# GREEN INFRASTRUCTURE: HOW BUILDING WITH NATURE CAN HELP HUMAN HABITATS

ESTIMATED READ TIME: 6 MINUT







## KEY TAKEAWAYS

Green infrastructure is any installation, environmental feature or space designed into built environments to deliver ecosystem services to society. Building with and alongside nature can help us better manage water shortages, mitigate floods and combat rising temperatures.

Public parks, community gardens and urban landscaping are all examples of attempts to make cities greener and to reap the health and aesthetic benefits of building around nature.



Green infrastructure: how building with nature can help human habitats continued



#### Rainwater harvesting

The term "green infrastructure" may not be familiar to all, but the concept is by no means a novel one. Throughout the history of urban planning and development, efforts have been made to integrate nature into built environments. Public parks, community gardens and urban landscaping are all examples of attempts to make cities greener, and to reap the health and aesthetic benefits of building around nature.

Trees provide shade and visual reprieve in "concrete jungles"; parks and open spaces are retreats for recreation and family outings; gardens provide opportunities for communal agriculture and building food security; and in general, greenery helps filter pollutants and improve air quality.

Green infrastructure is essentially any installation, environmental feature or space designed into built environments to deliver ecosystem services to society. As the world seeks more sustainable ways to construct and manage human habitats — to reduce their carbon and resource footprint and make them more resilient against the impacts of climate change — more developers are turning to green infrastructure solutions.

#### THE **CHALLENGE** OF WATER

While the term "green infrastructure" can subsume the gamut of ecoengineering projects, it is commonly used to refer to systems that help manage water use and runoff. Water presents a dual challenge for sustainable development. On the one hand, there is an entire United Nations Sustainable Development Goal (SDG) dedicated to addressing water scarcity and the management of freshwater sources. This is because heat stress and altered weather patterns are putting pressure on potable water sources across the globe.

On the other hand, we are also grappling with an excess of water due to severe storms and catastrophic flooding events. Stormwater runoff and floods can move leached toxins, sewage, and other harmful pollutants into freshwater reservoirs, cause damage to properties, incubate vectors and diseases and even lead to loss of habitats and life.

There is an opportunity to address both water shortages and surplus volumes using green infrastructure solutions.

#### Rainwater harvesting

Strategies and tools for rainwater harvesting mimic the natural environment's water catchment and storage basins. They are considered a green infrastructure solution because they help with resource conservation.

In the Caribbean, we have traditionally used barrels to collect rainwater for household use.





The use of rooftop gardens for growing food is a doubly sustainable solution as it leverages rainwater to help build food security. This technique of direct, natural irrigation is a useful short circuit in the water supply chain that immediately connects supply with demand.

This technique is already utilised in areas of prevalent water shortages, but it is also gaining popularity elsewhere as building and home designers are incorporating features to channel water from guttering systems into storage tanks.

Collected water can be used for maintenance and upkeep, sanitation, laundry and even dishwashing and showering. Agricultural facilities and greenhouses can use rainwater for irrigation, watering animals and sanitation, as applicable. Rainwater can even be used for cooking and drinking once it is filtered and sterilised.

Diverting some rainwater into storage, especially in heavily concreted areas, can help reduce the volumes of water that run off into storm drains or settle in lowlying areas, while boosting water availability for domestic, agricultural and commercial use.

#### Infiltration surfaces

Another solution for managing water involves engineering natural catchment areas by creating spaces for water to infiltrate into soil in places where there is significant concrete cover. Rooftop gardens, planter boxes and forested enclaves in urban areas can all help capture rainwater.

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#### Xeriscaping

The most popular options for landscaping around buildings include lawns and surfacing with lowermaintenance concrete, pavestones or tiles. Both options can impact water supply under different conditions. In some countries, for example, lawns need to be watered during dry weather to keep them lush, while non-porous surfacing can contribute to water runoff into storm drains and other reservoirs,

An environmentally friendly alternative that has been growing in popularity is xeriscaping. This refers to the practice of using landscape designs that require little or no irrigation. This technique involves replacing grassy lawns with rocks and mulch and planting drought-tolerant shrubs and trees. Green infrastructure: how building with nature can help human habitats CONTINUED



Vetiver grass is used as a solution for slope stabilisation.

Xeriscapes do not add additional burden to water supply, and can still absorb some rainfall, in contrast to non-porous yard surfaces.

#### **Greening of slopes**

In the Caribbean region, flooding and landslides are perennial risks during the rainy season. Deforested or degraded hills and slopes are major contributors to both, as loose soil can silt rivers and cause land slippages. Retaining walls are traditionally used for slope stabilisation in such areas, but certain trees and grasses can provide a natural engineering solution. In October 2022, local IAMovement, non-governmental organisation partnered with NGC to deliver the inaugural Caribbean Green Infrastructure Conference, wherein the merits of using vetiver grass for slope stabilisation were spotlighted.

This grass has a dense, fibrous root system which can grow past 10 feet long within two years.<sup>1</sup> Rows of vetiver can thereby serve as natural retaining walls as their roots hold the soil together, slowing runoff and preventing surface erosion.

Their roots also help absorb certain contaminants, such as heavy metals, which has led to their inclusion in remediation strategies for polluted waterways across the world.<sup>2</sup> In Trinidad and Tobago, organisations such as Vetiver TT and the United Nations Development Programme have been promoting vetiver as a cheaper alternative to building retaining walls at vulnerable sites across the country.

#### Leveraging mangroves

Abundant rainfall is just one water source that can present a challenge for human settlements. Artic ice melt and thawing permafrost are contributing to rising sea levels and saltwater intrusion into freshwater reservoirs. Coastal protection is therefore critical to sustainable development.

