



# GERMANY'S SPONGE CITIES TO TACKLE HEAT AND FLOODING

## Key messages

Germany promotes nature-based solutions to advance climate change adaptation in cities. By imitating the natural water cycle, green roofs, façades and other green spaces absorb the rainwater where it lands, soaking it up like a sponge until it can infiltrate into the ground or evaporate. This serves as a natural flood prevention and also helps keep buildings cool, encouraging biodiversity and improving air quality and citizens' well-being. Many German cities have embarked on greening their buildings.

**Country:** [Germany](#)

**Sectors:** [Buildings](#) | [Urban planning](#)

**Scale:** [Local](#)



Good health and well-being



Clean water and sanitation



Sustainable cities and communities



Climate action

## Challenge

Despite its generally temperate climate, Germany recently faced several heatwaves and floods. For example, the flood disaster of July 2021 led to devastating destruction, notably in the states of Rhineland-Palatinate and North Rhine-Westphalia. More than 180 people were killed and around 800 people were seriously injured. Like other European countries, Germany also experienced several heatwaves, with temperatures well above 35 degrees, especially affecting the elderly, young children and other vulnerable groups. Cities are usually warmer than rural areas as concrete buildings and sidewalks radiate sunlight; the temperature in cities is also higher due to a larger concentration of people, vehicles and industrial complexes. As the effect of heatwaves and related health risks is more strongly felt in cities (heat island effect), many German cities aim to become more climate resilient and offer citizens better protection. They are turning to nature-based solutions to improve cities' capacity to absorb rainwater and cool the buildings through green roofs, façades and other green surfaces. Among the key obstacles are business-as-usual mentality of grey infrastructure engineering, traditional urban planning practices and a comparatively high cost of retrofitting buildings.

## Approach

By imitating the natural water cycle, green roofs, façades and other green spaces absorb the rainwater where it lands, soaking it up like a sponge until it can infiltrate into the ground or evaporate. Green areas thereby ease the pressure on the sewage system, helping prevent or at least reduce the impacts of floods.

Green roofs and façades also help keep buildings and surrounding air cool, encouraging biodiversity and improving air quality and citizens' well-being.

There are two different types of green roof systems: intensive and extensive. Intensive green roofs use a deeper amount of vegetation and therefore have a stronger capacity to absorb rainwater. However, the extensive form requires much less maintenance, making it cheaper and more popular. In 2019, the large majority of German green roof areas (84%) used the extensive approach (BuGG, 2020). However, the trend is now moving towards intensive green roofs (e.g. accessible roof gardens).

The installation of green roofs and façades has been mostly encouraged by municipalities through provisions in local development plans. In 2019, about two-thirds of German cities had made green roofs mandatory in development plans (compared to one-third in 2010). Seven out of ten cities with more than 50 000 inhabitants provide for roof greening in their respective development plans. These provisions apply primarily to flat roofs and flat pitched roofs, with an average substrate layer of at least 10 cm (BuGG, 2020). In addition, some municipalities also define specific design requirements for building structures.

Targeted funding programmes are usually used to encourage the greening of specific neighbourhoods (sometimes also covering the entire city). About a quarter of Germany's larger cities provide financial subsidies for green roofs. The proposed funding can cover up to half of investment costs and represents on average 10-100 EUR/m<sup>2</sup> and 500-100 000 EUR per project (BuGG, 2020).

Within the framework of impact compensation regulation, about a quarter of cities award eco-points for green roofs. The promotion of green roofs and photovoltaic/solar thermal systems is complementary. The large majority of cities also grant a reduction for the split wastewater fee. However, this reduction is rather minor compared to the extra costs related to greening buildings.

## Results

Germany can build on a long green roof tradition. Drawing on a broad range of techniques and well-developed expertise, it has become a global frontrunner in greening buildings. Given their multiple benefits for the city climate (rainwater management, evaporative cooling, binding dust and reduced CO<sub>2</sub>), green roofs and façades have been recognised as an important climate measure in [Germany's Climate Action Plan 2050](#).

The total amount of greened roof areas, including extensive, inclusive and underground car park green roofs, was estimated at 120 million m<sup>2</sup> in 2019. The green roof areas have more than doubled over the past decade. In 2019, more than 7 million m<sup>2</sup> additional roof areas have been greened, representing about 9% of newly constructed flat roofs (BuGG, 2020). The green building sector also provides new jobs in related professions, including roof garden maintenance.

However, the situation varies greatly across the country, depending on a large number of different building regulations, urban development plans, municipal bylaws, nature-based-specific regulations, municipal funding and other incentives. According to a nation-wide Green Roof Index, the cities of Munich, Stuttgart and Berlin have the largest green roof areas with over 4 million m<sup>2</sup>; Stuttgart is the leader in terms of ratio per inhabitant (4.1 m<sup>2</sup>/inhabitant compared to 1.2m<sup>2</sup>/inhabitant; average of 15 major cities).

### Lessons learnt

To amplify the expansion of green roofs and façades, it would make sense to establish common standards and a nation-wide inventory to measure progress and assess the effectiveness of support measures. To date, German cities use different approaches to estimate the size of green roofs and façades (aerial or satellite images, building cadastral data or digital building models). Only a few cities maintain a green roof inventory with annual updates, although this information could help monitor the effectiveness of direct and indirect support measures.

Germany would also benefit from better analytical tools to measure the evaporation performance, and energetic effects of roof and façades greening, as well as from preparing a full life-cycle assessment and related cost analysis. Existing greenery will need to be better maintained with a view to developing a national long-term strategic framework that provides clear guidance and benchmarks, including for individual households.

Moreover, smaller municipalities may require additional funding from both the federal state and Länder levels to help them expand their green building ambitions.

In practice, this policy example may be suitable for OECD countries with similar weather conditions, especially regular rainfall patterns.

### Further information

OECD (2023), OECD Environmental Performance Reviews: Germany 2023, OECD Environmental Performance Reviews, OECD Publishing, Paris, *forthcoming*.

OECD (2021), Scaling up Nature-based Solutions to Tackle Water-related Climate Risks: Insights from Mexico and the United Kingdom, OECD Publishing, Paris, <https://doi.org/10.1787/736638c8-en>.

BuGG (2020). BuGG-Market Report on Building Greening 2020, Green Roofs, Green Facades and Interior Greening in Germany.

### Featured publication

OECD (2023), OECD Environmental Performance Reviews: Germany 2023, OECD Environmental Performance Reviews, OECD Publishing, Paris, *forthcoming*.

Link to: <https://www.oecd.org/climate-change/theme/resilience>.

**Last updated:** 07-11-2022