Taking Action for Urban Nature

Business Model Catalogue for Urban Nature-Based Solutions

Led by Durham University, NATURVATION involves 14 institutions across Europe working in fields as diverse as urban development, innovation studies, geography, ecology, environmental assessment and economics. Our partnership includes city governments, non-governmental organisations and business. We will assess what nature-based solutions can achieve in cities, examine how innovation is taking place, and work with communities and stakeholders to develop the knowledge and tools required to realise the potential of nature-based solutions for meeting urban sustainability goals.

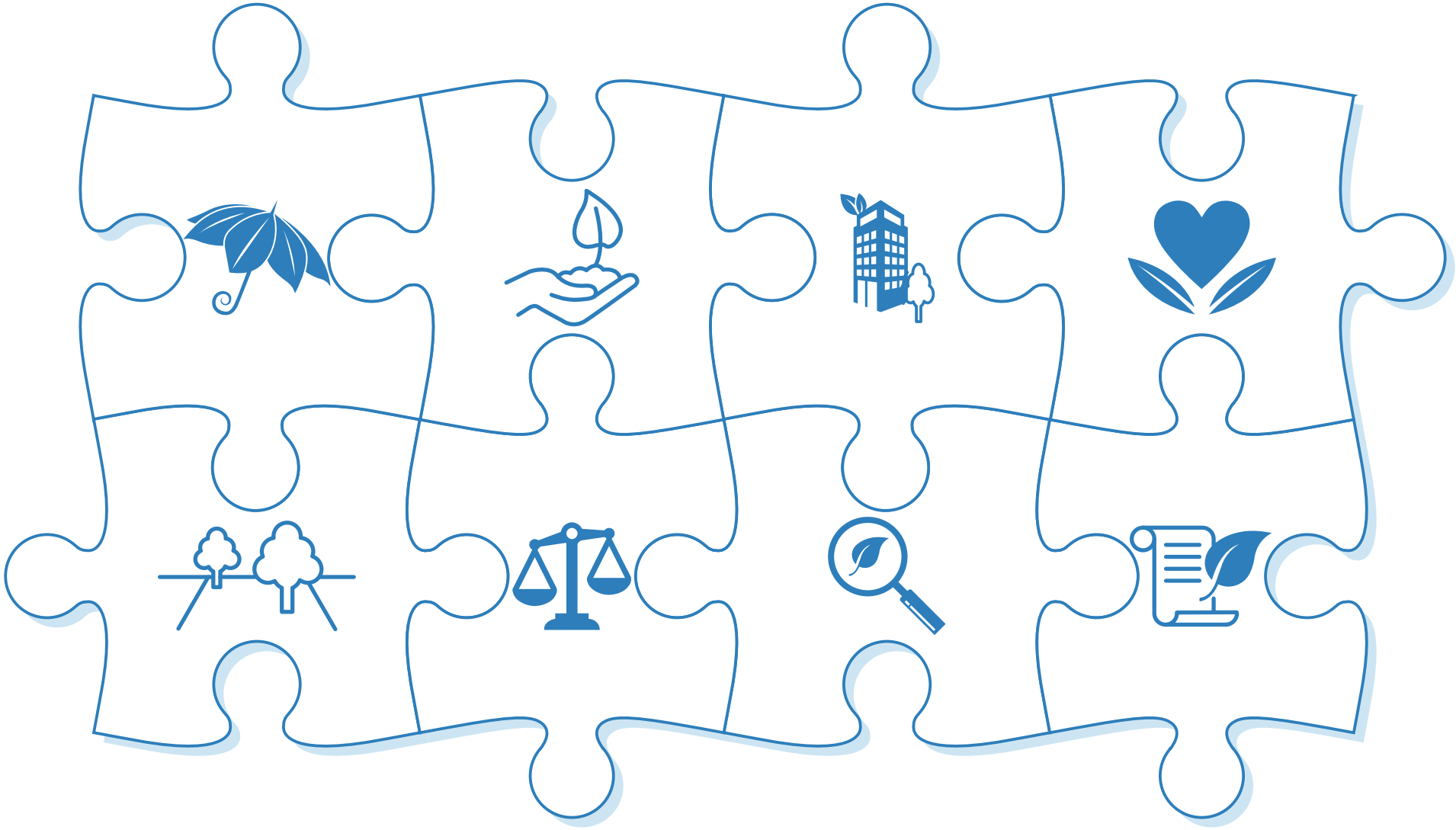
Author: Helen Toxopeus, Sustainable Finance Lab, Utrecht School of Economics, Utrecht University

Contributors: Harriet Bulkeley (DU), Friedemann Polzin (UU), Janice Astbury (DU), Hade Dorst (UU), Kathrin Hörschelmann (IFL), Stela Ivanova (IFL), Attila Katona (CEU), Bernadett Kiss (LU), Panagiota Kotsila (UAB), Yuliana Lazova (IFL), Chris Martin (DU), Kes McCormick (LU), Laura Tozer (DU), Alexander van der Jagt (UU), Christine Wamsler (LU), Anja Werner (IFL), Laszlo Pinter (CEU), Bettina Dreiseitl-Wanschura (Dreiseitl Consulting)

Citation: Toxopeus, H.S. (2019) Taking Action for Urban Nature: Business Model Catalogue for Urban Nature-Based Solutions, NATURVATION briefing

More information: www.naturvation.eu

This project has been funded by the European Union's Horizon 2020 research and innovation programme under grant agreement No. 730243



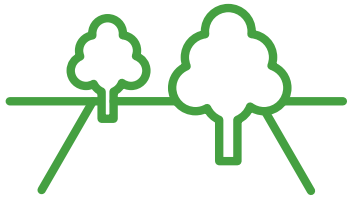
Urban nature-based solutions create many types of value...