<sup>&</sup>lt;sup>1</sup>https://tvnwi.org/what-is-vetiver-grass/ <sup>2</sup>Ibid

Mangrove trees can serve as natural structural reinforcements to coastlines and surrounding areas. Their above-ground roots encourage deposition of sediment and can help bind and build soils - a feature which offers some protection against rising sea levels.<sup>3</sup> They also buffer waves and help protect inland areas from storm surges, which can often cause severe flooding.<sup>4</sup> Protecting, restoring and planting mangrove belts is therefore recognised as an important strategy to help adapt our settlements to the impacts of our changing climate.

#### BEATING THE HEAT

Water management is not the only service that can be provided by green infrastructure. As temperatures get progressively warmer, we increasingly retreat into artificially cooled environments to escape the heat. Our higher appetite for air conditioning leads to increased burden on our power grids. In areas where electricity is still generated using fossil fuels, this climbing demand creates a vicious cycle — the more we burn fossil fuels to support cooling, the more we contribute to global warming. We all know that shade trees can provide welcome respite from the sun on a hot day. This is because tree canopies intercept some of the sun's light and heat. Trees can therefore be leveraged as a green infrastructure solution to help naturally cool built environments.

If a building is fronted by glass that is not tinted or windows without awnings, the interior could heat up quickly and demand more of air-conditioning systems. Planting trees in strategic locations around such buildings can create a natural defense against the sun's rays and help regulate internal temperatures, thereby reducing reliance on air conditioning.

Green spaces can also help reduce cooling needs by providing outdoor alternatives to artificially cooled environments for the pursuit of various activities. Exercise, social gatherings and even some officebased work can be accommodated in urban forests, parks and gardens. Indeed, many prefer to utilise such spaces when they are available, not just for the energy-saving advantage, but for the health and wellness benefits of spending more time in nature.

#### A SUSTAINABLE SOLUTION FOR THE REGION

Regardless of where they find themselves on the development curve, all countries across the Caribbean region are faced with the common challenge of balancing growth imperatives with climate action. As Small Island Developing States, we are experiencing firsthand the devastating effects of a warmer global climate, so we need to ensure that any plans we devise for long-term growth are both climateconscious and sustainable.

In that context, green infrastructure will be critical to our region's future. If we can leverage and work alongside nature when we plan and build, we can simultaneously serve our people and our planet.

<sup>3</sup>https://www.nature.org/media/oceansandcoasts/mangroves-for-coastal-defence.pdf <sup>4</sup>lbid



#### Horizon 1: Building the Right Foundation for Trinidad and Tobago

The first horizon and probably the most critical of all three will focus on building a strong foundation for Trinidad and Tobago. Some of the key activities in Horizon 1 will be the following:

- The completion of an offshore Wind Resource Assessment Programme (WRAP) to realise the activities required to support offshore wind development in Trinidad and Tobago. Of all the renewable energy sources available in Trinidad and Tobago, offshore wind offers the largest potential for the island.
- 2. Development of demonstration projects to test the end-use applications of green hydrogen in Trinidad and Tobago.
- 3. Creating the right enablers through regulations, policies and incentives that will support the development of this hydrogen economy.
- 4. Planning for the renewable energy and hydrogen campaign.

#### Horizon 2: Investment in Renewable Energy Projects

Horizon 2 builds on Horizon 1 and the enabling environment developed to initiate a utility scale renewable energy project as well as a green hydrogen production facility, fully launching Trinidad and Tobago on this pathway. By the end of Horizon 2, Trinidad and Tobago will have installed 25 gigawatts (GW) of offshore wind with 10.5 GW output to feed electrolysers to produce 1.5 Mtpa of green hydrogen.

#### Horizon 3: Large-Scale Investments in Renewable Energy Projects

Horizon 3 reinforces the leadership of Trinidad and Tobago in the new energy sector, reaching 57 GW of Creating a hydrogen economy will be a massive undertaking, but it is one that is well within the reach of Trinidad and Tobago through government intervention in policy and regulation in conjunction with careful planning and actions from key stakeholders.

offshore wind capacity with 25 GW output to feed electrolysers to produce 4 Mtpa of green hydrogen by 2065. This would provide Trinidad and Tobago with the opportunity to decarbonise the existing petrochemical industry and expand this industry in the future to contribute to the Gross Domestic Product (GDP) growth of Trinidad and Tobago through additional export potential.

### **FUTURE LANDSCAPE** FOR GREEN HYDROGEN AND NEXT STEPS

Creating a hydrogen economy will be a massive undertaking, but it is one that is well within the reach of Trinidad and Tobago through government intervention in policy and regulation in conjunction with careful planning and actions from key stakeholders. The immediate next steps will include a few interlinked activities such as:

- Securing funding for the activities in the roadmap. Funding sources, such as climate finance, carbon markets, private sector and national finance, will be explored by creating financing mechanisms that promote renewable energy and green hydrogen projects.
- Initiating the activities required to support the offshore wind

developments, most importantly, the offshore WRAP.

- Introducing demonstration projects to test the end-use applications of green hydrogen in Trinidad and Tobago.
- Securing the enablers that will support the development of the green hydrogen economy.

A green hydrogen economy will generate net benefits in the billions and create thousands of jobs in the construction, operation and maintenance sectors, and significantly reduce carbon dioxide (CO<sub>2</sub>) emissions. Trinidad and Tobago is at the beginning of a challenging and exciting journey.

The country will continue to play a major role as a natural gas exporter while leveraging existing heritage and facilities to position itself in the evolving energy landscape, thereby ensuring sustainable economic growth in the future. This journey starts with setting up a strong foundation with the right enabling policies, regulatory framework and institutional support to launch Trinidad and Tobago's hydrogen economy.