Nature-based solutions, enabled by green-blue infrastructure

GreenCityLab**Huế**

Green-blue infrastructure, nature-based solutions, and why they matter for Huế?

Green-blue infrastructure (GBI) describes the often fragmented network of urban nature—natural and semi-natural green (vegetation) or blue (water) elements. It covers a wide range of features, from street trees, green roofs, vertical greenery and ponds to larger features such as urban parks, gardens, or forests.

Nature-based solutions (NbS) cover a wide range of measures seeking to provide benefits for people and nature while addressing societal and environmental challenges such as rising temperatures, water security, water and air pollution, food security, public health and disaster risk. In Vietnam, the National Adaptation Plan (December 2022) clearly emphasises the significance of NbS or "ecosystem-based solutions" for disaster prevention. Hence, GBI as a form of NbS are key to tackle urban climate resilience and biodiversity crises. For example, trees, pergolas and vertical greenery reduce heat through shading and evapotranspiration. Bioswales and permeable pavements increase water infiltration and delay peak flows. Ponds and greener river edges with riparian planting retain water, recharge soils and restore microclimates. These benefits of GBI help to meet hotter seasons, heavy rainfall and runoff, and thus support building urban climate resilience.

Huế's green–blue fabric in practice. Shaded streets, riverside parks, and citadel moats/riverbanks—cooling the city, buffering stormwater, enriching amenity.

Appropriate planning, implementation and long-term maintenance of GBI helps to realise and sustain these benefits for health, liveability, and resilience, and may contribute to a more just distribution of green spaces by improving the accessibility to everyday green space across all wards of the city.

Key consideration

Use this as a quick checklist from early planning to long-term care.

- **Define goals and simple indicators.** Agree on target services and how to track them (e.g., canopy cover, shaded hours, permeable area, plant survival, infiltration tests).
- **Work through co-creation.** Involve users, operators and neighbours early to secure acceptance, fit and stewardship.
- **Target the right places.** Focus on heat and flood hot spots and on underserved areas.
- **Combine elements.** Pair trees, hedges, permeable paths and vertical greenery to deliver multiple benefits in one place.
- **Design for context.** In narrow street canyons, prefer hedges or green walls for air quality; size bioswales according to runoff and soils; pair water bodies with shade and circulation.
- **Choose resilient planting.** Use locally suitable, drought-tolerant species; plan irrigation for dry months.
- **Plan maintenance and budgets from day one.** Define tasks, frequencies, responsibilities and costs; make upkeep easy.
- **Check structures and safety.** Verify loads, waterproofing and fire safety for roofs and façades before greening.
- **Design for equity and access.** Prioritise everyday routes so people experience the benefits; focus on vulnerable groups (children, elders, outdoor workers).
- **Monitor and adapt.** Review performance annually; adjust planting, irrigation and maintenance as conditions change.

From elements to benefits

Ecosystem services are the benefits people receive from nature. In cities, they are co-produced by living—trees, soils and water—and by how places are designed, managed and accessed. Typical services include cooling and comfort, managing rainwater, improving air quality, and supporting biodiversity and everyday amenity. Because services depend on context and use, the same GBI element can perform differently from one street or season to the next. The matrix shows more or less popular/common and feasible GBI types in Huế and how they contribute to ecosystem services that matter most for climate resilience. The matrix helps compare options at a glance and shows where benefits are strong, limited or dependent on design and context. Use it as a guide to shortlist measures that fit local goals and site conditions; then tailor design and maintenance so benefits last.

Three tips for reading the matrix:

- **Multifunctionality.** Most GBI types deliver more than one ecosystem service at once. Combining elements (e.g., trees with hedges and permeable paths) often increases total benefits.
- **Trade-offs and disservices.** Strengthening one ecosystem service can weaken another (e.g., shade trees can reduce pollutant dispersion in narrow street canyons). Poor choices or neglect can also create disservices (e.g., allergens, clogging, upkeep burdens).
- **Scale, quality and care.** Benefits rise with canopy cover, healthy soils and water availability, and fall when systems clog or plants fail. Equity matters too: routes and sites used by vulnerable groups should be prioritised so benefits are widely felt.

Ecosystem service potential of selected GBI types. GBI's potential across seven services: evapotranspiration, shading, water infiltration, water retention, air purification, biodiversity, and amenity value.

Street trees / tree alleys	◍	◍	◌	◌	◌	○	◍
Green verge	○	—	○	○	○	○	○
Hedges	○	◌	○	◌	◌	○	○
Pocket / small urban parks	○	○	○	○	○	◌	◌
Medium to large urban parks	◍	◍	◍	◍	◍	◍	◍
Green playground / school ground	○	○	○	○	○	○	◍
Vegetated pergola	○	◍	—	—	○	○	◍
Balcony greening	○	—	—	—	○	○	○
Green roofs – extensive	◌	—	—	◌	○	○	○
Green roofs – intensive	◍	○	—	◍	◌	◍	◍
Vertical greenery (façade or ground-based)	◌	—	—	—	◌	○	○
Bioswales	○	—	◍	◌	—	○	◌
Permeable pavements	◌	—	◌	◌	—	○	◌
Ponds	◍	—	○	◌	—	◌	◌
Canals	◌	—	◌	◌	—	○	◌
Riverbank green	○	○	○	○	○	◌	◍
House gardens	○	○	○	○	○	◍	◍
(Urban) Forest	◍	◍	◍	◍	◍	◍	◍

Services: evapotranspiration, shading, water infiltration, water retention, air purification, biodiversity, amenity value

Ecosystem service potential: ◍ high, ○ fair, ◌ design and context-dependent, — none.

Notes and cautions: Trees can worsen near-road air quality in narrow street canyons, so hedges or green walls may be preferable there. Permeable pavements cool and store water when they are moist; benefits fall in long dry spells or when systems are clogged. Daytime cooling by water bodies depends on size, depth and shade, so pair ponds and canals with riparian trees. Amenity in private gardens is high for residents but low for the public if access is limited.

Get in touch with our local partners

Our work is locally coordinated by the Mientrung Institute for Scientific Research (MISR) of the Vietnam Academy of Science and Technology (VAST). Please get in touch with greencitylabhue@gmail.com.

Learn more

Get in touch with the team by emailing info@greencitylabhue.com. Learn more about this factsheet and the GreenCityLabHuế project by scanning the QR code or by visiting our website at www.greencitylabhue.com.

With funding from the:

Federal Ministry of Research, Technology and Space

FONA Research for Sustainability

SURE Sustainable Development of Urban Regions

The Federal Ministry of Research, Technology and Space (BMFTR) is funding this project within the framework of the Strategy „Research for Sustainability" (FONA) www.fona.de/en – BMFTR funding code: GreenCityLabHuế: Strengthening climate resilience of urban regions in Central Vietnam through nature-based solutions for heat adaptation and air quality improvement (FKZ 01LE1910A1/ FKZ 01LE1910B1) // GreenCityLabHuế: Strengthening climate resilience of urban regions in Central Vietnam through good governance in the co-creation of nature-based solutions (FKZ 01LE1910A2/ FKZ 01LE1910B2). The content of this document does not reflect the official opinion of the BMFTR. Responsibility for the information and views expressed lies entirely with the author(s).

Suggested citation: Jache, J., Scheuer, S., 2025. Nature-based solutions, enabled by green-blue infrastructure. GreenCityLabHuế project factsheet.