Mainstreaming ecosystem-base adaptation into clim resilience strategies informal settlement Windhoek, Namib

Urgent actions for tackling t development and climate emer

A drought-hit Namibia with growing informality

> ***"Areas in the south-western region* (of Africa)*, especially in South Africa and parts of Namibia and Botswana, are expected to experience the largest increases in temperature* (with climate change)*. The western part of southern Africa is projected to become drier, with increasing drought frequency and number of heatwaves towards the end of the 21st century."*** (Intergovernmental Panel on Climate Change, 2018)

In Windhoek, the capital of Namibia, 32% of the urban population currently live in informal settlements (i.e. housing built outside formally recognized systems), frequently characterized by:

(i) Insecure land rights and tenure for residents;
(ii) Habitations in marginal and hazardous areas; and
(iii) Lack of basic public services like energy and sanitation

While Namibia is a sparsely populated country, population growth in these poor urban areas is unprecedentedly high – with a growth rate between 9-11% every year, compared to around 4% in formal areas[1]. Despite social, economic and health benefits, rural-urban migration can increase residents' vulnerability to the predicted impacts of climate change such as unpredictable rainfall patterns (resulting in both drought and flood events, including increased flash floods) and higher temperatures[2]. An estimated 500,000 people are at risk, and 60,000 animals have died in the last six months[3]. Consequently, in 2018, the state of informal settlements in Namibia was considered a humanitarian crisis, and in 2019, following six years of drought, a state of emergency was declared.

[1] Weber, B. and Mendelsohn, J. (2017) Informal settlements in Namibia: their nature and growth.
[2] Hoegh-Guldberg et al, 2018: Impacts of 1.5°C Global Warming on Natural and Human Systems. In: Global Warming of 1.5°C; - Shikangalah, R. N. and Mapani, B. (2019) 'Precipitation variations and shifts over time : Implication on Windhoek city water supply', Physics and Chemistry of the Earth. Elsevier, (August 2018), pp. 0–1. ; - New, M. and Bosworth, B. (2018) OPINION: What global warming of 1.5 °C

Mainstreaming ecosystem-based adaptation resilience strategies for informal settlements in Namibia. Retrieved from: http://www.acdi.uct.ac.za/peri-urban-infrastructure-peri-urban-areas-sub-saharan-africa

For further information on Urban Ecolution's work, c

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For more information on related projects
http://www.acdi.uct.ac.za/peri-urban-resilient-ecosystems-pure
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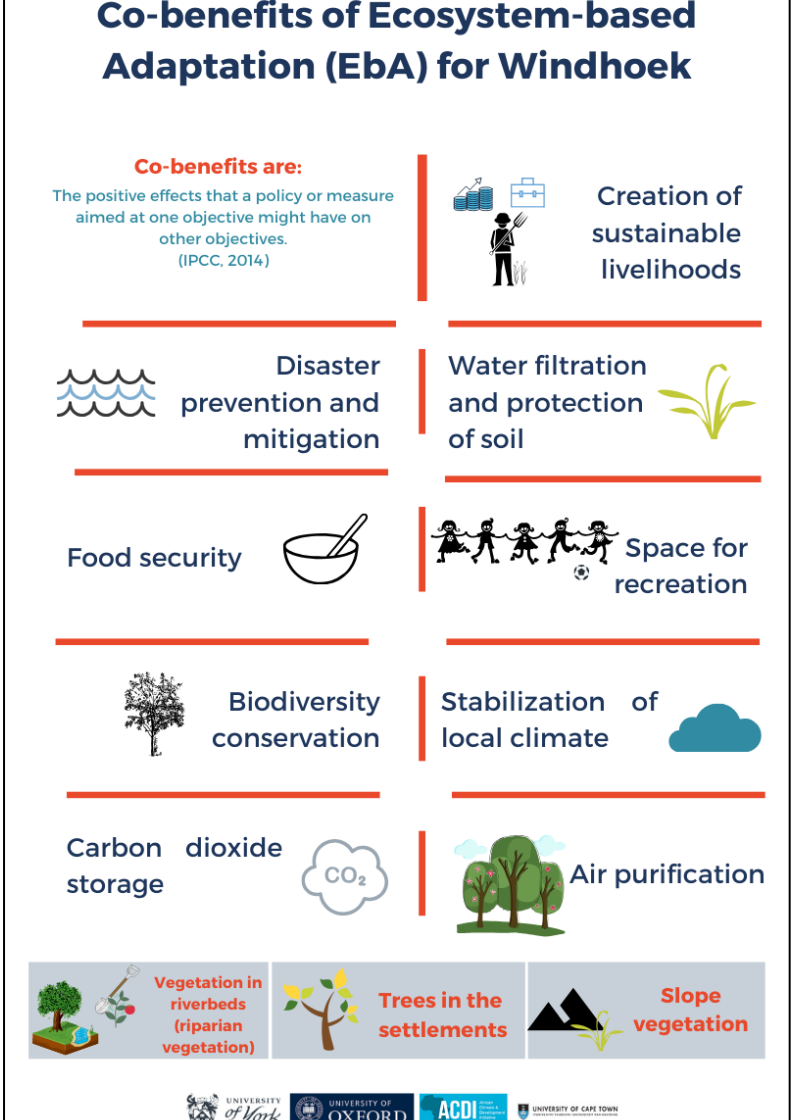
Photos by Valentina Giombini and Amayaa Wijesinghe



