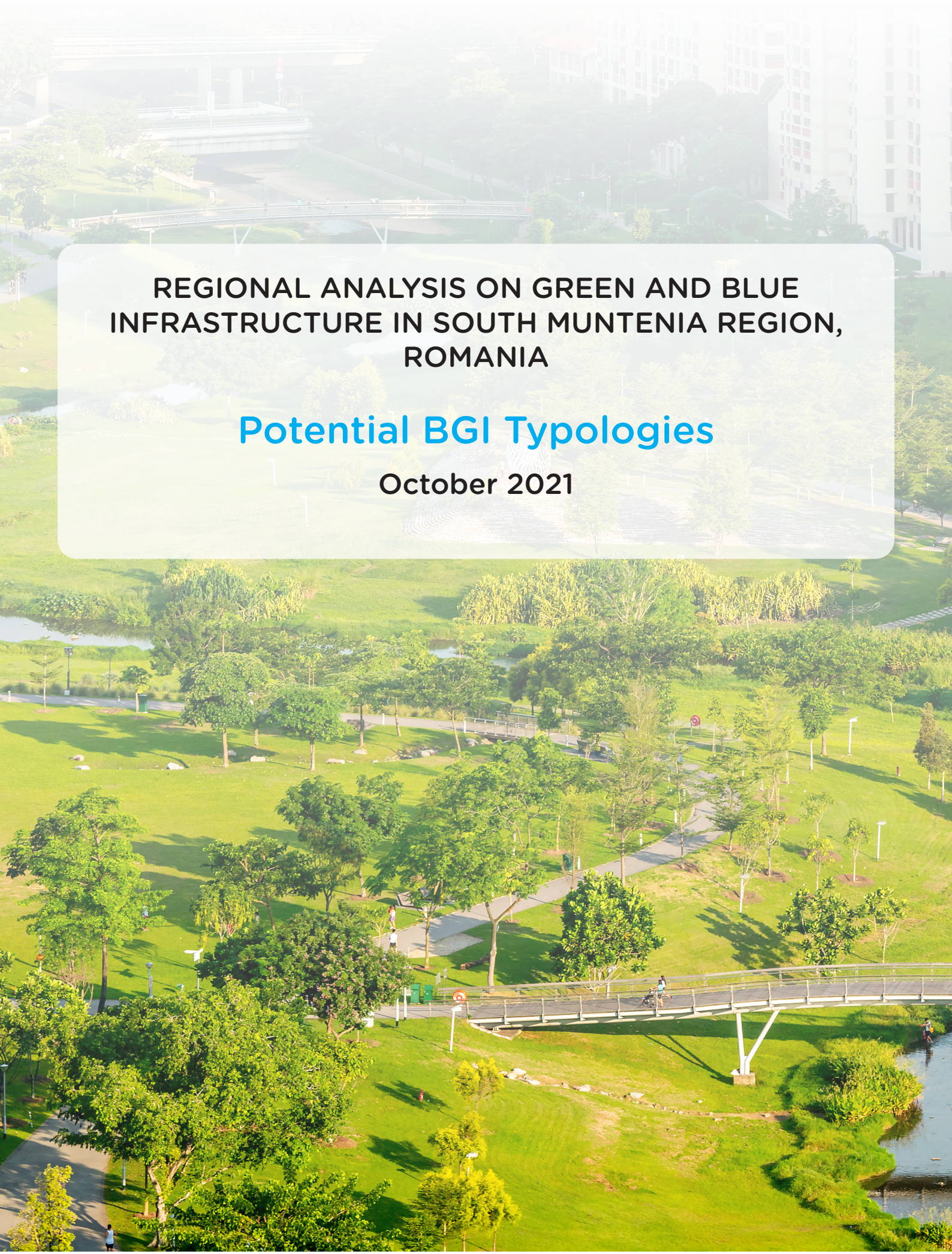
REGIONAL ANALYSIS ON GREEN AND BLUE INFRASTRUCTURE IN SOUTH MUNTENIA REGION, ROMANIA