...but who will pay for it, and why?

Risk reduction
Isar plan, Munich
Atlantis Water Fund Pilot, Cape Town

Green densification model
Parc Marianne, Montpellier
Eco-Valley, Tianjin

Urban offsetting model
Naturcent, Hamburg
Urban Forest Fund, Melbourne



Vacant space model
Pla Buits urban gardens, Barcelona
Winter ice at The Forks, Winnipeg

Local stewardship model
Roadside tree concept, Leipzig
Square meter for butterflies, Edinburgh

Green health model
Food for Good, Utrecht
Newcastle Parks Trust, Newcastle

Green education model
School gardens, Győr
Belvedere College Urban Farm, Dublin

Green heritage model
Park-Museum Vrana, Sofia
Chinampas agriculture, Mexico City

In the **risk reduction model**, upfront investments into urban nature-based solutions are made to lower future costs from extreme weather events such as droughts, storms and floods.

Value proposition | The **Isar Plan** is a river restoration project (8 km, 2000-2011) in Munich carried out in response to the need of **flood protection**, improvement of water quality and increased citizen awareness of the need of green in the city. The monotonous 'grey' river bed was replaced by a diverse, rewilding river landscape that not only offered flood protection and improved **biodiversity** but also became an **attractive recreation area for residents**.

Isar River - Credit: Bernadett Kiss

Value delivery | **The expiring of water contracts** with local energy plants were a key opportunity for renegotiation the amount of water flow in the Isar for energy generation. Also, citizens started asking for more green in cities and green parties were elected. An **interdisciplinary project team**, headed by the Bavarian Water Management Office, enabled different municipal departments and experts to cooperate successfully.

Enabling conditions | The project put **different goals** at the forefront, harmonizing the project plan across different sustainability goals (flood protection, water quality and recreation) and **successfully coordinating** between different municipal silos and actors.

Risks | The **recreational success** of the river seems to create **disturbances for fish**, which are found less than expected.

Value capture | The total budget was **EUR 35 million, jointly funded** by the Bavarian state and the city of Munich. **Flood events** (1999, 2005, 2013) increased the available budgets for flood protection. While the flooding corridor **has higher maintenance costs** than before, the new Isar park and bathing area attract **more guests** (including residents and visitors) than before during the whole year.

Isar River - Credit: Bernadett Kiss

In the **risk reduction model**, upfront investments into urban nature-based solutions are made to lower future costs from extreme weather events such as droughts, storms and floods.

Value proposition | The **Water Fund** in Cape Town is a public-private funding mechanism for urban nature-based solutions interventions that lead to **increased water security at lower costs**. The Western Cape is expected to become even drier as climate change impact increases, which means that a key value driver of this initiative is to **lower the incidence and extent of droughts** (increased climate resilience). The first intervention financed by the Water Fund is **removal of invasive species** from the catchment area, which will increase the city's water supply to an equivalent of approximately two months water usage.

Invasive plant clearing - Credit: Laura Tozer

Value delivery | The Water Fund, as a **'neutral' third party body**, creates the trust needed for private actors to collaborate around a common goal, facilitating **dialogue and - ultimately - investment**.

The invasive plant clearing work is carried out by women from nearby disadvantaged communities through a social enterprise.

Enabling conditions | Water management needs to include the greater Cape Town region. **Replicating the Water Fund model** from other cities in the world where the Nature Conservancy has implemented it, facilitates multinational players like Coca Cola and InBev to co-invest.

Risks | The municipality is hesitant to invest in catchment clearing **outside of city boundaries**. The importance of catchment clearing was also contested by many people because of the **focus on quick** wins to manage the drought.

Value capture | Future savings on **water treatment, desalination and conservation costs** are expected to easily offset the costs of watershed conservation for Cape Town, providing high return on investment.

Additionally, the program enables **stable job creation** for disadvantaged women near the watershed areas.

Cape Town's Table Mountain - Credit: Laura Tozer

The **green densification model** integrates nature-based solutions into (often large-scale) urban real estate development. The costs of creating and maintaining these NBS become an embedded part of a larger business case of 'sustainable urban living', captured through real estate value and economic growth.

Value proposition | **Parc Marianne eco-district in Montpellier** is a green urban development that integrates green-blue infrastructure into its design from the beginning; citizens are said to be '**living in a nature-based solution**'. As a district in a sea-side city, it is built in such a way that it addresses flood risk, leaving space for the water to run through in case of flooding allowing for **density and nature**. The district also received ecolabel certification (2015) on thermal performance, quality of life, nature and biodiversity and mobility.

Street in residential area of Parc Marianne - Credit: Anja Werner

Value delivery | **Controlled land prices** made it possible for the City of Montpellier to buy the land (in the 1980-90's) and develop **long-term plans** for the area. The master architect and the city council together developed **detailed social and environmental requirements** for the development of the new area.

