmbeek



importance of being aware of political sensitivities on a similar project in the Maarkebeek valley. Although highly innovative and well-received, this project did not result in a river contract validated by local authorities. This was partly because the final plan covered the entire valley system and included actions some residents and businesses objected to, making it difficult for local politicians to approve it.

Accordingly, rather than being an all-encompassing vision for the valley, the Zwalmbeek river contract focused on actions to reduce flood risk, based on voluntary, co-created commitments. It also promoted added-value benefits in terms of public space, ecology, recreation and so on.

The project involved both offline and online participation. We invited all residents to take part in an online flood risk test, which gave them an insight into

their current situation, and the potential future risks created by climate change. We then held workshops bringing together a broad range of stakeholders, including citizens, politicians, businesses, farmers, insurance companies, water managers and local, provincial and regional officers, in which we analysed the problem and started thinking about possible solutions.

Based on the findings of these participatory events, we began working on specific themes, such as waterways maintenance and management, and the roles of agriculture and spatial planning. For each area, we set up research-by-design workshops combining round-table sessions with field visits, using the STAR2Cs Knowledge Service stakeholder analysis tool to help us select appropriate stakeholders.

Due to COVID-19 restrictions, we were unable to organise a physical event

to discuss the results from these workshops with all interested stakeholders. We therefore presented intermediate results as short videos on the website, and invited people to provide feedback. Although these reports attracted good viewing figures and some very appreciative emails, only a small number of professional stakeholders booked an online meeting to discuss the results further. As with the online ideation platform, we learned again that this kind of online participation reaches fewer stakeholders than face-to-face events.

In conclusion, while digital media are useful for sharing information - which is crucial to every participation process - the real magic of co-creation still mainly happens by bringing stakeholders together in person, under appropriate conditions.

Top left: Stakeholders working on flood resilience options  
Top right: Signing of the River Contract





Gemeente Schouwen-Duiveland

## The Dos and Don'ts of Climate Dialogue

**T**hrough effective dialogue, local governments can actively engage the public in implementing climate adaptation measures. The form and content will depend on the region and its particular climate-related risks, the people taking part and other context-specific factors. In all cases, the overriding purpose is to improve public understanding and acceptance of adaptation measures in local development plans, and increase public awareness of what they can do in and around their homes. Based on our experience, we have created a list of dos and don'ts to consider when you are organising a public climate dialogue.



Top: Climate game in action

Bottom: Community engagement events

### Dos

- Formulate a clear objective which participants can relate to. This could be to discuss a new construction project, rebuilding, or climate policy development process.
- Use the dialogue to encourage discussion, not simply explain what is to be done. See it as an opportunity to listen to the experiences and perceptions of citizens and stakeholders on climate adaptation issues, not just disseminate information from the top down.
- Adapting to climate change is a joint effort, so involve other stakeholders who benefit from adaptation measures, such as housing companies, developers and other government agencies.
- Use a variety of complementary interventions with different objectives - for example, informing, inspiring or co-creating - adjusted to appeal to different target groups.
- Prepare thoroughly by mapping climate change impacts, through a rigorous, evidence-based assessment of local climate risks.
- Consider digital options when face-to-face dialogue is not possible.



Above: Community engagement events

### Don'ts

- Don't use distant examples. Participants are more engaged when presented with local cases and situations they can directly relate to.
- Don't assume the dialogue will simply proceed as you think it ought to. Use intermediate evaluation(s) to gain insights and make adjustments during the process.
- Don't let the dialogue end abruptly. Participants might require further information or help with implementing the adaptation measures you have been discussing.
- Don't be either too narrow or too broad in your approach, and remain open to examples and experiences offered by participants. Citizens often raise relevant topics not directly linked to climate change adaptation but nevertheless important for its success.
- Don't just invite citizens at random. A well-selected group will generally result in higher attendance, more positive engagement and better-quality dialogue.





Agence d'urbanisme des Vallées de l'Oise,  
Gemeente Schouwen-Duiveland

## Harnessing collective memory

**T**hrough effective dialogue, local governments can actively engage the public in implementing climate adaptation measures. The form and content will depend on the region and its particular climate-related risks, the people taking part and other context-specific factors. In all cases, the overriding purpose is to improve public understanding and acceptance of adaptation measures in local development plans, and increase public awareness of what they can do in and around their homes. Based on our experience, we have created a list of dos and don'ts to consider when you are organising a public climate dialogue.

