



GOOD GREEN IS GOLDEN

EXPLORING THE VALUE OF GREEN-BLUE
NETWORKS FOR THE CITY: CASE ZWOLLE

Greening urban infrastructure

CR^a

College van Rijksadviseurs



Ministerie van Infrastructuur en Milieu



Planbureau voor de Leefomgeving

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Kind lending of insects: **Museum of Natural History**

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A REVALUATION OF PUBLIC SPACE

Though green space in cities serves many purposes, they are rarely designed to actually deliver on any of those purposes. Besides practical functionality and structural aesthetics, well designed green spaces can contribute to better air quality, real estate value, storm water storage and public health, to name but a few. These 'other values' are hardly recognized and almost always underestimated in urban design. In the battle for the limited space in our cities, so called ecosystem services can offer proper economic arguments that underpin the need for radical urban greening.

"Good Green is Golden" proposes a reinterpretation of urban green-blue networks as infrastructural systems where traditional values of public space are combined with green values in, ecosystem services. There is an increasing necessity to deal with an excess or lack of water, the improvement of air quality, establishing an optimal temperature range and the sustainable consumption of resources, as services in our cities. Here ecosystem services can play an important supportive role. Benefits of green-blue networks have always been present in our cities by providing the base for urban wellbeing, but now it is time to move a step further and also consider them as valuable quantifiable assets in our urban economies and integrate them into urban public space design.



URBAN SQUARE
Provides open space and requires little maintenance. It offers no ecological value and has limited use.

URBAN PARK
Provides space for urban respite, relaxation and aesthetic value. It offers moderate ecological value and also needs moderate maintenance.

URBAN GARDEN
Provides ecological and aesthetic value and urban relaxation. Needs high maintenance.

NATURAL FOREST
Provides many ecological services and needs little maintenance. Its suitability as an urban context is limited.

Search to integrate traditional urban typologies and natural landscape into new public spaces for the city.

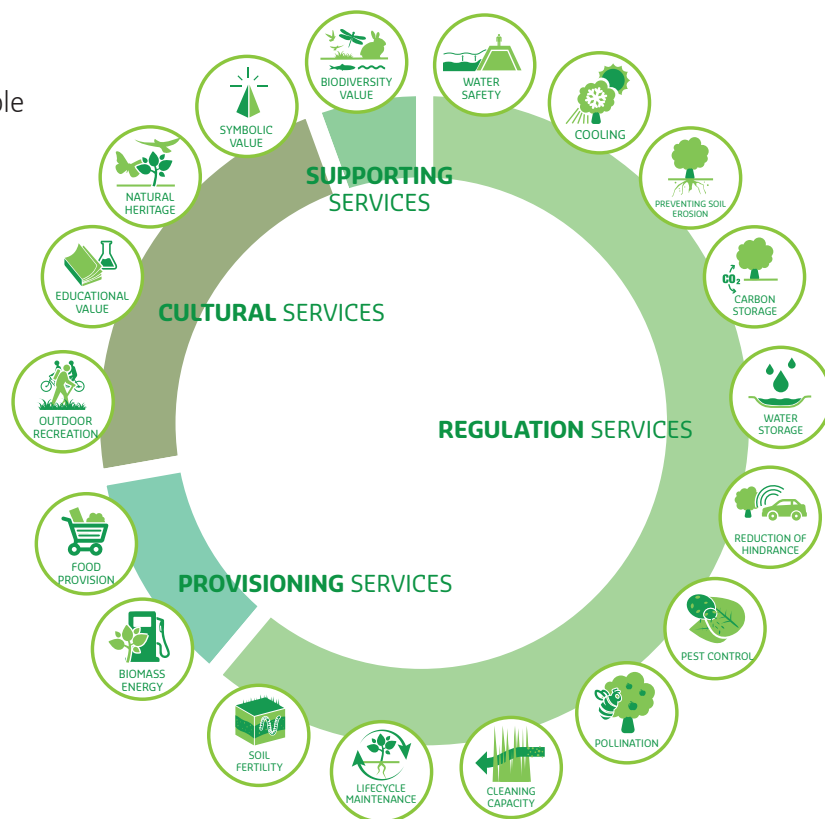
INTRODUCING ECOSYSTEM SERVICES INTO URBAN PUBLIC SPACE

The assets of green-blue networks are resources or processes that derive from natural ecological systems that are beneficial to the city and its inhabitants. These are called ecosystem services and they can be divided into four main service categories: regulating, provisioning, cultural and supporting. Regulation services are the services which ecosystems provide by acting as regulators controlling the quality of air, soil and water. Provisioning services are about product provision like wood or food. Cultural services refer to supporting human activity such as recreation and education. Support services include the intrinsic autonomous value of biodiversity.*

Ecosystem services can become an integral part of our urban public spaces, while at the same time serving relevant urban agenda's like climate adaptation ❄️💧🌿, water safety 🌊, healthy and learning environments 🧘🚲, and urban growth +🏠

A desirable green-blue network providing ecosystem services for the benefit of the city and its inhabitants is illustrated on the adjacent page. This condensed urban public space shows added values like: education, recreation, food provision, water storage, cooling, cleaning capacity, soil fertility, pollination, carbon storage, reduction of hindrance, symbolic value and biodiversity. The benefits of the aforementioned include the establishment of a stimulating environment for a healthier and more productive urban population, damage control during climatic extremes, the increase of social cohesion and the rise of real estate values.

Ecosystem services applicable to urban public spaces.



*based on the combination of two sources: ANK (Atlas of Natural Capital -Dutch-) and SRUC (UK hill and mountain research centre).



TESTCASE ZWOLLE

The test case is the city of Zwolle. We examined how green this city-one of the greenest in the Netherlands- really is, based on valuing the ecosystem services its public spaces provide. Next we explored how its public space can be upgraded into a rich green-blue network that maximizes the provision of ecosystem services for Zwolle, whilst simultaneously supporting its urban agenda.

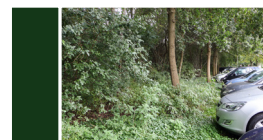
First, all the existing public spaces of Zwolle were meticulously mapped based on traditional functional categories such as sports fields, cemeteries, hard and soft playgrounds, parking places, woods, parks, and so on. It delivered a colorful map encompassing all the public spaces of Zwolle.