Montpellier has a long history or building on floodplains, as is the case with Parc Marianne. The **neighborhood was built elevated** so that the natural terrain could be used as a retention basin, which is a more sustainability solutions.

Enabling conditions | The former major, George Frêche, set out a long-term vision for Montpellier which was very **interventionist**; this allowed the municipality to buy a lot of land with tax money, control prices and plan projects like Parc Marianne.

Risks | While **biodiversity** is a goal, it is not taken into account explicitly. There are concerns about the way the apartments are divided between different milieus, and it is noted that the more expensive houses are positioned along the green areas.

Value capture | The project was financed by developers **buying the land** from the municipality. The total investment from the developers was around **EUR 110 million**. The city prescribed the rents that the developers can ask for each flat; the price was not a factor in the tender allocation.

Riverbed in Parc Marianne - Credit: Anja Werner

The **green densification model** integrates nature-based solutions into (often large-scale) urban real estate development. The costs of creating and maintaining these nature-based solutions become an embedded part of a larger business case of 'sustainable urban living', captured through real estate value and economic growth.

Value proposition | The **Eco-Valley of the Sino-Singapore Tianjin Eco-City** has been designed and realized as an integral part of the Tianjin Eco-City. The Eco-Valley cuts across the entire Eco-City like a 'fishbone' with a total surface area of approximately 180,000 m2 (3.17km long, minimum 50m wide) . It links together the city center with all residential districts, parks, community spaces, commercial zones and waterside areas as a park and transportation spine. It is expected to lead to a **high quality of life** for its 350,000 residents and its businesses, simultaneously serving as a rain- and **stormwater management system**.

Developing the Eco-Valley - Credit: SSTEC

Value delivery | Tianjin Eco-City, which the Eco-Valley is part of, is set up as a large **public-private partnership** between Chinese and Singaporean development companies. The **Singaporean National Parks Board** was in charge of planning the Eco-Valley, implementing its expertise on green infrastructure, park connector concepts and water management. The Eco-City and Eco-Valley are delivered in **three phases**. There is a master plan, but also some room for a learning approach based on input from the first residents. Maintenance of the Eco-Valley's vegetation and public spaces is **subcontracted**.

Enabling conditions | The Eco-Valley (and Eco-City) had strong **political support**: it was initiated through a framework agreement between China and Singapore, as a pilot of China's "sponge cities" project. A set of **Key Performance Indicators (KPI's)** were developed for the Eco-Valley with a strong focus on ecological urban development.

Risks | Commercial pressure from real estate development in combination with unexpected high costs led to a decrease in the proportion of **affordable housing** from 50% to 20%.

Value capture | The cost of the Eco-Valley is approximately **€ 20.8 million**. While revenue streams were not calculated explicitly for the Eco-Valley, developers anticipated **an increase in the value of the real estate** in the Eco-City, and assumed that it contributes to a successful 'live-and-work' concept. The Eco-Valley should **generate revenue** by attracting residents, visitors, businesses and industrial parks to the Eco-City. The Eco-Valley acts as the water management and stormwater retention structure of the Eco-City, also **lowering extreme weather costs**.

Tianjin - Credit: Shutterstock.com

In the **local stewardship model**, local nature-based solution plots and trees are valued by citizens and businesses who are willing to protect and support nature in their neighborhood based on the direct value and sense of identity and meaning that they derive from it.

Value proposition | The **'Straßenbaumkonzept'** (roadside tree concept) in the city of Leipzig offers citizens the opportunity to contribute to the funding of specific street trees near to where they live. For a **minimum donation of €250**, citizens can adopt a tree ('Patenbaum') which is then planted in a designated area along a roadside and receives a dedication plaque. This approach builds on the **cultural meaning** that people can attach to trees, as a symbol of life or memorial site. Also, it profits from increased recognition with citizens to **improve air quality** and **reduce noise levels** in Leipzig, which can be mitigated through tree planting.

Roadside tree planting in Leipzig - Credit: Kathrin Hörschelmann

Value delivery | The Straßenbaumkonzept was developed through a **cooperation** between the municipality and the environmental NGO Ökolöwe. The **low level of bureaucracy** involved made it possible to facilitate private funding for street trees, as well as a **tax rebate** offered on the donation, making it easier and more attractive for citizens to fund a street tree. A **detailed city tree map / registry** on the website of the municipality allows citizens to identify specific locations for a tree they would like to fund.

Enabling conditions | The municipality needs to designate **space** for trees along the roadside, where it competes with grey infrastructure – both above (car parking) and underground (sewage pipes).

Risks | The tree planting needs to be **additional** to the amount of trees that are already promised to be planted. If there are no regulations on tree cutting or if it replaces municipality planting, the net impact of this concept may be zero or even negative.

Value capture | The **costs** of new tree planting and maintenance is a barrier for increasing the number of trees in Leipzig. The contribution of citizens lower the cost of tree planting, and at the same time increase the **symbolic value** of the tree. However, public funding, and the strong involvement of the NGO, are still needed to administer this program.

