

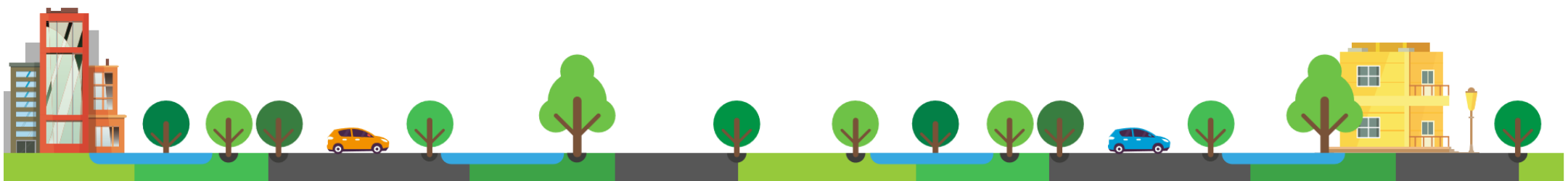


2 Seas Mers Zeeën
Water Resilient Cities

European Regional Development Fund

Water Resilient Cities

Introducing the Guide



Greening the Grey

A guide to retrofitting
sustainable drainage systems
into urban areas





Source control

Manage runoff where the rain falls e.g.: green roofs, permeable paving, bioretention and infiltration trenches.



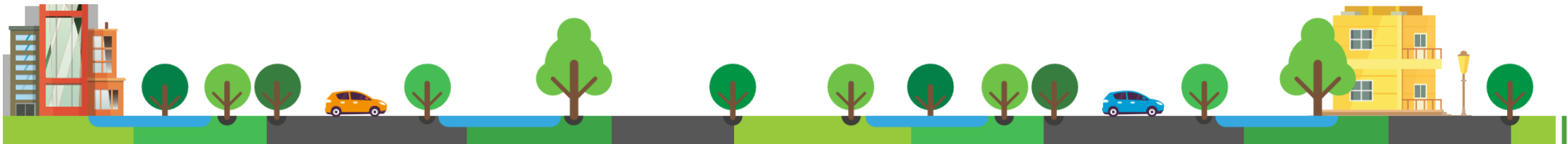
Site control

Provide in-situ rain water management e.g.: retention basins, ponds, swales and ditches.

