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United Nations Habitat – Mobilizing the Private Sector to Finance Nature-Based Solutions

Introduction

Context for Heat & its Preponderance in the Global South

The facts are undeniable: the world is getting hotter and climate change is to blame. Not only is this a problem for future generations, but the ever-present danger of extreme heat presents dire issues today that will only get worse. Quite literally, the world is in hot water.

Today, heat stress is the leading cause of extreme weather deaths, outpacing even disasters like hurricanes, cyclones, and droughts. Estimates show that, between 2000 and 2019, there were approximately 489,000 heat-related deaths each year, with 45% occurring in Asia and 36% in Europe (Zhao et al. 2021). UNICEF has even found that, if the current heat trend continues, by 2050, almost every child under 18 in the world – nearly 2.2 billion – will be exposed to high heatwave frequency, up from only 24% of children in 2020 (United Nations Children's Fund 2022). This is a crisis of such magnitude that last year in 2024, the United Nations Secretary-General issued a global call to action on extreme heat in four key areas: caring for the vulnerable; protecting workers; boosting the resilience of our economies and societies using data and science; and limiting global temperature rise to 1.5°C (UN Secretary-General's Climate Action Team 2024).

The pervasive effects of extreme heat extend into nearly every aspect of human life. Heat affects the health of individuals, societies, and ecosystems; labor and economies; education; large-scale energy availability and consumption; and agriculture and food systems. Productivity begins to decline once temperatures reach 24°C, dropping by 50% once the 33°C threshold is crossed. If this trend continues, economic losses will reach $2.4 trillion by 2030; an enormous figure equivalent to 2.2% of all global working hours, or 80 million full-time jobs (Tord Kjellstrom et al. 2019). Additionally, every additional temperature increase by 1°F in environments without air conditioning reduces the amount learned during the school year by 1% - correlating with lower exam scores, especially among lower-income populations.

These effects are even further exacerbated in our urban settlements, where the majority of our population lives. Cities around the world are experiencing a rise in heat at twice the global average rate due to the effects of the urban heat island effect compounded by rapid urbanization (United Nations Environment Programme 2021). Composed mostly of heat-absorbing surfaces like roads, buildings, and pavements (and typically lacking naturally cooling vegetation), cities pose the greatest risks of extreme heat-related maladies to their inhabitants. This issue is

magnified by the fact that urbanization is increasing yearly - another two-and-a-half and a half billion people are expected to join the current urban population by 2050 (United Nations 2018). As extreme heat continues to worsen, many cities will become places where extreme temperatures persist for nearly half the year. Even at the lowest target temperature of 1.5°C, it is predicted that 67 cities will experience 150 or more days a year of temperatures exceeding 35°C. Under 3°C of warming, this rises to an enormous number of 197 cities. However, the numbers likely undershoot the true scope of urban heating, as the urban heat island effect will propel warmer further and faster around the globe than these predictions expect (Mackres et al. 2023).

Although this is a global issue, the impacts of extreme heat are not evenly shared between or within cities. For instance, a staggering 101 of the 197 cities mentioned above are in India alone. Also, between 1.5°C and 2°C of global warming, the most significant temperature increases and extreme heat impacts will occur in the tropics, which house a disproportionate amount of people living below the poverty lines (Puley 2022). Further clarity comes from the IPCC, which states that Central and South America, southern Europe, Southern and Southeast Asia, and Africa will be most affected by heat-related mortalities by 2100 (IPCC 2021). There is a clear divide here, where the rising temperatures and moralities in the Global South demand an immediate and significant focus before the effects worsen. This is compounded by the fact that there are serious income disparities on the effects of heat- both geographically and monetarily, the world's poorest countries and peoples in the Global South are bearing the brunt of extreme heat. Urban and rural poor are disproportionately exposed to the impacts of heat due to low-quality housing and lack of access to cooling. Due to building materials, informal settlements, and camp environments that host refugees and internally displaced people these areas are often significantly hotter than other urban areas in some cities (Puley 2022). Worsening this is a system of cyclic poverty, where the most impoverished are trapped in a vicious loop forcing them to maintain their conditions.

This effect is worsened by heat. In an exemplary study by the Food and Agriculture Organization, they found that in an average year, poor rural households lose 5% of their total income due to heat stress relative to better-off households. Inequality is further exacerbated as heat stress widens the income gap between female-headed and male-headed households by US$37 billion a year" (FAO 2024). Without proper care and diligence, the effects of extreme heat will worsen in the coming decades, adversely affecting the poorest in the Global South most of all. Immediate and long-lasting solutions are required to combat the global warming effects of climate change and ensure that all populations are adequately prepared for future changes to our planet.