City park



Generic soft playground



Dense forest



Wild field edge



Sports field



Generic hard playground



Allotment / nursery



Stony public space



Generic green structure



Wild meadow



Shrubs / Bushes



Stony parking lot



Cemetery



Wet bank



Sandy underused plot



Asphalt parking lot



Lawn



Green underused plot



Grassland



Stony underused plot



Generic schoolyard



Wood less dense

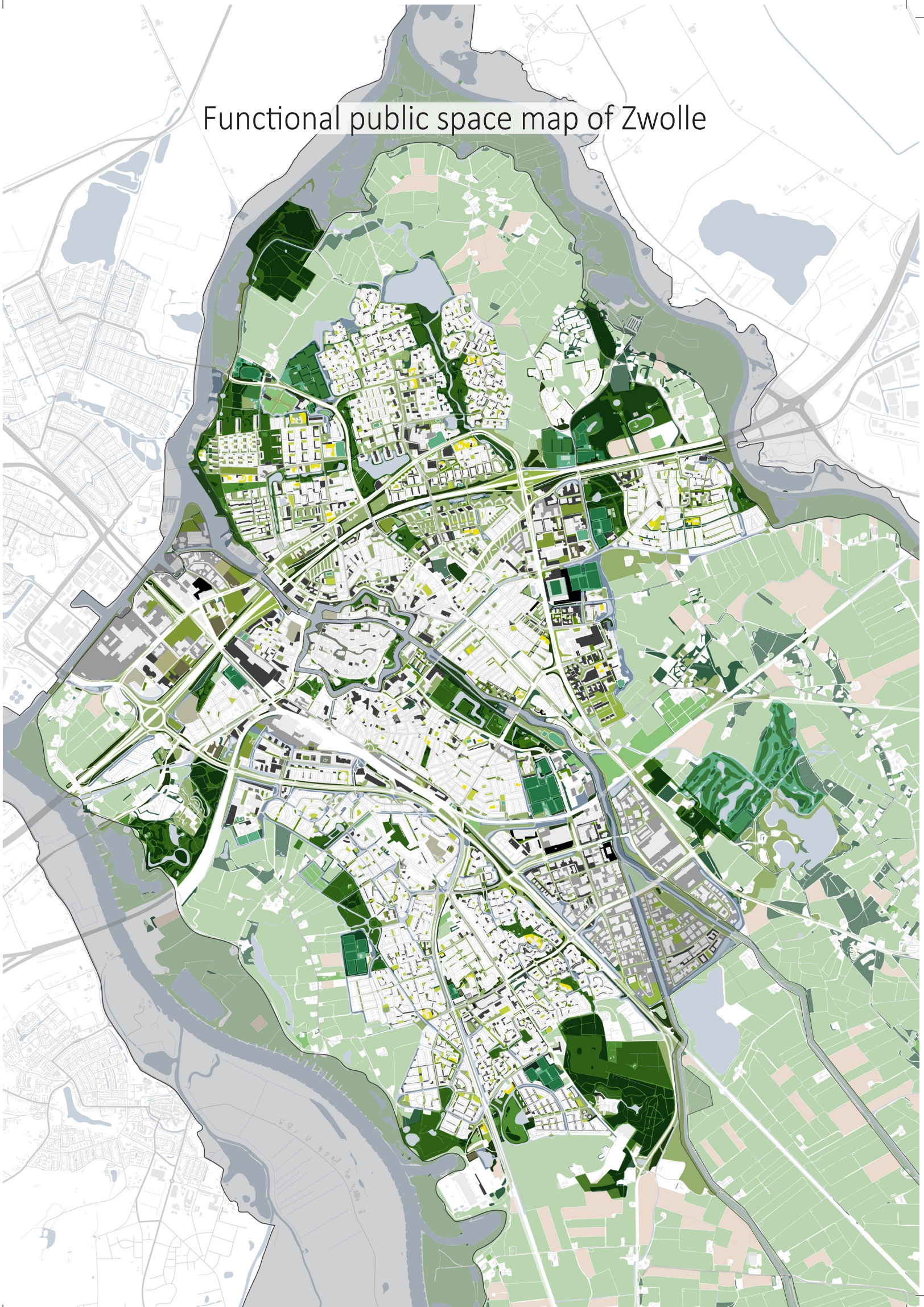


Agriculture field



Logistic space

Functional public space map of Zwolle

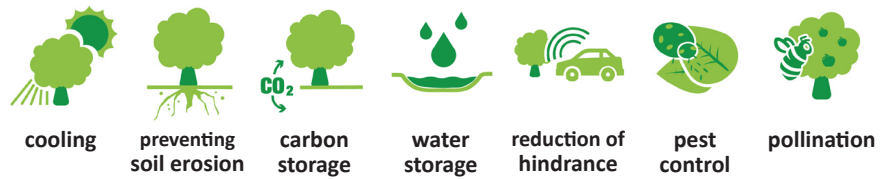






*All existing public spaces of
Zwolle meticulously mapped.*

FUNCTIONAL PUBLIC SPACES SCORED ACCORDING TO 18 ECOSYSTEM SERVICES



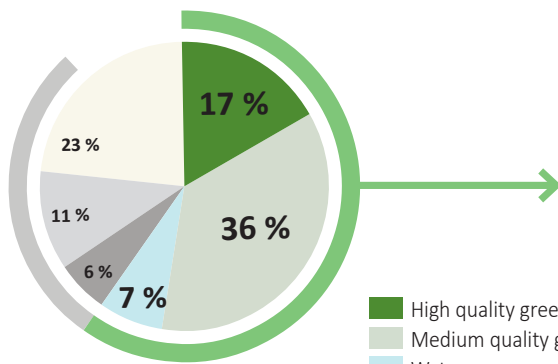
Public Space Type	cooling	preventing soil erosion	carbon storage	water storage	reduction of hindrance	pest control	pollination
City park	●	●	●	●	●	●	●
Sports field	●	●	●	●	●	●	●
Generic green structure	●	●	●	●	●	●	●
Cemetery	●	●	●	●	●	●	●
Lawn	●	●	●	●	●	●	●
Generic schoolyard	●	●	●	●	●	●	●
Generic soft playground	●	●	●	●	●	●	●
Generic hard playground	●	●	●	●	●	●	●
Wild meadow	●	●	●	●	●	●	●
Wet bank	●	●	●	●	●	●	●
Green underused plot	●	●	●	●	●	●	●
Wood less dense	●	●	●	●	●	●	●
Dense forest	●	●	●	●	●	●	●
Allotment / Nursery	●	●	●	●	●	●	●
Shrubs / Bushes	●	●	●	●	●	●	●
Sandy underused plot	●	●	●	●	●	●	●
Grassland	●	●	●	●	●	●	●
Agriculture field	●	●	●	●	●	●	●
Wild field edge	●	●	●	●	●	●	●
Stony public space	●	●	●	●	●	●	●
Stony parking lot	●	●	●	●	●	●	●
Asphalt parking lot	●	●	●	●	●	●	●
Stony underused lot	●	●	●	●	●	●	●
Logistic space	●	●	●	●	●	●	●

SCORING ZWOLLE PUBLIC SPACE ON THEIR PROVISION OF ECOSYSTEM SERVICES

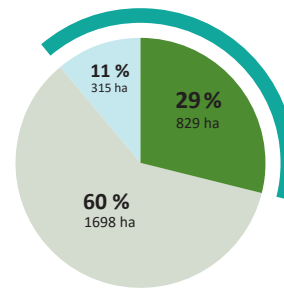
Next, all functional public space categories are scored in relation to each of eighteen ecosystem services on the range: low-middle-high. These scores we base on our own expert judgements. The cumulative score adds up to a green valuation map showing a city that has a lot of middle range quality green (36%) and a limited amount of high quality green (17%) based on the amount of ecosystem services they can provide.