change in Windhoek

The municipality authority - City of Windhoek (CoW
the process of formulating Namibia's first city-specif
Climate Change Strategy and Action Plan (ICCSA
years between 2019-2026. This policy is currently in
covering **adaptation measures**: (1) water security an
(2) biodiversity and ecosystem goods and service
settlements; (4) healthy communities; and
preparedness; and **mitigation measures**: (1) sustain
and low carbon development; (2) waste minim
management; (3) sustainable transportation; and
public awareness and capacity building.

To ensure ICCSAP is democratically accountable a
community members, it is important that strategie
adaptation in marginalized and under-serviced com
included in this plan, as well as in other plans such
upgrading policy of the Human Settlements Division

Role of green infrastructur ecosystem services

Urban Green Infrastructure (UGI)[4] refers to interconn
functional green spaces that contribute to
functioning and human wellbeing. These spaces pro
of different **ecosystem services**[5], which are freque
as:

(1) **Supporting services** (e.g. nutrient cycling,
maintenance); (2) **Provisioning services** (e.g. food,
(3) **Regulating services** (e.g. climate regulation

[4] Gómez-Baggethun, E. and Barton, D. N. (2013) 'Classifying and valuing ecosyste
planning', Ecological Economics. Elsevier B.V., 86, pp. 235–245.
Lindley, S. et al. (2018) 'Rethinking urban green infrastructure and ecosystem servic
perspective of sub-Saharan African cities', Landscape and Urban Planning. Elsevie

spiritual and aesthetic appreciation)

Ecosystem-based Adaptation (EbA) is the use of UGI and ecosystem services as part of an overall adaptation strategy to help people to adapt to the adverse effects of climate change. In other parts of Southern Africa, decision-makers and communities have mainstreamed ecosystem-based adaptation into citywide climate risk reduction strategies. For example, in South Africa, the extended public works programme Working for Water aims to provide income generating opportunities by restoring riparian buffer zones to clean water, reduce erosion, reduce downstream flooding, and beautify green spaces in informal settlements.

(Left) Not all trees have been cut down in informal settlements of Windhoek. Some are valued for shade, as meeting places, and are protected by the residents. *Prosopis* trees, which are classified as invasive in certain policies, are common here. Suitability of these trees should be explored further.

(Right) A woman cuts grass from the riverbeds, to sell as fodder to farms on the periphery

slopes, solid and human waste management w
settlements. Collecting firewood, grasses and tree p
spaces provides present livelihoods for informal settl
this may lead to long-term degradation of the eco
green spaces of the city. Greater support fo
environmentally enhancing livelihood opportunities
to curve associated degradation.

Community participation: Presently, Environm
Assessments processes are frequently not fully co
and often lack the necessary input of local
participation. There remains limited CoW Division ar
from an explicitly environmental standpoint
settlements, leaving land and housing divisions
NGOs attempting to address this gap. New u
development and conversations around the flexibl
system offer important opportunities to counter e
and information asymmetries, through new
platforms to better consider society, natural envi
ecosystem services in upgrading schemes.

Safeguarding Windh
future

In the future, there are many opportunities to lev
green infrastructure for climate change adaptation
overall socio-economic resilience and develop
informal settlements. There are some context-specif
to overcome as well, but transformative, inte
innovative leadership, coupled with an involve
community, will pave the way for a resilient and p
trajectory for informal settlements in Windhoek.

firewood supply chains is needed in and outside poor urban centres, exploring the mix of renewable energy sources that would be socially and economically feasible in informal settlements to replace firewood. This would both reduce environmental degradation and enhance human health. Servicing and upgrading through renewable energy alternatives are needed, as are localized awareness raising and disincentives for firewood collection and "debushing".

Health: City, federations and NGOs are working together to provide sanitation facilities to the settlements, while facing the crisis of the Hepatitis E outbreak. Riverbeds and hill slopes are still used by 73.11% of Windhoek residents for open defecation[9]. If strategies to resolve sanitation issues are integrated with awareness raising efforts highlighting the benefits of having clean, restored riverbeds (such as recreational, psychological, and disaster risk reduction benefits), this may encourage a sea change in residents' use of these green and blue spaces.