Addressing Extreme Heat?

Green Projects and Nature-Based Solutions (NbS)

A green project is an initiative that contributes to environmental sustainability by mitigating negative environmental impacts, promoting resilience, and fostering long-term ecological balance. These projects align with broader sustainability goals, such as climate change mitigation, adaptation, biodiversity conservation, and sustainable urban development.

Green projects can be classified into several categories based on their environmental objectives and sectoral focus: renewable energy and energy efficiency, sustainable urban infrastructure, climate resilience and adaptation, circular economy and waste management, and nature-based solutions (Mubarak et al. 2024). Green projects tend to primarily focus on land-based interventions such as reforestation, urban greening, and sustainable energy solutions, while blue projects emphasize water-based solutions which include wetland restoration, coastal protection, and sustainable water management. Although the scopes of these two types of projects seem very distinct, they often actually work synergistically. For example, urban green spaces help cool cities and also improve air quality, while blue infrastructure such as wetlands and raid gardens help enhance stormwater absorption and mitigate flooding. Integrating both green and blue elements in environmental solutions allows for a holistic approach to solving environmental problems that benefit both land and water ecosystems (Mubarak et al. 2024).

Nature-based solutions are actions that protect, restore, or sustainably manage natural and modified ecosystems to address societal challenges, while also providing biodiversity benefits and human well-being improvements. They are cost-effective, multi-functional, and offer long-term sustainability compared to traditional engineered solutions (IUCN 2024). According to the International Union for Conservation of Nature (IUCN), the goal of nature-based solutions is to reduce climate risks such as floods and extreme heat, enhance biodiversity and ecosystem health, improve human well-being, particularly for vulnerable communities, and support economic sustainability by creating green jobs and reducing infrastructure costs (IUCN 2024). There are a couple of different types of nature-based solutions which include green infrastructure, blue infrastructure, coastal and riverine protection, sustainable agriculture and urban food systems.

According to the Federal Emergency Management Agency (FEMA), there are three broad types of nature-based solutions which are watershed or landscape scale practices, neighborhood or site scale practices, and coastal practices (FEMA 2025). Watershed or landscape-scale nature-based solutions focus on restoring and conserving large natural systems that regulate water flow, maintain biodiversity, and provide essential ecosystem services. Since these interventions are used large-scale, they require long-term planning as well as collaboration among governments and environmental organizations. These projects are especially important for regions that face deforestation and water scarcity. An example of this was the Great Green

Wall initiative in Africa (United Nations 2023), which is restoring degraded land across 8000 km in the Sahel in an effort to combat desertification. The second type of nature-based solutions are neighborhood or site-scale practices which are designed in an effort to improve urban resilience by managing stormwater, reducing urban heat, and improving air quality. These solutions can usually be incorporated into existing infrastructure without requiring many land use changes which makes them ideal for environments that are highly urbanized. An example of this is New York City's Million Trees Initiative (NYC Parks n.d.) where they planted one million trees in an effort to reduce the urban heat island effect and absorb excess stormwater. The last type of nature-based solutions are coastal practices. Given that coastal areas are particularly vulnerable to climate change, coastal nature-based solutions work to stabilize shorelines, protect marine ecosystems, and safeguard coastal communities from natural disasters. An example of this is Louisian's Coastal Master Plan (Coastal Protection and Restoration Authority of Louisiana 2023) which includes wetland restoration to mitigate land loss and also protect against storm surges in the Gulf Coast.

Nature-based solutions are not only cost-effective and environmentally sustainable, but they also provide long-term economic and social benefits. Their ability to cool cities, prevent flooding, enhance biodiversity, and improve food security makes them especially crucial for rapidly urbanizing regions facing severe climate threats. However, despite their benefits, mature-based solutions remain underutilized in many regions due to policy gaps, financial constraints, and land-use conflicts. Overcoming these barriers will require stronger policy frameworks, innovative financing mechanisms, and greater integration of nature-based solutions into urban planning

Case Studies

Seoul, South Korea — Cheonggyecheon Restoration Project ***via Government Funding***

Project Description

The Cheonggyecheon Restoration Project in Seoul, South Korea, is one of the most well-documented examples of nature-based solutions effectively reducing extreme urban heat. The project, completed in 2005, involved the removal of a 5.8 km elevated highway and the restoration of a buried stream, transforming it into a vibrant public green space. Studies have shown that temperatures along the stream are 3.3°C to 5.9°C lower than on nearby roads due to the cooling effects of the open water, increased vegetation, and improved wind circulation (Robinson and Hopton 2011). Additionally, the urban heat in the surrounding areas has been significantly mitigated, making it one of the most impactful urban greening projects globally.