A green cycle path in Leipzig - Credit: Kathrin Hörschelmann

In the **local stewardship model**, local nature-based solution plots and trees are valued by citizens and businesses who are willing to protect and support nature in their neighborhood based on the direct value and sense of identity and meaning that they derive from it.

Value proposition | The **'square meter for butterflies'** project in Edinburgh engages private and public organizations to enhance their green roofs. This measure provides the **biodiversity quality** necessary to attract and sustain **native butterfly species**. The project focuses on a particular pollinator species (the native Northern Brown Argus butterfly, often referred to as Edinburgh's butterfly). This is thought to help capture people's **imagination** and encourage them to **contribute** to urban biodiversity. The focus on just a 'square meter', aims to show that **even small interventions** can make a difference.

Northern Brown Argus - Credit: Shutterstock.com

Value delivery | The **Royal Botanical Garden Edinburgh (RBGE)** initiated this project, using funding from the Edinburgh Living Landscape (ELL) network's program. They approached the Butterfly Conservation Trust to develop this project. Together they identify **buildings which already have green roofs** where greening could be enhanced. If the building users commit to a 'square meter for butterflies', RBGE **provides the plants**. Wherever possible, **building users** are involved in the creation and maintenance of the square meters.

Enabling conditions | Knowledge on native butterfly species and their **habitats**, available information on green roofs in the area and networking by the initiators were essential for the engagement of organisations to enhance their green roofs.

Risks | **Upscaling** this model requires enough capacity to raise additional square meters, which is not available in this phase of the project.

Value capture | This nature-based solution is seen as a **cost-effective intervention** for delivering biodiversity value. Building users contribute **green space** on their roof and are stimulated to take part in creation and maintenance. RBGE providing funding for **an officer** to help deliver some of the actions in the Edinburgh Living Landscape (ELL) network's program, and also **providing the plants**. The Butterfly Conservation Trust provides **training** to all staff on butterflies and their ecology.

The roof of Edinburgh City Council - Credit: Anthony McCluskey

In the **green health model**, the therapeutic, health and wellbeing value of urban nature-based solutions is recognized and used as a driver to finance urban nature-based solutions.

Value proposition | The **urban garden 'Food for Good'** in Utrecht is a 0.7 ha vegetable garden that connects and supports **vulnerable people** from different backgrounds (such as refugees, elderly, disabled people). By **growing and harvesting fruit and vegetables together**, the garden initiators aim to provide a **therapeutic environment** to connect people with themselves, other socio-economic groups and the natural environment, to help them flourish.

The "Food for Good" Garden - Credit: Hade Dorst

Value delivery | Food for Good was set up as a **partnership** between a foundation, a social care organization and an environmental foundation. It was created on a **derelict piece of land**. As it grew, other social care organizations started referring their service users to Food for Good. Key staff have **expertise** both in agriculture and in social care, which contributes to the success of the garden.

Enabling conditions | The space used by Food for Good was previously earmarked for development, but this was adjusted to a **park/greenspace designation**.

Risks | In spite of their business model, Food for Good still **struggles to secure long-term funding**. They start up new projects all the time to attract (temporary) project funding.

Value capture | Food for Good has **higher costs than average** urban garden because of its focus on vulnerable people, which requires **competent staff** to be involved in the daily activities in the garden. At the same time, it receives **income from the healthcare budgets** of service users (vulnerable people), in exchange for providing activities and daycare. The garden received **support from the municipality** in the form of a 1-year urban agriculture grant, the allocation of the land and free services, such as waste collection.

The "Food for Good" garden in Utrecht - Credit: Hade Dorst

In the **green health model**, the therapeutic, health and wellbeing value of urban nature-based solutions is recognized and used as a driver to finance urban nature-based solutions.

Value proposition | The Newcastle City Council established an independent charity – **Newcastle Parks Trust** – to care for all of the city's parks and allotments. It promotes **public health for its citizens as a core objective of parks in Newcastle**. This vision returns to the original Victorian ideal of urban parks for health and wellbeing in the city. By developing activities and facilities that encourage active lifestyles and act as **disease prevention mechanisms**, park maintenance and enhancement can lead to better, efficient health outcomes.

Leazes Park in Newcastle - Credit: Shutterstock.com

Value delivery | The Newcastle Parks Trust will undertake two key activities: generate revenue by providing **commercial services** (i.e. health, events, parking) and **maintain/develop** Newcastle's parks.

Enhancement and maintenance of **sports facilities** in parks are expected to improve the health effect of parks. Parks can also be used as a form of **secondary prevention**, reducing health problems by facilitating interventions directed at **lifestyle change** such as prescribed walking, outdoor exercise, gardening and social activities.

Enabling conditions | The shift from a **national to a local healthcare regime** facilitate the earmarking of public health budget for park maintenance.

Risks | The public health budget for parks is a temporary solution. There is a risk that the public health objectives of the parks **cannot be translated successfully into sufficient funding streams**.

Value capture | Based on the benefits of parks for public wellbeing and health, the Newcastle City Council Public Health department committed **£1m per year** until 2019 to support their **maintenance**. More expensive and elaborate NHS treatments are envisioned **to be substituted** by leisure facilities and health interventions in parks, thus **lowering health costs**. Income from health funding sources is expected to lead to revenues for the Parks Trust.

