

GREEN ROOF NEWS



International Green Roof Association
Global Networking for Green Roofs

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Title image: Potsdamer Platz, © IGRA



Dear Reader,

Welcome to this edition of Green Roof News!

One only needs to listen to the news or read the local paper to hear of all too common stories of flooding and property damage caused by seemingly routine rainfall events. Green Roofs help in reducing the amount of stormwater runoff. This results in decreased pressure on sewer systems at peak flow periods.

As part of our Main Theme, this time we spoke to Herbert Dreiseitl, the Managing Director of Rambøll Liveable Cities Lab, about the importance of stormwater management for the cities of tomorrow.

Scientific studies from the HafenCity University Hamburg determine the water retention capacity of an extensive Green Roof via rainfall-runoff measurements.

In other features we look at spectacular Green Roof projects in the Netherlands, Denmark, Spain, Germany and Ukraine and also provide you an inside look at the Natural Capital Finance Facility and their way to finance Green Roofs.

Have fun reading!

Wolfgang Ansel
Director IGRA

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The International Green Roof Association (IGRA) is a global network for the promotion and dissemination of Green Roof topics and Green Roof technology.

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MAIN THEME Introduction to the Topic:

Stormwater Management with Green Roofs Over the Course of Time

There is a close link between Green Roofs and local stormwater management. Depending on the Green Roof system and the depth of the growing medium, the immediate water run-off can be reduced by 50–90 %.

Most of this water returns directly into the natural water cycle by transpiration/evaporation of the Green Roof. The excess rainwater is filtered and drained off with a temporal delay. This leads to reduced stress on the sewer system during the year and at peak flow periods. As a result less or smaller dimensioned sewerage systems can be installed.

In combination with other forms of modern stormwater management (for example cisterns, bioswales, rain gardens or urban waterscapes) the rainwater can be entirely managed on the own property and support the natural water cycle of evaporation, condensation and precipitation. The stormwater management concept of the Potsdamer Platz in Berlin which was designed by Prof. Herbert Dreiseitl is a pioneering example for this approach (see page 4–6).

Unfortunately stormwater management with Green Roofs is still not main stream in the planning and design of drainage systems. This could be due to the fact that there is scientific disagreement about the quantification of the storage and delay effects.

A literature review of the Hafencity University Hamburg (Germany) combined with long-term measurements of a Green Roof (approx. 600 m²) under real conditions is shedding some light on the topic (see page 7–8).

And how does the Green Roof industry handle this situation? They have developed a new generation of stormwater management roofs which expand the retention capacity temporally and deliver fixed values for this effect (see page 9–10). A very promising solution!

In this context it is also very important that many municipalities support the public benefits of Green Roofs for stormwater management with financial subsidies (see City of Rotterdam, IGRA Green Roofs News 2/2015), reduced stormwater taxes or public relation activities.

Blue-Green City Infrastructures can support each other perfectly – for the benefit of the environment and the residents.



An outstanding example for sustainable stormwater management with Green Roofs – The VanDusen Botanical Garden Visitor Centre in Vancouver, Canada. © ZinCo

MAIN THEME Potsdamer Platz, Berlin: Harvesting and Utilization of Rainwater



Urban Waterscape. © Atelier Dreiseitl / Rambøll Group

On Potsdamer Platz in Berlin, Germany, the aesthetic qualities of water have been exploited most successfully – without wasting a single drop. The Urban Waterscape scheme combines rainwater harvesting with a recreational cityscape and demonstrates how recycling rainwater can be of benefit to the cities of the future affected by climate change. The idea is that rain falling on the square will be used on the spot.

Completed in 1998, the waterscape project at Potsdamer Platz has contributed to making Potsdamer Platz one of the most visited places in Berlin.

During the first half of the 20th century, Potsdamer Platz was an important square and intersection in Berlin. In World War II it was completely destroyed by bombings and later divided in the 1960s by the Berlin Wall. When the Wall came down in 1989, the redevelopment of the empty Potsdamer Platz provided one of the largest building sites in Europe. As an office, entertainment and shopping development, the area today holds the headquarters for multinational corporations like Sony and Daimler AG with its 21-story high rise headquarters, along with theaters and a large mall.

The idea behind the Urban Waterscape is that the rainwater should be used where it falls. This is achieved by collecting approximately 23,000 m³ of rain water a year from the roofs of the 19 buildings in the area. About 60 % of the roof space is covered with vegetation, so that some of the rainwater evaporates while the rest is stored.

Another benefit of the Green Roofs is that the temperature in the buildings is reduced during the summer, thus saving energy that would otherwise be spent on cooling.

A little more than half of the harvested rainwater is used for irrigation, the pools and canals in the area, while the rest is used in the buildings to flush lavatories and by fire extinguishing systems. Five massive underground cisterns (approx. 900 m²) accommodate the excess water in the event of extremely heavy rainfall. From here, the water is fed into the system of canals built on the south side of the building complex. Integrated into the system are biotopes, plants with a cleansing effect which filter the water as it passes through them.



Artificial water basin at Potsdamer Platz. © Atelier Dreiseitl / Rambøll Group

Climate change will cause periodically heavier rainfall and as a result, the sewers of the cities will become overloaded, increasing the risk of freshwater becoming polluted.

During reconstruction of Potsdamer Platz they also had to take into consideration that the soil in the area was not able to absorb such large quantities of precipitation. It was therefore necessary to develop new, efficient and environmentally sustainable solutions.

