

Urban Ecology GLOSSARY

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Introduction

Urban ecology is an emerging interdisciplinary field that studies ecological processes in urban areas. Traditionally, ecologists have focused on environments with minimal human impact to understand ecological processes. However, increasing urbanisation is rapidly transforming natural landscapes and habitats across the globe, significantly altering ecological patterns and processes. Urban ecology seeks to study and understand these changes and their drivers. Understanding urban ecological dynamics is crucial for developing strategies to mitigate biodiversity loss, promote nature conservation within cities, and improve sustainability. The process of urbanisation intertwines with social and economic factors, creating complex interactions that demand our attention. Urban ecology addresses these challenges by studying ecology in, of, and for the city.

This glossary of 100 terms is designed as an accessible learning resource for students, educators, and curious readers at all levels. It brings together key concepts that are often scattered across multiple disciplines such as ecology, geography, urban planning, sociology, public health, and environmental science. By clarifying the shared language and ideas, this glossary enables readers to develop a foundational understanding of urban ecology and appreciate the diverse methods, perspectives, and approaches employed to study and shape ecological life in human settlements.

This glossary is part of the urban glossary series produced by the IIHS Library. Access the complete collection on the IIHS Knowledge Gateway: <https://iihs.co.in/knowledge-gateway/glossaries/>

Crafting the Glossary

To compile these resources, we drew on a range of authoritative literature and reference materials, including foundational and contemporary books, publications by the Indian Institute for Human Settlements (IIHS), the Fifth and Sixth Assessment Reports, special reports of the Intergovernmental Panel on Climate Change (IPCC), as well as The New Urban Agenda developed through the UN Habitat III Conference.

This curation formed part of the IIHS Library Exhibition, titled “Urban Ecology: A New Lens on Biodiversity,” held from October 3 to December 24, 2024, at the IIHS, Sashivanagar Campus in Bengaluru. The exhibition was organised in collaboration with the Bengaluru Sustainability Forum (BSF). This aimed to bring together diverse perspectives and knowledge systems to highlight the importance of urban ecology in understanding and sustaining biodiversity in cities.

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A

Aerosol

The suspension of small solid or liquid particles, such as water, pollen, or ash, in air or any gas. The sizes of the suspended particles can range from 1µm to 100s of µm. The most significant size classes from a human health perspective are 1µm, 2.5µm and 10µm (also referred to as PM1, PM2.5 and PM10, where PM stands for particulate matter) levels.

Source: Adler and Tanner 2013

Albedo

The fraction of radiation, such as solar energy, that an object reflects. It ranges from 0 (for black objects, which absorb 100% of the radiation and reflect nothing) to 1 (for white objects, which reflect 100% of the radiation).

Source: Adler and Tanner 2013

Algal blooms

A rapid increase in the population of algae in water bodies, often triggered by 'eutrophication', that is, increased nutrient levels (such as nitrates and phosphates) and warm temperatures. The resulting dense growth of algae on the water surface leads to depletion of oxygen from the water below. Blooms of toxin-producing algae (Harmful Algal Blooms, HAB) can adversely impact fish health. As a consequence, not just are the humans who consume these fish affected adversely, but also there is a rise in fish mortality. In freshwater habitats, blooms of Cyanobacteria (also known as blue-green algae) are observed, some of which produce toxins.

Source: Denchak and Strum 2019

Aquifer

An underground layer of permeable rock or sand that stores water, and from which groundwater can be extracted.

Source: Adler and Tanner 2013

Atmosphere

This is a many-layered envelope of gases that surrounds every astronomical body, including the Earth. On Earth, it helps make life possible by trapping oxygen and making the air breathable, by shielding the planet from harmful ultraviolet (UV) radiation coming from the Sun, by trapping heat to warm the planet, and by preventing extreme temperature differences between day and night.

Source: UCAR Center for Science Education 2025

B

Biodiversity

This is the term given to the variety of life on Earth and the natural patterns it forms. The biodiversity we see today is the fruit of billions of years of evolution,

shaped by natural processes (e.g., geology of the area, plate tectonics, climatic changes) and, increasingly, by the influence of human activities. It forms the web of life of which humans are an integral part, and upon which they depend so fully. In addition to diversity of species, biodiversity also encompasses genetic, functional and evolutionary diversity.