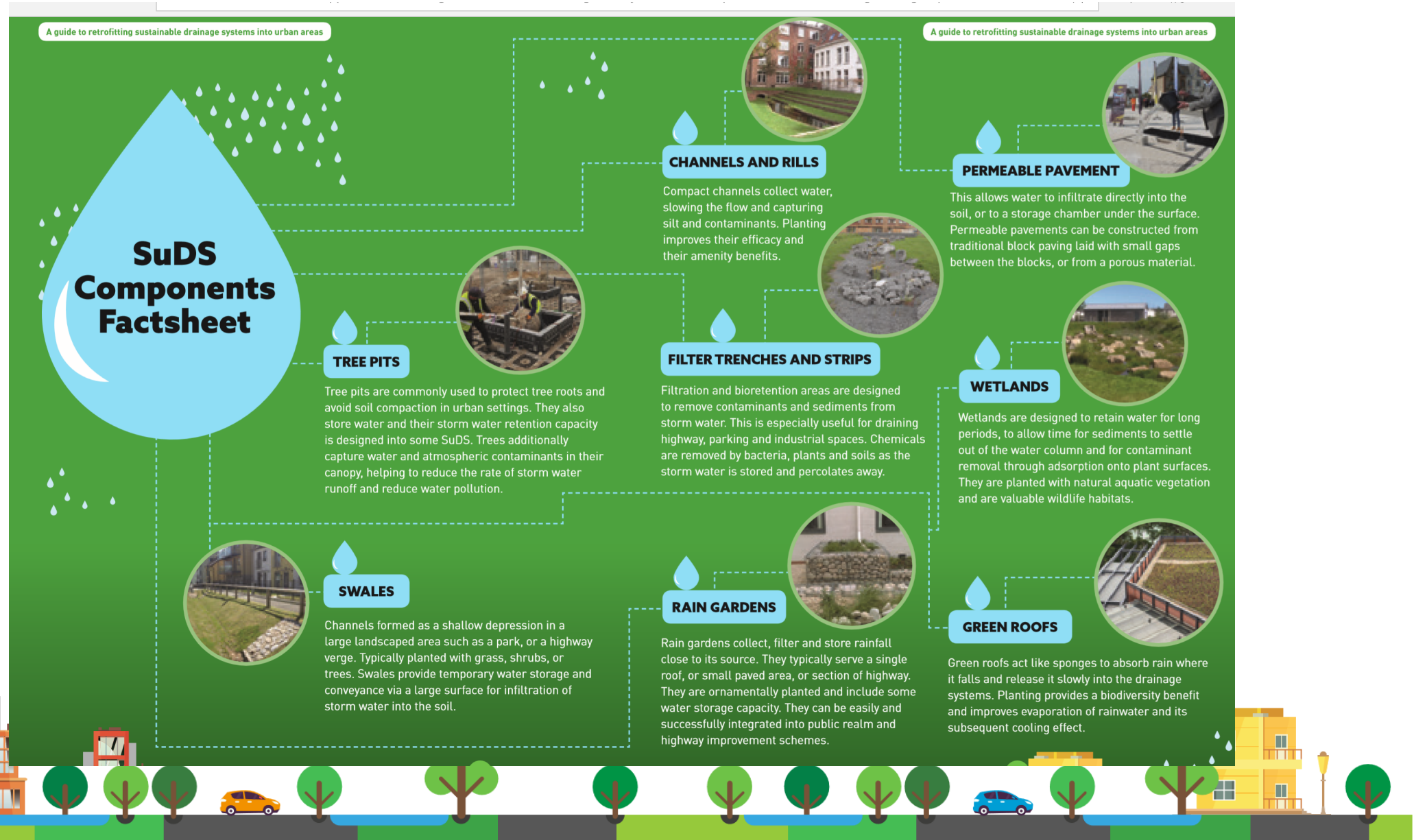


Catchment control

Manage runoff from several sites or a large site e.g.: ponds and wetlands.



Retrofitting – Its a tricky business...but we will get there using the tools available



Design Principles

RETROFITTING SuDS IN URBAN AREAS CARRIES UNIQUE CHALLENGES



CREATING VARIETY AND CONNECTIONS

SuDS provide wide scope for creative design, to improve the quality of public space as well as reducing flood risk. That creativity can extend to their connectivity, enabling managed water flow and storage throughout the city, and supporting ecological, mobility and visual connectivity at the same



DESIGN WITH PEOPLE IN MIND

Considering the needs of the people who live in and use the urban setting in which the SuDS are to be located is essential. Local people are able to provide a broad perspective which should be used to inform the design, taking into account engineering design constraints.



MAXIMISING THE PURPOSE

When designing SuDS, a holistic, multi-functional design perspective is necessary, to avoid conflicts and to maximise additional benefits and value for money. This is a site-specific activity involving analysis, consultation and integrated planning.



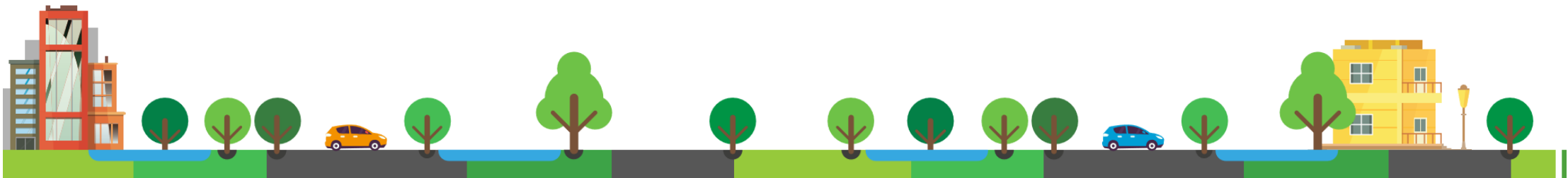
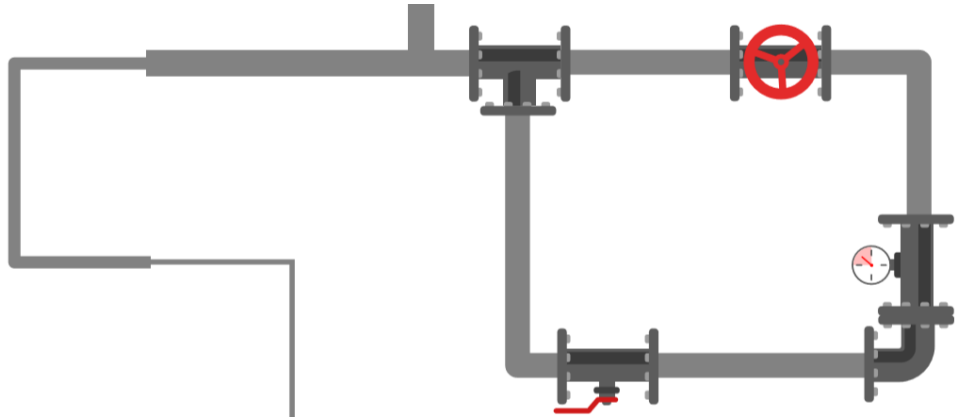
FLEXIBILITY TO ADAPT TO CHANGES

