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The Role of Green Spaces in the Environment

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Source: AI generated



The Urban Challenge

3% of Earth's land

Cities occupy just 3% of the planet's surface, yet consume **75% of natural resources** and generate the majority of global emissions.

(UN-Habitat, World Cities Report 2024)

Urban Heat Island

Concrete and asphalt surfaces can be **10–20°C hotter** than surrounding rural areas, creating dangerous microclimates in summer.

(Scientific Reports, 2021)

Air Quality Crisis

Urban vegetation remains our most effective, low-cost filtration system — absorbing pollutants and producing oxygen at scale.

(Nature Cities, 2024)



Source: AI generated





🌡️ Temperature Regulation

A mere **5% increase in green cover** can lower summer temperatures by up to **2.2°C** — a natural air conditioner for entire districts.

(Scientific Reports, 2021; Nature Cities, 2024)

🌿 Air Purification

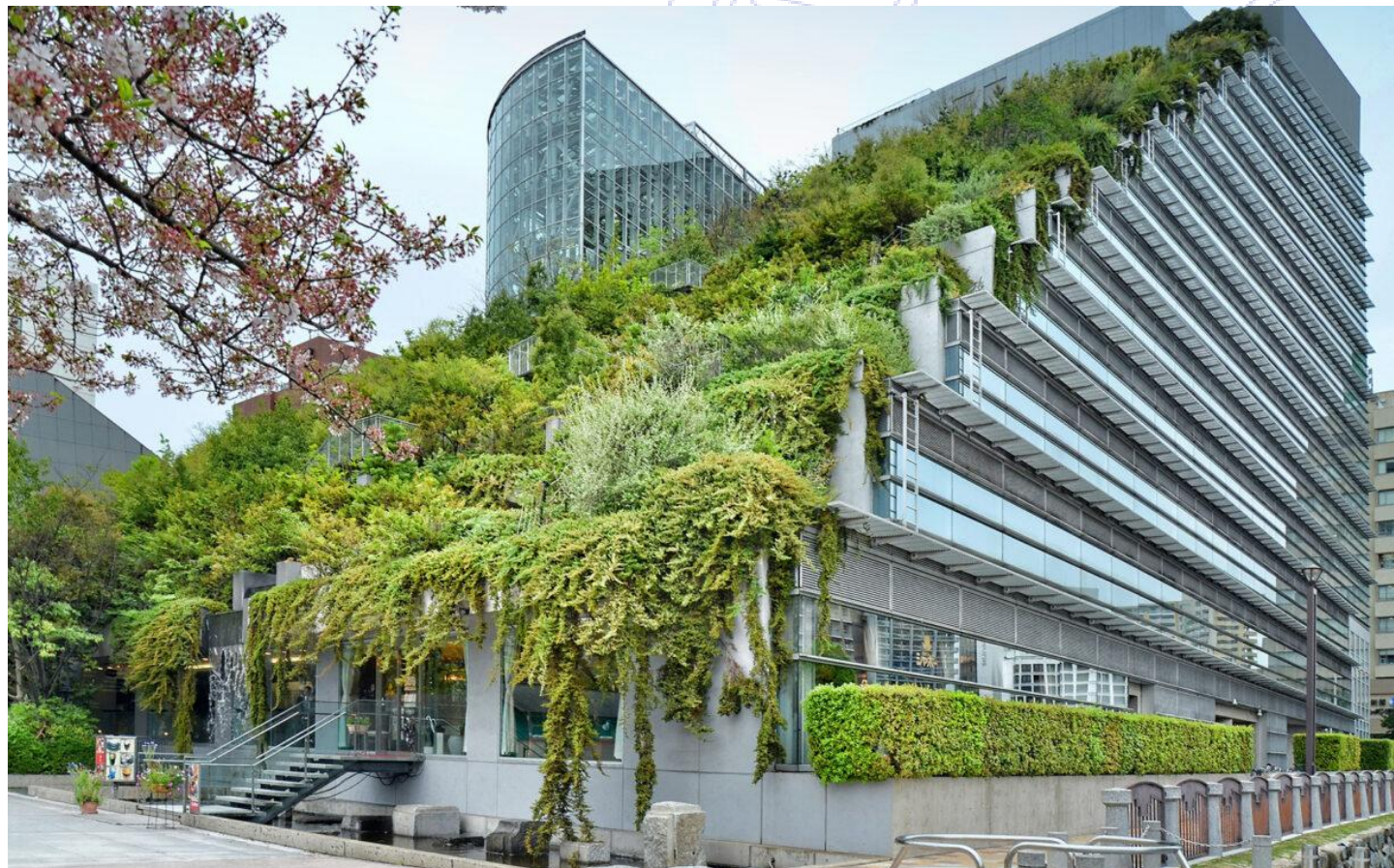
Plants absorb CO₂ bind fine dust particles, and neutralize toxic chemicals — acting as living air filters across the urban landscape.