HARD 29 % SOFT 60 %

40 % CONTRIBUTIVE


























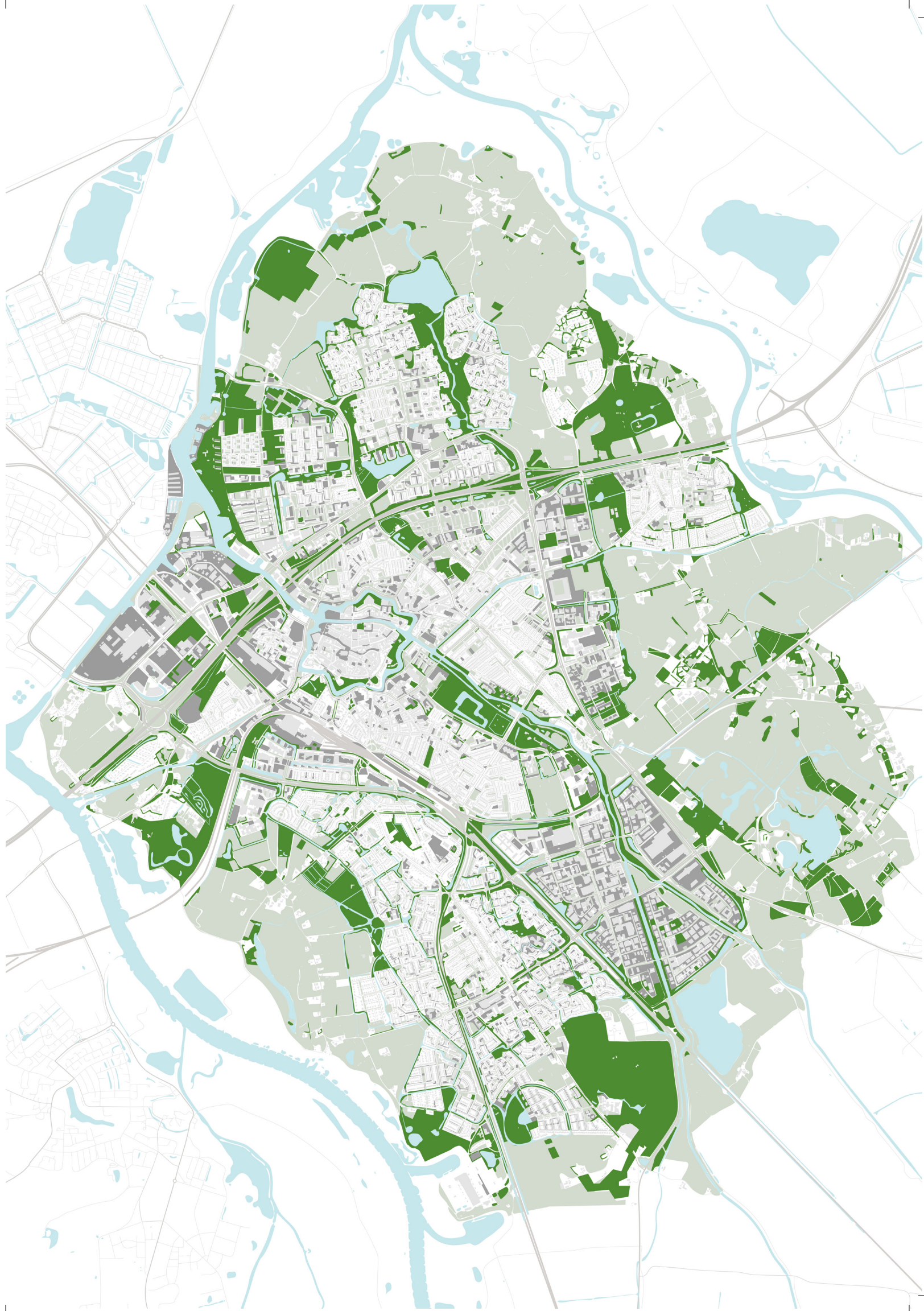
Proportional distribution of all surfaces of the city of Zwolle.



Proportional distribution of the green-blue surfaces.

- High quality green
- Medium quality green
- Water
- Hard
- Buildings
- Others

HIGH QUALITY GREEN					
	Allotment / Nursery	Park	Meadow	Wet bank	
					
	Woods	Forest	Green underused land	Cemetery	
	MEDIUM QUALITY GREEN				
		Soft playground	Lawn	Sport-field	Bushes / Shrubs
					
		Agriculture	Grassland	Green structure	
LOW QUALITY GREEN					
		Logistic spaces	Playground school	Sandy underused land	Paved playground
					
	Paved public area	Paved parking lot	Asphalted parking lot	Stony underused plot	



DEVELOPING ECOSYSTEM SERVICES INTO A REFINED GREEN-BLUE PUBLIC SPACE NETWORK

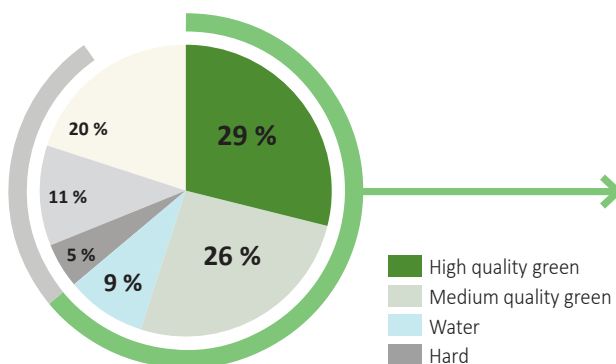
We set out to prove that well designed green areas have eco-system value. To prove this, we increased the amount of high quality green or 'good green' in the city within a system that can basically assess the economic output. To differentiate the output we introduce different spatial conceptual models of which one is being shown here: Zwolle SINGELSTAD. This proposal consists of a very refined green-blue structure based on the existing waterways in Zwolle. They are being extended, widened, connected and enriched into an extensive and biodiverse landscape of flows. This can be done by incorporating all adjacent existing public spaces of the water network and by transforming them into good green spaces. Herein one can find wild meadows and wild playgrounds, rich banks, small wet forests and urban farms. Together they connect many isolated spots into a large green-blue network of small scale biotopes.

Altogether the total amount of green space slightly increases by replacing grey open spaces. But the main gain is the amount of high quality, good green space that increases to almost 30% of the total city surface. Together with the increase of water, the green-blue network providing ecosystem services proportionally goes up to 60% of all the soft surface, just by smartly transforming the existing public space of Zwolle.

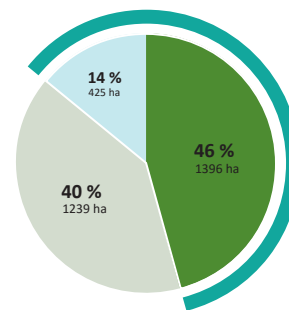
Zwolle Singelstad provides ecosystem services that support its urban agenda on themes like climate adaptation 🌿💧🌱, water safety 🌊, healthy and learning environments 🧘🚴, and urban growth +🏠. We explore these contributions in thematic maps, illustrating the spatial impact of the green-blue network on the urban agenda per topic. Furthermore the impact has been quantified in euros added value, by applying a calculation tool called Teeb.stad*. For this purpose the Singelstad model has been quantified into added amounts of water volume, reeds surface, number of trees and overall green percentages. Also the number of positively affected existing houses has been estimated, as has the densification potential been quantified in numbers.

HARD 25 % SOFT 64 %

60 % CONTRIBUTIVE



Proportional distribution of all surfaces of the city of Zwolle.