Project Data

Location: Potsdamer Platz, Berlin, Germany

Construction Year: 1998

Green Roof Area: 44,000 m²

Architects/Design: Renzo Piano
and Christoph Kohlbecker

Water Design and Green Roof:
Atelier Herbert Dreiseitl

Landscape Architect: Moehrl + Partner
and Daniel Roehr



A special developed and selected substrate is treating rainwater without any fertilizers. This water is captured in 5 large cisterns and in the open lagoon of the urban waters. Rain and stormwater is buffered and reused. Eventual overflow discharge is feeding the Landwehr Canal. © IGRA

MAIN THEME The Art to Integrate Blue-Green and Social Factors:

Interview with Prof. Herbert Dreiseitl, Director of Rambøll Liveable Cities Lab



Herbert Dreiseitl is an urban designer, landscape architect and an expert in creating Liveable Cities. A trademark of his work is the inspiring and innovative use of water to solve urban environmental challenges, connecting technology with aesthetics, encouraging people to take care and ownership for places. As the founder of Atelier Dreiseitl, Herbert has realized ground-breaking contemporary works in

urban design, public health, urban hydrology, art in the public domain, biodiversity, stormwater management, climate-adaptation, planning and landscape architecture. Within the new Liveable Cities Lab, Herbert explores the potentials and conditions for Liveable Cities of the future. The Liveable Cities Lab (LCL) is the new innovation and research laboratory of Rambøll, directed by Herbert Dreiseitl, dedicated to support cities in envisioning their future development.

I know that this is a challenge, but can you please describe in a few words your approach towards a Blue-Green city infrastructure?

Infrastructures are the physical backbone of urban functionality. Beside mobility and resources like water supply, energy, food and waste management it is the urban environment like air quality, temperature balance and outdoor comfort that creates the standard of living. But there is also a social and cultural component that drives people to move more and more to cities.

Blue-Green Infrastructures are still not properly understood in their true function and value for the city and its inhabitants as backbone for liveability, and as dynamic depository resource to balance and stabilize life processes. But it is the character of these flexible and ever changing elements.

We cannot as easily measure, count and quantify the values of the Blue-Green components in the urban structure as we can on hard build forms of engineered infrastructure, of buildings and real estate development.

Holistic attitudes for Blue-Green Infrastructures are not only a nice addition to create more liveability but will become a necessity as survival strategy for cities. Especially with the challenges of climate change, cities will be hit enormously and we can see this already happening today.

In our research we found strong arguments of value building but we have to measure with different forms of capitals.

How important are the social factors in this context?

One of these benefits is the social and human capital that profits enormously by Blue-Green Infrastructures. We know today that green in cities is not only nice to have but essential for human health. With the Biophilic effect, green can contribute for psychological health like avoiding depressions, burnout and other dysfunctions. Even the immune system is influenced as studies in Singapore hospitals show.

For social connectivity and peoples' wellbeing the public realm with vegetation and water is essential and makes a city liveable.

In several of your projects Green Roofs are part of the overall concept. What are the most important functions that you expect from this green technology?

Green Roofs are not only an important part of the treatment train for sustainable rainwater management but contribute so much for the urban climate. They balance the weather extremes and stabilize the temperature and humidity just to mention some points on this.

We include Green Roofs also for reasons like biodiversity and habitat by creating an Eldorado for birds, insects and plant variety and we know the bee honey in cities is often better than in rural areas.

On top of all this it looks attractive and has this human psychological health aspect that we think is getting increasingly important.

You are working on an international level. Is there a country or city that stands out with regard to the implementation Blue-Green Infrastructure?

Many cities around the world go for more Blue-Green. Some of the progressive cities are Copenhagen with its Cloudburst project in reaction of the enormous flooding's, likewise New York City, Portland Oregon and Chicago in America but also Singapore is on the forefront of new integrated solutions for Blue-Green in dense urban environment. This always includes more Green Rooftops and facades.

In this context, what is the significance of Potsdamer Platz in Berlin?

The Blue-Green factor on the Berlin city centre, Potsdamer Platz, is a pioneer example that inspired many other cities around the world.

Without this project including Green Roofs, urban waters, harvesting rain and cisterns to recycle water, many programs like the ABC water guidelines in Singapore and better-integrated sustainable solutions in China and USA would not have been possible.

This case has surely changed the mind-set and given confidence to many new developments.

Finally if you could make a wish, what would be the key to boost the development of water sensitive urban design?

The challenge is not the technology but their implementation within the urban fabric because the stage of Blue-Green Infrastructures is foremost in the public domain.

We all can see and experience those spaces are getting more and more tightly and there is a growing competition about functions, programs and occupations. Instead of a competition where the loudest and most brutal voices but not necessarily the most important elements win, better ways of sharing and multifunctional structures need to be developed.

I would wish that municipalities would give better frame-conditions and the private sector would have a longer perspective in seeing their benefits.

Liveability is basic for healthy cities; therefore we need courage, perspectives and hope.

Interviewer: Wolfgang Ansel, Director of IGRA



For people's wellbeing the public realm with vegetation and water is essential and makes a city liveable. © Atelier Dreiseitl / Rambøll Group

MAIN THEME HafenCity University Hamburg:

Evaluation of Green Roof Hydrologic Performance for Rainwater Run-off Management in Hamburg



Michael Richter, stormwater researcher at the HafenCity University, Hamburg. © HafenCity University, Hamburg

Summary

Adaptation to the unpreventable consequences of climate change is one of the main challenges for cities in the coming decades.

Our research focuses on one example of climate adaptation measures: Green Roofs.

In addition to long-term economic benefits they offer a wide range of benefits for urban ecosystems. Besides thermal benefits, like reduction of heating and cooling costs and reduction of the urban heat island effect, Green Roofs improve the urban water cycle, reduce air pollution and enhance biodiversity.