Source: United Nations 2017

Biodiversity hotspot

Biodiversity hotspots are regions that contain a high level of species diversity that includes many endemic species (that is, species not found anywhere else in the world) and a significant number of threatened or endangered species.

Source: Anderson 2023

Biodiversity Net Gain

BNG is a new approach to development. The concept of minimising the impacts of human activities on the environment and society has long been established in some sectors (e.g. mining and other extractive industries). In recent years, however, the civil society, regulators, and investors are beginning to have a growing expectation from developers, both in the private and public sector, to not only do no harm but, in some cases, also contribute to local, national or global targets for environmental and social wellbeing. Within the context of biodiversity, this has led to the establishment of measurable targets to mitigate adverse developmental impacts. These targets are 1) net maintenance of biodiversity features, resulting in "no net loss" and/or 2) net improvement of biodiversity features, termed as "net gain" or "net positive impact". This is subject to the fulfilment of established principles for determining the success of these targets, such as defining a clear reference level based on the status of biodiversity under a pre-project or no project scenario, implementing hierarchical actions ranging from avoidance to restoration, etc. Biodiversity Net Gain (BNG) or Net Positive Impact (NPI) have become popular umbrella terms for these approaches, and many guidance documents, reviews and policy statements have been produced by IUCN and partners that explore this concept and its appropriate application.

Source: IUCN 2017a

Bioenergy

A kind of renewable energy derived from any form of biomass (organic material obtained from living organisms or their parts) or their metabolic by-products.

Source: IPCC 2023c

Bioindicator

Bioindicators are biological processes, species, or communities that are used to assess the quality of the environment in a specific area and how it changes over time. Changes in the environment are often attributed to anthropogenic disturbances (e.g. pollution, land use changes) or natural events (e.g. drought, rain), although anthropogenic stressors are the primary focus of bioindicator research. Not all biological processes, species, or communities can serve as successful bioindicators. Successful bioindicator species are those that effectively indicate the condition of the environment because of their moderate tolerance to environmental variability. Rare species (or species assemblages) are not very useful, since they either have very narrow tolerances and are too sensitive to environmental changes, or they are too infrequently encountered to reflect a wider biotic response. In contrast, ubiquitous species (or species assemblages) with very broad tolerances are almost insensitive to environmental changes which otherwise disturb the rest of the community, and hence are also not desirable as bioindicators. The use of bioindicators is not just restricted to a single species with a limited environmental tolerance. Entire communities, encompassing diverse organisms with different ranges of environmental tolerance, can provide a better representation of environmental conditions and are used as a “biotic index” or “multimetric” approach.

Source: Holt and Miller 2010

Biological invasion

This implies that the introduction, establishment, and subsequent ecological effects of a non-native organism that has entered a new environment are usually to the detriment of the native species. The spread of such invasive species is aided by several evolutionary and ecological factors such as physiological adaptations (e.g. higher reproductive rate), chemical defences (e.g. secretion of chemicals to kill or repel native species), absence of predators in the new habitat, and human-mediated dispersal (e.g., for gardens, pet trade, etc.). All invasive species are non-native, but not all non-native species are invasive. A species categorised as invasive in one region is native to another region. E.g., *Lantana camara* is an invasive plant in India. However, it is a native species in South America.

Source: Adler and Tanner 2013

Biological or Biotic Homogenisation

This is the process by which an urban-adapted or ecological generalist species becomes progressively dominant in towns and cities around the world. In natural conditions, different regions have different

communities due to historical (occurring over millions of years) processes like geological changes and evolution. However, biotic homogenisation can reduce these differences through contemporary phenomena like the introduction and establishment of hardy non-native species via human-mediated disturbance, local extinctions and so on.

Source: Douglas et al. 2020; Adler and Tanner 2013

Biomass

Organic material excluding the material that is fossilised or embedded in geological formations. Biomass may refer to the mass of organic matter in a specific area.

Source: IPCC 2023a

Biophilic Urbanism

Designing cities with green roofs, green walls and green balconies to bring nature into the densest parts of cities to provide green infrastructure and human health benefits. Related to the “Biophilia,” which refers to the innate human desire to connect with nature and other living things.

