Parques del Río Norte: Expanding urban green space to increase climate resilience and well-being in Medellín, Colombia

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The Medellín River runs through the heart of its namesake city. Once protected by wide, green banks, informal housing and commercial retail outlets have encroached on the river, negatively impacting the ecosystem. Increased river erosion, water pollution, and flooding are just some of the effects of this rapid urbanization—and climate change has amplified these negative impacts.

Known as the "City of Eternal Spring" due to its temperate climate, the City of Medellín has been looking for solutions to help restore its green space. The Secretariat of Physical Infrastructure (SIF) of Medellín and the C40 Cities Finance Facility (CFF) proposed **Parques del Río Norte**, a green space project along the river seeking to address and mitigate these issues.

In densely populated cities like Medellín, maintaining green space is crucial. As green areas diminish, residents are increasingly impacted by flooding, water pollution, heat islands, and air pollution. These effects are regulated or alleviated by natural green areas (see Figure 1).
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Figure 1. The benefits of nature-based infrastructure (NBI) considered in the assessment

Additionally, a variety of environmental, economic, and social co-benefits arise from green spaces, but they are consistently undervalued at critical points of the infrastructure planning process. Jointly with C40 CFF and the City of Medellín, we developed an integrated cost-benefit analysis to capture and quantify these and demonstrate the societal value of the park.

Our assessment focuses on the park’s proposed extension north, adding an additional 300,000 m² (30 ha) of parkland along the Medellín River. We used the Sustainable Asset Valuation (SAVi) methodology, which is rooted in systems thinking and uses tools like spatial, Excel-based, and system dynamic models to provide a
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We used the **Sustainable Asset Valuation (SAVi) methodology**, which is rooted in systems thinking and uses tools like spatial, Excel-based, and system dynamic models to provide a more holistic understanding of the value of NBI. All models and data inputs were customized to the Parques del Río Norte project and co-created through consultation with the city and C40 CFF. You can download the technical report discussing the approach, data, and results here.

### Our Findings

“Over 30 years, the park is estimated to generate **USD 1.67 in benefits for every dollar invested.**”

The combined effects of Parques del Río Norte bring tremendous value to Medellín. Through our integrated cost-benefit analysis, we found that the total net value of benefits from the park’s installation amounted to COP 1,995.27 billion\(^1\) (equivalent to approximately USD 475 million\(^2\)).

Over the next 30 years, **each dollar invested in the project would return USD 1.67 through benefits to the environment, economy, and society — increasing the value of the initial investment by two thirds.** As depicted in Figure 2, the most notable benefits stem from increased retail revenues and increased physical activity, leading to improved human health in Medellín. Additionally, Parques del Río Norte will help the city **avoid the costs to infrastructure from flood damage and reconstruction**, among other factors.

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\(^1\) “Billion” in this assessment is aligned with the short scale, corresponding to 10\(^9\) (1,000,000,000).

\(^2\) The exchange rate used for this assessment is USD 4,200 = COP 1.
The most significant benefits of the green space will be felt by the residential population of **1,073,319 people** closest to the new green space. The proximity of the Acevedo metro station, which connects the city to neighbouring regions, also increases the beneficiaries of the park by an average of 2,021 commuters each day.
**Key Benefits**

**Reduced flood risk:**

- **Increased green space acts as a sponge,** absorbing excess water during river floods and preventing the city’s sewer and stormwater systems from being overwhelmed. Water retention in the buffer area, a 250-m bank on each side of the Medellín River, increases by 57.68%.

- This increased water retention **protects people, buildings, and infrastructure from flooding,** avoiding damage and reconstruction worth COP 1,312.08 billion (USD 312.40 million) between 2023 and 2053.

**Environmental benefits:**

- Retained runoff by the green space **improves water quality** in the Medellín River.

- Green space reduces emissions and traps PM$_{2.5}$ particles, **improving air quality** in the area. Parques del Río Norte would also store 18,584 tonnes of CO$_2$, worth COP 2.15 billion (USD 511,217), an increase of 103.75% from the status quo.

- Spatial analysis reveals that the Parques del Río Norte project would result in an 86.43% increase in habitat quality around the river, which would result in a **significant increase in biodiversity.**

**Economic benefits:**

- Parques del Río Norte will **create construction and permanent operation and maintenance jobs** during the park’s lifetime, worth COP 22.27 billion (USD 5.30 million).

- Increased foot traffic from pedestrians using the green space will lead to **higher retail revenue** in the area, worth COP 1,336.83 billion (USD 318.29 million), as well as **boosting property values** by COP 148.88 billion (USD 35.45 million).

**Human health benefits:**

- Green parks play a crucial role in **mitigating the urban heat island effect.** Urban green spaces release moisture into the atmosphere and provide shade, lowering elevated temperatures, enhancing air quality, and improving human health.

- **Increased physical activity, such as walking and cycling within the park, positively impacts human health and well-being.** The park is projected to attract approximately 44,994 visitors daily and an additional 4,659 cyclists using the dedicated bike paths and trails. The health benefits for the community are worth COP 2,080.50 billion (USD 495.36 million).
**Recommendations**

1. **To avoid flood damages that negatively impact human health and infrastructure, Medellín should invest in NBI along the Medellín River.**

   The park’s implementation is crucial for reducing flooding and its adverse impacts on residents, infrastructure, and the environment. By acting as a buffer between the river and surrounding areas, the park reduces impervious surfaces along the riverbanks. Opting for the park as a flood mitigation strategy proves to be more sustainable and economically viable than traditional grey infrastructure, such as further investment in water and waste management systems and river dredging.

2. **Medellín could serve as a powerful example, demonstrating the use of NBI to combat challenges in densely populated and rapidly expanding cities.**

   The park’s potential to provide environmental, economic, and social benefits for the community, as well as to enable the area to adapt to the worsening effects of climate change, offers valuable insights for future planning and financing strategies across Colombia and further afield.

3. **Continuous maintenance is crucial to ensure that the park delivers its full benefits.**

   Routine maintenance will be indispensable to ensuring that the park functions optimally and reduces floods and erosion. This maintenance is particularly critical in the first few years of the project as trees and plants within the park mature. In addition, many co-benefits of Parques del Río Norte, such as the health benefits from cycling and increased retail revenues, depend on keeping the green space attractive and safe. The continuous maintenance of the park also brings direct benefits to the local communities through job creation.

4. **Medellín must invest in further measures to ensure protection from climate change.**

   Scaling up natural infrastructure can help Medellín to address flooding and improve the quality of life for residents. Nevertheless, additional measures, such as floodproofing critical infrastructure and urban planning that avoids construction in flood-prone areas, are essential to ensure safe and sustainable living conditions for Medellín’s residents.
Conclusion

The results from the integrated valuation clearly support the use of NBI as a strategy for addressing flood risks, heat stress, and pollution in the city of Medellin. These findings are critical when presenting the compelling case for implementing NBI in the city and for informing financing strategies. Parques del Rio Norte is presented as a comprehensive solution that provides long-term benefits in various aspects of urban life, proving to be a valuable investment for the well-being and sustainable development of the city.