### Using the past to build resilience

In both France and the Netherlands, the collective memory of catastrophes helps us cope with this reality. It empowers the population with knowledge of how to live with risks, and what to do during extreme weather events - an important element of risk management.

The extent to which people remember and react to flood events largely depends on their impact. Major floods, where lives are lost and homes destroyed, become firmly ingrained in the collective memory, often beyond the lifetimes of those who directly experience

them. In the Netherlands, for example, 2021 sees the 600th anniversary of the Saint Elizabeth flood marked nationally to remember the thousands who died. The nation also remembers more recent events, such as the North Sea flood of 31 January 1953, when sea defences

Top: Climate Wall exhibition

were overwhelmed, causing extensive flooding and the loss of 1,836 lives. Following the disaster, work began on a system of dams and flood defences to protect the southwest of the country against high water; actions such as the Deltaworks and the national 'Room for the River' programme are heavily influenced by the collective memory of 1953.

Such collective memory also plays an important role in preserving knowledge for future generations. Formal acts of remembrance and learning from past experiences maintain awareness of the importance of understanding and mitigating flood risks. This, of course, becomes more difficult when those who lived through natural disasters are no longer with us. However, it is increasingly important for society not just to remember what happened, but also to learn from the

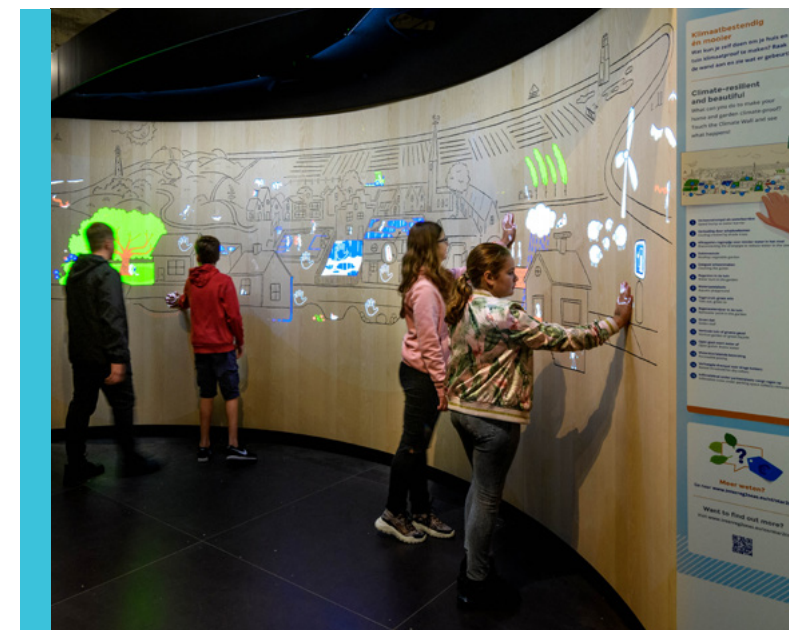
past and ensure it feeds into the policy process to prevent a repeat of the tragedy.

Alongside formal acts of remembrance, the collective memory of flooding in the Netherlands is maintained physically through the landscape. A bike route on Schouwen-Duiveland called 'Battle Against the Water' is widely used and popular with visitors; the Flooding Museum in Zeeland attracts more visitors than any other in the province. By connecting past experiences with real, present issues through museums and other educational programmes, we can reach people and encourage them to make positive change and adapt. This is especially important for those who haven't experienced the negative impacts of severe flooding - and, we hope, never will.

The message 'no more flood' is etched into the

collective consciousness in the Netherlands. We can learn from history and our own power to recover and rebuild. Our hope is that we can use this to proactively adapt to climate change, without needing further tragedy to spur us into action.