Source: IPCC 2022

Bioswale

Bioswales are channels constructed to filter surface water runoff and divert it to nearby waterbodies. They are vegetated conveyance systems that provide an eco-friendly alternative to storm sewers as they can absorb low flows and carry runoff from heavy rains. Bioswale elements like vegetation and baffles help in slowing the flow, promoting biological filtration that prevents silting, and in recharging groundwater. This can benefit biodiversity while maintaining ecological connectivity between waterbodies.

Source: Douglas et al. 2020; Mangrulkar et al. 2024

Biotic Resistance

The capacity of an ecosystem to deter invasion by non-native species. This is mediated by existing interactions between native species and their adaptations to the local environmental conditions. This resistance to invasion is weakened by disturbances in the habitat itself (e.g., deforestation of old growth forests), which can partially or completely disrupt interactions among native species, thereby providing opportunities for the establishment of non-native species.

Source: Adler and Tanner, 2013

Biotope

An area of uniform environmental conditions which supports a characteristic assemblage of native organisms.

Source: Douglas et al. 2020

Black Water

Sewage water is output from domestic use, which cannot be reused without treatment. This is characterised by large amounts of fecal material, chemicals (used for cleaning bodies and household objects) and bacterial load (particularly E.Coli from faeces).

Source: Deal 2025

Blue infrastructure

It is a network of natural or planned/designed water bodies such as lakes, rivers, streams, canals, storm drains, etc. Blue infrastructure contributes to critical ecosystem services and ecological functions, including resources, fundamental ecological processes like nutrient cycling, supporting biodiversity and cultural/aesthetic importance. Blue infrastructure also can act as an effective Nature-based Solutions for a range of urban issues, such as water security, heat stress, biodiversity loss, etc.

Source: Knowledge4Policy 2021

Blue water

The fraction of precipitation which is stored in liquid form in surface water bodies (e.g., lakes, rivers etc.) and groundwater (e.g., in aquifers). This fraction is directly utilised for human activities.

Source: Deal 2025; Rodrigues, Gupta, and Mendiõdo, 2014

Brownfield sites

Abandoned industrial or commercial site. These spaces are common in urban/peri-urban areas.

Source: Adler and Tanner 2013

C Carbon sequestration

This is a process of capturing atmospheric carbon dioxide and storing it in natural sinks for a long time. Naturally, this happens when plants use the atmospheric CO₂ and convert it to biomass. This carbon is thus stored above the ground (tree trunk, leaves, etc.) and below ground (decomposing leaves, microbes, fungi, etc.). Carbon sequestration also happens in aquatic ecosystems, where carbon is stored in aquatic plants, microbes, sediments and as carbonate compounds. Recently, other synthetic approaches like using chemical processes, capturing emissions and injecting them into specific geological formations, etc., to enhance this storage are being tried out.

Source: USGS 2025

Cities

A city is a large, organised, densely populated human settlement. It is a permanent hub for commerce and transportation, and comprises residential, governmental as well as commercial buildings. Cities are open systems, continually exchanging resources, products and services, waste, people, ideas and finances with the hinterlands and broader world. They are complex, self-organising, adaptive and constantly evolving systems. They encompass multiple actors with varying responsibilities, capabilities and priorities, as well as processes that transcend the institutional sector-based approach to city administration. Cities are embedded in broader ecological, economic, technical, institutional, legal and governance structures that enable or constrain their systemic function, which cannot be separated from wider power relations.

Source: IPCC 2023a

Citizen science

Large-scale collection of scientific data or dissemination of information via a public network of volunteers.

Source: Authors

Community-based adaptation

Community-based adaptation focuses on empowering local communities and promoting their adaptive capacity to approach climate-resilient development and risk management. It is an approach that takes context, culture, knowledge, agency and preferences of communities as strengths.

Source: IPCC, 2023b

D Dead zone

Extremely hypoxic (i.e., low-oxygen) areas in oceans and lakes. The oxygen levels drop below 2 mg/L, which is the minimum requirement for sustaining aquatic life, leading to the death of several organisms. This may be caused by altered pH, polluted wastewater runoffs, reduced water circulation, rising temperatures, etc. In addition, excessive algal, cyanobacterial, or microbial growth fuelled by large nutrient input from human activities can lead to depletion of dissolved oxygen levels.