Creative place-making is important. People's needs, the climate and the environment are constantly changing. SuDS have to be designed in such a way that they can respond to these changes by gradual adaptation. Consideration should be given to possible future needs, especially



RETROFITTING IN HISTORIC CITIES

Retrofitting SuDS in historic cities is constrained by requirements to protect the historic character. It is therefore important to take historic features, building materials and design style into account, and to investigate how permeability, buffering and surface conveyance of storm



The Quick Scan Tool for SuDS

The Water Resilient Cities project partners have developed a 'quick scan' tool as an aid to designing integrated SuDS schemes. The tool is designed to help project designers to think about the range of additional benefits that could be incorporated and help them to optimise the design. A full guide is available on the Water Resilient Cities website: www.waterresilientcities.eu

The aim of the tool is to evaluate the different benefits of a SuDS and to visualise them in a user-friendly format that helps to compare different SuDS options at the same location and identify which one is the most beneficial.

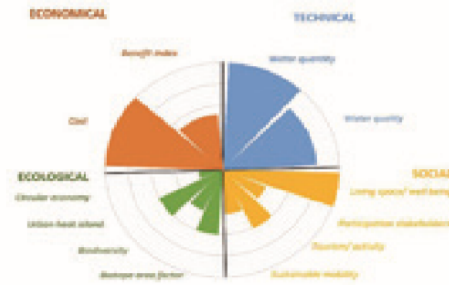
The quick scan tool is divided into four main parts, corresponding to the main objectives of SuDS: technical, social, ecological and economic.

Each category has a number of key performance indicators (KPIs), chosen to reflect the challenges of retrofitting SuDS. In the example below the length of each segment illustrates the value of each KPI resulting from the SuDS solution. By comparing the KPIs of the existing situation, or a different design, a clear view can be gained of the benefits of a SuDS solution.

The KPIs are based on the benefits of SuDS as described on pages 30-31, with for example:

- ➔ The water quantity KPI reflecting the increase in buffering capacity and the reduction in the impermeable area of land.
- ➔ The benefit index KPI reflecting the total cost of the solution in relation to the benefits it provides.

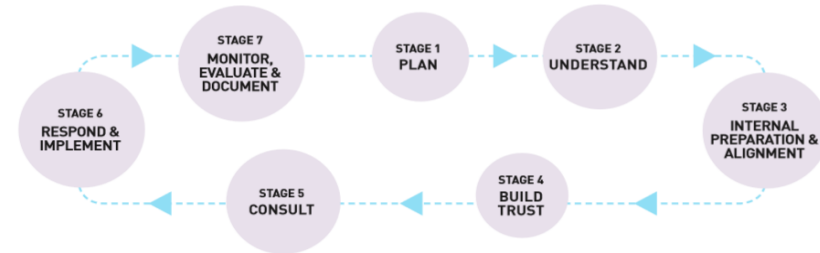
SuDS design 1



SuDS design 2



Stages of a stakeholder engagement process

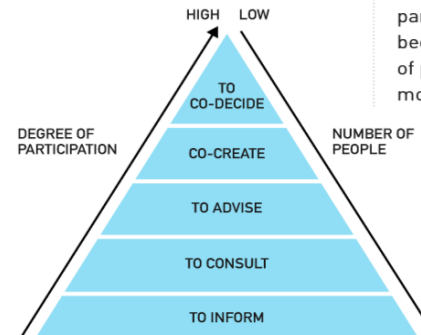


The implementation of SuDS should take into account:

