



Sustainable Cities

# MULTIFUNCTIONAL Green Infrastructure in Pursuit of UN SDG 11

New approaches to development are needed if cities are to achieve the United Nations SDG 11

A team of researchers from North-West University and the University of Technology Sydney investigated multifunctionality in urban green infrastructure planning as a means of achieving the United Nations Sustainable Development Goal (SDG) 11 which aims to “Make cities and human settlements inclusive, safe, resilient, and sustainable”. The [research](#) focused on the South African (Global South) context in order to fill a knowledge gap that exists in such research as most has historically focused on the Global North.

According to the researchers, alternative green development approaches to urban planning could promote sustainability in urban development, particularly applying nature-based solutions to complement or replace traditional urban development instruments (grey infrastructure). The green infrastructure (GI) approach has become a major research theme that cuts across several disciplines such as geography, ecology and urban planning. GI can be identified as “An interconnected network within an urban area, consisting of a broad range of environmental features (including all natural, semi-natural, and man-made green and blue spaces) planned, designed, and managed to conserve ecosystem functions, contributing to biodiversity conservation and providing social, economic, and health benefits to humans by delivering multiple ecosystem services”. Examples of GI include a broad spectrum of elements such as natural green spaces designed as green reservations, e.g. wildlife parks and sanctuaries; developed public spaces often integrating hard surface civic spaces such as playgrounds, plazas etc with elements of vegetation; and human-built green spaces such as golf courses, sports fields, botanical gardens, school grounds etc developed primarily for their recreational characteristics and secondarily for their environmental contributions.

The delivery of the benefits as ecosystem services (ES) is facilitated by the multifunctionality that GI

provides through its varied elements. ES is defined as “...the benefits all living species (especially humans) derive, directly or indirectly, from the capacity (function) of ecosystems to provide goods and services that satisfy needs”.

The researchers used the classification system of ES into four categories of services – provisioning, regulating, cultural, and habitat/supporting services, according to TEEB (2010) ([www.teebweb.org](http://www.teebweb.org)).

## Provisioning services

Provisioning services refers to the capability of natural green spaces (rivers, biomes etc) and semi-natural green spaces (community gardens, parks etc) to contribute physical products, materials or consumable goods to humans, e.g. food, fresh water, energy, raw materials, medicinal plants etc.

## Regulating services

These include services provided by the ecosystem functions such as climate regulation; removal of pollutants through air and water filtration; seed dispersal and pollination; water storage, filtration and drainage; disaster protection; pest and disease regulation.

## Cultural services

Cultural services include cognitive development, recreation, aesthetic experiences, spiritual enrichment and tourism opportunities, providing support to knowledge systems, accommodating social group gatherings and sense of community.

## Habitat/supporting services

These services, while not directly benefiting humans, are important for facilitating the fulfilment of all of the other ES. Examples include natural habitats that accommodate genetic diversity.

## Dimensions of multifunctionality

Multifunctionality is a key feature of GI, referencing the integration and/or combination of different

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functions within a GI element that enhances the delivery of multiple economic, social and environmental benefits. Urban planning defines concepts of multifunctionality within spatial coverage; usage; delivery of different functions at different times; and through economic, social and environmental service requirements.

### Examples in South Africa

The researchers included a variety of GI typology elements with specific case studies in South Africa that need to form part of a framework from which GI and ES should be mainstreamed in urban planning. These included, among others:

- **Grey-green designed elements** such as the Green Roof Pilot Project in eThekweni Municipality where a vegetated landscape is installed on a roof surface in place of traditional roof material; and sustainable drainage systems such as constructed wetlands as in Intaka Island in Cape Town.
- **Urban agriculture** such as vertical farming (Priority Zone Rooftop Garden in Durban) and community garden projects such as Siyakhana Food Garden Project in Johannesburg.
- **Urban natural elements** such as Johannesburg's urban forest; urban rivers such as the Liesbeek urban river in Cape Town; and the existing natural remnant area of the Rondebosch Common Urban Nature Reserve in Cape Town.
- **Public green spaces** such as urban parks and child-friendly spaces such as the Green Point Park in Cape Town and green sports facilities such as

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Grimbeek Park Golf Course in Potchefstroom.

- **Private green spaces such as home gardens with** Cosmo City in Johannesburg as a case study.
- **Informal green spaces** such as the riverbank greenery found along the Mooi River in Potchefstroom.

The researchers' literature review and case studies revealed sufficient evidence

of the potential application of a variety of GI elements to provide multiple ES which are manifested in the multifunctional nature of many GI elements as spaces which fulfil multiple roles. One example of this is wetlands which can deliver high value by contributing to all four ES categories mentioned earlier. The contribution by natural remnants is also important to note as the Global South is characterised by a high native biodiversity and, therefore, urban planning must include elements for the protection of sensitive ecosystems.

The benefits of this address the requirements of SDG 11 and hold the promise of reducing the environmental impact of cities by focusing on ES such as air quality, waste management and the provision of safe green spaces to the public. However, the researchers also discovered that multifunctionality through GI is not widely embedded in urban planning practice. A good starting point to address this issue is the education of both qualified and trainee urban planners and the integration of such education into curricula for urban planning. 



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