Source: IPCC 2014

Density-diversity paradox

The phenomenon where heavily built areas have low species diversity, but high density of individuals of only a handful of species due to their adaptive success to the built environment.

Source: Adler and Tanner 2013

E**eDNA**

This refers to environmental DNA - the genetic material obtained directly from the environment (soil, water, air) rather than from organisms (organismal DNA). This is trace DNA left behind in the environment by organisms in the form of excretory products, skin cells, moults and so on. The concentration of DNA in these samples is much lower than the DNA obtained directly from organisms. eDNA is analysed using high-sensitivity and high-throughput methods like next-generation sequencing, and requires extensive computational resources. This technique is useful in detecting the presence of rare or invasive species in the absence of direct observation. It is also a highly effective tool to study biodiversity in an area.

Source: Authors

Ecological community

All of the organisms living and interacting within an area; in other words, all the living components of an ecosystem. An assemblage of species at a particular time and place.

Source: Perlman and Milder 2005; Forman and Godron 1986

Ecological footprint

A measure of human demand on the Earth's ecosystems in terms of how much land and sea is required to produce the resources that are consumed and to process the waste that is generated.

Source: United Nations 2017

Ecological rucksacks

The total quantity (in kg) of materials moved from nature to create a product or a service, minus the actual weight of the product. An ecological rucksack looks at hidden material flows. This takes a life cycle approach and signifies the environmental strain or resource efficiency of the product or service.

Source: Srinivas 2015

Ecological trap

Situations where organisms inhabit habitats/areas which are of poor ecological quality, which leads to costs associated with survival and reproduction. This is quite common for several species in urban areas. E.g., Dragonflies select water bodies for laying their eggs based on the reflection of sunlight from the water surface. However, in cities, other horizontal/near-horizontal reflective surfaces like car windows are mistaken as ponds. This leads to wasted reproductive efforts, thereby affecting the population.

Source: Schlaepfer, Runge, and Sherman, 2002

Ecological urbanism

In ecological Urbanism, an urban settlement is designed keeping in mind the potential and limitations of the natural setting. It considers the city using multiple instruments and with a worldview that is fluid in scale and disciplinary focus. Such a design provides a key to connecting ecology with an urbanism that is not in contradiction with its environment.

Source: Mostafavi and Doherty 2013

Ecology

The scientific study of the relationships between organisms and their environment.

Source: Forman and Godron 1986

Ecology in cities

The study of species' distributions, abundances, and interactions with their biological and physical surroundings in an urban environment.

Source: Adler and Tanner 2013

Ecology of cities

Extension of 'ecology in cities' to include the study of the sociological, economical, and political factors that shape the urban environment.

Source: Adler and Tanner 2013

Ecosystem

A group of living organisms plus their nonliving environment, including soil, water, nutrients, and climate. Forests, grasslands, deserts and lakes are all examples of ecosystems.

Source: Perlman and Milder 2005

Ecosystem disservices

The financial, health and other costs created by natural elements within urban environments.

Source: Adler and Tanner 2013

Engineered ecosystems

These are ecosystems designed and managed for a specific purpose. These can be created artificially or by modifying existing natural or degraded habitats. Engineered ecosystems are a part of Nature-based Solutions. E.g., a constructed wetland is a type of engineered ecosystem which combines natural elements like rocks and plants in a specific arrangement for treating wastewater. This term derives from "Ecosystem engineers," which refers to organisms which significantly modify their habitat through their physical or chemical activities and cause large-scale alteration in the surrounding ecosystem. A classic example is the beaver, which can create large wetlands by building dams across streams.

Source: Authors

Ecosystem-based adaptation

This is an approach which involves the conservation, sustainable management and restoration of ecosystems to help people adapt to the impacts of climate change. It is a nature-based solution that harnesses biodiversity and ecosystem services to reduce vulnerability and build resilience to climate change.

Source: IUCN 2017b

Ecosystem functions

These are the fundamental ecological processes that involve the capture of solar energy, its conversion and storage in biochemical compounds and its transfer across trophic (or food) webs comprising multiple organisms and abiotic processes. These happen both within and between ecosystems, and are achieved via interactions between biological and physical components.

Source: Authors

Ecosystem services

Ecosystem services are the benefits humans obtain from ecosystems. These include provisioning services such as food and water; regulating services such as regulation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious and other nonmaterial benefits.