Benefits Beyond Heat

Beyond heat reduction, the project had remarkable ecological and economic benefits. Between 2003 and 2008, overall biodiversity increased by 639% (Robinson and Hopton 2011).

Additionally, Seoul has since removed 16 other elevated highways and replaced them by public spaces or wider pavements (Rashid 2025).

Financial Mechanisms

The Cheonggyecheon Restoration Project in Seoul was fully financed by the Seoul Metropolitan Government, with a total budget of ₩384 billion KRW ($323 million USD). The city strategically reallocated funds, using ₩100 billion KRW ($84.13 million USD) originally set for expressway renovations, and saved an additional ₩100.4 billion KRW (84.47 million USD) by downsizing less urgent projects and improving administrative efficiency (Amirtahmasebi et al. 2016). The remaining funds came from the city's general budget, amounting to approximately 1% of the municipality's total annual budget over the project's three-year span (2003–2005). While alternative financing methods, such as tax increment financing (TIF)—which leverages future land value increases to subsidize costs—were considered, they were ultimately not adopted due to legal restrictions in Korea at the time. However, post-restoration real estate values in the surrounding area increased by 30-50% (Robinson and Hopton 2011), demonstrating that TIF could have made the project self-sustaining over time.

The tripartite governance structure, including a Citizens' Committee, a Research Group, and a dedicated Project Office, played a crucial role in securing public support and ensuring smooth implementation (Amirtahmasebi et al. 2016). The restoration was also phased strategically to minimize disruptions, with the initial phase focusing on riverbed restoration and public land improvements, paving the way for private-sector investments to revitalize downtown Seoul. While not all governments can get this much capital from strong government commitment, strategic financial planning through TIF and public engagement can successfully scale across different metropolitan areas in the execution of large-scale nature-based solutions.

*Panama — Reforestation **via Mobilizing the Private Sector***

Project Description

Deforestation, particularly in the tropics, contributes to rising global temperatures and disrupts local weather patterns. In Panama, reforestation plays a crucial role in mitigating climate change while also providing economic opportunities for landholders. The primary population impacted by these efforts includes rural landowners, small-scale farmers, and Indigenous communities who rely on the land for their livelihoods (Sinacore et al. 2023). Given Panama's status as a key carbon sink within the neotropics (Baez 2024), reforestation has been championed by environmental organizations, the Panama Canal Authority, and international climate agreements aimed at reducing emissions. Research suggests that large-scale reforestation in Panama could reduce land surface temperatures by up to 1.5°C (Geldin and Koh 2024), particularly in areas that were previously cleared for cattle ranching.

Benefits Beyond Heat

Reforestation refers to the process of restoring forests on deforested land to a healthy state. Methods include controlling invasive species, maintaining tree diversity, and returning forest composition with the goal of improving biodiversity, carbon sequestration, and climate resilience (American Forests, n.d.). Forests are natural air conditioners, helping to regulate

temperatures by absorbing carbon dioxide and releasing moisture into the air (US EPA 2024). The cooling effect is especially important for climate-vulnerable regions where extreme heat can exacerbate droughts and threaten food security.

Financial Mechanisms

However, transitioning from traditional agricultural practices, such as cattle ranching, to sustainable forest management requires significant financial investment and long-term planning, making it a challenging endeavor for many landowners. Establishing a tree plantation costs between $1,200–$1,500 per hectare (Sinacore et al. 2023), making it a significant financial challenge for small-scale landowners. Unlike cattle ranching, which provides annual income, reforestation efforts often require waiting 15+ years before generating revenue from timber or carbon credits. This delay creates a financial gap that discourages many landowners from adopting sustainable land-use practices.

To address these challenges, carbon payments have emerged as a critical tool in incentivizing reforestation. In Panama, landowners can receive a flat annual payment of $130 per hectare for maintaining forest cover, similar to Costa Rica's Payment for Ecosystem Services (PES) program. Research from the Smithsonian Tropical Research Institute (STRI) indicates that with carbon payments, secondary forest Net Present Values (NPV) can increase from -$1,781 per hectare to over $10,000 per hectare, making reforestation more financially attractive (Sinacore et al. 2023). However, carbon payments alone may not be sufficient, as many landowners still struggle with the initial costs of reforestation.