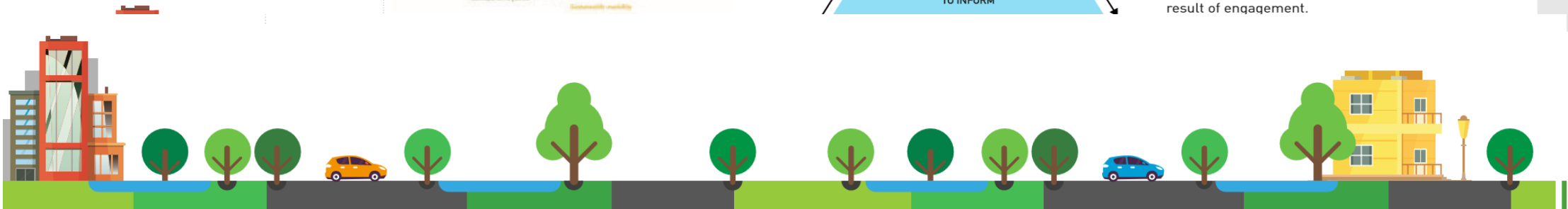
- ➔ The local circumstances.
- ➔ The specific situation.
- ➔ The stakeholders.

Public spaces are used by many stakeholders, amongst whom there will be many different opinions and perspectives. This creates potential for disagreement and conflict, which introduces political, design and financial risks into a project. The level of resources needed for good quality engagement should not be underestimated, but done well it is time and money well spent, delivering better quality schemes, with less time and money spent resolving stakeholder conflicts.

There are different levels of participation as shown in the participation Lubberding pyramid. The degree of participation becomes higher as one ascends the pyramid, and the number of people involved decreases (mostly due to the practicalities of more intense involvement).



The key issue is to explore the relationships between the involved stakeholders, the way trust and loyalty are built in these relationships, and how this translates into an overall stakeholder strategy in which communication, opinions and proposals flow in both directions and where the organisation is willing to change its behaviour as a result of engagement.



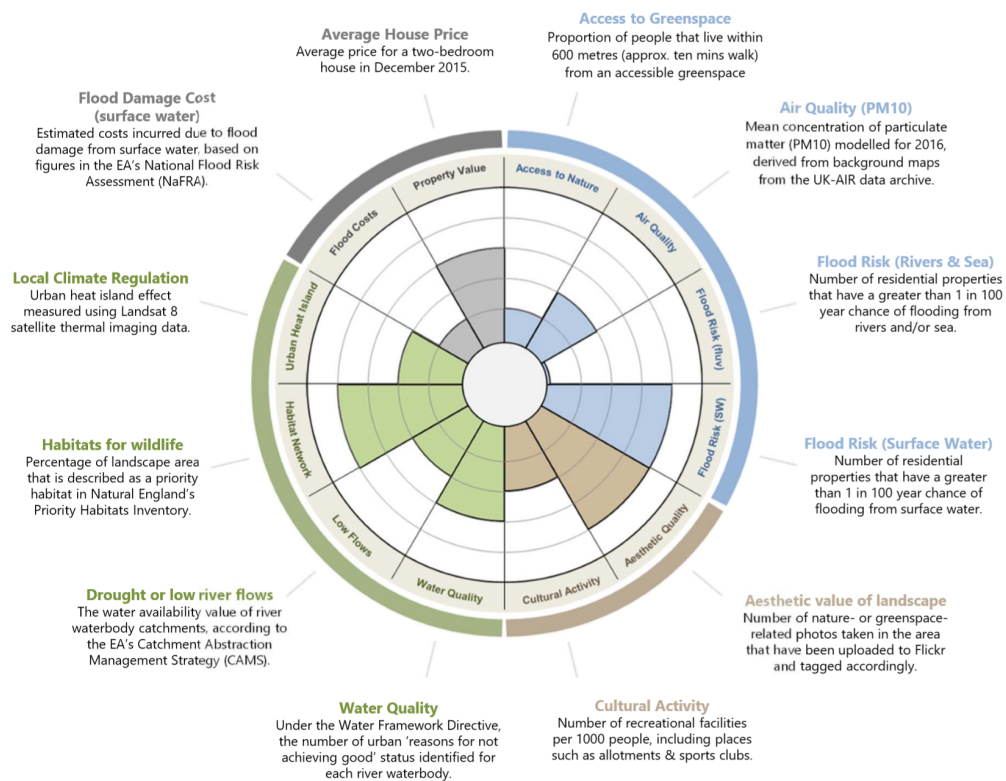
Its not just about cooperation
across project partners but
across Interreg 2Seas Projects ...