(Geography and Sustainability, 2025)

💧 Water Management

Green roofs and permeable surfaces function as natural sponges, reducing flood risk and easing pressure on sewage infrastructure.

(Scientific Reports, 2021)



The ACROS building in Fukuoka, Japan
Source: <https://magazynieplasytemowego.pl/ekologia/ogrody-na-scianie/>





Economic & Social ROI

79%

Energy Savings

Green roofs can reduce building cooling costs by 17–79% annually, depending on climate and design. (Scientific Reports, 2021; Nature Cities, 2024)

20%

Property Value

Green-integrated districts consistently attract higher investment, tourism, and premium real estate values. (UN-Habitat, World Cities Report 2024)

30%

Stress Reduction

Regular access to nature measurably reduces stress, lowers violence rates, and improves community focus. (TU Dresden Meta-Analysis, 2026; Frontiers in Public Health, 2025)

**Green infrastructure is not a cost
— it is a long-term investment with measurable financial and social returns.**

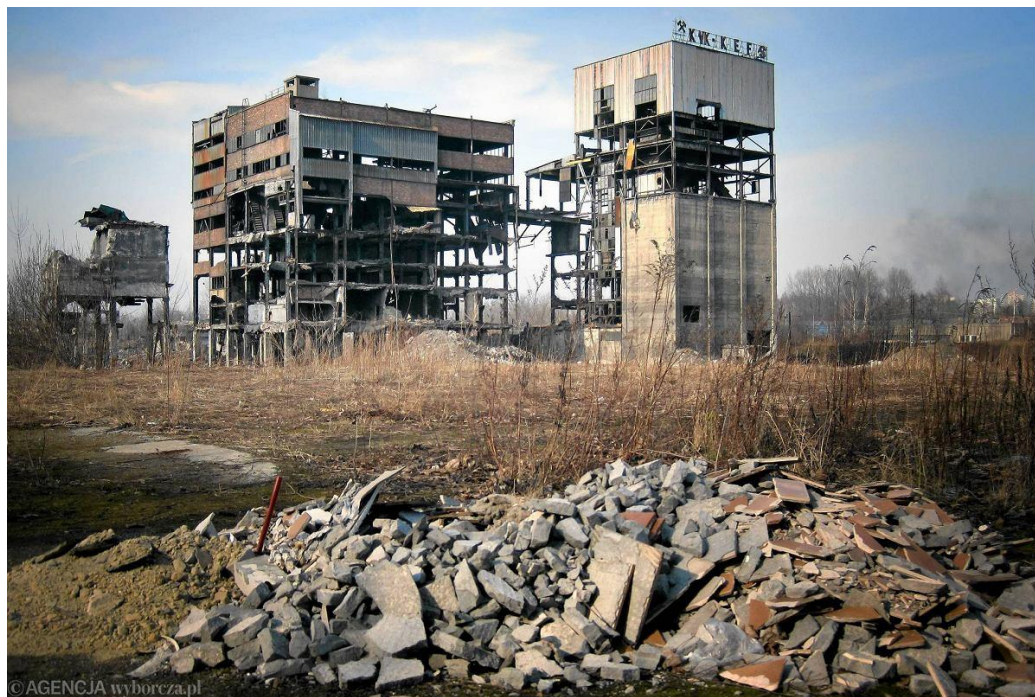
Sources: UN-Habitat, Nature Cities, Scientific Reports, Frontiers in Public Health