In Hamburg, heavy precipitation events regularly lead to overwhelmed urban drainage systems. Such events are expected to occur more often in the future with increasingly frequent extreme precipitation events. Therefore, rainfall-runoff measurements of an extensive Green Roof on the HafenCity University building are carried out to determine the water retention capacity of the roof and to estimate the potential retention during heavy precipitation events. The long-term results show rainfall-runoff relationships under various weather conditions and are important for the development of future water management strategies and to overcome doubts about the effectiveness of Green Roof water retention, especially related to extreme precipitation events.

Introduction

Several studies regarding rainwater runoff retention state that the rate of rainwater retention for certain rainstorms depends on roof slope [14], substrate depth [4], rainfall characteristics like duration and intensity [15], season [16], soil moisture [17], roof age [18], plant species [12] and growing media type [19].

It is clear that over a whole year, Green Roofs with a substrate layer thickness of more than 6 cm can retain about 50 % of precipitation and intensive Green Roofs with growing medium thickness > 50 cm can retain up to > 90 % [20].

For urban rainwater management, especially the dimensioning of sewage systems and prevention of flash floods due to sewage overflow, the retention capacity of Green Roofs during local extreme precipitation events is of interest.

It is still not clear whether comprehensive implementation of Green Roofs can have significant impacts on rainwater retention, runoff reduction and the delay of heavy rainfall events that cause flooding due to over-charged sewer systems. This problem is tackled by a comprehensive systematic review of literature regarding Green Roofs and water retention and a rainfall-discharge measurement approach on the Green Roof of the HafenCity University (HCU) building.

Methodology

To get an overview of the published research regarding Green Roofs and their possible effects on rainwater management, a systematic review methodology was applied. With these data, water management related factors were analyzed and statistically tested to recognize significant dependencies between different factors.

Precipitation and runoff from the HafenCity University Green Roof are measured separately. A Lambrecht rain gauge including a tipping counter is situated at the northeastern part of the building. Runoff from the roof is drained from 3 roof outlets into a measurement box in the ground floor of the building.

The measurement system was installed in March 2015 and has been recording rainfall and runoff since then in a temporal resolution of 1 minute.

Results and Conclusion

The systematic review results indicate a wide variety of properties characteristic for rainwater management. Across all studies, the average yearly (or whole study period) water retention was 56 %, ranging from 12 % to 90 %. The periodic retention rates differ within colder and warmer periods.

For single precipitation events investigated in the studies, the average water retention of Green Roofs was 57 % and the average peak discharge coefficient was 0.4 (range: 0–1).

The duration till runoff initiation from the Green Roof and peak delay from rainfall peak intensity to runoff peak intensity were delayed for 277 minutes (–8 – 2290 min) and 192 minutes (0–2000 min) on average.

Correlation tests with data from the reviewed studies showed that the runoff-retention described were significantly correlated ($p < 0.05$) with the thickness of soil substrate, the soil moisture before the rain event, the precipitation intensity and duration, the roof slope, the season and latitude. During the here presented period of study, 410 mm precipitation were recorded whereof 142 mm were discharged; this means 65 % of the rainfall were retained by the Green Roof.

During the study period 2 short heavy precipitation events were recorded and evaluated from which about 50 % of water was retained.

Analysing precipitation events and related Green Roof retention it could be shown that there is a wide variety of characteristics (technical and climatological) that influence retention on a roof. Therefore, the Green Roof measurement campaign on the HCU Green Roof is intended to collect data of a wide variety of (extreme) rain events and retention to draw conclusions for urban stormwater management.



View over the HCU extensive Green Roof. © Hafencity University Hamburg

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MAIN THEME Mitsubishi Electric Europe B.V., Ratingen, Germany: New Roof Build-up Reduces the Risk of Flooding



The concept for the new office and administration building of the Mitsubishi Electric Group includes the installation of stormwater management roofs on all roof areas. © kresings architektur GmbH

In 2015, the new German headquarters of the Japanese company, Mitsubishi Electric Europe B.V. was built in Ratingen and incorporated a stormwater management roof into the building. This stipulation set down by the City of Ratingen fitted well with the corporate guiding principle of “Changes for the Better” and the environmental declaration “Eco Changes” of this world leader in the electrical engineering sector.

The company aims to reduce the environmental impact of its business activities and to contribute to the protection of the species. This is to be achieved so that LEED certification in the highest category, Platinum, will be awarded for the new office and administration building in Ratingen.

The Leadership in Energy and Environmental Design (LEED) defines a series of standards for environmental, resource-conserving and sustainable building. Green Roofs and particularly stormwater retention roofs make a valuable contribution to this.

The building complex comprises an area of about 16,000 m² of office space over five floors for up to 750 employees and has 500 underground parking spaces.

The architectural concept of the commissioned architects kresings architektur GmbH from Münster basically divided the building into two separate parts that present towards the North and the South as separated, solid brickwork façades. Two light-infused atria in different sizes were created as a result.

The two atria with a combined area of about 640 m² were developed as intensive Green Roofs and contain grasses, groundcover and topiaries as solitary plants and also some circular pathways. On the actual roof area of about 3,800 m² various different types of sedum are planted here as germinating seeds.



Extensive Green Roof with stormwater retention across the actual roof area of 3,800 m² resembles sealed surfaces such as is the case in the entrance area of the new company building. © Mitsubishi Electric Europe B.V.

6 cm high spacer elements were installed across the entire roof area beneath each of the two types of Green Roof.