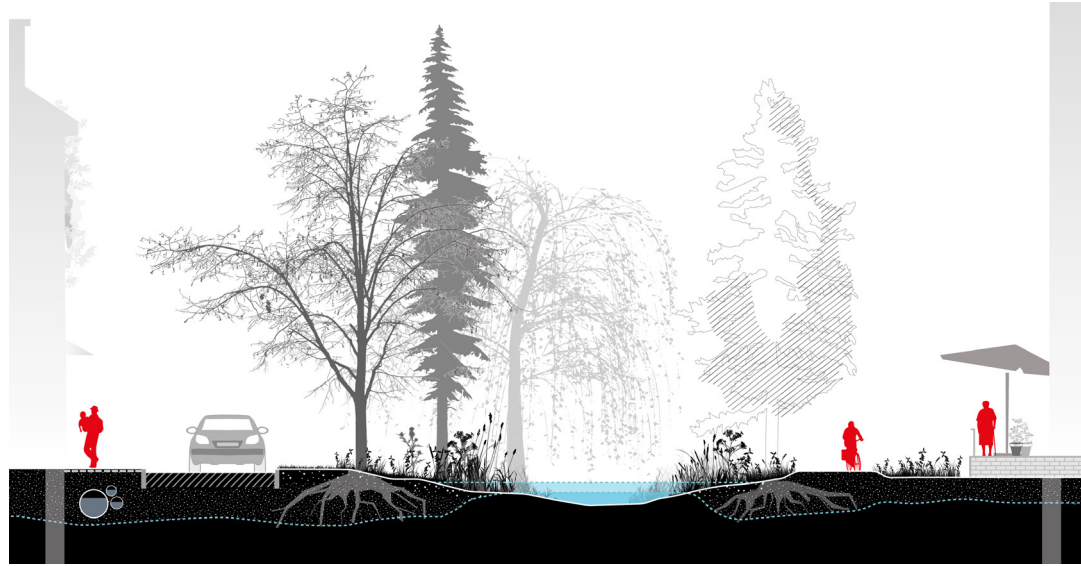


Proportional distribution of the green-blue surfaces.

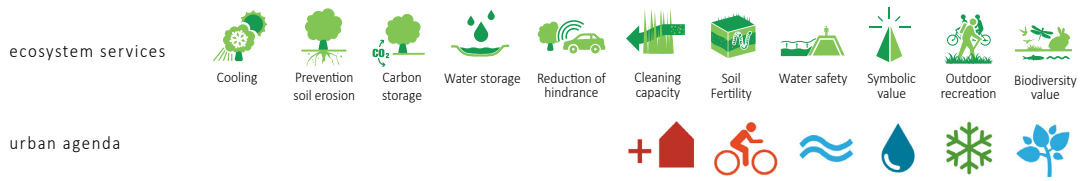
* source: www.teebstad.nl by RIVM and PBL.



RICH BANK



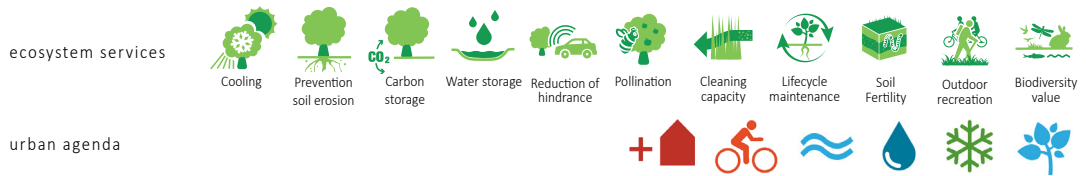
Rich banks are a gradual transition between water and dry land, capable to handle floods, improve water quality and provide abundant habitats.



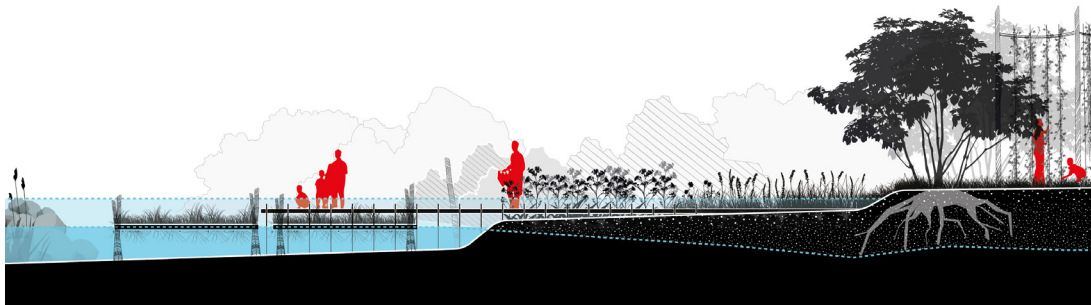
WET FOREST



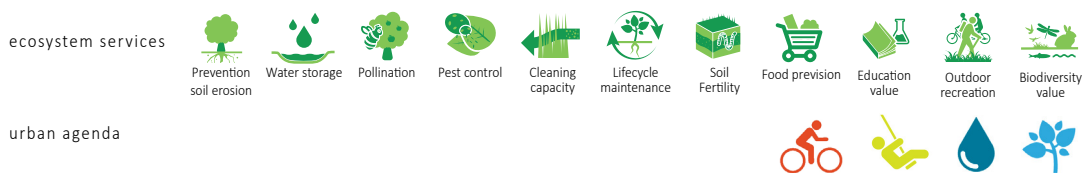
Wet forests are effective in reducing effects of flood events by delaying, storing and reducing speed of the water. It also provides a rich natural habitat.



URBAN FARMS

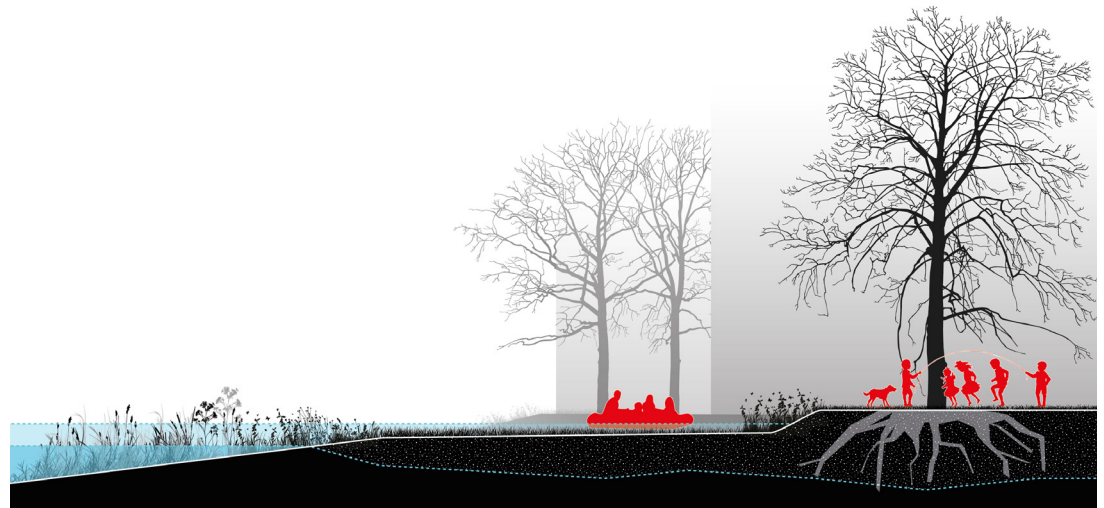


Urban farms or allotment gardens are sources of biodiversity and social interaction. Knowledge about cultivation and natural processes can meet here.