Exhibition Park, Newcastle-upon-Tyne - Credit: Shutterstock.com

In the **urban offsetting model**, a 'no net loss' approach incentivizes or requires offset investments into urban nature-based solutions that are lost because of real estate and infrastructure development within the city.

Value proposition | The **Urban Forest Fund** in Melbourne is created as a financing mechanism to support private actors to green their properties, offering a 50% subsidy on greening costs. Apart from municipal funding, the fund draws on an **offsetting mechanism**, requesting private actors – such as VicRoads, a firm which develops road infrastructure – to contribute money as a way to **compensate the negative impact** their activities have on urban green space by helping create green in other parts of the city.

An urban green wall in Howlett Street - Credit: City of Melbourne

Value delivery | For VicRoads to be able to offset their negative impact on green urban space, the Urban Forest Fund is a **financing mechanism** that facilitates their funds to be redirected towards development of urban nature-based solutions in other parts of the city. Offsetting by VicRoads was voluntary, which means it required a contribution to urban green to be **an integral part of VicRoad's strategy**.

Enabling conditions | The underlying activity needs to be **profitable enough** to carry the offsetting costs.

Risks | The allocation of funds through the Urban Forest Fund may be delayed through the **bureaucratic process** that is set up to facilitate this, in particular maintenance requirements. Another risk is that the availability of an offsetting mechanism **makes loss of natural areas in cities more acceptable**.

Value capture | VicRoads contributed **$215,000** to the Urban Forest Fund and ran additional sustainability initiatives including: planting 320,000 trees and shrubs, rehabilitating urban green spaces along the corridor and offering sustainability grants to community groups. The costs of paying for offsetting by VicRoads can be **attributed to the revenues** they generate by developing the road infrastructure. Their contribution towards offsetting improves their image, **lowers resistance** against infrastructure developments and adds to their **objectives** to leaving a 'green legacy' in a growing city.

The Urban Forest Fund Winning Project "Greening Howlett Street" -
Credit: AKAS Landscape Architecture

In the **urban conservation offsetting model**, a 'no net loss' approach incentivizes or requires offset investments into urban nature-based solutions that are lost because of real estate and infrastructure development within the city.

Value proposition | The **Naturcent program** in Hamburg was set up by the municipality in 2016 **to enhance the ecological and recreation value** of green areas in the city while at the same time carrying out ambitious building plans (10,000 houses a year to keep housing affordable). The offsetting policy addresses fears from citizens that the intensive real estate development in Hamburg will threaten its high livability as a green city, aiming to reconcile building with greening by **focusing on the quality instead of the quantity** of green areas in the city. The program does not require direct payments from citizens, since it is funded by additional land taxation income from building activities in areas that are designated as landscape protection areas.

Building activity in Hamburg - Credit: Helen Toxopeus

Value delivery | The Naturcent program is facilitated by setting up a designated **nature and landscape conservation fund** at the municipality. This allows for transparency, since incoming funds from additional land taxes are **earmarked** for upgrading existing nature. **Districts and environmental organizations** in Hamburg can apply to this fund to invest in upgrading the ecological and recreation value of green areas.

Enabling conditions | Underlying the Naturcent policy is a **differentiated taxation system** that stipulates higher taxes for built land use than for green areas. The success of the Naturcent system is dependent on **applications** from districts and environmental organizations for investments in existing green spaces.

Risks | There is a risk that the funding from Naturcent will chip away at **existing district budgets** for nature maintenance.

Value capture | For every **square meter** of real estate development in the city, **€ 6.36 of land taxation income** is paid into this fund. A one-off of **€ 3 million** was entered into the fund when it commenced as an approximation of land taxes between 2016-2018. It is expected that in 2019 an additional **€ 750,000** will flow into the fund.

Between 2016 – early 2019, approx. **€ 0.5 million total** has been re-invested into upgrading and maintenance of Hamburg's green areas.

Aerial view of Hamburg - Credits: www.mediaserver.hamburg.de / Andreas Vallbracht

In the **vacant space model**, the government steps back and provides space for local initiatives and (sometimes temporarily) unused urban public space.

Value proposition | The **Forks North Portage Partnership ('The Forks')** – a publicly owned merger of two development corporations - develops the Winnipeg rivers in wintertime, maintaining (>10 km) skating trails and warming huts. The frozen river and its skating trails are used for **outdoor recreation**, **cultural events**, **fine dining** and as a **public commuting route**, reducing the need for motorized traffic and connecting otherwise distant neighborhoods to the city center. The Forks have led to a drastic increase of the use of the river during the coldest time of year, with over **700,000** citizens using the river ice in 2018.

Fun on the icy river - Credit: Shutterstock.com

Value delivery | The Forks (FNPP) is governed by a tri-level board of directors from the federal, provincial and municipal government. At the same time it enjoys **a high level of independence** due to it being financially self-sustainable (not receiving any government funding). Conceptual and strategic decisions do require approval of the Board.

Enabling conditions | In 2008, Winnipeg became the **Guinness Book of World Record Holder** for the longest naturally frozen ice trail, which led to **a lot of media attention and 'buzz'**, facilitating entrepreneurship on the river.

Risks | Justice related issues include **unequal access to the trails** (no responsible party looking after the access points to the river; part of the riverside is privately owned). Others suggest that the river trails allow low **income citizens** to enjoy nature without having to leave the city.