Source: Millennium Ecosystem Assessment 2003

Edge effect

This is a change in species composition, physical conditions or ecological factors at the boundary between two habitats or two types of land-use (e.g., a protected area and a non-protected area). The degree of these changes will vary depending on the size of the areas. Habitat fragmentation (e.g., caused by highways through a forest) creates more “edges” in a contiguous habitat, thereby increasing the areas of impact.

Source: IPBES 2012

Environmental impact

Effect of human actions on the natural environment. This includes direct effects through pollution, cutting down trees, and so on. These impacts are quantified by Environmental Impact Assessment (EIA) methods, which identify and assess the actual and potentially long-term environmental implications of a project before the project commences. EIA is important not only to assess the impact but also to develop and implement appropriate mitigation measures.

Source: Bush 2000

F

Fauna

This comprises all the animals that live in a particular area, as well as their scientific descriptions.

Source: Cambridge Learner’s Dictionary 2025

Flora

This refers to all the plants occurring within a given region, as well as their scientific descriptions.

Source: Harvard University Herbaria & Libraries n.d.

G

Geosphere

The strictly inorganic state of the Earth (all the “abiotic” parts of the planet), similar to what existed before the origin of life forms, is referred to as the Geosphere. This is divided into the lithosphere (the rock and soil), the hydrosphere (the water), and the atmosphere (the air).

Source: Thompson, Gates, and Thompson, 2025

Green city

A green city, or as it is sometimes described, a sustainable or eco-city, is an urban enclave where construction, design, and operation prioritise the preservation of the natural world alongside the social, physical, and economic health and wellness of the city’s inhabitants.

Source: Loughlin 2024

Green Infrastructure

A strategically planned network of natural/semi-natural or designed green spaces such as woodlands, forests, open spaces, parks, gardens, etc., which conserve the ecosystem value and ecological functions to provide associated benefits to humans. These benefits can include resources, contribution to fundamental ecological processes like nutrient cycling, support for biodiversity and addition to cultural/aesthetic importance. These spaces can vary widely in area, ranging from large protected areas like sanctuaries to very small “pocket” parks.

Source: Douglas et al. 2020; European Commission 2013; Blake n.d.

Green urbanism

Green Urbanism is a conceptual model for zero-emission and zero-waste urban design, which arose in the 1990s, promoting compact energy-efficient urban development, seeking to transform and re-engineer existing city districts and regenerate the post-industrial city centre. It promotes the development of socially and environmentally sustainable city districts.

Source: Lehmann 2010

Green water

The fraction of precipitation which infiltrates the soil, retained as soil moisture or in vegetation. Eventually, this returns to the atmosphere via transpiration or evaporation.

Source: Deal 2025; Rodrigues, Gupta, and Mendiondo 2014

Green-grey infrastructure

A combination of vegetated - plant dominated - ecological systems and traditional grey - human-engineered - infrastructure, which results in the provision of lower-cost and more resilient services. Such infrastructure is created by incorporating new approaches to ecology and environmental management into traditional engineering.

Source: Douglas et al. 2020

Greenfield sites

A site which hasn't previously had any commercial or industrial development on it.

Source: Authors

Grey infrastructure

This refers to the built or constructed part of the urban environment, invariably using different/novel materials. Part of green and blue infrastructure can also be grey - e.g., constructed canals, dams, etc.

Source: Authors

Grey water

Water outputs from household use, excluding sewage that can be reused for irrigation after treatment.

Source: Deal 2025

H Heat island effect

Heat islands occur when a particular area experiences higher temperature than nearby areas, particularly at night and during winter. This effect is most commonly associated with urban areas, which often have higher temperatures than surrounding peri-urban or natural areas.

Source: EPA 2025

Heatwave

A period of abnormally hot weather, often defined with reference to a relative temperature threshold, lasting from two days to several months. Heatwaves and warm spells have various, and in some cases overlapping, definitions and are often also described as extreme weather events.