The Good Green public space typologies of Zwolle **SINGELSTAD** provide ecosystem services and strengthen its urban agenda.

TERRACE LAWNS



Lawns can be used to buffer extra amounts of water, while serving daily urban use and even adding fun and variety to possible activities.

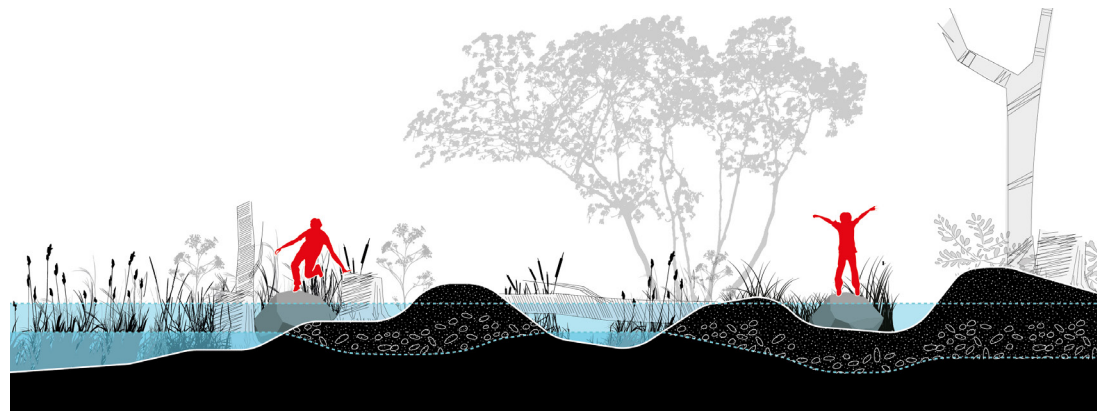
ecosystem services



urban agenda



WILD PLAYGROUND



Dynamic playgrounds where water is part of the challenge, bring excitement for children, increase their resilience and water awareness.

ecosystem services



urban agenda

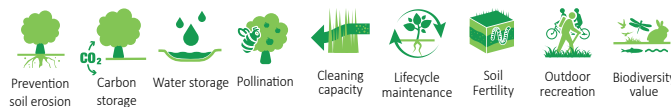


WILD MEADOW



Wild meadows can absorb water, contribute to biodiversity and offer a dynamic appearance throughout the seasons.

ecosystem services

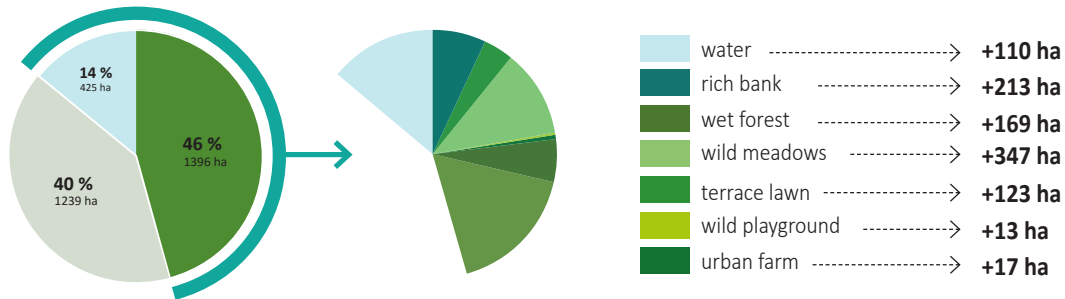


urban agenda



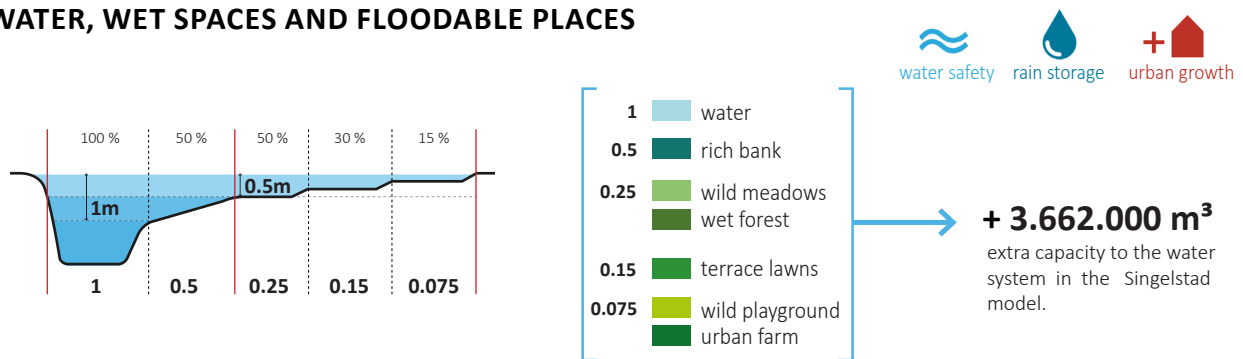
QUANTIFYING ADDED VALUES OF ZWOLLE SINGELSTAD

QUANTIFICATION OF GOOD GREEN SURFACES OF ZWOLLE SINGELSTAD.

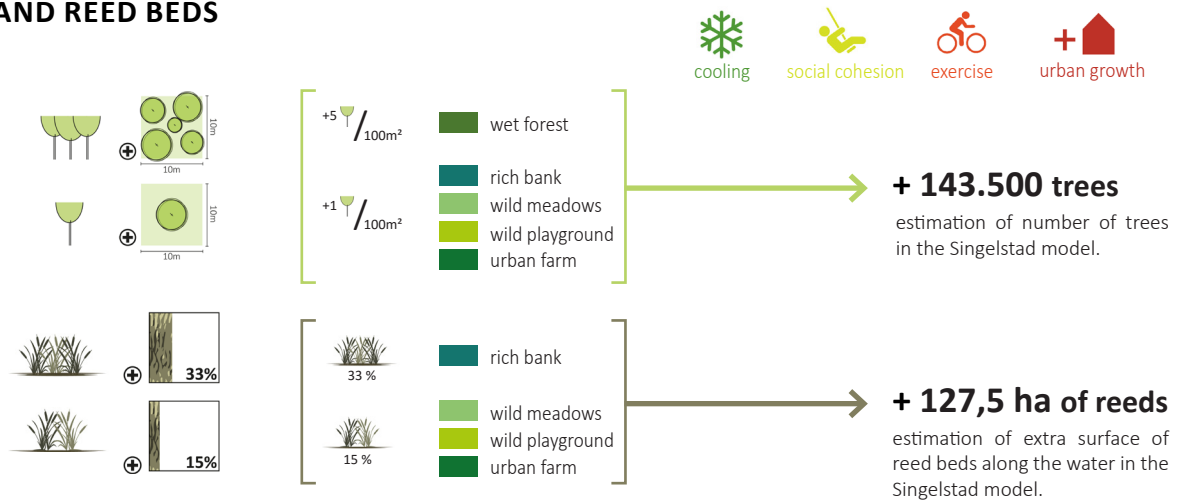


Proportional distribution of the green-blue surfaces.