Value capture | The costs of **maintaining** the trails and providing the warming huts is estimated at around **€175,000** a year. **Parking revenues** and **sales** during the winter season easily exceed these costs, allowing for funding to be spent on **experimentation** (social innovation, low cost entrepreneurship and cultural events).

Making use of the river in Winter - Credit: Shutterstock.com

In the **vacant space model**, the government steps back and provides space for local initiatives and (sometimes temporarily) unused urban public space.

Value proposition | The **Pla Buits** scheme in Barcelona is a participatory intervention that gives the opportunity to public entities or non-profit associations to develop **temporary uses and activities** (1-3 years) on small plots of unused land. Out of the 14 selected projects in the first phase, nine are **urban gardens**. They 'fit' well to temporary use because no large infrastructure is needed. The Pla Buits urban gardens represent a form of **social entrepreneurship**: self-governed projects are given a space to flourish, contributing to urban green and related ecosystem services, while also offering a solution to social issues of community bonding, integration, and awareness-raising on food production and consumption.

Pla Buits urban garden - Credit: Panagiota Kotsila

Value delivery |Only **legal entities** (such as neighborhood associations) can apply to a Pla Buits plot. The City Council contributes to its basic amenities (water, electricity).

A **successful bottom-up dynamic** is essential for the success of these urban gardens; **families with young children, looking for outdoor activities**, play an important role in creating active communities.

Enabling conditions | The Pla Buits scheme developed after the **financial crisis**, when many construction projects were cancelled leading to unused plots of land.

Risks | There are concerns that urban gardens in temporary spaces lead to a **social loss** once they are displaced. This would **demotivate** the continuation or transfer to a different site. Others are less concerned and find the **social dynamics** is most important, not the space itself.

Value capture | The **low cost** of the unused public space assigned for these urban gardens is driving the feasibility of this model, as well as the fact that its use can be **temporary**. The municipality offers several **support schemes**, for example to pay an instructor who oversees member participation, and in one of the gardens (Illa de 3 Horts) families pay **a small contribution for running costs**. The density of Barcelona increases the value of these small urban green spaces for its members.

A vegetable garden in Pla Buits - Credit: Francesc Baro

In the **education model**, urban nature-based solutions are set up and managed to support environmental education and allow young, urban citizens to engage with food and nature.

Value proposition | **School gardens** in Győr, Hungary, have recently **revived**, creating a setting for children to learn to **care for nature 'by doing'**. The increased interest in **sustainability education** seems one of the key drivers. Apart from building environmental stewardship, other positive impacts include: more **efficient and varied education**; enrichment of **other subject areas** (such as biology, mathematics, arts); building **nutritional knowledge** to prevent child obesity; building **work ethics** and planning skills; social equity; food security and community building.

Pupils at a school in Győr also care for their indoor plants – Credit: Lorna Winship

Value delivery | The vice-dean of the Apáczai school garden in Győr co-founded the **Foundation for Hungarian School Gardens** in 2015 to **support school gardens** across Hungary. This has become a fast-growing **networ**k (over 200 schools). They offer free membership, trainings, best practices and free guidance. The fast uptake of school gardens in Hungary (8%, over 1,100 schools) is partly due to **sustainability-oriented schools** (eco-schools and Waldorf schools). The school garden Apáczai offers **a university course** on organizing and maintaining school gardens to future school teachers.

Value capture | The Apáczai garden keeps **costs at a minimum** to illustrate to students and visitors how a garden can be run with minimal financial resources, focusing instead on motivation, creativity and volunteer effort. **No paid staff** is hired for the garden while **utility costs** (land, water, electricity) are covered by schools. **Material costs** (tools, seeds, construction) are usually provided by parents. The Ministry of Agriculture launched **a pilot program** to fund 50 school gardens, the Foundation manages this process. **Donations for material (~€200)** are sometimes received from the school maintenance organization KLIK, and from the Foundation for Hungarian School Gardens.

Enabling conditions | A national **urban agriculture strategy** has been formulated. This **supports the funding and uptake** of school gardens through the Foundation for Hungarian School Gardens.

Risks | School teachers can get **over-burdened**, managing the school gardens next to their regular duties.

The children love getting involved in the school gardens - Credit: Shutterstock.com

In the **education model**, urban nature-based solutions are set up and managed to support environmental education and allow young, urban citizens to engage with food and nature.

Value proposition | **At the Belvedere College Urban Farm, high school** students have become engaged in an experimental learning process on urban farming on their own premises, using both traditional urban farming methods like **bee-keeping** as well as modern experimental techniques such as **aquaponics**. The integration of an urban farm into the college aims to improve the **quality of education** and to make the school more sustainability-oriented. Students help to run the farm, and farm projects have entered the **official curriculum** of the school.

Aquaponics at Belvedere College Urban Farm - Credit: Panagiota Kotsila

Value delivery | A creative sustainability entrepreneur of Urbanfarm.ie, was crucial in **designing and building** the urban farm at the college, and **connecting** to the urban farming community. **Produce was sampled** for nearby restaurants in the early phase of the project. **A coordinator was employed** to train students, monitor maintenance and keep records on the project.