Up to 40 l/m² of water can be stored within these elements (after subtracting material thickness and air volume), that is to say a maximum of about 4,440 m² × 40 l/m² = 177,600 l = 178 m³ water, which runs off in a time delay, providing effective relief for the sewerage system.

Added to this is the stormwater capacity of the extensive and intensive Green Roofs. They help to balance out precipitation peaks and reduce the risk of flooding.

Project Data

Location: Mitsubishi Electric Europe B.V., Ratingen, Germany

Construction Year: 2014–2015

Roof Area: Approx. 4,440 m²

Architects/Design: kresings architektur GmbH, Münster, Germany

Landscape Architects: RMP Stephan Lenzen Landschaftsarchitekten, Bonn, Germany



The spacer creates space to store the water, while above it virtually any type of Green Roof and roof utilisation is possible. © Zinco GmbH

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“La Casa por el Tejado” in Barcelona: An Exemplary Roof Garden in the Middle of Barcelona



A bird's eye view of the head office roof garden of “La Casa por el Tejado” in the district of Eixample in Barcelona. © Ira Irina Ivanova



Street's view up to the spectacular roof garden of “La Casa por el Tejado”. © Ira Irina Ivanova

“La Casa por el Tejado” (LCT) is an architecture firm specialized in the development of new penthouses built on top of old existing buildings in the urban areas of Barcelona and other large Spanish cities. The companies’ name which means “The House on the Roof” tells much about their work and philosophy based on the belief that growth of a city should start using up the remaining buildable space of already existing buildings.

Using a sort of module construction, LCT develops modern attic flats on rooftops characterized by their minimal environmental impact and maximum respect for the surrounding area. In many cases, an extensive Green Roof or a roof garden is included in the design of these new penthouses increasing their ecological value.

The new LCT head office with its extraordinary roof garden is only one of the many successful and impressive examples of this new form of innovative architecture developed by LCT.

A roof garden in the famous Eixample district

Situated in the old district of Eixample in the very center of Barcelona the new LCT head office occupies the completely renovated fourth floor of the original building and an additional attic storey which was set on top as an industrialized module now forming the fifth floor.

On top of this new attic floor there was plenty of space for the design and build of 84 sqm of spectacular roof garden rounding up this extraordinary piece of architecture.

It is part of the LCT approach to bring back to memory these forgotten roof-tops on existing buildings which are unused by their owners although – situated in the Barcelona Mediterranean climate – they offer pleasant outdoor living conditions during 9 months a year. In many LCT projects such spaces are transformed into outdoor living areas providing them with suitable grounds, vegetation and equipment.

This approach is also reflected in the design of their own office roof garden where space is being provided for meetings as well as for recreational use. The landscape architects and gardeners created a garden characterized by the great diversity of plants, their variety in size and height, their absence in certain areas and the combination with wooden floors and walls creating spaces with containment, protected from noise, surrounded by green, cool in the summer, with framed views.

According to Gerardo Wadel, responsible for R & D at LCT, "it is an eloquent example of what can be done in many buildings. And what they can bring to the city: many roofs with vegetation increase urban biodiversity, they collect and release rainwater, capture airborne dust, absorb carbon dioxide ... return part of the ecological services of the land occupied by buildings."

Proven Green Roof system technology

Landscape contractor Massoni Jardinería S.L. brought to life what was designed by landscape architect Lina Seguró Mendlewicz. To meet the requirements of different grounds they used the proven technology of a multiple purpose drainage element suitable for both greened areas and walkable areas depending on how it is installed. In combination with various protection mats and filter sheets different build-up systems were created adapted to suit the great variety of hard and soft surfaces included in the landscape design. These consist of different kinds of wooden decking, slab paving, walls requiring ground support and vegetated areas including bamboo always requiring special attention due to the special characteristics of its strong rhizomes.

In addition, the roof of the stairway leading up to the roof garden, was greened with a sedum carpet build-up using sedum mats to achieve fast covering.

Project Data

Location: Head office of La Casa por el Tejado
Carrer de Roger de Llúria, 41, 08009 Barcelona, Spain

Construction Year: 2015

Planted roof areas: approx. 100 m²

Architects/Client: La Casa por el Tejado, Carrer de Roger de Llúria, 41, 08009 Barcelona, Spain

Landscape architect: Lina Seguró Mendlewicz

Green roof contractor: Massoni Jardinería, S.L, Calle Torrefigueras, 37, 08830 Sant Boi de Llobregat, Spain



Different hard and soft ground coverings required a multiple purpose drainage element to meet very diverse requirements on "La Casa por el Tejado" roof garden. © Ira Irina Ivanova



Wooden decking and wooden walls with framed views characterize the roof garden of "La Casa por el Tejado" providing a special meeting place for the employees of "La Casa por el Tejado". © Ira Irina Ivanova

Elderly Residence in Egeparken, Denmark:

A Sensory and Therapy Garden on a Carpark Roof

The modern and contemporary nursing home Egeparken is located in Ølstykke, Denmark near the recently built Egedal town hall, health center and Egedal station. It comprises 72 bright homes with private kitchens and balconies as well as lots of common rooms and has direct access to the adjacent health center.

The plants have been chosen in a way that residents can enjoy and experience the garden with all their senses: listen to the water features or the rustling of the plants when the wind blows through the vegetation, smell various scents, watch the different shapes and colors of vegetation and other materials used, and feel the peace and quiet of the place.

The greening runs through the entire concept of the building. An extensive 1,300 m² Green Roof has even been installed on the very top of the building.