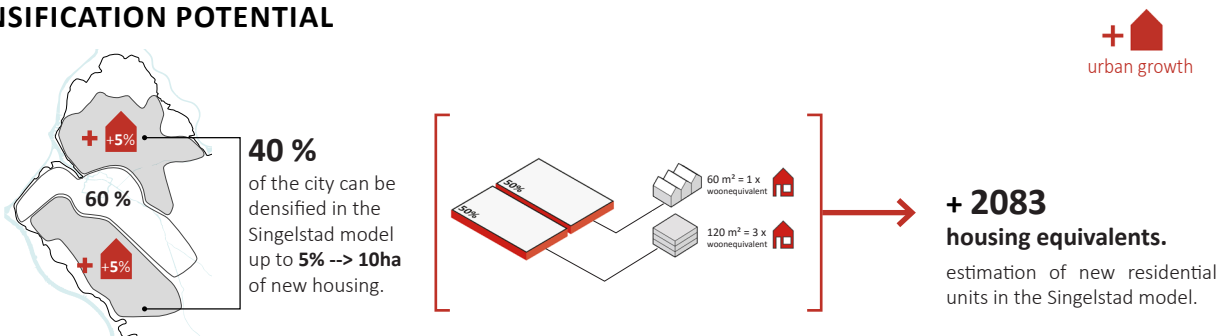
WATER, WET SPACES AND FLOODABLE PLACES



TREES AND REED BEDS



DENSIFICATION POTENTIAL



URBAN GROWTH

Potential for small scale densification within the green-blue network, plus rise of value of existing real estate.

+ € 11.400.000,- annually

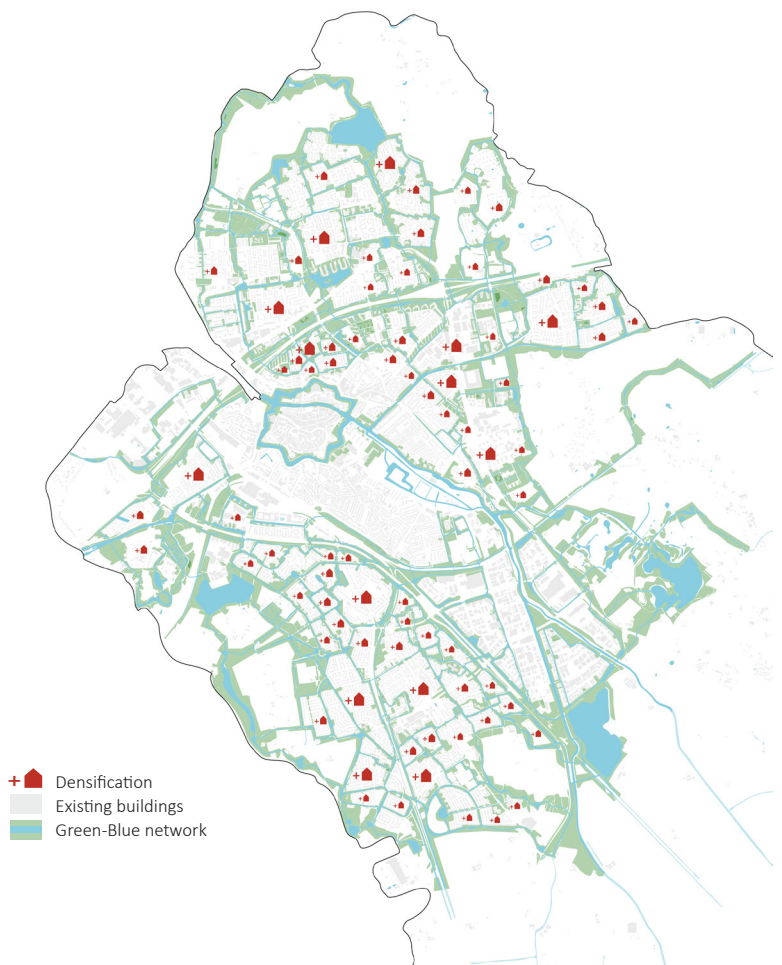
Rise in property values of existing homes

+ € 2.766.000,- annually

Rise in property values of new homes

Beneficiaries:

Home and land owners (property value), local government (taxes), banks and mortgage providers (risk reduction, rise of reliability).



WATER SAFETY

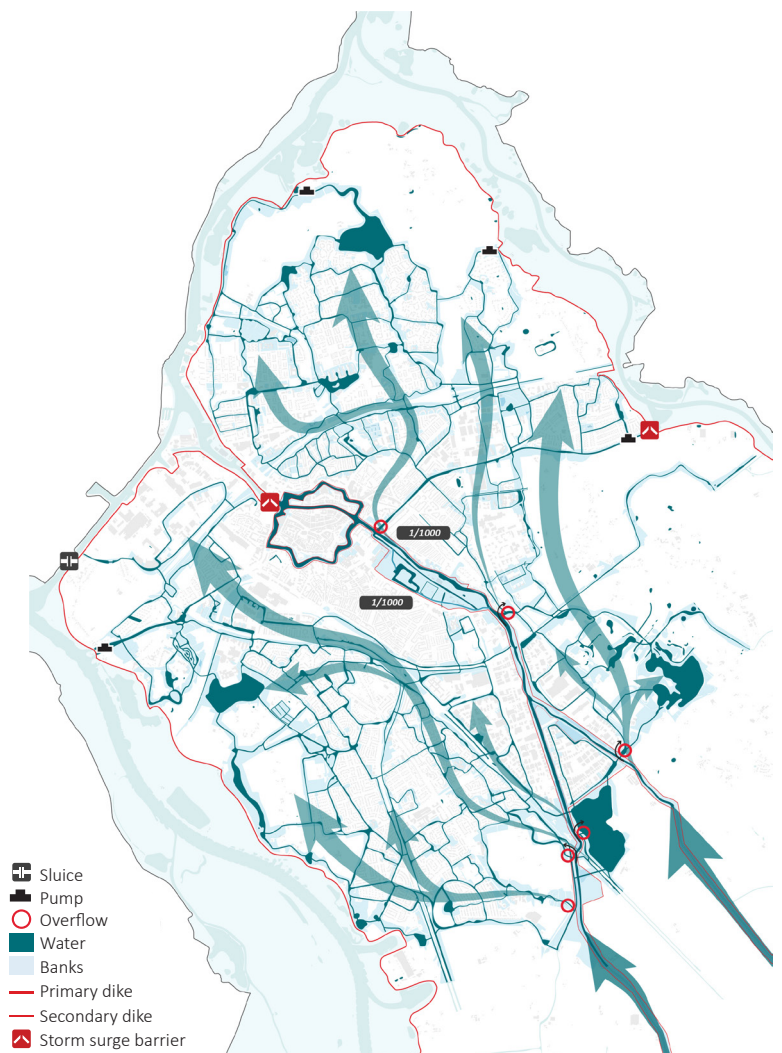
Enlarge buffer capacity by incorporating the water into the blue veins of the city.

+ € 5.033.000,- annually

Avoided water damage

Beneficiaries:

Property owners and local government (avoided damage), insurance companies (avoided payments), water board, national and local government (less investment costs by combining functions), banks and mortgage providers (risk reduction, increased reliability).