In France, responsibility for crisis management is 'legally' shared by the state and territorial authorities. It is based on tools and regulatory mechanisms that frame their structural actions and responsibilities; the resilience of the individual is often absent. Yet the collective memory of people and organisations can be decisive in shaping a society's overall resilience. Preserving it through training, formal acts of remembrance and wider educational activities in the Oise Valley can be vital in ensuring different sectors of society respond effectively to emergency situations.



Above: Climate Wall in action



Above: Historic map of the Dutch coast





De Vlaamse Waterweg

## Achieving public support

**A**t the start of the project we carried out stakeholder mapping with corresponding participation levels. However, important questions remained. How would we translate the project objectives into communication objectives? Which stakeholder groups would we approach and how? What level of participation should we expect and plan for?

### Dender Valley's Strategic Plan 'Room for Water'

To tackle these questions, we divided stakeholders into two groups: Organised (municipalities, NGOs, other Flemish and provincial authorities) and Non-organised (residents and visitors) then created specific goals and engagement strategies for each. We invited our organised stakeholders to join the existing Flemish

Coordination Committee on Integrated Water Policy (CIW) consultation structures for the strategic plan. They have since received biannual reports of ongoing work from the Dender basin steering committee, and taken part in working sessions with the newly-formed 'Room for Water' working group. We have also organised

focus groups, with selected stakeholders examining specific themes, when required. We hope this will ensure each organised stakeholder has the opportunity to share their visions and concerns at each step in the process of creating and implementing the strategic plan.

Top: **Flooding in Flanders**

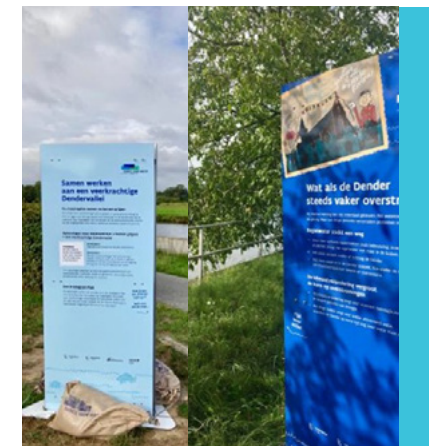
For the non-organised stakeholders, we set two objectives: firstly, to increase awareness of existing flood risk in the Dender Valley; secondly, to encourage people to actively participate in reducing this risk. To achieve these twin goals, we conducted two public information campaigns in 2020. The first was designed to inform residents about flood risk in their area, and what they can do to reduce it. We installed attractive information signs in public locations in each of the project's nine municipalities.

Each resident also received a postcard with an image of a possible future flood in a well-known place in their municipality. The information boards, postcards and an accompanying social media strategy, mainly via Facebook, provided a link to our newly launched website [www.ruimtevoorwater.be](http://www.ruimtevoorwater.be).

The second campaign aimed to challenge people to actively participate in

managing flood risk. We provided residents with a road map of the Dender Valley and invited them to plan a route, on foot or by bike, between one or more of the flood risk signs. Each of these signs has a QR code linked to an online questionnaire about two or three proposed flooding solutions for that specific stretch of river. This questionnaire was also shared through social media and made available on the website.

It is still early in the process, but we are confident that this differentiated stakeholder engagement strategy, together with interactive and challenging public engagement campaigns, will increase awareness of flood risk in the Dender Valley, the actions required to mitigate it, and peoples' willingness to be active participants in the 'Room for Water' strategic plan.



Above: **Flood information signs**



Figure: **Flooding imagined postcard campaign**



Above: **Examples of community engagement**





STAR2Cs Partners

## Common goal, multiple partners

**T**hrough STAR2Cs, 8 organisations and over 2000 stakeholders have worked together to produce and pilot a revolutionary cross-border and evidence-based solution that supports the implementation of adaptation measures in challenging and uncertain environments. Here are some of the experiences and lessons learned from partnership work within STAR2Cs.

### Kent County Council

- Collaboration with partners throughout the initiation, development and application stages of the Adaptation Catalyst improved the quality of the tool, increased its relevance across all member states, and became a real highlight of the STAR2Cs partnership.
- We learned valuable lessons from Belgian partners on co-creation and stakeholder engagement. These have been transferred to other Council projects where the Knowledge Service tool has been used to identify and engage key stakeholders.