Project Data

Location: Ølstykke, Denmark

Construction Year: 2015–2016

Landscape Architects/Design: Mangor & Nagel

Landscape Contractor: MALMOS

Client: Egedal Municipality



On top of an underground car park, the beautiful courtyard in the center of the care center. © MALMOS

The inner courtyard is located on the first floor on the roof of an underground car park. It has been designed as a “sensory and therapy garden” by landscape architects Mangor & Nagel and provides beautiful views for the residents on the upper floors.

The brick-red soft-rubber coated circular walkways between the raised planting beds are wide enough to be used by wheelchair users and contrast beautifully with the green of the garden and the limestone-covered with water features and benches, which are an invitation to stop and rest a while.

In the heart of the garden is a circular pavilion with a diameter of 6 meters. It is made of galvanized steel and teak wood slats, and planted on the outside with fragrant, flowering climbers. The planting beds are also separated from the walkways by galvanized steel edges, making the garden appear bright and welcoming. Climbing plants which grow up quality wire rope nets have been planted in front of the underground car park.



Oasis of tranquility and experience nature © MALMOS



A circular pavilion covered with climbing plants. © MALMOS

32nd Floor of the Royal Tower Residential Building in Kiev: A Private Park between the Clouds



Incredible view over the central part of Kiev. © ZinCo UA

In the middle of historical Kiev, the small island in the heart of the business and political part of the city, the newest apartment complex with a private rooftop garden was built. The roof of the one of the highest buildings in the city center is situated on the 32nd floor of the Royal Tower residential building and seems to be a private park between the clouds.

The idea of the landscape architect was to add a new layer as an unusual alternative to a missing local area around the building. The space was planned for outdoor recreation in the warm season and, of course, a panoramic area with incredible views over the central part of Kiev. Free access to this fabulous place is only open to residents of the complex and their guests.

The latest Green Roof Technology enabled tall trees, such as Canadian Shadbushes, pine and maple (3.5–7 m), to be planted. A specially designed technological device which anchors the root ball of the central pine (over 7 m tall and weighing 5 t) was used.

Depending on their depth of growth, various lawns, perennials, shrubs or small trees were planted.



The garden centrepiece, a pine over 7 m tall and weighing 5 t.
© ZinCo UA

Powerful drainage and water retention elements were used on the intensive Green Roof and roof landscape.

When the garden and green spaces around the private restaurant for the residents was planned, plant selection was carefully considered for seasonal colour variation.

The hallmark of the project is that it has no counterparts anywhere in Ukraine.

Project Data

Location: Shevchenkivskiy district, Kiev, Ukraine

Roof Area: 700 m²

Construction Year: 2016

Landscape Architects/Design: Landscape Design Pro; www.landdesigno.com

Client: Poznyaki Zhilstroy



Outdoor recreation is possible within the city on the 32nd floor. © ZinCo UA

New Residential Area Laan van Spartaan, Amsterdam: Beaver, Butterfly and Bird Roof Gardens

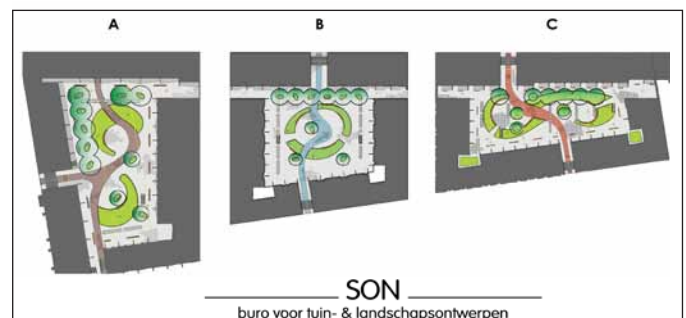
Laan van Spartaan is a new residential area in Amsterdam-West, the Netherlands. High apartment blocks, some over 30 meters high, border the area, whereas further inside smaller apartment blocks up to 12 meters high have been built. They are arranged around three carefully planned courtyards which cover the roof of an underground parking lot. The courtyards have been designed as private roof gardens for the residents and are not accessible to the public.

General Design

The design of the three roof gardens was inspired by the adjacent Amsterdam ring railway (Ringspoorbaan). Each roof garden has a different theme, but they all complement each other.

As these gardens represent an ecological stepping stone in the city, the themes were chosen from nature and named accordingly. The designs consist of loose shapes which contrast with the sleek and urban development of the buildings.

In addition to their beautiful optical aspects, the gardens were created for recreation, games, etc. Besides walkways, each garden provides a number of meeting venues or places to relax. Seats have been scattered throughout the gardens, each one offering a different view and experience of the garden.



Floor plan of the three courtyards. © SON buro voor tuin- & landschapontwerpen, Sonja van Wieringen

Different elements have been used to bind the three gardens, for example a line of trees, the pavement, loose shapes, colourful vegetation placed in planters of varying heights, and integrated benches. To avoid any obstacles in the gardens, lights have been installed on tensioned cables.

Design Courtyard A

The theme of courtyard A is birds, which has given the garden its name "Vogelvrij" (free as a bird).

The meandering brown path resembles a tree with branches. The curved raised planters represent birds' nests in the tree. The row of trees provides a spatial transition from the lower to the higher buildings. Smaller trees are scattered around the garden. Plants such as Rosa, Chaenomeles and Malus were selected to attract birds. In addition, the planting is interesting and attractive every season.



The meandering brown path of Courtyard A resembles a tree with branches. © ZinCo Benelux, Harmen Riemens

Design Courtyard B

Courtyard B is dedicated to small mammals and is called “Beaverloop” (beaver walk).

