



# GREEN CORRIDORS AND TREE ROWS

SLU5



ADDRESSED HAZARDS



PROTECTED CRITICAL INFRASTRUCTURE



WWW.NATURE-DEMO.EU/



**Tree rows in Medellín, Colombia.**

Coordinates: 6°15'17"N 75°36'18"W  
Image Credit: [E. Canga, via Google Earth], [2025], Free to use.



**Zoom in of tree rows in Medellín.**

Coordinates: 6°14'43"N 75°36'40"W  
Image Credit: [E. Canga, via Google Earth], [2025], Free to use.

## Primary functions and key services

Green corridors and tree rows contribute to **infrastructure** and **ecosystem resilience** by:

- **Biodiversity enhancement:** links fragmented ecosystems, enabling species migration and habitat protection.
- **Wind mitigation:** reduces wind speeds, protecting **buildings, roads, and agricultural fields**.
- **Flood risk reduction:** enhances infiltration, reduces peak water flow, and stabilise riverbanks.
- **Soil stabilisation:** prevent erosion, protects slopes, and strengthens land resilience against landslides, protecting **roads, streets** or **bridges** from this hazard.
- **Microclimate regulation:** lowers local temperatures, mitigates urban heat island effect, and improves soil moisture retention.
- **Air quality improvement:** filters pollutants, reduces airborne dust, and enhances CO<sub>2</sub> capture.
- **Infrastructure protection:** shields **roads, streets, bridges**, and in addition: **agricultural fields, and urban spaces** from wind and water damage, reducing maintenance costs (Felling UK, 2025; Pantera et al., 2018).

## Hazards mitigated by this NbS

### Climatological hazards:

- Moderate mitigation of drought by improving soil moisture retention.

### Meteorological hazards:

Moderate mitigation of wind erosion, strong gusts, and storm damage.

### Hydrological hazards:

- Moderate mitigation of pluvial and fluvial flooding
- Limited mitigation of surface runoff and soil erosion.

## What is it?

**Green corridors** and **tree rows** are linear vegetated structures designed to enhance ecological connectivity, mitigate climate risks, and provide multiple environmental, economic, and social benefits.

**Green corridors** are continuous strips of vegetation, often consisting of trees, shrubs, and grasses, that connect fragmented ecosystems and facilitate species movement. They can be found in urban areas, agricultural landscapes, riverbanks, and coastal regions, enhancing biodiversity, supporting climate resilience, and improving air quality.

**Tree rows** are single or multiple rows of trees, planted along roads, fields, rivers, or urban boundaries, providing shade, carbon sequestration, biodiversity habitat, wind protection, and erosion control.

They are essential in agriculture, urban planning, and flood protection systems. Both green corridors and tree rows play a vital role in improving microclimates, protecting infrastructure, regulating water flow, and mitigating environmental hazards such as extreme heat, wind, erosion, and flooding (Felling UK, 2025; Panagakos et al., 2014; Pantera et al., 2018).

## Challenges this NbS addresses

- **Extreme heat** - Prevention and reduction (provides shade, enhances cooling through evapotranspiration)
- **Drought** – Reduction (enhances soil moisture retention, prevents water loss).
- **Flooding & runoff** – Reduction (improves infiltration, slows down surface water flow).
- **Erosion & landslides** – Prevention (stabilises soil and reduces wind and water erosion).

## Site suitability, scale and coverage

Green corridors and tree rows can be **customised** based on local **climatic, hydrological, and ecological** conditions. They are **versatile solutions** suitable for:

- **Urban environments:** tree-lined streets, greenways, park networks.
- **Agricultural landscapes:** windbreaks, shelterbelts, erosion control.
- **Riverbanks and coastal areas:** riparian buffers, flood protection.
- **Highways and transportation corridors:** noise reduction, storm mitigation.
- **Mountainous and erosion-prone regions:** slope stabilisation, watershed protection.

## Ecosystem services

- ▶ **Climate regulation:** reduces temperature extremes and mitigate heat stress.
- ▶ **Biodiversity conservation:** supports wildlife movement and ecological connectivity.
- ▶ **Carbon sequestration:** captures and stores CO<sub>2</sub> in trees and soil.
- ▶ **Water conservation:** improves infiltration, reduces surface runoff.
- ▶ **Air purification:** removes pollutants and improves urban air quality.
- ▶ **Aesthetic and recreational benefits:** creates green spaces for public well-being.



# GREEN CORRIDORS AND TREE ROWS



## Cost-benefit profile

Regarding infrastructure protection, green corridors and tree rows reduce maintenance costs for roads, bridges, and stormwater drainage systems by mitigating erosion and runoff.

The establishment of green corridors and tree rows presents varying costs depending on location, species selection, and management practices. Urban tree rows require higher initial investment due to soil preparation, infrastructure integration, and long-term maintenance. In rural settings, costs are generally lower, though additional expenses such as irrigation and pest control must be considered. Green corridors, integrating ecological and transport functions, require substantial upfront investment but enhance biodiversity, air quality, and urban cooling, generating long-term savings in public health and climate resilience. For instance, in the United Kingdom, the cost of planting a mature tree in an urban setting can range from £50 to £100 per tree, depending on different variables (Felling UK, 2025; Pantera et al., 2018).