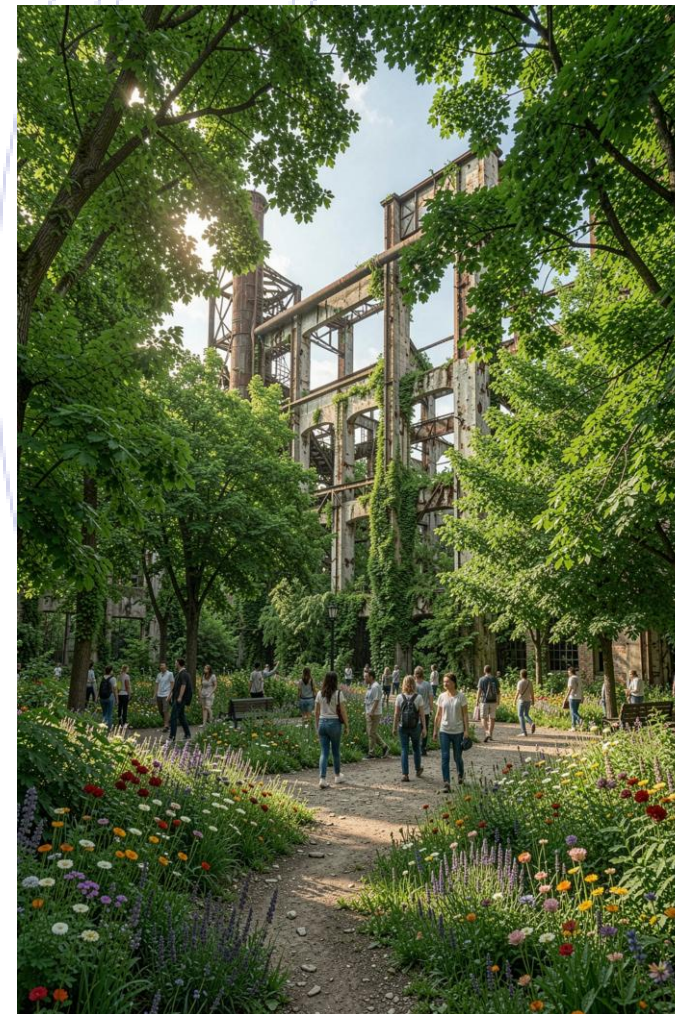


From Decay to Vitality

A grey, abandoned industrial site — once a symbol of urban decline — reborn as a lush, vibrant public park. This transformation illustrates the true potential of post-industrial revitalization.



Source: Fot. Grzegorz Celejewski / Agencja Wyborcza.pl



Source: AI generated





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Landschaftspark Duisburg-Nord

This is industrial heritage: where workers once toiled, more than one million visitors every year now party, climb, dive and ramble. A disused ironworks has been transformed into a city oasis.



Events in the Landschaftspark



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Play area with giant slide tunnel



Revitalizing Post-Industrial Heritage



The Zollverein Model

The UNESCO-listed Zollverein complex in Germany demonstrates how industrial heritage can be integrated with modern ecological functions — preserving history while serving the community.

UNESCO World Heritage Site (2001), Essen, Germany, ~1.5 million annual visitors

- **Adaptive reuse** transforms old factories into cultural and creative hubs
- **Remediation** of contaminated soil and water is the essential first step
- **Green technology** bridges industrial legacy with sustainable futures

Sources: UNESCO World Heritage List, HUB-IN Atlas, Google Arts & Culture





Innovative Solutions



Source: <https://www.sempergreen.com/project/daycare-centre-baakenhafen-hamburg/>

Vertical Forests & Living Walls

Maximizing greenery in high-density areas by turning building facades into living ecosystems that filter air and insulate structures.



Source: <https://www.metadata.cat/noticia/567/tram-dades-usuaris-millorar-servei>

Green Tram Tracks

Integrating vegetation into tramways reduces noise pollution, absorbs heat, and creates continuous green corridors through the city.



Source: Ian Adams,
<https://www.bhg.com/gardening/landscaping-projects/landscape-basics/make-a-rain-garden/>

Rain Gardens

Natural water retention systems that manage stormwater runoff while doubling as beautiful, biodiverse public spaces.





Green Infrastructure Solutions in Poland

Polish cities are leading the way in implementing innovative green infrastructure projects, demonstrating how urban environments can be transformed through nature-based solutions.