SPONGE 2020: LOCAL ACTION PROJECT

Managing the rainwater that falls on our towns and cities is an important task. As we start to feel the effects of climate change, extreme rainfall events are expected to increase. This is creating real challenges for water managers and local authorities. SPONGE 2020, an Interreg 2 Seas project, part-funded by the European Regional Development Fund, is working with local stakeholders to co-create innovative adaptation measures across a range of settings to reduce the impact of climate change and make communities more resilient.



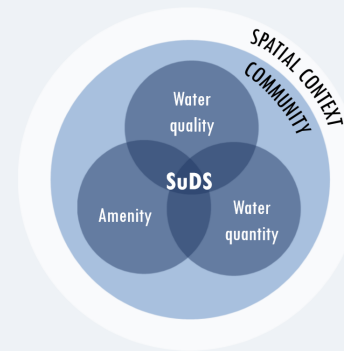


THE SUDS TRIANGLE

In traditional drainage systems, surface water is moved away from the surface as quickly as possible, with the key aim of preventing flooding. Other important issues like water quality, amenity (how useful and attractive local spaces are) and biodiversity are typically given little consideration.

Sustainable Drainage Systems (SuDS), in contrast, aim to replicate natural processes and are designed to manage surface water to provide maximum benefits. Managing the quantity of water, and therefore preventing flooding, is still important. But by allowing water to remain at the surface for longer and soak into the ground at a more natural pace, droughts can be reduced, water quality can be better protected, spaces can be created which are attractive with more green areas, and there is more space for wildlife and habitats.

The context, in terms of both the spatial location within the urban landscape, and the people and communities affected, is also important to consider. Engaging with stakeholders at all levels is a key part of the SPONGE2020 approach, and is explored further to the right.



KEY

Four Types of Benefits -

1. **Social**
2. **Cultural**
3. **Environmental**
4. **Economic**

Framework applicable to -

1. Existing natural capital or green/blue infrastructure typologies
2. Strategic needs/benefits/opportunity assessment at various spatial scales
3. Intervention-derived benefits
4. Delivery 'optioneering'

Benefits/value calculated -

1. Intervention suitability to address need/deficiency (Y/N)
2. Semi-quantitative indication of likely benefits provided

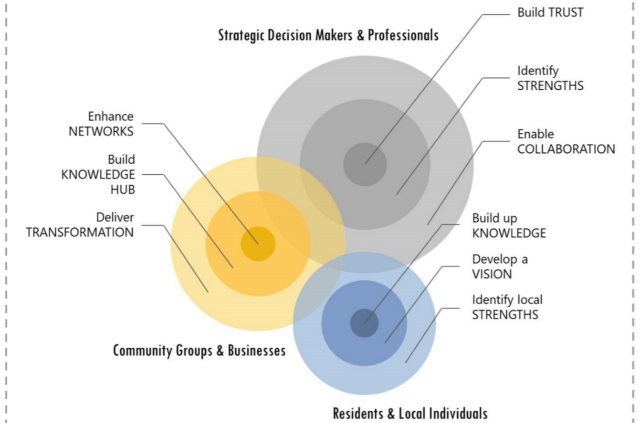
EXPERIENCE



CO-DESIGN & CO-CREATION

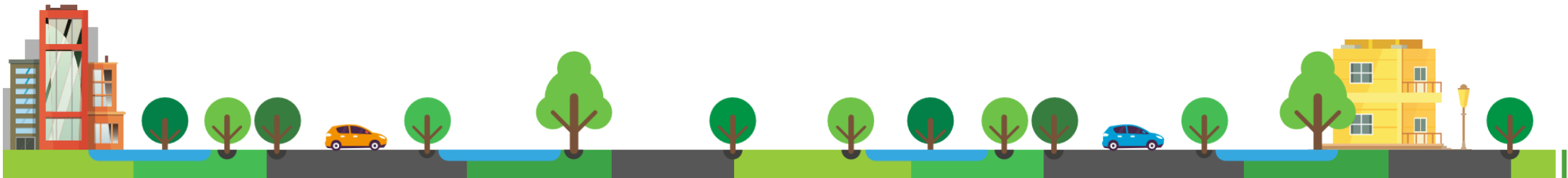
An important part of SPONGE2020 is getting local stakeholders involved with Sustainable Drainage Systems, to help people understand how surface water flooding affects them and how it is affecting others, and how they can take action to increase the resilience of their town or neighbourhood.