Qualitatively, a heatwave is a condition of air temperature which becomes fatal to the human body when exposed. Quantitatively, it is defined based on

the temperature thresholds over a region in terms of actual temperature or its departure from normal. In certain countries it is defined in terms of the heat index based on temperature and humidity or based on the extreme percentile of the temperatures. Different criteria for declaring a heat wave are

1. Location: The absolute temperature exceeding 37, 40, and 30°C in coastal, plains or hilly regions, respectively.
2. Difference from normal temperature: A temperature difference of 4.5-6.4°C, >6.5°C is considered a heatwave and severe heat wave, respectively.
3. Actual maximum temperature: Actual maximum temperatures of ≥ 45 and ≥ 47 are considered a heatwave or severe heatwave, respectively. This has to be recorded in at least 2 stations in a meteorology sub-division for 2 consecutive days to be declared.

Source: IPCC 2023b; Rajeevan et al. 2023

Industrial ecology and ecosystem

Industrial ecology conceptualises industry as a man-made ecosystem that operates in a similar way to natural ecosystems, where the waste or byproduct of one process is used as an input into another process. Industrial ecology interacts with natural ecosystems and attempts to move from a linear to a cyclical or closed-loop system. Like natural ecosystems, the industrial ecosystem too is in a continual state of flux.

Source: Srinivas 2015

Long Term Ecological Research (LTER) projects

Long Term Ecological Research projects are a network of observatories which aim to understand ecosystems at different spatio-temporal scales to generate knowledge through interdisciplinary approaches, synthesis and well-documented long-term experiments and observations. This knowledge is shared with the society through outreach, education and new databases.

Source: LTER Network 2023

M Microclimate

The actual conditions experienced by an organism in the small area surrounding it. Due to numerous factors such as shading, drainage and sheltering, the microclimate may be quite distinct from the overall 'macroclimate'. Often used to refer to the climate beneath a vegetation canopy.

Source: Bush 2000

N Nature-based Solutions (NbS)

Nature-based solutions are actions to protect, sustainably manage, and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits. Effective NbS integrates blue-green and gray infrastructure. e.g., a bioswale with flowering plants beneficial for native pollinators.

Source: IUCN 2020

Nature's contributions to people (NCP)

This approach succeeds the Ecosystem Services framework, building on its basic principles. The NCP framework explicitly recognises the deep relations of cultural practices, traditional knowledge, art, literature etc. to biodiversity. It also recognises negative effects of biodiversity and natural ecosystems (ecosystem disservices), which include the financial, health and other costs created by natural elements.

Source: Authors

Normalised Difference Vegetation Index (NDVI)

Normalised Difference Vegetation Index is a remotely sensed variable which is used to quantify the greenness of vegetation in an area. Using satellite imagery, the green cover is quantified by measuring the difference between near-infrared (NIR, strongly reflected by vegetation) and red light (R, absorbed by vegetation). Live, healthy vegetation has a stronger NIR reflectance and R absorbance, whereas stressed, dry vegetation, barren land or snow has a Stronger NIR absorbance and R reflection. NDVI is calculated as $(NIR - R) / (NIR + R)$, and its values range from -1 to +1, with higher values indicating healthier vegetation cover.

Source: Douglas et al. 2020; NASA Earthdata 2026

P Peri-urban areas

Peri-urban areas are those parts on the edge of a city that appear to be rural, but in reality are strongly linked functionally to the city in its daily activities.

Source: IPCC 2022

Phytoremediation

The treatment of pollutants or waste (contaminated soil or water) by the use of green plants that remove, degrade or stabilise the undesirable substances (such as toxic metals)

Source: Douglas et al. 2020

Planetary boundaries

These refer to nine processes driven by human activities that impact the stability and smooth

functioning of the Earth system. These include freshwater use, biogeochemical flows, land-use changes, ocean acidification, climate change and so on. Planetary boundaries are quantitative assessments of the safe limits for human pressure on these nine critical processes. Crossing these boundaries increases the risk of generating large-scale abrupt or irreversible environmental changes. Individually, the impacts of these changes may not necessarily be immediate or drastic. But together, the boundaries mark a critical threshold for risks to societies and the biosphere we are a part of. Planetary boundaries are interdependent. The long-term large-scale stability of the past, which allowed human societies to develop and thrive, comes from the complex interactions of biophysical processes within the Earth system. This means we cannot consider planetary boundaries in isolation in any decision-making on sustainability. An action that affects one process in the planetary boundaries framework will affect the risks of the other processes. Only by respecting all nine boundaries can we maintain a safe operating space for humanity.