The main blue accented walkway winds through the garden like a stream. The curved raised planters and seating areas are reminiscent of a beaver dam. The rushes, willows and irises of the garden are similar to the vegetation a beaver would actually use. A central meeting place in the middle of this garden represents the beaver’s lodge. A place where beavers find shelter and protection is also a good place for humans to rest and be comfortable.

The planting transports you to another place: ornamental grasses and reedy vegetation suggest the waterfront. These are preeminent plants that would fit in perfectly with water. This is where the beaver is at home.

The beauty of the grasses is not limited to the summer months, they are very appealing in autumn and winter too. The garden is a year round attractive location for the residents.

Design Courtyard C

Insects are the theme of Courtyard C, so the garden is called “Vlinderschoon” (beautiful butterfly).

The garden is an ecological interpretation of butterfly wings. Looked at from both above and from garden level, you experience the ease of flying butterflies.



Courtyard C – an ecological interpretation of butterfly wings. © ZinCo Benelux, Harmen Riemens

The main trail through the garden has an orange-red accent, representing the body of a butterfly. Two meeting places have been created in this courtyard. The curved raised planters are the wings of the butterfly.

The fragrant and continuously flowering plants were chosen because they naturally appeal to butterflies. This ensures that butterflies, and insects like bees and dragonflies, visit, find pleasure, and return to this garden.

Roof Garden Build-up

These three beautiful roof gardens were all built the same way and installed using ZinCo technology.

As they are on top of an underground parking lot, a protection layer was used to cover and protect the waterproofing of the garage. Drainage layers ensure a perfect and permanent drainage of rainwater below the paved areas. The drainage elements are filled with stone chippings to create a stable bedding layer for the concrete tiles and brick paving. A drainage layer of 40 mm was chosen for the raised planters which provide, in combination with an intensive growing medium, the necessary habitat conditions for the chosen plant communities in the three roof gardens.

Author: Sonja van Wieringen, SON buro voor tuin- & landschapsontwerpen

Project Data

Location: Laan van Spartaan, Noordstrook Amsterdam, The Netherlands

Construction:

Phase A: 2016, 2,240 m², Wieringen Prins Hoveniers

Phase B: 2014, 2,700 m², Van der Tol

Phase C: 2011, 2,600 m², Van der Tol

Total Area: 7,540 m²

Architect/Design: SON buro voor tuin- & landschapsontwerpen; www.buroson.nl

Year of Design: 2008

Developer: BPD; www.bpd.nl
in cooperation with Ymere; www.ymere.nl

The Natural Capital Finance Facility (NCF): A Way to Finance Your Green Roof



The NCF is a financial instrument providing loans to projects that are expected to have a positive impact on biodiversity. The Facility is managed by the European Investment Bank ("EIB").

Green Roofs are known to have many positive effects on the environment. Benefits reach from contributing to improving local air quality, providing a better thermal performance of buildings, reducing urban heat island effects or urban noise pollution, to contributing to storm water retention and finally, of course, to improving the local biodiversity.

Eligibility for financing a Green Roof Project

- Project can pay back a loan (e.g. through savings from reduced water treatment costs)
- Loan size EUR 1–10 Million (e.g. through bundling several Green Roof projects or combining the financing with other green infrastructure elements: green walls, green spaces, storm water infiltration, green corridors or others)
- Project aims at contributing to increasing biodiversity and thus to the EU's LIFE objectives
- Is located in one of the EU Member States

What's in for the project developer?

- Attractive interest rates
- Up to 3 year grace period on capital repayments
- Long tenors (3 year disbursement period and 10 year repayment period)
- Free financing of technical assistance that ensures your project will become a success, allows to monitor the projects' impact on biodiversity or contributes to the sharing of lessons learnt and knowledge (e.g. technical or financial feasibility studies, support in project design, biodiversity monitoring studies)
- An enthusiastic team at the European Investment Bank (EIB) supporting your project over its lifetime.

Background

The Natural Capital Financing Facility (the "Facility" or "NCF") is a financial instrument blending EIB funding with EC financing funded by the Programme for the Environment and Climate Action (LIFE programme). The NCF has the mandate to contribute to meeting the LIFE objectives, in particular for the priority areas "nature and biodiversity" under LIFE Environment and "climate change adaptation" under LIFE Climate Action by providing financial solutions to bankable projects which are revenue-generating or cost-saving, and promote the conservation, restoration, management and enhancement of natural capital for biodiversity and climate adaptation benefits. This includes ecosystem-based solutions to challenges related to land, soil, forestry, agriculture, water and waste.

For more information, please contact:

Natural Capital Financing Facility (NCF)

Internet: <http://www.eib.org/products/blending/ncff/index.htm?lang=en>

New Project:

The IGA Berlin 2017 Biodiversity Green Roof



Already underway: the IGA Berlin 2017 Biodiversity Green Roof. © DDV



An exciting new Green Roof project is underway on top of the International Garden Exhibition Berlin 2017 visitor centre. The German Roof Gardener Association, together with the Green Roof installer fairplants-system GmbH, the Green Roof system manufacturer ZinCo GmbH and other cooperation partners, is turning the 2,000 m² roof area into a field of biodiversity experimentation. Visitors can view the roof from a platform throughout the garden exhibition, which runs in 2017 from April 13 to October 15 (see "events"). (<https://iga-berlin-2017.de/en>).

Green Roofs can partly compensate for lost green spaces in places where nature has been destroyed by construction by providing substitute habitats for flora and fauna.

In particular natural, low maintenance extensive Green Roofs offer important retreat habitats for animals and plants by providing foraging opportunities and shelter for wild bees, butterflies and beetles, to name a few.

