

Use of pre-cultivated perennial mats in large cities\*  
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Problem

- The increasing sealing in cities with the accompanying deterioration of the overall urban climatic situation leads to stress and health problems
- It comes to a reduction in the quality of life of the population
- Especially in congested and heavily sealed inner city areas in large cities, there is a lack of extensive and species-rich green spaces and aisles
- In addition, the increase of CO<sub>2</sub> concentrations in the atmosphere continues, which is a major cause of climate change
- For this reason, great efforts are being made internationally and nationally to reduce CO<sub>2</sub> emissions
- Innovative developments to reduce CO<sub>2</sub> emissions, but also to absorb them, are therefore urgently needed

Objective

- In the research project "Use of pre-cultivated perennial mats in large cities for ecological enhancement", vegetation mats made of sheep's wool were developed for planting with perennial mixtures with high CO<sub>2</sub> uptake
- The objective is to develop an alternative greening concept with an appealing, durable and low-maintenance planting for public spaces
- In a model project in Berlin, over 600 m<sup>2</sup> of pre-cultivated vegetation mats made of sheep's wool and coconut fibers were pre-cultivated
- Various perennial species were used for shadow and sunny places
- The mats were installed on selected areas with heavy traffic and sealed surfaces or areas that are difficult to green
- Two selected plant mixtures with 8 different perennials were also tested for a roof greening and a greening of an underground garage

Results of vegetation mats of sheep's wool

- After one year, *Aster ericoides*, *Stachys byzantina* and *Nepeta x faassenii*, growing at the sunny site, already reach a high biomass and thus a high CO<sub>2</sub> uptake (Table 1)
- At the shady location *Carex hachijoensis* and *Carex pendula* reach a very high biomass and thus a high CO<sub>2</sub> uptake (Table 2)
- The CO<sub>2</sub> uptake of the roots also plays a decisive role
- A perennial mixture of 8 plants can absorb up to about 1110 g of CO<sub>2</sub> in the first year.

- The sheep's wool in the vegetation mats is mainly responsible for the good growth of the perennials
- The mats can absorb up to 27 l/m<sup>2</sup> of water and hold it for more than 26 days
- The natural nitrogen content in the wool of approx. 10-15% is a long-term fertilizer to the perennials
- In the future, the vegetation mats can also be used for green roofs

Table 1 Dry substance and CO<sub>2</sub> uptake of perennials for sunny location after 1 year

Plant name	Above-ground biomass (dry substance) [g/plant]	Root (dry substance) [g/plant]	Whole plant (dry substance) [g/plant]	CO <sub>2</sub> uptake [g/plant]
<i>Aster ericoides</i>	46.1	152.2	198.4	294.0
<i>Achillea filipendulina</i>	16.8	19.1	35.8	55.2
<i>Panicum virgatum</i>	20.6	82.7	103.3	142.2
<i>Stachys byzantina</i>	38.8	90.6	129.4	160.9
<i>Nepeta x faassenii</i>	36.3	83.6	119.9	171.4
<i>Sedum telephium</i>	38.9	42.9	81.8	117.9
<i>Calamintha nepeta</i>	29.3	34.2	63.4	99.0
<i>Sedum floriferum</i>	21.4	23.9	45.3	69.5
Total	248.2	529.1	777.3	1110.1

Table 2 Dry substance and CO<sub>2</sub> uptake of perennials for shady location after 1 year

Plant name	Above-ground biomass (dry substance) [g/plant]	Root (dry substance) [g/plant]	Whole plant (dry substance) [g/plant]	CO <sub>2</sub> uptake [g/plant]
<i>Carex pendula</i>	30.8	63.2	94.0	150.6
<i>Hosta lancifolia</i>	8.1	20.8	28.8	43.6
<i>Hosta ventricosa</i>	13.5	35.1	48.6	74.8
<i>Bergenia cordifolia</i>	41.4	27.2	68.5	107.8
<i>Carex hachijoensis</i>	48.9	72.9	121.8	192.9
<i>Liriope muscari</i>	15.0	32.6	47.5	73.1
<i>Vinca minor</i>	19.9	19.6	39.5	63.8
Total per 1 m <sup>2</sup>	177.4	271.4	448.8	706.6