Source: Stockholm Resilience Centre 2025

Pseudo Tropical bubble

It refers to how the urban environment mimics the consistency of temperature and reduced seasonality of the tropics through anthropogenic processes.

Source: Authors

R Rain garden

A garden of native shrubs, perennials and flowers planted in a small depression, which is generally landscaped onto a natural slope. It is designed to temporarily hold and soak in rainwater runoff from roofs, driveways, patios or lawns.

Source: Douglas et al. 2020

Reconciliation ecology

It is the practice of making provision of habitats for other species and taking steps towards biodiversity conservation within human settlements. This is done by addressing behavioural and evolutionary ecological mechanisms that allow other species to coexist in human landscapes, and promote coexistence.

Source: Douglas et al. 2020

Resource efficient city

A sustainable, resource-efficient city can be defined as a city that is significantly decoupled from resource exploitation and ecological impacts, and is socio-economically and ecologically sustainable in the long-term.

Source: United Nations 2017

Retention ponds

Ponds or pools are designed with additional storage capacity to manage heavy/excess surface runoff during rainfall events. They consist of a permanent pond area with landscaped banks and surroundings to provide additional storage capacity.

Source: Douglas et al. 2020

S Safe bearing capacity of soil

It is the measure of how much weight the soil can support without sinking or shifting.

Source: Mangrulkar et al. 2024

Scope I, II and III emissions

The Greenhouse Gas Protocol Corporate Standard classifies a company's GHG emissions into three "scopes". Scope I emissions are direct emissions from owned/controlled source(s). Scope II emissions are indirect emissions from the generation of purchased energy. Scope III emissions are all indirect emissions (not included in scope II) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

Source: Douglas et al. 2020

Sediment ponds

Sediment ponds are provided to prevent silting and improve water quality. These shallow ponds decrease the velocity of stormwater, allowing suspended sediments (a mix of soil, sand, and organic matter) to settle at the bottom. The cleaner water then flows out through an outlet into the main tanks.

Source: Mangrulkar et al. 2024

Smart city

An approach to urban design which integrates information and communication technologies by utilising data collected by different types of sensors to enable rapid responses to changing conditions, including traffic congestion, waste accumulation and energy use in cities.

Source: Authors

Socio-Ecological System (SES)

This framework considers humans as an integral part of natural systems, thereby linking ecological and social aspects. This has been very useful in the design of sustainable management and conservation strategies in terrestrial and aquatic habitats.

Source: Authors

Sponge city

Urban design concept which uses integrated blue-green infrastructure to address key urban issues like

urban flooding, groundwater recharge and water quality. This includes the use of several interventions such as permeable built surfaces, natural green spaces, water bodies, and constructed wetlands to absorb, purify and contain rainwater.

Source: Authors

Stormwater

Runoff generated from rain and snowmelt events that flows over land or impervious surfaces (paved streets, parking lots, rooftops, etc.) and does not infiltrate into the ground. This is often channelled to nearby natural/constructed waterbodies or storage reservoirs. Improper management of stormwater is often associated with urban flooding incidents.

Source: Douglas et al. 2020

Sustainability

Economic development that takes full account of the environmental consequences of economic activity and is based on the use of resources that can be replaced or renewed, and therefore are not depleted. It involves ensuring the persistence of natural and human systems, implying the continuous functioning of ecosystems, the conservation of high biodiversity, the recycling of natural resources and, in the human sector, the successful application of justice and equity.

Source: Allaby, 2010; IPCC 2023b

Sustainable development

Development that provides people with a better life without sacrificing or depleting resources or causing environmental impacts that will undercut future generations.

Source: Bush 2000

Synanthropes

Undomesticated organisms such as pigeons and rats that live in close association with people and benefit from urban surroundings and human activities.

Source: Douglas et al. 2020

Synurbanisation

Evolution of trait combinations among wild species which help them adapt successfully to survive and reproduce in urban environments.

Source: Adler and Tanner 2013

U Urban

Pertaining to city areas, which are designated for residential, commercial, and industrial development at urban or suburban densities in the landscape conservation and development plan.

Source: Bush 2020; Perlman and Milder 2005

Urban adapter species

A species which can tolerate humans and anthropogenic factors, but does not rely on them for persistence in urban habitats. These are usually found on the edges of urban areas - in suburban and periurban regions.