BYDGOSZCZ	GDAŃSK	LEGNICA	KATOWICE	NATIONWIDE INITIATIVES
"Green-Blue City" Water Management	Comprehensive Blue-Green Infrastructure System	Community-Led Green Renewal Program	Vertical Forests & Green Roofs	
• Project value: €264.6 million (€165.9 million EU funding) • Timeline: 2024-2027 • Key achievements: 6.01 km of new stormwater network, 1.55 km modernized, 15,000 m³ small retention capacity • Innovation: AI-powered retention management with climate projections to 2050 • Impact: 144,649 residents with access to new green infrastructure • Philosophy: "Sponge City" concept - distributed retention instead of large drainage channels	• 53 retention reservoirs with 752,000 m³ total capacity (5x increase since 2001) • 9 rain gardens - Poland's first groundwater rain gardens • Sustainable Rainwater Management Systems project: €123.6 million (€92.9 million EU funding) • Micro-forests using Miyawaki method in 7 locations • Blue-Green Infrastructure Policy integrated with Water and Green Space Policies	• Green Renewal of Medium and High Vegetation" - ongoing since 2010s • 6,000+ trees and shrubs distributed annually to residents, schools, and institutions • Recognized by Supreme Audit Office (NIK) as best practice for other municipalities • Community participation model: residents plant and maintain trees • 2017-2018: 900+ trees and 33,000 shrubs planted	• Tax exemption for green roofs, vertical gardens, and green facades • Damrota Garden: "Polish Bosco Verticale" - vertical forest on 11-story building • Green roof benefits: water retention, thermal insulation, reduced urban heat island effect • 25+ applications for green infrastructure tax relief (mostly facades) • Galeria Silesia: rooftop garden example of integrated urban greenery	• Rain gardens in Warsaw, Cieszyn, and Zielona Góra • Stormwater management projects across multiple cities • Nature-based solutions (NBS) and Blue-Green Infrastructure (BZI) frameworks • EU funding through FEnIKS program (2021-2027) supporting climate adaptation

Sources: City of Bydgoszcz, Gdańskie Wody, City of Legnica, City of Katowice, NFOŚiGW (National Fund for Environmental Protection)





Guidelines for Urban Integration

Green Space Factors & Blue-Green Indices

Mandate minimum green coverage ratios in all new urban developments and zoning plans.

Protect Mature Trees First

Existing mature trees provide decades of ecological value — prioritize their preservation over replanting.

Public-Private Partnerships

Create financial incentives — tax breaks, grants — to encourage green roof and wall installations on private buildings.

Integrate at Every Scale

From pocket parks to rooftop gardens, green infrastructure must be woven into every layer of the urban fabric.



Source: AI generated





Benefits of Blue-Green Infrastructure

Climate Adaptation

Helps cities adapt to heat, drought, and extreme rainfall by combining vegetation and water-sensitive design.

Supports Natural Processes

Restores urban hydrology and ecological cycles by reconnecting water, soil, and plant systems.

Reliable Water Resources

Improves stormwater capture, infiltration, and reuse, helping maintain local water availability in cities.

Biodiversity Protection

Creates connected habitats for plants, insects, birds, and aquatic species across the urban landscape.

Better Water Balance

Reduces runoff, slows peak flows, and increases retention to improve the urban water balance.

Urban Cooling

Lowers local temperatures through shade, evaporation, and evapotranspiration, reducing heat island effects.

Lower Flood Management Costs

Reduces pressure on drainage systems and helps lower the cost of flood protection and stormwater management.

Reduced Infrastructure Costs

Can decrease the need for expensive gray infrastructure by using multifunctional, nature-based solutions.

Spaces for Recreation

Creates attractive public spaces for walking, leisure, and active transport along waterways and green corridors.

Improved Urban Landscape

Enhances the visual quality of streets, parks, and waterfronts while making cities more liveable.

Educational Value

Serves as a living learning environment for understanding water cycles, ecology, and sustainable urban design.





The Power of Participation

Community Dialogue

Residents must actively shape their local green spaces — co-design ensures spaces are used, loved, and maintained.

Collaboration

Long-term success requires alignment between local government, businesses, and NGOs for funding and maintenance.

Education

Shifting public perception to view nature as a core urban utility — not a luxury — is essential for lasting change.

Research shows that community-led green space projects have 40% higher long-term success rates and stronger mental health outcomes

(TU Dresden, 2026; *Ecosystems and People*, 2026)





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A Call to Action: Designing for the Future

Cities are more than buildings — they are living ecosystems. Every square meter of green space is a step toward a cooler, cleaner, and more resilient future.

Cool

Reduce urban heat islands through strategic green cover

Clean

Purify air and water with living infrastructure

Resilient

Build cities that breathe, adapt, and thrive



Source: <https://www.origint.inc/blog/en/archives/5523>



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