CLIMATE ADAPTATION RAIN

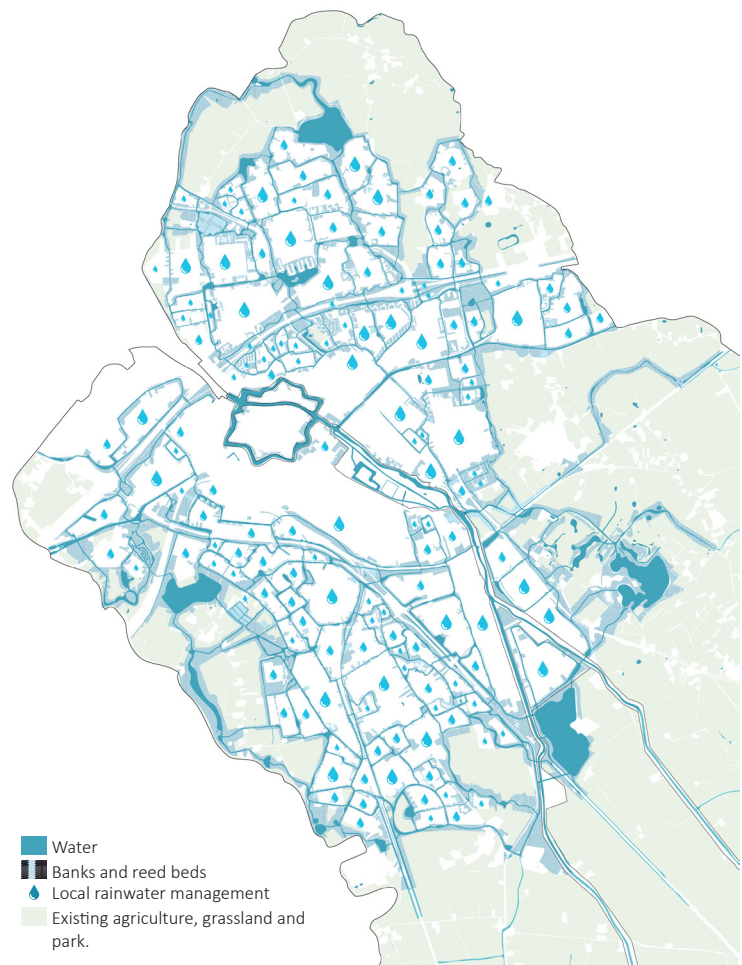
Catchment of storm water in the blue and green veins of the city.

+ € 1.433.000,- annually

Avoided water purification costs

Beneficiaries:

Dwellers and owners of all ground floors plus basements and local government (avoided damage), insurance companies (avoided payments), water boards and local government (less investment costs by combining functions), banks and mortgage providers (risk reduction, increased reliability).



CLIMATE ADAPTATION COOLING

Passive thermal regulation provided by a refined green tree structure. Cooling via water circulation loops fed by the cold water of deep sand mining ponds.

+ € 300.000,- annually

Avoided healthcare costs by extra green

+ € 1.466.000,- annually

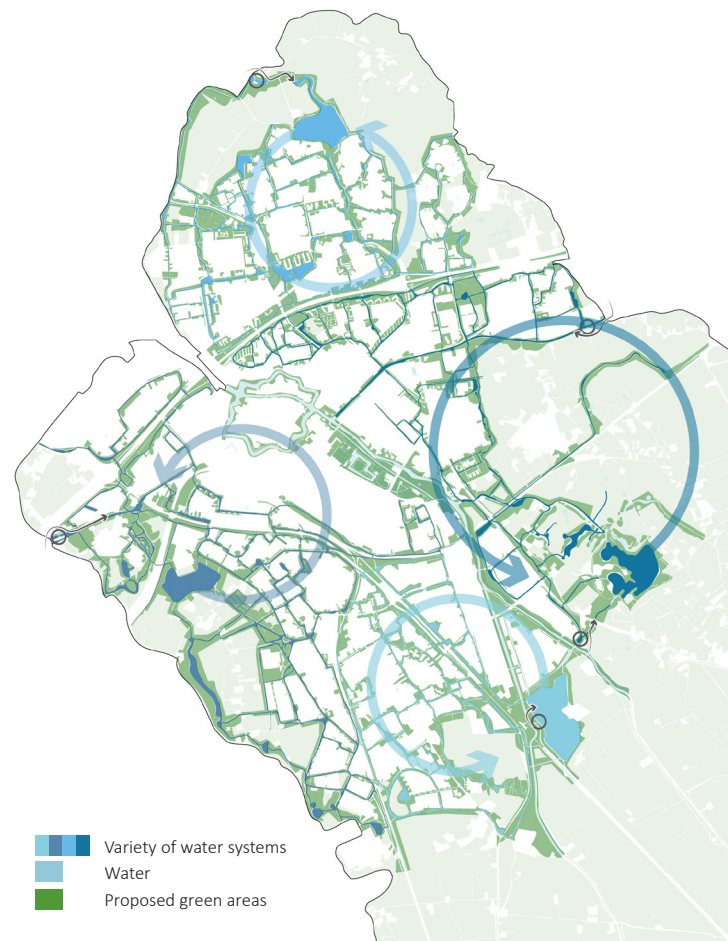
Value of productivity increase by extra green

+ € 250.000,- annually

Value of energy savings by extra green

Beneficiaries:

All residents (avoided health costs and productivity increase), health insurance companies (avoided payments), all property owners and renters (less energy costs), employers and companies (increased productivity), local government (decrease of maintenance costs).



 **HEALTHY CITY
SOCIAL COHESION**

A learning environment ensuring direct access to sport facilities and playgrounds.

+ € 24.600.000,- annually

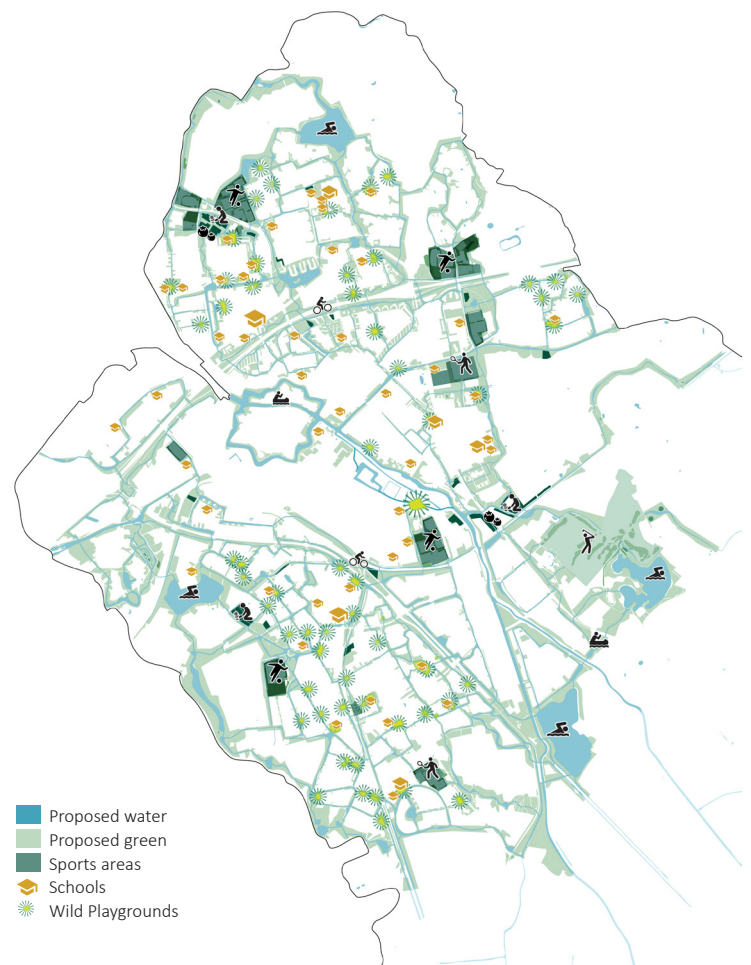
Positive effects on social cohesion by extra green

+ € 8.366.000,- annually

Positive effects on social cohesion by extra water

Beneficiaries:

All inhabitants, especially children (more social interaction, positive attitude towards life, better future prospects), local government (avoided damage), insurance companies (avoided payments).