Potential BGI Typologies

October 2021

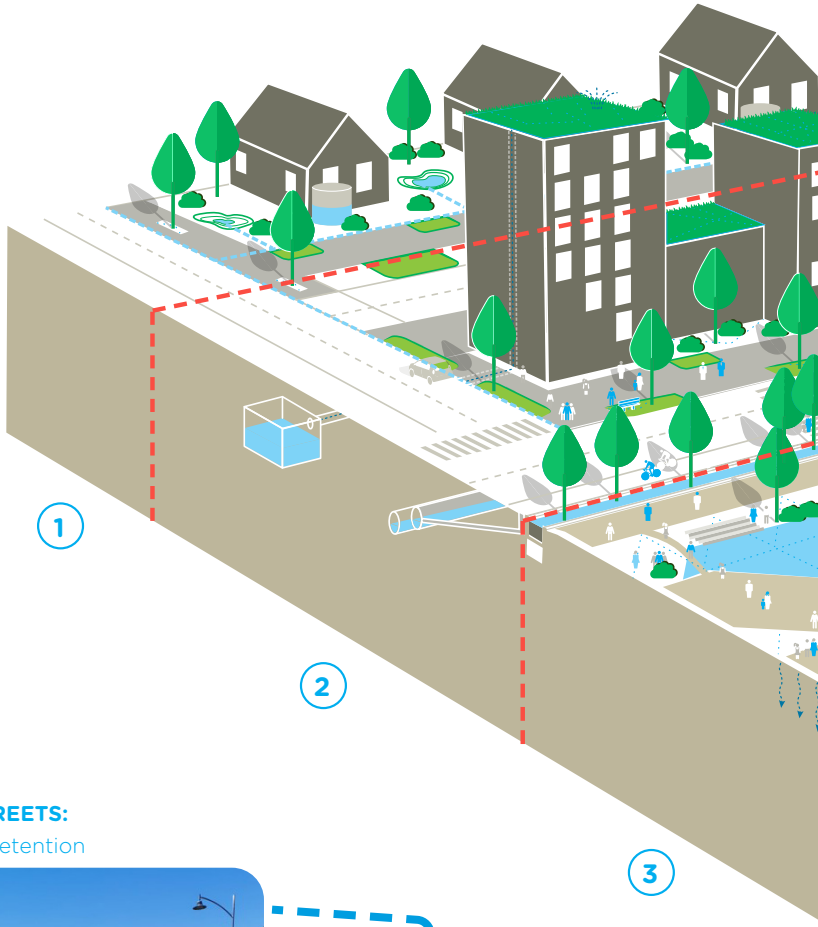


RAMBOLL

WHAT IS BLUE GREEN INFRASTRUCTURE

BGI are engineered solutions that mimic nature, connecting urban hydrological functions (blue) and permeable recreational spaces (green), with wider urban design and planning benefits. BGI can address typical drainage issues such as water quality and extreme flooding, while generating social and environmental value for local areas, that also addresses the challenges of urban growth and climate change.

BGI includes features like bioretention basins, swales, raintanks, permeable paving, green streets, green roofs, water reuse, wetlands and floodable parks, to name a few. Where necessary, BGI is supported by traditional grey infrastructure and technologies to address specific issues or targeted water pollutants. At all scales of development, BGI can be used to directly improve water quality, waterway health and beach swimability, address capacity issues in stormwater and combined network systems and provide flood risk reduction.



1. SMART HOME SOLUTIONS

Rainwater tank & Raingarden

BENEFITS

Reduced potable water use, less runoff and reliance on pubic drainage networks, increased property value, reduced cummulative effects

2. GREEN STREETS:

Roadway bioretention

BENEFITS:

Greener communities, less storm water pollution, aquifer recharge

3. STORMWATER PARKS:

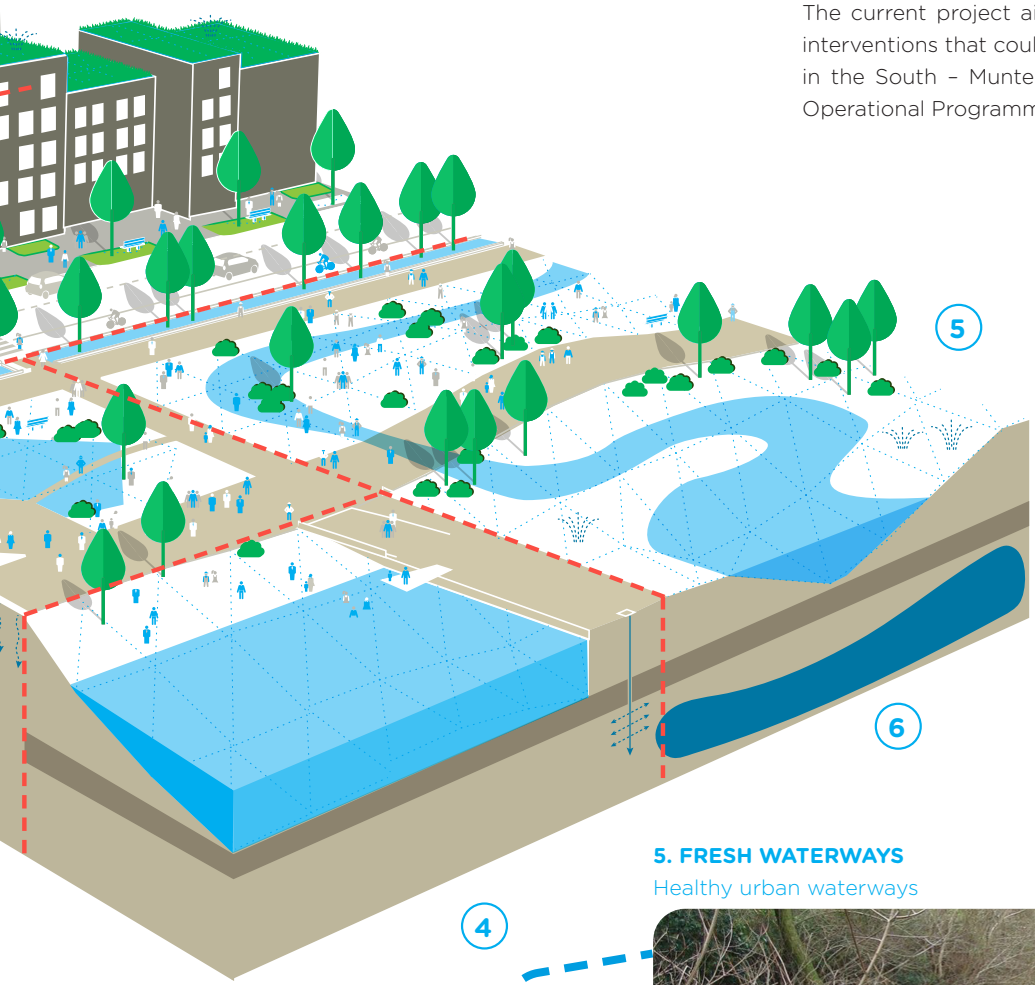
Stormwater retention systems

BENEFITS

Dual use parks, enhanced comunity and aesthetics, flood protection

When BGI is considered as a common and accepted approach across the community and government agencies, then broad cumulative benefits of BGI can be realised. It has the ability to enhance mobility, social spaces, economic value, and longevity of existing assets through the development of multi-functional spaces.

In cities such as Copenhagen, New York and Singapore, water is now at the forefront of integrated urban and infrastructure planning, with BGI being the main driver bringing all key stakeholders together working for a common vision and tapping from the many benefits and co-benefits offered by BGI. Locally, the South – Muntenia Region in Romania presents a varied number of environmental challenges, ranging from drought, flooding, air pollution, loss of biodiversity, etc. The current project aims at identifying potential BGI interventions that could be financed and implemented in the South – Muntenia Region, under the Regional Operational Programme being currently developed.



6. RECHARGED AQUIFERS
Reliable drinking supply

BENEFITS:
Clean drinking water

5. FRESH WATERWAYS
Healthy urban waterways

BENEFITS:
Natural, clean and resilient ecological areas

4. HEALTHY HARBOURS:
Active & Clean waterfronts

BENEFITS:
Safe swimming & healthy marine environment

POTENTIAL BGI TYPOLOGY

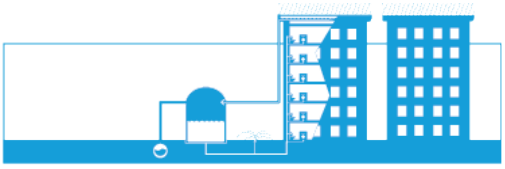
A typology is a congregation of functions adapted to local context. The specification of individual typologies should recognise stormwater *quantity* management as the project's primary driver but also acknowledge the water *quality* benefits, and wider environmental, cultural, and amenity enhancements, that accrue from BGI implementation.

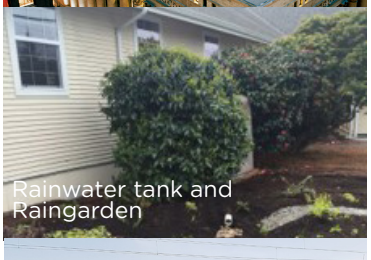
Living Roofs and Walls

Integrating vegetation and storage potential into new buildings and infrastructure acts as a first response in reducing local cloudburst runoff. With multifunctional potential, living roofs replace underutilized hard surface spaces in cities with rain soaking materials and vegetation that can reduce stormwater volumes and improve water quality, as well as reduce the urban heat island effect.