The benefits of green corridors and tree rows outweigh their costs over time. In urban areas, they mitigate heat island effects, increase property values, and reduce stormwater runoff, while rural green corridors and tree rows improve agricultural productivity by preventing soil erosion and enhancing carbon sequestration. Despite high initial investments, cost-sharing mechanisms, such as agroforestry and freight optimisation in green corridors, help offset expenses (Panagakos et al., 2014). The economic viability of these systems depends on strategic planning, balancing ecological functions with sustainable financial models.

## Example of installation

- ▶ **Medellín's Green Corridors** (C40, n.d.; Varga, n.d.)
- ▶ **Location:** Medellín, Colombia
- ▶ **Implemented by:** Medellín's Joaquin Antonio Uribe Botanical Garden and the city government.
- ▶ **Description and results:** the Green Corridors project aimed to create a network of 30 interconnected green spaces across the city, including major roads and stream beds. 2.5 million plants and 880,000 trees were planted across city between 2016 and 2021. This initiative (\$16.3 million) was designed to combat the urban heat island effect, improve air quality, and enhance urban biodiversity. The project successfully lowered the city's average temperature by 2°C and it significantly improved air quality by capturing fine particulate matter (PM 2.5). The initiative boosted urban biodiversity by creating habitats that attract wildlife. A bioclimatic study estimated that in just one corridor, the new vegetation growth would absorb 160,787 kg of CO<sub>2</sub> per year for the initial phase of the plants' lives (C40, n.d.). Additionally, the project trained 75 citizens from disadvantaged backgrounds to become city gardeners and planting technicians.



**A part of the Medellín's city where green corridors and tree rows have been implemented.**  
Image Credit: [ACI Medellín], [2018], Used with permission.

## Environmental impacts (EU taxonomy)

- ☑ Climate change mitigation
- ☑ Climate change adaptation
- ☑ Sustainable use and protection of water and marine resources
- ☑ Transition to a circular economy
- ☑ Pollution prevention and control
- ☑ Protection and restoration of biodiversity and ecosystems.

## Main components

- **Urban Green Corridors** connecting parks and city districts.
- **Tree-lined highways** for noise and wind reduction.
- **Riparian buffers** along riverbanks to reduce flood risk.
- **Agroforestry tree rows** for windbreaks and soil conservation.

### Spatial arrangement and structure

- **Linear arrangement:** designed for maximum connectivity and climate resilience, ensuring wind and flood mitigation.
- **Zonation strategy:** composed of outer canopy trees, shrubs, and ground cover layers for diverse ecological functions.
- **Canopy density:** optimised for shade provision, temperature regulation, and windbreak efficiency.

### Functional Design and Implementation Considerations

- **Hydrological integration:** positioned in watersheds, floodplains, and riparian zones to enhance stormwater infiltration and reduce peak runoff.
- **Erosion control mechanisms:** integrated along riverbanks, slopes, and roads to prevent soil loss and sediment displacement.
- **Wildlife corridors:** designed to connect fragmented habitats and facilitate species migration.

### Vegetation elements

- **Native and climate-resilient tree species:** vegetation selected based on local environmental conditions.
- **Understory vegetation:** shrubs, grasses, and ground cover as part of the selected species.
- **Drought- and flood-resistant species:** trees and plants adapted to local hydrological conditions.

## References

- Benstrup, G. (2008). Conservation Buffers—Design guidelines for buffers, corridors, and greenways. Gen. Tech. Rep. SRS-109. Asheville, NC: US Department of Agriculture, Forest Service, Southern Research Station. 110 p., 109.
- Beule, L., & Karlovsky, P. (2021). Tree rows in temperate agroforestry croplands alter the composition of soil bacterial communities. *PLoS one*, 16(2), e0246919.
- C40 Cities Climate Leadership Group, Nordic Sustainability. (2019) Cities100: Medellín's interconnected green corridors. Retrieved from: [https://www.c40knowledgehub.org/s/article/Cities100-Medellin-s-interconnected-green-corridors?language=en\\_US](https://www.c40knowledgehub.org/s/article/Cities100-Medellin-s-interconnected-green-corridors?language=en_US) (accessed 03.03.2025)
- Panagakos, G., Psarftis, H. N., & Holte, E. A. (2014). Green Corridors and Their Possible Impact on the European Supply Chain. In W. K. Talley (Ed.), *Handbook of Ocean Container Transport Logistics* (pp. 521–550). Springer. [https://doi.org/10.1007/978-3-319-11891-8\\_18](https://doi.org/10.1007/978-3-319-11891-8_18)
- Panduro, T. E., Nainggolan, D., & Zandersen, M. (2024). Cost-effectiveness analysis of urban nature-based solutions: A stepwise ranking approach. *Nature-Based Solutions*, 100186.
- Swarnamaheswaran, K. V. (2023). Sustainable management of green corridors below overhead lines in Europe (Doctoral dissertation, Technische Universität Wien).
- Varga, T. (n.d.) Earthly Mission. 2 C cooler, cleaner air, wildfire returns: How 3.4 Million new plants transformed Colombia's second-largest city. Retrieved from: <https://earthlymission.com/medellin-colombia-green-corridor-project-corredores-verdes-cooler-temperature/> (accessed 03.03.2025)
- Zhang, Z., Meerow, S., Newell, J. P., & Lindquist, M. (2019). Enhancing landscape connectivity through multifunctional green infrastructure corridor modeling and design. *Urban forestry & urban greening*, 38, 305-317.