 **HEALTHY CITY
EXERCISE**

A refined bike network directly connected to the green-blue network providing fresh air .

+ € 3.266.000,- annually

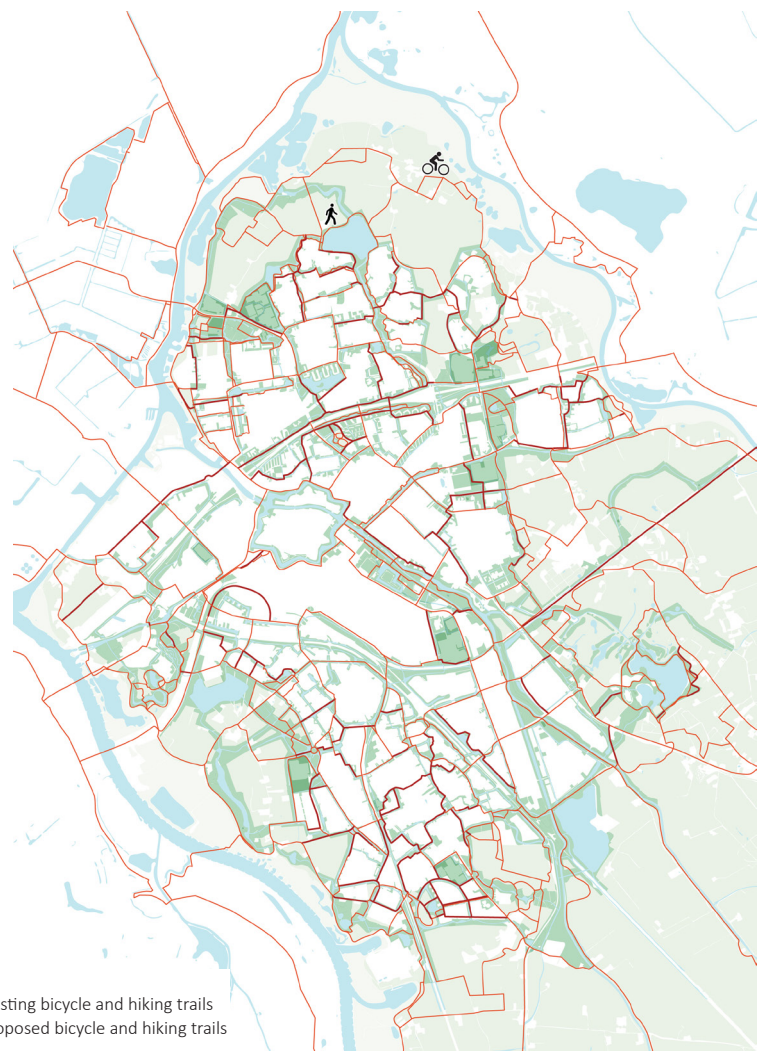
Direct health effects by adding extra trees and reed beds

+ € 2.666,- annually

Recreation value

Beneficiaries:

All residents (avoided health costs), health insurance companies (avoided payments), local government and hospitality (increase of visitors and consumption).



HOW TO BENEFIT FROM ADDED VALUES

Can we live up to this promise of a rich, extended and refined green-blue network? Can the immediate benefit of the amount of built space be considered fairly in relation to the added value of high quality green public space? Can we build more compact in pursuit of creating green-blue networks which provide our cities residents with a healthier environment? Could private entities sponsor our public spaces like bike lanes, parks full of trees and rich river banks, because they also benefit from their presence? Can the assessment criteria be adjusted the next time we have to decide between a parking and a park?

Step one is to understand that problems can be solved by integrated public space design. This concerns, for example issues on water safety and climate adaptation. Integrating engineering solutions into public space can play a contributive role in storm water collection and reducing heat stress and dry periods. This means that solving infrastructural problems and the creation of quality public space become mutually inclusive strategies. Practice is proving that in such cases more impact can be achieved with the same or even less amount of money than if the two were treated and dealt with separately.

Step two is to acknowledge that public space serves more purposes than spatial aesthetics, functional usability and the provision of outdoor 'breathing room' in the urban fabric. Public space can provide a wide range of ecosystem services. They can help avoid damage and moreover they add value in their contribution to better public health, more labour productivity and higher real estate values. The exact quantification of these added values is still disputable but becoming more comprehensible and credible.


Step three is to negotiate new models of exploitation and return of investments. The beneficiaries with added value are mostly not the ones that have to invest in good green-blue public space networks. Local governments still hold a pivotal position in this scheme, because they benefit on many aspects concerning climate adaptation, water safety and public health. And they also are the ones that invest the most because of their traditional role as keepers of the public realm.* The challenge will be to involve other stakeholders to see their potential future personal benefit in added values as a viable investment in improving public space.

Our designs address the first two steps and offer proposals for a better, more integrated design of green-blue public space in the cities. However, . They are not just places to spend money based on aesthetic and functional use. They are places that possess the potential to add real economic value to the city, to cut costs on infrastructural investments by combining them into inclusive space design. And in doing so, public space can mitigate the negative effects of climate change and moreover generate added value by creating an urban environment that supports city residents to become healthier and happier. That is why good green-blue public space deserves to shift from the last item of the expenditure budget to a priority factor of significance in investment decisions.

** According to the traditional European perception of urban public space. This is different in other parts of the world like USA and Asia.*

Exhibition lay-out guide to 18 ecosystem services on display





The infrastructure of our cities is twentieth-century, outdated and overburdened. The Next Economy requires a redesign of the city and its infrastructure. In collaboration with design offices, the PBL (Netherlands Environmental Assessment Agency) and the CRa (Board of Government Advisors) have investigated what cities in the Netherlands can do to improve the sustainability of their infrastructure.

With DE URBANISTEN the urban green-blue networks have been examined as infrastructural systems where traditional values of public space are combined with green values in ecosystem services. There is an increasing necessity to deal with an excess or lack of water, the improvement of air quality, establishing an optimal temperature range and the sustainable consumption of resources, as services in our cities. Here ecosystem services can play an important supportive role. Benefits of green-blue networks have always been present in our cities by providing the base for urban wellbeing, but now it is time to move a step further and also consider them as valuable quantifiable assets in our urban economies and integrate them into urban public space design.