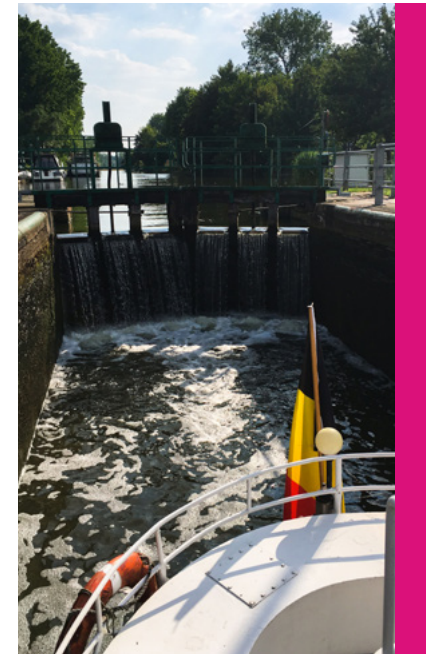
Top: Dune stabilisation measure in the Municipality of Schouwen-Duiveland  
Bottom: Site visit to coastal defences in the Municipality of Schouwen-Duiveland

## Flanders Environment Agency

- Through collaboration with the Province of East-Flanders we initiated public discussions which increased support for our flood management work.
- We also benefitted from knowledge exchange, particularly sharing hydrological information to help decision-makers estimate climate change impacts and weigh up possible interventions.

## Province of East Flanders

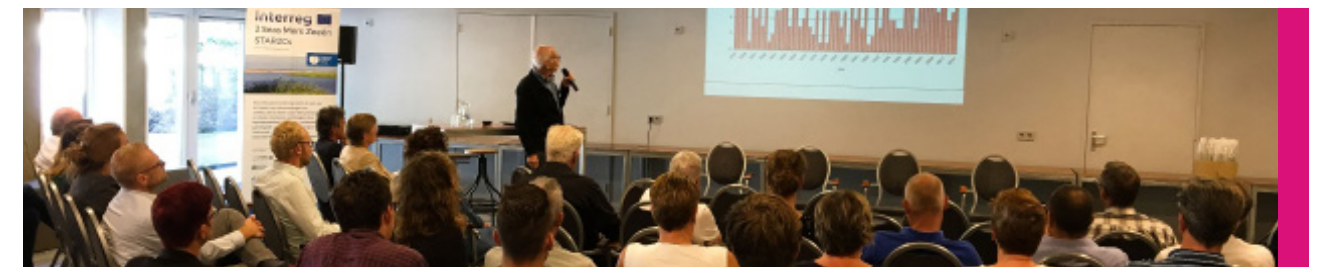
- We have learned from each other and enriched our own work on the pilots with insights from partners.
- HHNK's work with flood and risk intervention simulators to assess possible actions with stakeholders was really inspiring. It would be great to develop something similar in Flanders



Above: Lock in action on the Dender River

## Municipality of Schouwen-Duiveland

- We learned how partners organise citizen participation at a local level to make climate dialogues more attractive and engage people on a personal level.
- We learned a lot in helping to develop the Adaptation Catalyst, particularly using an adaptive pathway approach. We applied this to our climate change impacts survey of Natura 2000 protected areas.
- From Oise Valley Urban Planning Agency we learned household-level adaptation measures can deal with rising water levels. This is another approach to complement the dominant strategy in the Netherlands that focuses on raising defences and returning land to the sea or rivers.
- From Municipality of Capelle aan den IJssel, we learned about innovative local flooding solutions in urban areas using Bufferblocks that could also be applied within our own projects.



Above: Stakeholder event





Above: STAR2Cs stand at the Interreg 2 Seas Mid-term Conference

### Hoogheemraadschap Hollands Noorderkwartier

- Through the tools and results generated by the Water System Analysis 2.0, HHNK can now play a more significant role in co-designing public space. We have worked with local and regional authorities to ensure that principles of a flood-resilient water systems are part of broader spatial (climate) adaptation plans. One example is developing flood resilience standards for new housing projects, resulting in more space for water and open green areas.