Rainwater Tank

A rainwater tank is a retention container used to collect and store water that can be re-used for non-potable purposes. Rainwater tanks are generally used to supplement water supply systems and have nearby functions for both outdoor and in-house usage such as irrigation or toilet flushing.





Permeable Pavements

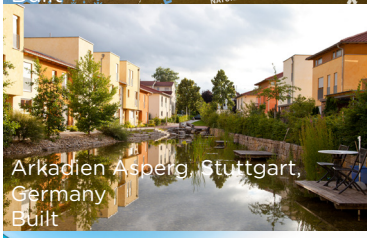
Any system providing hard or trafficable areas which also provides for downward percolation of stormwater runoff. This includes no-fines concrete or porous asphalt, permeable pavers, porous pavers, and stabilised loose material. The flow of stormwater from the surface to the collection system is slowed through infiltration and is temporarily stored and slowly released by the base course, resulting in detention of the peak flow.

Wetlands

Constructed stormwater wetlands are ponded areas, densely vegetated with water-loving plants that mimic the treatment processes of natural wetlands with detention, fine filtration and biological absorption, to remove contaminants from stormwater runoff.

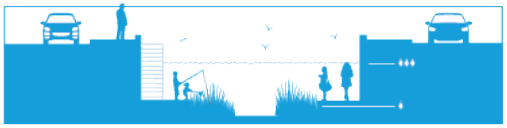
Bioretention Basin

Bioretention basins such as rain gardens (including 'pocket parks'), planter boxes and swales can involve daylighting historic streams, formalizing existing streams, or creating new streams as quality improvement and conveyance connections between other cloudburst elements. Typically, smaller in scale, bioretention basins can re-establish or create new neighbourhood character and social spaces.



Urban Canal

Urban canals are larger infrastructure projects that typically involve daylighting of a stream or river within a dense urban area. They can be designed to create new and healthy oases in the city while increasing biodiversity and stormwater volume capacity.

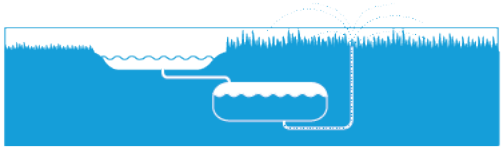


Stream Restoration

Stream Restoration and re-profiling existing urban water edges can help build capacity for stormwater through retention and detention. Additionally, redesign of stream or riverfront parks to allow for seasonal and cloudburst flooding can reduce downstream flooding in unwanted areas. Inclusion of natural edges and floating islands/floating wetlands/ floating gardens improves water quality and provides amenity enhancement.

Underground Basin

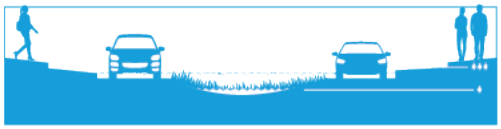
An underground basin is a buried system, which stores stormwater for either detention or large volume re-use purposes such as irrigation. It should be sized to manage excess stormwater runoff that cannot be stored by any other traditional or BGI component. It is often connected to a primary drainage system where it discharges to, by means of a regulator, to slowly release stormwater overflow to reduce peak discharges downstream.




Symfonivej, Herlev, Denmark

Retention Boulevard

Retention boulevards are similar in scale to cloudburst roads, but incorporate large green, depressed medians that can detain and retain stormwater while allowing regular traffic use of the street. It requires taking away space from existing roads, but can be very effective along larger urban arteries that are underutilized.




Sankt Annae Plads, Copenhagen
Built

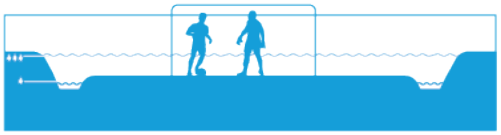
Cloudburst Roads

Cloudburst roads are used to channel and direct cloudburst water. These streets can be formed with a V-shaped profile and raised curbs to ensure water will flow in the middle of the road, away from the buildings. In addition, channels and swales can be established at the side of the road so that the water runs in urban rivers or green strips.


Copenhagen Cloudburst Street
Visualization

Floodable Parks

Floodable Parks and recreation spaces present the greatest opportunity for large retention spaces within urban areas. They can be located throughout the watershed and receive stormwater conveyance systems or adjacent water bodies. They can provide a combination of hydrological services including, water quality improvements via filtration, retention, detention, and infiltration.