Another financial strategy is cost-sharing models, where governments, NGOs, or private investors cover a portion of the upfront expenses. One of the most promising financial models for reforestation in Panama is long-term carbon offtake agreements, as seen in Microsoft's investment in the Azuero Reforestación Colectiva (ARC) project. The project will restore 24,700 acres of degraded forest, removing over 3 million tons of CO2, with Microsoft committing to purchase half of its carbon credits over 30 years (Morales 2024). This upfront financing, combined with a long-term purchase agreement, reduces investment risk and attracts additional investors. Rubicon Carbon is providing tens of millions in early-stage capital, while Carbon Streaming is also contributing, demonstrating how corporate-backed deals can scale nature-based climate solutions.

To ensure financial security for local landowners, ARC uses a hybrid payment system, combining fixed land-lease payments with a share of future carbon credit sales. This structure guarantees stable income while also aligning landowners' interests with long-term carbon market success. The project is expected to generate over 300 jobs, covering land maintenance costs like fencing and fire prevention, making reforestation a viable economic alternative to cattle ranching (Morales 2024).

Africa — Great Green Wall ***via Funding Through IGOs***

Project Description

Launched in 2007, the African Great Green Wall Project was launched by the African Union to restore the continent's degraded landscapes. This ongoing project has achieved approximately 18% of its restoration goals, with a revised completion date set for the end of

2025, preceded by an impact assessment in 2023. The restoration of over 100 million hectares of degraded land aims to deliver numerous benefits, including reducing heat Source

Initial studies have concluded that tree canopies and vegetation have the potential to reduce peak summer temperatures by 1° to 5°C (Campbell et al. 2021). However, following its initial states of implementation, scientific researcher Francesco Pausata conducted high-resolution computer simulations to model future global warming scenarios, both with and without a vegetative barrier in the Sahel. The results indicate that, despite overall global warming, the Great Green Wall could reduce average summer temperatures in much of the Sahel by up to 1.5 degrees Celsius. However, he also concluded that while the GGW helps lower temperatures during the summer, it contributes to warming in other seasons (Gramling 2022).

Financial Mechanisms

The Great Green Wall project operates on a $2 billion budget, with co-financing from the World Bank and partnerships facilitated by the African Union. At the One Planet Summit in January 2021, hosted by French President Emmanuel Macron alongside other world leaders, over $18 billion in pledges were secured for five key action pillars. Additionally, multilateral and bilateral organizations committed to working together to accelerate the GGW initiative until 2025. The Funding Mechanisms and Alignment working group identified limitations in utilizing project funding effectively, as financial resources are often mismanaged within ministries with minimal coordination between them. They note that a primary reason the GGWI has struggled to achieve the large-scale implementation it originally envisioned is the lack of commitment from sectoral ministries to align financial efforts. Instead, available funds are being directed toward other priorities, such as regional security and public health (Neely 2022). Moreover, in some countries, such as Mauritania, a lack of intersectoral coordination results in finance management being restricted to individual departments rather than a cohesive national approach (Trautman 2024). In an attempt to overcome some of these initial challenges A Green Accelerator program was established to improve coordination amongst stakeholders and to meet the initial established goals (The Great Green Wall Initiative, n.d.)

South America — Urban Forest Rehabilitation Project: "Salvador Capital da Mata Atlântica" - ***via Funding Through Key Partnerships***

Project Description

In Salvador, Bahia, Brazil, the implementation of 15 policies aimed at transforming public spaces and promoting sustainable urban development has proven to accelerate ecological resilience in the region. With a goal of capturing over 200,000 tonnes of CO_2 in 20 years, this nature-based solution offers significant co-benefits, such as reducing the urban heat island effect (EcoAct 2021). Moreover, these initiatives aim to improve the city's environmental quality and increase green spaces, benefiting both residents and local biodiversity.

Benefits Beyond Heat

Key measures include the requalification of the existing Botanical Garden, the distribution of tree seedlings, and the planting of forest areas. The last project progress reports

note that 39 conservation areas have been established, covering a total of 19 km², 75,000 trees have been planted, and approximately 30 m² of green space is now available per inhabitant.

Financial Mechanisms

The presence of key partners, including SEINFRA, FMLF, BID, and SUCOP, has played a crucial role in these efforts by (1) reducing the economic burden of the project and (2) providing administrative and technical support to ensure its successful implementation (EcoAct 2021). To finance this project, the city government encouraged private businesses to "adopt" green spaces in the city. This entails private businesses funding and maintaining these areas. This arrangement is mutually beneficial, as both the area and the community the business serves get to reap the benefits (FAO 2024). This project has been found to be an effective mechanism for financing large projects—essentially by localizing efforts.