Enabling conditions | **Safe access to the roof** needed to be secured for the farm to expand to the rooftop of the school.

Risks | **Weather conditions** and **bad maintenance** sometimes disrupt the farm. The **professionalization** of the (aquaponics) project also means it has become more **expensive to operate**, making it less transferable to other entities like public schools.

Value capture | In the beginning, **costs were low**, using upcycled materials such as used fish tanks. Some companies offered **services and donations** and parents bought some produce. In 2017 the project won the **Zayed Future Energy Prize**, giving the school $100,000 to professionalize the project. This was used to expand (and provide safe access) to the roof. An **Erasmus funding scheme** allowed for a project coordinator to be hired.

Experimental techniques at Belvedere College - Credit: Panagiota Kotsila

The **green heritage model** builds on cultural values and a sense of identity to sustain and develop urban nature-based solutions. The green spaces that support / are cultural heritage can lead to different types of value creation, ranging from tourism and education to cultural healing.

Value proposition | **Xochimilco** in Mexico City is the last remnant of the historical lake system that the city was built on. Here, the **traditional agricultural practice "chinampas"** – floating agricultural islands –and its (threatened) **endemic species**, the axolotl are sustained since the Aztek period. Local communities and farmers are working to develop **new and better markets** where they can offer high quality, traditional and seasonal **agricultural produce**, showcasing the cultural heritage that is being sustained and connecting citizens with producers and place, for example through Sunday markets.

Supporting local markets - Credit: Janice Astbury

Value delivery | Local community organizations, producer-consumer networks and cooperatives are created to work with producers across Xochimilco. They focus on creating value-added markets. The products are often sold at **pop-up markets**, to situate themselves close to their potential customers and differentiate themselves from standard market produce. The origin of the products and their **eco-friendliness** is highlighted. All of groups combine sales of produce with **ecotourism**, **educational programming**, **volunteering opportunities** and other engagement activities. **Academics** play a large role through action research, technical support and social service. The Chinampero agricultural system has been **recognized** as a Global Agricultural Heritage Site by the UN FAO.

Enabling conditions | **Working directly with people / producers on the ground** has been identified as an important condition for sustaining the chinampas agricultural system, because the **government is usually replaced after 3-year terms** which makes it difficult to sustain long-term policies.

Risks | In spite of the high cultural value of Xochimilco, it remains under serious threat as a result of **urban sprawl** and consequent change in **land use**.

Value capture | Revenues are being created by **finding value-added markets for produce**. Consumers, academics and visitors are active as **volunteers**, lowering costs. **Tourism** is expected to raise these revenues.

At the same time, the agricultural activity is seen as a as a route to **ecosystem restoration and social-ecological resilience**, targeting funding for these values, as well.

Traditional boats in Xochimilco - Credit: Janice Astbury

The **green heritage model** builds on cultural values and a sense of identity to sustain and develop urban nature-based solutions. The green spaces that support / are cultural heritage can lead to different types of value creation, ranging from tourism and education to cultural healing.

Value proposition | **The Park-Museum Vrana** in Sofia, Bulgaria, is a historical urban park (100 ha) whose history goes back to antiquity, when it was a connection point between Europe and Anatolia. The Iskar river runs through it and it is the residency of the Tsar. It holds century-old riverside forests and rich biodiversity. As a biodiversity hotspot with historical significance in a dense urban area, the park offers **cultural and recreational services** alongside **habitat and cultural preservation services** and enjoys great interest from visitors – tourists as well as city residents.

Park Museum Vrana - Credit: Shutterstock.com

Value delivery | **The Tsar family** donated most of the park to the municipality for it to become a community park, while remaining owner of 2.5 ha for themselves. They requested a **restricted access policy** to protect rare species in the park. Visitors can only visit in the weekend and have to buy an entry ticket. The conservation of wildlife in the park is regulated through several legal policies. **The municipal enterprise 'city parks and gardens'**, created in 2011, carries out the maintenance of the park. They are open to collaboration with citizens and private firms, The park offers highly educated **tour guides** who are experts not only on the history of the park but also on plants, birds or landscape and can educate the visitors.

Enabling conditions | This historical green site was **closed off** from the public between 1946 – 2003 before it was made public, which allowed such rich biodiversity to develop in a (peri-)urban area.

Risks | **Unclear ownership** prevents investments that can increase the value of this green space, such as an information office.

Value capture | **Maintenance costs** are carried by the municipality; **entry tickets** bring in some revenue but not enough to cover costs. The price is kept low to allow broad access. The **historical and ecological** value of the park is being delivered together with specialized tours. More private funding is looked for but is held back because of ownership disputes over the space.