Fostering biodiversity depends largely on how the plant and animal habitats are constructed. Pure sedum planting, which is often combined with a very shallow substrate, can only make partial use of the potential at hand.

Creating a Green Roof habitat is quite easy if certain design measures and basic principles of biodiversity are taken into account. This approach is being put to the test on the roof of the International Garden Exhibition visitor centre in Berlin. A mosaic of different biodiversity modules will complement the conventional extensive Green Roof type.

The following biodiversity modules are being installed on the 2,000 m² roof of the visitor centre:

Modulation of the substrate surface and depth:

Different habitats can be created by varying the substrate depth, thus extending the range of plants which can be included. While low growing and low maintenance sedums and other succulents can survive in a 6 cm substrate depth, other species, such as herbs and grasses, need more room for their roots and are being planted on mounds of up to 15 cm substrate depth.

Improved substrate quality: Apart from substrate depth, the composition of the Green Roof substrate plays an important role in plant establishment. The standard nutrient poor and mineral soil used for extensive Green Roofs has been enriched with an organic substrate which serves as a valuable humus and nutrient supplier for the more demanding mixed flora on the mounds.

Vegetation free areas (sand islands and clay and gravel beds): Vegetation free areas in the form of sand islands and clay and gravel beds are important supplementary habitats for invertebrates and other roof fauna as cover, breeding and sunning places. The sand beds aim to attract special sand breeding insects (e. g. digger wasps and sand bees) while the clay is used as building material by many insects and birds and gravel provides cover for creatures such as spiders and beetles.

Temporary water features: Membrane pieces have been covered with sand in certain areas of the roof in order to keep rainwater on the roof for longer. These areas should provide more water for insects and birds.

Choice of plants: Food plants for foraging insects are being planted on the elevated areas. Because the roof climate resembles to some extent that of natural dry grasslands, similar plants are being used. Apart from pre-cultivated herbaceous perennials, a herb and grass seed mixture is being used on two of the mounds.



A mixture of herbs and grasses was planted on the substrate mounds in September 2016. © DDV

Nesting aids for insects: Different nesting aids have been installed on the roof to attract permanent insect colonies. There are insect hotels for wild bees and parasitic wasps as well as bumble bee nestboxes and ant pits.



Nesting aids support insect colonies. © DDV

Log piles / Deadwood: Dead branches and logs are particularly valuable structural elements. They provide valuable habitats for moss, lichen, fungi, invertebrates, flies, mosquitoes, ants and solitary wild bees or wasps. Birds also use the wood piles to perch, hide, sing and feed.

The various elements should provide exceptionally species-rich and ecologically valuable habitats over time.



A bird's eye view of the various habitat elements. © DDV

The IGA Biodiversity Green Roof has been developed as a practical demonstration project. Visitors to the garden exhibition will be able to view the roof from a platform next to the building. The species-rich green area on the roof is also part of the IGA biodiversity path and can already be visited thanks to the garden show webcam (<http://iga-berlin.contempo-webcam.de/iga-hautpeingang-gaerten-der-welt.php>).



A model has been made to better illustrate the concept. © DDV

Apart from the IGA Berlin 2017, Grün Berlin GmbH, fairplants-System GmbH, ZinCo GmbH and the German Roof Gardener Association, a host of other experts are involved in the project. The planting materials for the substrate evaluations were provided by Fehrlé Stauden GmbH and Rieger-Hofmann GmbH. Schwegler Vogel- und Naturschutzprodukte GmbH is the company to contact about the nesting aids used. Kusche und Dremel GmbH Baumdienst kindly provided the wood elements.



The IGA visitor centre roof – an unusual training place for the landscape gardening trainees. © DDV

A particularly fruitful and future looking partnership was found with the Landscape Contractors Association of Berlin and Brandenburg. The various biodiversity elements were installed on the roof of the visitor centre at the beginning of August with the help of fourteen highly motivated landscape gardening trainees. Four weeks later the herbaceous perennials, which had been specially propagated for the project, were planted.

The German Roof Gardener Association sees the Berlin Biodiversity Green Roof as an important reference project for the future to foster greater species variety in new Green Roof projects. “Upgrading” already existing species-poor extensive Green Roofs to create biodiverse roofs can also be achieved through the targeted use of modules.

The Technical University of Berlin is responsible for the documentation and scientific monitoring of the project. The research is not only monitoring the development of biodiverse habitats, it is also addressing various economic questions. For example, if the valuation of the ecosystem services of biodiverse Green Roofs can offset the higher installation and maintenance costs. Here the UK is already further ahead. The biodiverse Green Roof of the Sharrow Primary School in Sheffield already was included in the national list of conservation areas seven years ago.

Further information about this project is available through the German Roof Gardener Association:

Tel.: +49 7022 301378,
E-Mail: contact@dachgaertnerverband.de

Bau 2017: Munich, Germany – 16th–21st January 2017:

The Future of Building on 180,000 m² of Exhibition Space



January 16–21 · Munich
World's Leading Trade Fair for
Architecture, Materials and Systems

More than 2,000 exhibitors will be presenting architectural solutions, materials and systems at BAU 2017. As before, the exhibits in the 17 exhibition halls will be organized according to product, material and theme. Set out below is a summary of what to find where in the individual halls.

BAU, the World's Leading Trade Fair for Architecture, Materials and Systems, is the biggest and most important event in the sector. The next BAU takes place from January 16th to 21st, 2017 at the Messe München exhibition center. Around 2,000 exhibitors from more than 40 countries and approximately 250,000 visitors from all around the world are expected to take part.

