



Case 17 Copenhagen Green Roofs Program¹ (2010)

Primary Tool: →Tool URR 1

Problem to resolve: Already in 2008 the City of Copenhagen began exploring alternative ways to handle rainwater in the city. In 2009, Denmark was in charge of the UN Climate Change Conference COP15 which defined the framework for the strategies that can be implemented for meeting the challenges of climate change. During that period, the focus on green roofs intensified setting a goal for urban design with green roofs in the Climate Plan of the City of Copenhagen. Since then Green Roofs have become integrated in different guidelines such as the Guidelines for Sustainability in Constructions and Civil works, which mandates green roofs for all the Municipalities buildings. Green roofs are also a part of the city's Strategy for Biodiversity. Already from 2010 onwards, green roofs are mandated in most new local plans. A calculation based on approved new local plans mandating green roofs gives a total of 200.000 m² of green roofs to be installed.

In Europe, green roofs can absorb between 50% and 80 % of the annual rainfall. Some of the water evaporates and cools the air in that way. Rainwater from the roof will be collected and utilised on the property for watering, recreational purposes or similar, while rainwater from certain areas is redirected to flush the sewage system given that it is badly polluted.

Green roofs also support biodiversity. They lead to larger quantities of rainwater being absorbed in a sustainable way and can curb the rise in temperature at the same time. Green roofs are therefore part of the City of Copenhagen's Climate Plan and Climate Adaptation Plan. Green roofs also create habitats for animals and plants and in this way support biodiversity. For these reasons, they have become integrated in the City of Copenhagen's Strategy for Biodiversity.^{2,3,4}





Green Roof in Copenhagen, Denmark ⁵



First Climate Adjusted Neighbourhood in Copenhagen ⁶

How does it work? → Rain water harvesting

Rainwater from the roof will be collected and utilised on the property for watering, recreational purposes or similar, while rainwater from certain areas is directed to the sewage system given that it is badly polluted.

The City of Copenhagen has mandated green roofs in most new local plans since 2010. Green roofs are an important part of our city's strategy to meet the challenges of climate change, to enhance biodiversity and to create a greener city. Green roofs can absorb as much as **80%** of rainfall, helping to reduce stress on stormwater systems. They help reduce urban temperatures (the "[heat island effect](#)"). And, they protect roof membranes from the sun's UV rays and the greatest temperature swings, such that roof membrane life is extended as much as double that of an unprotected membrane.⁷

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Green roofs absorb the rainwater, and some of it evaporates. The roofs can absorb between 50 and 80 % of the annual rainfall. If it rains a lot, the green roofs delay the water on its way to the sewers. This means that rainwater which would otherwise have an adverse impact on the sewers does not reach the sewers until there is enough space for it. For this reason, green roofs form part of the Climate Plan and the Climate Adaptation Plan of the City of Copenhagen.

In the Climate Adaptation Plan, experts have assessed which climate change challenges are the biggest and where Copenhagen as a city can derive the greatest benefit by taking action now and in the coming years. At the same time, the city is looking at how such measures – necessary for Copenhagen to adapt to the future climate – can be of pleasure and benefit to the city immediately. Thus, the Copenhagen Climate Adaptation Plan is "designing the city of tomorrow *today*" as IN-DEX: Award jury member John Heskett puts it.

Copenhagen is taking a lead in addressing climate change by targeting three key levels of climate adaptation:

- Minimizing potential damage arising from climate change.
- Warning and response systems to deal with abnormal conditions.
- Preventive infrastructure to cope with damage, loss and traffic disruption

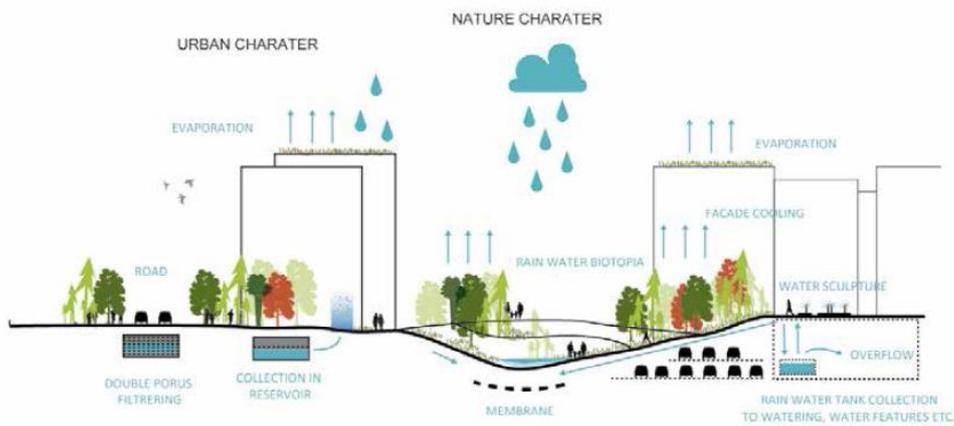


Illustration of sustainable water management

As the risks from extreme weather events in Copenhagen are becoming increasingly clear, another area where innovation in municipal planning and budgeting, and effective public and private collaboration is required, is stormwater management. Major flooding events in the summer of 2010 and 2011 were a stark reminder to citizens of the costs and inconveniences associated with these events, which are projected to increase and become more severe as a result of climate change. City attention has in fact been shifting for several years in this direction: the Copenhagen Climate Adaptation Plan approved in 2011 (with its primary focus on stormwater and sea level rise and secondary focus on the urban heat island effect and groundwater resources), and the 2012 Cloudburst Management Plan both provide detail on how costs and available resources can be spread amongst multiple parties to address these challenges. The plans recognise that the responses required – principally increasing ‘green’ and ‘blue’ infrastructure to manage and retain stormwater flows - will mean more surface conveyance and retention of water in the future, and less reliance on subsurface systems. This creates challenges in governance and responsibility for the infrastructure, together with shifts in who pays and how investments are financed.

Credentials

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References

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- ⁵ Source: <http://www.greenroofs.com/images/content-WGRC2012-DNA-DortheRomo.jpg>
- ⁶ Source: <http://inhabitat.com/tredje-natur-architecture-designs-worlds-first-climate-adjusted-neighborhood-in-copenhagen-denmark/>
- ⁷ <http://inhabitat.com/copenhagen-adopts-a-mandatory-green-roof-policy/> viewed 19/05/2015