Vrana Palace in Sofia - Credit: Shutterstock.com

BUSINESS MODELS	 Risk reduction	 Local stewardship	 Green densification	 Green health
Value proposition What is being offered in the market? Who is the customer?	Nature-based solution interventions are valued for their ability to reduce climate risks (and costs) such as flooding, extreme heat and drought.	Urban real estate developers develop nature-based solutions along with housing and commercial buildings, targeted at quality of life of residents/employees (green roofs, gardens).	Local small plots of nature (and single trees) are valued by citizens who are willing to protect and support nature in their neighbourhood.	The therapeutic and health value for citizens of interaction with urban nature-based solutions is valued by (mainly) non-profit and public actors.
Value delivery What resources are needed? What network? What is the strategy?	Targeted at municipalities, citizens, firms. Data / metrics needed to increase risk awareness and underpin investments.	Green development expertise or partnerships with experts are required (roofing firms, landscape architects, ecologists).	A coordinating mechanism is needed for individuals to contribute at large scale, i.e. tool that identifies individual trees to build value and monitor.	In the case of vulnerable citizens, expertise is needed to help them recover through their interaction with nature. Sometimes maintenance needs to be provided for, as well.
Value capture What costs are being made (or prevented?) What revenues, for whom?	High, irregular costs prevented in case of extreme weather; insurance products remain accessible and attractive, can grow the market.	Real estate projects often generate high returns; use part of this to integrate nature-based solutions into building project. Expectations of higher sale prices / rents / occupation.	Many donations from citizens and firms; transaction costs and campaign costs can be lowered by implementing digital monitoring/platform.	Investments into urban greening can help deliver health objectives, both preventive and recovery, thus lowering (other) health-related costs.
Enabling conditions & risks What conditions enable this business model to be effective? What risks are there?	Awareness of risk is crucial, as is availability of data. Municipality should help poorer citizens who cannot afford insurance & risk mitigation interventions.	Green tender procedures / requirements, land ownership and monitoring by the municipality speed up this business model. Subsidies may be needed for social housing to be included.	Accounting for the additional nature provided by local citizens and businesses is important to prevent 'double counting'. Campaigning is often needed, including funding.	This model requires expertise on how green spaces need to be designed and used to support citizen health. Just stating 'green is healthy' will not be enough.

BUSINESS MODELS	 Urban offsetting	 Vacant space	 Education	 Green heritage
Value proposition What is being offered in the market? Who is the customer?	When green-blue urban space is lost to real estate or infrastructure development, a 'no net loss' program can incentivise or require offset investments into urban nature-based solutions elsewhere in the city.	Government steps back and provides space for local initiatives and (social) entrepreneurship in (temporarily) underused urban public space.	Urban nature-based solutions are set up and managed in support of environmental education, allowing young, urban citizens to engage with food and nature, usually through urban farming / gardening.	A green region, city or neighborhood creates value through its green cultural heritage which attracts tourists, residents and businesses.
Value delivery What resources are needed? What network? What is the strategy?	A reliable governance structure needs to be in place to earmark funds obtained from building activities for nature-based solution investment (i.e. a designated fund).	Governments can support through in-kind services and by (temporary) allocation of urban space; volunteer and community groups organize themselves bottom-up.	Using nature-based solutions as a form of education requires governance support from a specific school or school network. It also requires expertise on how to teach with an urban nature-based solutions.	Actors need to acknowledge the cultural value that is embedded in this green nature-based solution. It also needs to combine cultural and ecological expertise to deliver this joint value.
Value capture What costs are being made (or prevented?) What revenues, for whom?	The cost of offsetting biodiversity is internalized in larger real estate or infrastructural development projects, and paid out of the revenue or tax stream that is created.	Facilitates private actors to develop meaningful activities at low cost (low land rent), which enables (social) entrepreneurship even at low/no revenue.	Cost effective and interactive way to implement sustainability education, enriching other subjects and nutritional knowledge in children, as well.	A green cultural space can benefit from volunteers, networks and public financing. Value-added cultural produce and ticket / tour sales can provide income.
Enabling conditions & risks What conditions enable this business model to be effective? What risks are there?	An offset mechanism should not become a 'wildcard' to build on high quality green-blue spaces, but should be used as a 'last resort. It requires availability of green spaces to invest into.	Closing temporary plots can destroy social capital built up in communities. Prevent through alternative location, integrate into urban development strategy.	Guidance, monitoring and expertise is needed from school teachers or staff. Adds to work load of sometimes already overburdened school teachers.	Cultural heritage needs to be equally accessible so entry prices may not be too high. Both ecological and cultural expertise is needed to deliver this model.

	Example	City	Case author (field research)
	Atlantis Water Fund Pilot	Cape Town	Laura Tozer
	Isar plan	Munich	Bernadett Kiss and Christine Wamsler
	Eco-Valley	Tianjin	Attila Katona
	Parc Marianne	Montpellier	Anja Werner
	Roadside tree concept	Leipzig	Kathrin Hörschelmann
	Square meter for butterflies	Edinburgh	Sander van der Jagt and Hade Dorst
	Food for Good	Utrecht	Sander van der Jagt and Hade Dorst
	Newcastle's parks	Newcastle	Chris Martin
	Urban Forest Fund	Melbourne	Kes McCormick and Bernadett Kiss
	Naturcent programme	Hamburg	Helen Toxopeus
	Pla Buits urban gardens	Barcelona	Panagiota Kotsila
	Winter ice @The Forks	Winnipeg	Attila Katona
	School gardens	Győr	Attila Katona
	Belvedere College Urban Farm	Dublin	Panagiota Kotsila
	Chinampas agriculture	Mexico City	Janice Astbury
	Park-Museum Vrana	Sofia	Yuliana Lazova and Stela Ivanova

NATURVATION

cities – nature – innovation

www.naturvation.eu

@naturvation