Source: Adler and Tanner 2013

Urban agriculture

Urban agriculture includes the cultivation, processing, and distribution of agricultural products (food or non-food) in urban and suburban areas. Urban farming can provide environmental, economic, and social benefits to the surrounding communities.

Source: USDA n.d.

Urban avoider species

A species which is poorly adapted to humans and anthropogenic factors and persists in non-urban habitats.

Source: Adler and Tanner 2013

Urban boundary layer

The portion of the atmosphere situated just above, and mixing with, the urban canopy. It is the layer most impacted by the heat and pollution caused by the activities in an urban area.

Source: Adler and Tanner 2013

Urban canopy layer

This is the layer of the atmosphere in urban areas that stretches from the ground to the rooftops of buildings, and mixes with the urban boundary layer, where pollution and particulates remain trapped.

Source: Adler and Tanner 2013

Urban canyon

Built environment in which vertical structures create physical properties which are similar to natural canyons. These narrow corridors often trap heat and pollutants, and also give rise to gusty winds.

Source: Adler and Tanner 2013

Urban CO2 dome

A combination of anthropogenic and biogenic factors leads to higher CO2 concentrations in urban centres.

Source: Adler and Tanner 2013

Urban commons

Commons were traditionally defined as the elements of the environment – forests, atmosphere, rivers, fisheries or grazing lands, that were shared, used and enjoyed by all. Today, the term “commons” also includes public goods such as public spaces, public education, health and the infrastructure that allows our society to function.

Source: United Nations 2017

Urban dust dome

A phenomenon where air circulates in the atmosphere above a city by leaving and re-entering an urban area, each time accumulating particulate matter and pollution.

Source: Adler and Tanner 2013

Urban ecology

Urban ecology is the systems-based understanding of biotic and physical elements that occur in urban areas. It recognizes the interaction between natural systems and social and cultural systems, among others. Urban ecology places particular importance on the primacy of natural systems in contributing to livelihoods, well-being and resilience, and focuses on the interdependence of key resources (usually water, waste, and energy) and their impact on city development.

Source: United Nations 2017

Urban ecosystems

Urban ecosystems apply the ecosystem approach to urban areas. Urban ecosystems are dynamic ecosystems that have similar interactions and behaviours as natural ecosystems. Unlike natural ecosystems, however, urban ecosystems are a hybrid of natural and human-made elements whose interactions are affected not only by the natural environment, but also culture, personal behaviour, politics, economics and social organisation.

Source: Srinivas 2015

Urban exploiter species

A species which takes advantage of, and generally relies on, the ecological effects of urbanisation.

Source: Adler and Tanner 2013

Urban metabolism

Quantification of the flow of nutrients, energy and materials into, through and out of an urban ecosystem. This approach likens the urban area to a living entity (e.g., cell or organisms), and aims to quantify the inputs required for its functioning (resources, energy etc.) and outputs it generates (e.g., goods and services, waste).

Source: Adler and Tanner 2013

Urban sprawl

The growth and spread of a city, leading to automobile-dependent development of suburbs that remain economically and culturally linked to the urban core.

Source: Adler and Tanner 2013

Urban-rural gradient

Description of changes from urban to rural ecological conditions as one moves away from the urban core.

Source: *Adler and Tanner 2013*

W**Wildlife Corridors / Ecological (Green) Corridors**

Wildlife/Ecological/Green corridors are stretches of vegetation that form connections across the landscape, linking areas of natural habitat. They support natural processes that occur in a healthy environment, including the movement of different species to find resources such as food and water, specifically across fragmented landscapes. In cities, such corridors can take many forms: riverbanks, urban greenways, tree-lined streets, or even vegetated rooftops that connect natural habitats within cities. By integrating nature into urban and suburban environments, green corridors create pathways for ecological connectivity.

Source: *Department of Climate Change, Energy, the Environment and Water 2021; Future of Cities 2025*

Z**Zero Emissions**

Zero Emissions represents a shift from the traditional industrial model, in which waste is considered the norm, to integrated systems in which everything has a use. It advocates an industrial transformation whereby businesses emulate the sustainable cycles found in nature, and where society minimises the load it imposes on the natural resource base and learns to do more with what the earth produces.

Source: *Srinivas 2015*

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