Green rooftops: an opportunity for urban biodiversity

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Building cooling

Stormwater runoff reduction

Human health & well-being

Biodiversity

Air cooling

Air quality
>25 cm
>180 kg/m²
>15 mm

7-25 cm
80-180 kg/m²
5-15 mm

3-7 cm
<80 kg/m²
2-5 mm
7–20% increase in PV efficiency (when done right)
Ecological quality of green roofs

- Assessing biodiversity

- Identifying design factors contributing to biodiversity

- Focus on high roofs: 10 – 70 meter

- Urban context; 21 roofs in cities in the Netherlands
Insect diversity is higher on intensive roofs
Plant species richness = insect species richness
Height matters (sometimes)

Intensive roofs

Extensive roofs
Green roof quality is:

- Thick substrate layer (>25 cm)
- High plant species diversity
- Variety in microclimates (relief, plant structures, objects)
- Locally adapted (soil, plant material)

- Large water buffering capacity
  - improves performance when hot for both ecology and cooling
Green roofs on a city scale

- Effects for building owners/users:
  - building cooling, recreation, health, CSR
  - **Private benefits**

- Effects for urban resilience
  - Stormwater buffering, air quality, temperature, UHI mitigation, biodiversity, CO2 reduction
  - **Public benefits**
Roof greening strategy

Local government subsidies for green roofs (in Netherlands: ~ 15 municipalities, water boards)

Green rooftops as a prerequisite in real estate development (e.g. in Basel, Denver)

High abundance of cheap & easy Sedum systems with limited benefits

Do we find green rooftops in places where they’re needed?
Focus areas:

- Low amount of (public) green areas
  - Large distance of residential buildings to public green areas

- Severe UHI effect (partial effect of ↑)

- High % of ground surface covered by flat roofed buildings

- High vulnerability for pluvial floods
Green roof subsidies per neighbourhood
Green roofs for impact

**Quality** - intensive green, thick substrate layer
  maximise water retention, cooling effect and biodiversity

**Scale** - Collective, not individual
  Large roofs for higher impact or higher density of smaller roofs

**Equitable** - Also available for rental houses
  Benefits of green roofs also for lower incomes
Tools for scaling

- Differentiate funding for different green roof qualities
- Cooperate with social housing, home owners associations, commercial building owners
- Focus on local stormwater reduction
- Showcase best practices
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