On display at BAU on 180,000 square meters of exhibition space – for years all the available space has been fully booked – are architectural solutions,

materials and systems for commercial and residential construction and for interior fit-out, for both new-build and renovation and modernization. Every two years this event brings together market leaders from the sector to participate in a unique international display of competence spanning all the construction trades including Green Roofs.

BAU is also the world's largest trade fair for architects and construction engineers, attracting more than 60,000 design professionals. The exhibits at the fair are organized according to building material and also product and theme area.

The many attractive events in the supporting program, including high-caliber forums with experts from all over the world, round off this industry showcase.

For further information please visit the website:
<http://bau-muenchen.com/>

Save the Date 20th–22nd June 2017:

World Green Infrastructure Congress WGIC 2017 in Berlin

Multi-day events concerning the greening of buildings (greening of roofs, façades and indoor areas) with the associated accompanying topics (urban climate, demographic development, rainwater management, sustainability). At the end of the congress, it will be possible to participate in excursions to special Green Roofs and Living Walls in Berlin.

The congress is named after the WGIN World Green Infrastructure Network e. V., which has been organizing this event since 2007, each year in a different member

country. In 2017, it will be organised by the Fachvereinigung Bauwerksbegrünung e. V. (Green Building Association) (FBB) with the support of other German-speaking associations of the sector.



DESIGNING
WITH NATURE

20 – 22 JUNE 2017

World Green
Infrastructure
Congress

Montreal, Canada – 16th–25th October 2017:

Designing the Future. The World Design Summit.

The World Design Summit (WDS) in Montreal is an unprecedented international gathering of diverse disciplines with a common focus: how design can shape the built environment of the future. Montreal will host design professionals, government and business leaders, industry representatives, media and NGOs from around the world. For 10 days, attendees will come together to transcend silos, foster cooperation and enhance professional development. More than a mere celebration

of design, the Summit will demonstrate the tremendous power of design to create viable solutions to global social, economic, cultural and environmental challenges.

For further information please visit the website:
<http://worlddesignsummit.com>



13th April – 15th October 2017 International Garden Exhibition Berlin: Garden Art in the Gardens of the World

The centrepiece of the largest garden festival in Germany IGA Berlin 2017 is the already internationally renowned “Gardens of the World”, which will be doubled in area by 2017. An impressive point of attraction will be among other things the new international gardens there. Therefore the best landscape architects from all five continents created designs in enclosed garden cabinets, which show contemporary trends in garden art. In the new park areas, more atmospheric water gardens are being created, an English landscape garden, an energy-efficient tropical hall around the Balinese garden as well as an open-air stage with up to 4,000 seats. A modern visitor centre with a biodiverse Green Roof will receive guests in the future as a meeting, conference and information place.

From the 13th April to 15th October 2017 more than two million guests from Berlin, Germany and all over the world will experience both traditional gardening art and inspiring exhibition contributions for a green lifestyle. A cable car will float over the site and open up an impressive birds-eye view panorama.

For further information please visit the website: <https://iga-berlin-2017.de/>



Ropeway station “Blumberger Damm”: For the first time, there will be a cable car in Berlin on the occasion of the IGA. © LEITNER ropeways, Kolb Ripke Architekten

The Rooftop Growing Guide: How to Transform Your Roof into a Vegetable Garden or Farm

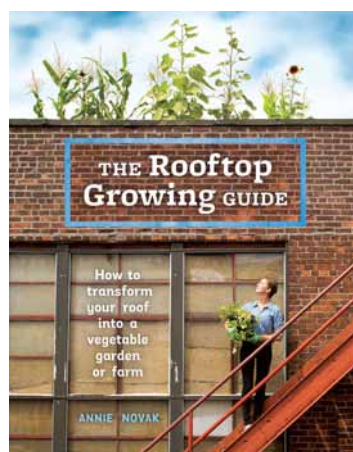
Tapping into the expanding market for rooftop farming and Green Roofs, this is the first stylish, easy-to-use book for urban gardeners interested in utilizing their roof space for growing food.

As more people experiment with growing their own food in urban and suburban areas, farms and edible gardens are popping up on rooftops across the country. But there can be challenges, as rooftop spaces have their own unique set of rules for soil maintenance, watering, crop management, installation, and more.

Author Annie Novak cofounded America's first fully landscaped Green Roof farm, and her expertise shines in *The Rooftop Growing Guide*, the first book for a general audience on how to make an edible rooftop garden thrive.

Novak has visited and interviewed rooftop farmers and gardeners across the country, so her advice works no matter where you live. With sample crop plans, case studies from around the country and notes on harvesting, fertilizing and more, *The Rooftop Growing Guide* provides inspiration and practical advice for a new generation of urban farmers and gardeners.

The Rooftop Growing Guide was photographed by Naima Green and Jackie Snow (unless otherwise noted) with Lucas Foglia; illustrations by Annie Novak and Lauren Heanes.



Author: Annie Novak
ENGLISH
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Global Networking for Green Roofs

The International Green Roof Association IGRA

Green Roofs have become a very important component of sustainable urban development within the last 30 years. At present, Green Roofs can be found in nearly all big cities around the world, benefiting the urban environment and their inhabitants. In order to guarantee lasting function, Green Roofs are all based on the same principles: high quality materials, professional planning and installation, state-of-the-art technology and acknowledged guidelines.



IGRA's targets are:

- Worldwide promotion of the ecological Green Roof idea
- International knowledge transfer in the field of Green Roofs
- Sensitisation of the population and political decision makers
- Stimulation of international standards for Green Roof technology and Green Roof policies

IGRA's services include:

- Consultation
- Networking
- Newsletters
- Research Database
- Conferences
- Public relation material