Takeaways

Each case study in this paper offers a distinct yet complementary lesson toward the broader goal of scaling nature-based solutions across the Global South through innovative financing models. In Seoul, the Cheonggyecheon Restoration Project demonstrates that while strong government commitment and capital availability may be unique to wealthier nations, the strategic use of financial planning tools like Tax Increment Financing and robust public engagement can be adapted to other urban contexts to attract investment and political buy-in. Although not all countries can get this much capital from strong government commitment, strategic financial planning can scale across different metropolitan areas. In Panama, the Azuero Reforestación Colectiva illustrates how private-sector participation, especially through carbon offtake agreements and job-creating models, can de-risk long-term projects and generate sustained local economic benefits—making reforestation a viable alternative to extractive land uses. This demonstrates that a viable financing approach for reforestation involves the active contribution from the private sector and the creation of jobs for local populations. The Great Green Wall project in Africa underscores the importance of a blended finance approach—where public and private funds are pooled under the oversight of a third-party administrator to improve transparency, reporting, and cross-sector alignment. Finally, in Brazil, Salvador's "Capital da Mata Atlântica" initiative reveals that localizing funding mechanisms, including public-private partnerships like "adopt-a-park" programs and institutionalizing compensation schemes, can empower municipalities and businesses to co-own and co-finance sustainable urban greening projects. Collectively, these cases reveal that NbS financing is not one-size-fits-all: it requires tailored mechanisms, governance structures, and stakeholder incentives—but can be scaled and adapted with the right combination of innovation, accountability, and local grounding.

Challenges

Financing

Even though nature-based solutions are essential for addressing increasing heat, financing these solutions poses several challenges. Through a systematic review of barriers facing NbS,

two main challenges are revealed: (1) difficulties in establishing effective coordination between public and private financers, and (2) the inadequate integration of NbS into valuation and accounting models (Toxopeus and Polzin 2021). These obstacles arise from the challenges of mobilizing private capital for implementing NbS, especially since there are so many questions surrounding them as a nascent concept. There is high uncertainty about their implementation and effectiveness, as well as an unclear ROI. As well, since they are so new, there is a current lack of supportive policy across domestic and multilateral levels, which must be mobilized soon. Additionally, the long term investment timelines paired with intimately location and environment-specific considerations and complex processes for quantifying and disseminating results result in high risks for investors which discourage them from supporting NbS.

Negative Externalities

Additionally, there are associated unintended consequences of large-scale solutions such as those of the GGW when tree planting in arid and semi-arid regions. When non-native species are introduced, they can exacerbate soil degradation and water depletion. As well, there are always political consequences - when all stakeholders are not considered, conflicts over resources emerge. Similarly, poor coordination and governance have also led to inefficiencies, with some projects failing due to a lack of local engagement and inadequate maintenance strategies (UNCCD, 2023). Socially, some communities have experienced displacement or reduced access to vital resources, exacerbating poverty and food insecurity rather than alleviating it. These externalities demonstrate the need for more context-specific and ecologically sound strategies to ensure the long-term success of nature-based solutions.

What are the Ways Forward?

Nature-based solutions (NbS) have proven to be powerful tools in mitigating the effects of extreme heat, restoring ecosystems, and promoting sustainable urbanization. However, scaling these solutions requires overcoming significant financial, structural, and policy challenges. A key barrier is the difficulty in mobilizing private-sector investment, as NbS projects often have long investment timelines, high uncertainty, and lack of clear return on investment.

To enhance large-scale implementation, governments and financial institutions must prioritize NbS within national development plans and urban policies. Establishing public-private partnerships and leveraging mechanisms like blended finance and green bonds can further attract capital by reducing risk and ensuring more predictable returns. Additionally, improving public awareness and corporate engagement through branding NbS projects as sustainable investments with measurable social and environmental impacts can further drive private-sector involvement. Businesses stand to benefit from integrating NbS into their sustainability strategies, as they help mitigate climate risks, enhance corporate reputation, and unlock potential tax incentives.

Ultimately, the success of nature-based solutions depends on a shift in how they are perceived—not just as environmental initiatives but as viable, long-term investments with tangible economic and societal benefits. By developing innovative financing mechanisms, streamlining implementation processes, and fostering cross-sector collaboration, NbS can be

effectively scaled to address extreme heat and other climate-related challenges. As global warming intensifies, the urgency to make these solutions more appealing, financially viable, and widely adopted has never been greater.

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