Substantial, environmental and legal aspects of green roofs and living walls concept in Switzerland
What ever, where ever you want to...
Isn´t it against all logic, if a whole urban surface remains unused, missing the dialogue with the stars?“
History and spatial approach

Campaigning green roofs

Role of Biodiversity, Nature conservation aspects

Quality

Future challenges
History and spatial approach

15% of the city surface (Basel) is covered with buildings with flat roofs

Source: ZHAW
Green roofs and the forgotten space

Source: Theodore H. Osmundson
History and spatial approach

Stephan Brenneisen Zurich University of Applied Sciences

Amount of realized green roof area in the 1st Green roof campaign

- Le Corbusier
- Pilot green roof complex University Hospital
- 1st Green roof campaign

<table>
<thead>
<tr>
<th>Year</th>
<th>Green roof area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1920</td>
<td>0 m²</td>
</tr>
<tr>
<td>1970</td>
<td>0 m²</td>
</tr>
<tr>
<td>1980</td>
<td>200,000 m²</td>
</tr>
<tr>
<td>1990</td>
<td>400,000 m²</td>
</tr>
<tr>
<td>2000</td>
<td>600,000 m²</td>
</tr>
<tr>
<td>2012</td>
<td>800,000 m²</td>
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</table>
Campaigns to raise awareness

1 Mio. SFr. Subsidies for green roof projects

Pushing a new technology to enter into the mind of people

Improving know-how of planners and contractors

Competition and reduction of cost

Efficient green roof technology

Research
Campaigns to rise awareness

Amount of realized green roof area in the 2\textsuperscript{nd} Green roof campaign

Amount of realized green roof area in the 1\textsuperscript{st} Green roof campaign

<table>
<thead>
<tr>
<th>Year</th>
<th>1\textsuperscript{st} Green roof campaign</th>
<th>New building code</th>
<th>2\textsuperscript{nd} Green roof campaign</th>
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<tr>
<td>1920</td>
<td>Le Corbusier</td>
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</table>
Successful implementation in Switzerland

Green roofs are mandatory on all flat roof buildings in

- Basel
- Zurich
- Bern
- Lucerne

...all major cities in Switzerland
Successful implementation in Switzerland

Basel:

2’500 Green roofs (2012)

Foto: Pia Zanetti
Key factors and Milestones

- Pilots
- Campaigns to rise awareness
- Implementation into building code
- Monitoring of success/ research (Biodiversity/Green roof area)
- Affordable cost
2012: 30% of all flat roofs are green

Foto: Magdalena Mioduszewska
Monitoring

Water retention study

Annual water retention:
- 76.5%
- 56.4%
- 47.4%
- 54.2%
- 62.8%
- 45.5%
- 35.4%
- 43.1%

Source: ZHAW
Lessons learned

The more water the substrate can store, the more biomass you will get on the roof

Source: ZHAW
Lessons learned

Green roofs can be designed for biodiversity

Source: ZHAW
Lessons learned

Green roofs can be designed for biodiversity

Source: fotocommunity.de
Orchids on roofs
Role of Biodiversity, Nature conservation aspects

Source: fotocommunity.de
Key factors and Milestones

- Pilots
- Campaigns to rise awareness
- Implementation into building code
- Monitoring of success/research (Biodiversity/Green roof area)
- Affordable costs
Affordable costs

Efficient solutions

Source: ZHAW
Simplifying green roofs

STANDARD SYSTEMS IN NEW MARKETS

STANDARD SYSTEMS IN ESTABLISHED MARKETS: SIMPLIFYING GREEN ROOFS

Source: Theodore H. Osmundson, ZHAW

Stephan Brenneisen Zurich University of Applied Sciences
Green roofs cost in Switzerland 1995:

100-300 Euro/m²

Green roofs cost 2012:

10-30 Euro/m²
Quality?
Quality

Role of Biodiversity, Nature conservation aspects
Role of Biodiversity, Nature conservation aspects

Stücki shopping center
35’000 m²

Source: ZHAW
New light weight systems

Stephan Brenneisen Zurich University of Applied Sciences

Source: Baader Architects
Min. thickness of growing media (9-13 cm, depending on region)

Min. quality for growing media for plants (water capacity, organic content)

Biodiversity aspects

Etc....
Future
Making it happen