The SPONGE2020 Somerset Pilot team are working with stakeholders at all levels to get this important message across. We are working with decision makers to promote the need for sustainable drainage and build collaborations, with local groups and businesses to share knowledge and help deliver changes across neighbourhood, and with community members themselves, to understand their needs and priorities, to gather their ideas and to get their help and support in the creation and maintenance of the SuDS features. By gaining buy-in at all these levels, we can ensure the changes we make are effective and long-lasting.



The Journey ... How the Guide Developed

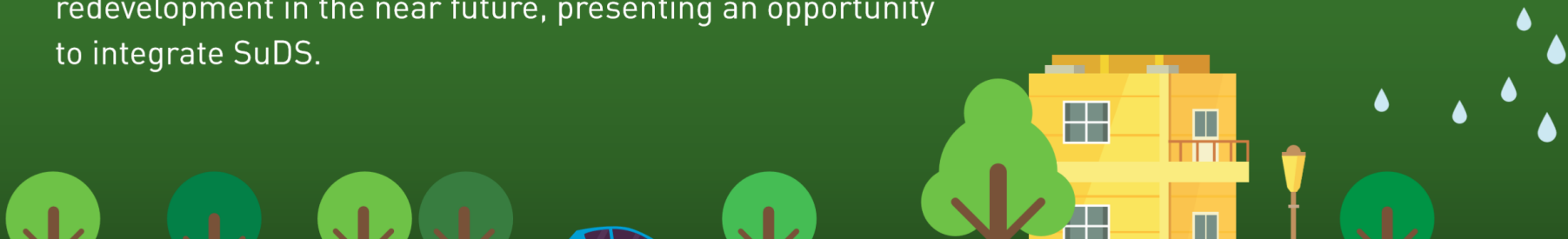
- The Evaluation Team
- Designing and Implementing the Pilots
- Cross Border Seminars
- Workshops
- Partnership Working



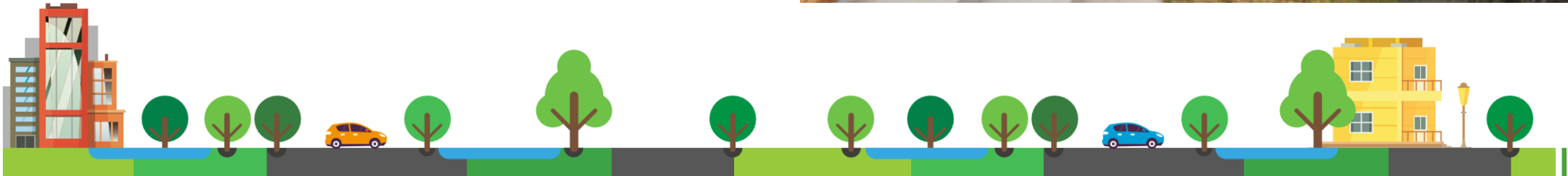
Action Plans and Strategic Planning

Action plans for retrofitting SuDS, should achieve the following:

- ➡ Presentation of conclusions of city, neighbourhood and site level diagnostics regarding flooding risk, future climate change effects, and existing drainage capacity and infrastructure. Much of this is already necessary under existing flood risk management responsibilities.
- ➡ Identify locations in the city which present opportunities for improving storm water drainage through SuDS. This may be related to existing green infrastructure, or planned redevelopments of city buildings or neighbourhoods.
- ➡ Assess and prioritise opportunities to integrate SuDS with green spaces.
- ➡ Assess and prioritise opportunities to make new green-blue networks that can be integrated with SuDS.
- ➡ Identify and assess site-specific drainage options and potential additional benefits for priority sites. Priority sites are those that need early action, or those which are likely to undergo some form of redevelopment in the near future, presenting an opportunity to integrate SuDS.