Hans Tasvens Park
Visualization - SLA A/S

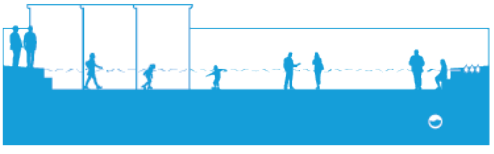
Cloudburst Pipes

A cloudburst pipe handles rainwater in the same way as cloudburst roads. This is placed just below street level to ensure connection to other surface solutions. This solution is used if there is limited space for above ground conveyance.


Sankt Annae Plads, Copenhagen
Built

Wet Plazas

Wet plazas or floodable public spaces are another great opportunity for large retention capacity within denser urban environments. Typically hardscapes with some potential vegetation, these spaces collect, detain and retain stormwater to reduce flooding downstream. Additionally, they can incorporate drainage connections to allow the plaza, courtyard, etc. spaces to return to normal use quickly.




Mailänder Platz Stuttgart, Germany
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Green Streets

Green Streets (including railway corridors, tram lines, cycling routes, pedestrian paths) are located as upstream connections to all cloudburst roads or retention areas. The green streets should be established with a combination of small scale channels and stormwater planters or permeable paving. Stormwater should be collected, delayed, and then channelled toward the cloudburst roads.


Watts Branch, DC
Visualization

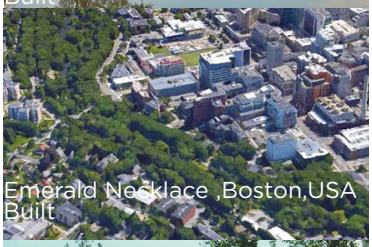
Parks and Gardens

Parks and gardens are examples of green infrastructure that can host stormwater management solutions such as bioswales, cleansing biotopes/ raingardens, retention and detention swales and lakes, infiltration systems and others. . Parks and gardens present opportunities for improving the air quality and reducing the urban heat island effect incorporating a multifunctional design enhancing socio-economic and socio-ecological benefits.

Ulu Pandan Park, Singapore
Built

Urban Forest

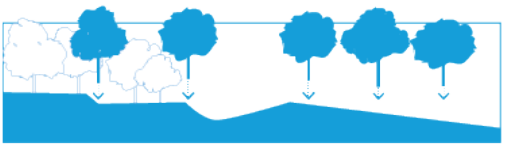
Urban Forests are highly effective ecological solutions for nature enhancement within city limits. The design consists of large, densely planted, high vegetation areas with few to no amenities. Urban forests are beneficial for mitigating heat island effect, enhancing biodiversity and strengthening urban ecosystems.



Emerald Necklace ,Boston,USA
Built

Afforestation and Re-afforestation

Afforestation and re-afforestation consist in planting or growing forests in high risk areas. On top of the ecological value, afforestation and reforestation can mitigate landslides and flooding by serving as sponges, trapping water after heavy rains, and releasing it into waterways, reducing flood incidence and maintaining stream flow during dry periods.



Hannover-Kronsberg, Germany
Built

Active Water Front

Waterfronts present opportunities to integrate multifunctional solutions combining flood protection and public amenities. While serving an essential utilitarian function of protecting, waterfront designs can enhance livability and contribute to the aesthetic, functional, and cultural values of urban landscapes.

Hafencity, Hamburg, Germany
Built

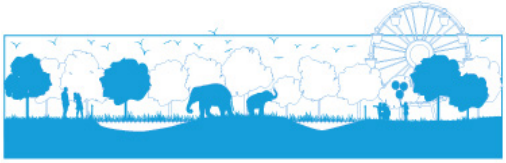
Orbital Forests

Orbital Forests are a system of large, densely planted areas that surround cities and act as green buffers. Among a wide range of benefits, orbital forests are especially efficient for pollution mitigation, soil erosion control and biodiversity enhancement. They can also mitigate the dust storm and snow drift.

Tirana, Albania
Image source: sustainablecities.eu

Thematic Parks

BGI can host a variety of functions such as botanical or zoological gardens, amusement parks and temporary events. Thematic parks are a good example for BGI multifunctionality and added value as they enhance socio-economic benefits.



Frederiksberg Zoo,Denmark
Built
Image source: SLA

Pocket Parks

Pocket parks are small green spaces with recreational value that hold the potential to integrate stormwater management solutions such as infiltration systems, raingardens, small retention and detention swales. Their small scale lends itself to phased implementation over a larger area.

Portland, Oregon, US


PCN