Disaster Risk Reduction: Disaster planning should further mainstream green infrastructure (e.g., restoration of riparian vegetation along the riverbeds, swales for filtration) and begin to consider increased temperature, in addition to water scarcity and flash flooding, as a chronic environmental risk for informal settlements. Upgrading plans should enforce flood lines and buffer zones, and the restoration of green riparian vegetation in these zones must be explored.

Governance and awareness: The municipal divisions responsible for managing open spaces (e.g., parks, health and environment) in formal areas must be given a mandate to carry out similar management in informal settlements. At the same time, community-led initiatives must be encouraged through increased awareness of nature's contribution to livelihoods and well-being, and integration of environmental education into local curricula. Piloting is also important, and learning by doing is encouraged to find optimal solutions for Windhoek.

Job creation: There is the potential to provide alternative sources of employment. For example, new, low-skilled labour and

Bold policy and action shape change

> ***"Nature can be conserved, restored and used sustai simultaneously meeting other global societal goals thr and concerted efforts fostering transformative*** Intergovernmental Science-Policy Platform on Biodi Ecosystem Services (IPBES, 2019)

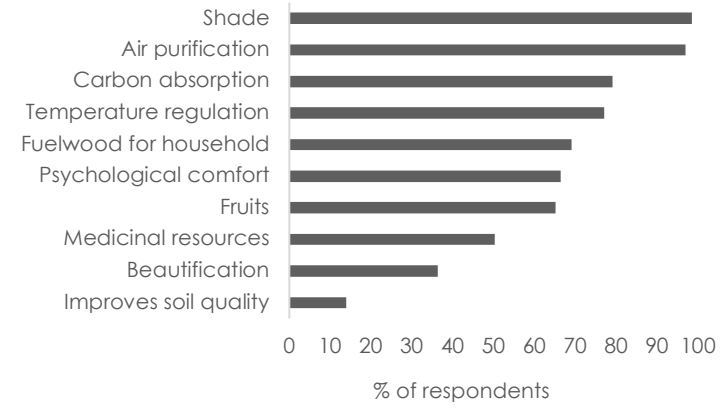
Recent research involving key informant interview and household and field surveys, has found that private businesses and individuals working on dive for informal settlement development – *inter alia* th land tenure; water, energy and sanitation service management, and health and wellbeing - shou (along with residents themselves), the possible s trade-offs that may exist between their activities Windhoek's informal settlements. Doing so wo increase the climate resilience of these communities.

Research can help us uncover benefits and service Green Infrastructure (UGI) for Windhoek's informal s which may previously have gone unnoticed.

In the context of Windhoek, UGI in and arou settlements mainly refers to the ephemeral river syste riverbeds and vegetation on riverbanks), shrub land trees in the settlements' surroundings, the Goreang associated vegetation.

According to a recent household survey of 332 (carried out in Windhoek's informal settlements b Ecolution project[6] in 2019)[7], informal settlers ecosystem services from the UGI around them:

[6] http://www.gedi.uct.ac.za/green-urban-infrastructure-peri-urban-areas-sub-sah



(Above) Top 10 ecosystem services identified by informal settlement respondents

Examples of ecosystem services in and around informal settlements Tomatoes and other vegetables being cultivated by an informal settlement resident **(Above-L);** riverbed with vegetation that can absorb nutrient and form a barrier against stormwater **(Above-R);** Penduka, a tourist destination, recreation location, and livelihood development center near Goreangab dam **(L)**

towards change in Windhoek

In developing bold policy, and based on ongoing recommend that the following policy domains an Windhoek's urban social-ecological system considered:

Water: Various stakeholders, from NGO initiativ Okukuna to the City of Windhoek's (CoW) Parks Div use innovative, dryland-adapted, water-spa infrastructure systems, which can be adapted for settlements. Growing non-invasive dryland-adapted could provide shade and cooling in a scenario temperatures, as demonstrated by previous UNFA other SSA dryland systems[8]. For instance, a loc purification facility for water from the Goreangab d integrated into the upgrading programme of the C Settlements Division, with water subsequently chann pipes for a street trees programme in the informal s

Food: Food insecurity and a lack of nutritional divers settlements could be addressed by promoting urba which also provides an opportunity for livelihood d Developing urban agriculture systems should co sparing cultivation systems; changing attitud cultivation through awareness; (re)conceptualizing harvest; provision of skills training, inputs and start-u which could aid scaling up of current efforts fo dryland urban farming.

Energy: Forty percent of energy in informal settleme from firewood for household cooking, whil surrounding Windhoek's periphery in the last ten yea declined by 284.41 ha in just the last 10 years,