Pilots and SUDs Components – Learning about opportunities and constraints



Case Study

Mechelen

tree pit

PROBLEM

In common with many older cities with beautiful historic centres, Mechelen has some narrow streets with ageing drainage infrastructure. Hallestraat is a typical example of this. The narrow confines of this shared-space street limits design choice for drainage engineers seeking to alleviate the pressure of storm water surges on drainage systems which were designed for a different era. Paved space, vehicular access and traffic management mean traditional rain gardens and swales are not feasible.

Below-ground services and utilities added a further dimension to the challenge, as is typical for such locations, so the solution needs to both protect these and provide for the tree root system.

SOLUTION

Working closely with GreenBlue Urban, the City of Mechelen installed a special SuDS tree pit system which has been developed for tree planting in urban locations. The system allows a tree to be planted with minimum surface paving loss, but maximising the below-ground storage and water buffering potential from the tree pit zone.

The solution allowed for the diversion of a traditional gully drain directly into the root zone of the tree. This allows water to disperse across the total tree pit area and then percolate down into the soil.



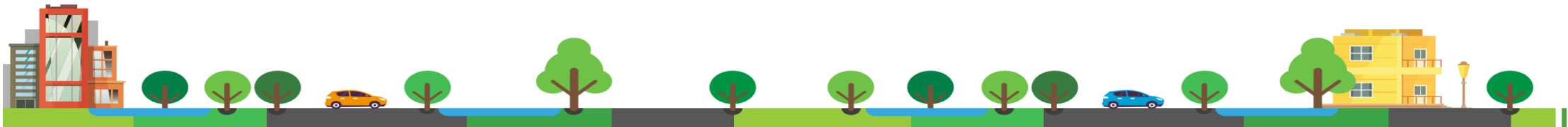
BENEFITS

The benefits to Mechelen from using this strategy are multiple: 3,520 litres of storm water can be accommodated within the tree pit design, so reducing significantly the pressure on drains in storm events. In addition, the water is cleaned through biofiltration before it eventually reaches the exit drain. Once established the tree will give additional benefits through canopy interception of rainwater, urban cooling through shade and evapotranspiration, air pollution removal and carbon sequestration, as well as its aesthetic appeal.

Mid work



Completed work



Common Problems, A Guide for Shared Solutions

Coastal

BENEFITS

Other than solving flood episodes and water quality problems, the project has created a high quality urban environment with plantings, new and sustainable urban furniture, plus new walking and cycling infrastructure. This approach reduces the vulnerability of people to road accidents thanks to more space allocated to a cycle path. More parking spaces in the redesigned Avenue and Square reduces parking on pavements, saving on the cost of repairing damaged walkways.



During construction



Historic



Inner City

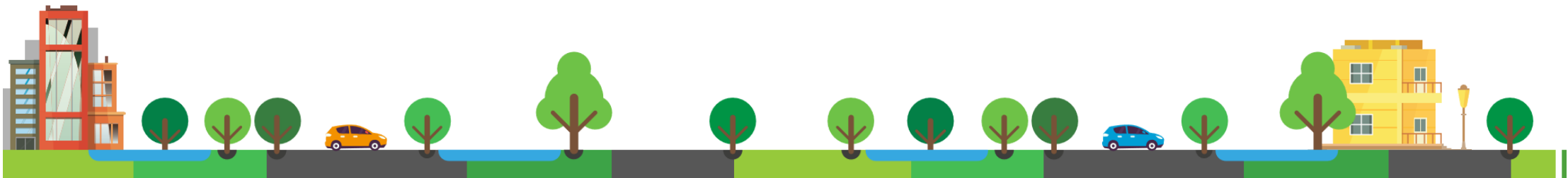
Public Realm 3D Image
View From North West

hdh HAND
DRAWN
HOME
PROJECT: 1513



DATE OF ISSUE - 04/07/2017 - Rev G

119 Mayflower Street



CONCLUSIONS

This guide should:

- ENCOURAGE policy makers to think about strategic planning of retrofit SUDs, how this transects different policy areas and relates to the future visions for our urban conurbations
- INSPIRE designers and engineers to think outside the box and learn from the implementation of a variety of retrofit solutions
- INFORM new initiates into the industry to explore possibilities and see every scheme as a chance to retrofit and embed resilience whilst capturing co benefits for the long term