### Flemish Waterways

- We learned how to prepare a citizen engagement and participation process, essential for successful flood management and climate adaptation. actions to reduce flood risk, the importance of no-regret actions, 'quick-wins', and future-proofing interventions.
- We also learned how to prioritise and phase actions to reduce flood risk, the importance of no-regret actions, 'quick-wins', and future-proofing interventions. Through collaboration with project partners, we saw the importance of clearly and regularly communicating alternatives, actions and project progress to the public. We also saw the value of creating maps and climate change simulations for stakeholder visualisation and spurring climate action.

### Municipality of Capelle aan den IJssel

- In Capelle, we now use the Knowledge Service tool to tailor stakeholder engagement across various projects in a much more structured way. and the Life Cycle Costs model we can now demonstrate how more expensive adaptation investments translate into lower costs in the long run.
- Through the model we developed with Deltares



Above: STAR2Cs partner workshop

### Oise Valley Urban Planning Agency

- We were able to connect with neighbouring European countries and benefit from their experience in risk prevention. In particular, the Ghent experience of drawing up river contracts presents interesting possibilities that could be applied to the Oise Valley to reach consensus in terms of development in flood-prone areas. discussion and reflection which helped to establish the role of the urban planning agency for protecting against floods. This will allow it to lead and deepen its thinking over the long term.
- The partnership offered us a framework for



Above: Lock in action on the Oise River





Kent County Council

## Routes to resilience

**T**he STAR2Cs project has made great progress in building climate change adaptation into decision-making processes since it commenced in early 2018. Through pilot studies and knowledge-sharing, the partners have designed and produced innovative, transferable and effective mechanisms to overcome the 'implementation gap' that currently exists in delivering local adaptation action.

### Reducing climate risk through adaptive planning

The tools created within STAR2Cs are diverse in terms of their intended users and the challenges they aim to address. For example, the Adaptation Catalyst can provide insights into how best to implement incremental adaptation measures to experts and non-experts alike. HHNK's 3Di modelling allows planners and decision-makers to assess future flood vulnerability and tests potential solutions. The Bufferblocks trialled by the Municipality of Capelle aan

den IJssel offer a lightweight and durable technical solution to flooding and subsidence. The stakeholder tool developed by the Province of East Flanders helps planners develop a targeted participation plan for climate projects. What unites all the tools created during the project is their commitment to a flexible adaptive pathway approach to climate planning.

While innovative technical solutions are fundamental to building local adaptive

capacity, they are not enough on their own to bridge the implementation gap between climate strategy and concrete action. One of the project's initial drivers was the recognition that many good climate plans and tools are created but never put into practice. As an emerging discipline, climate adaptation is overwhelmingly presented as a technical problem requiring technical solutions. The

Top: **Sunset over the Hollandsche IJssel River**

STAR2Cs partnership has demonstrated that social as well as technical innovation is required to successfully frame the challenges of climate change and inspire, drive and guide effective action.

The STAR2Cs partners are uniquely positioned to do this. They have the technical expertise to plan and implement evidence-based adaptation; they can also engage with politicians and government decision-makers and connect them with the needs of local communities. Crucially, they have shown that the potential of technical solutions to build adaptive capacity is maximised

through effective social engagement, and gaining support from policymakers and communities alike. The co-creation process for developing the river contract in East Flanders, the iterative process of designing and implementing climate dialogues in the Municipality of Schouwen-Duiveland, and preserving and harnessing collective memory of floods in France and the Netherlands to encourage action today are great examples of this.

Over the STAR2Cs project's lifetime, climate change has moved rapidly up the political agenda. Around the world, decision-makers and citizens are increasingly

aware of the devastating impacts of climate change, and the need to take urgent transformative action both to tackle its causes and adapt to its effects. The partners in STAR2Cs have played a key role in shaping this process in their regions and will continue to do so long after the project formally concludes. The project's enriching experiences of knowledge exchange, discussion forums and organising cross-border action have created a platform for ongoing collaboration. This must be maintained if we are to successfully adapt to the challenges ahead. We are confident that it will be.



Above: **STAR2Cs partners on a site visit in the Oise Valley**



# Interreg



EUROPEAN UNION

## 2 Seas Mers Zeeën

### STAR2Cs

European Regional Development Fund



*Project partners:*

