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2nd African Forum On Urban Forests

Green Horizons: Shaping the Future Resilience of African Cities through Urban Forests

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Relief from Urban Heat: Insights from Johannesburg's Ecosystem Goods and Services Assessment

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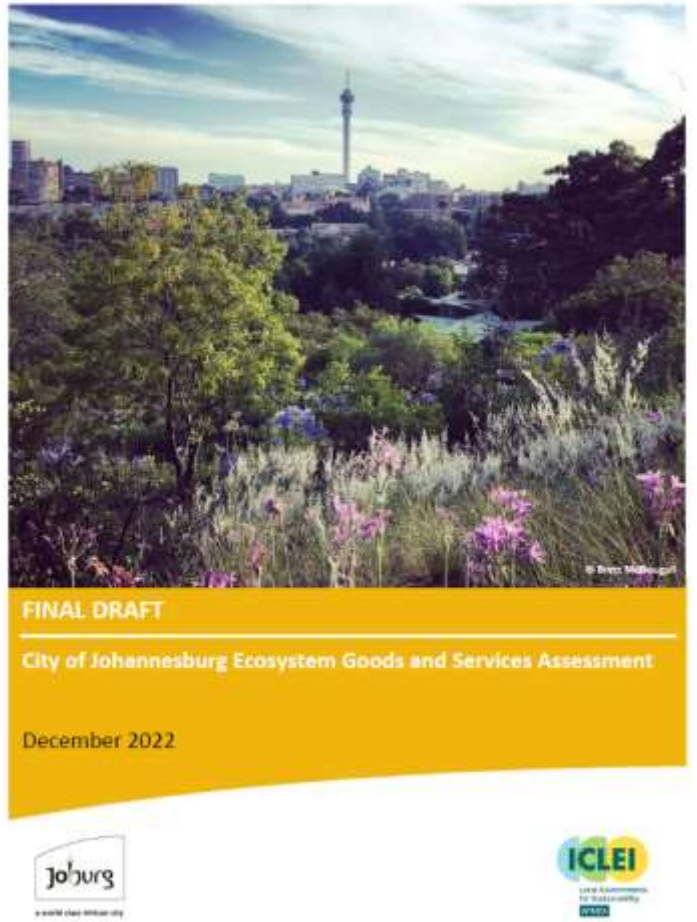
Why an Ecosystem Goods and Services Assessment?

- Urbanisation: Globally a major driver of environmental degradation, increased consumption of natural resources, loss of biodiversity and ecosystem change.

- Cities rely heavily on ecosystems goods and services to sustain human life: e.g. food and water, health and well-being, social relations and nature's ability to mitigate climate change impacts.

- The economic and intrinsic values of ecosystems are seldom considered in policy-making and management in the urban context.

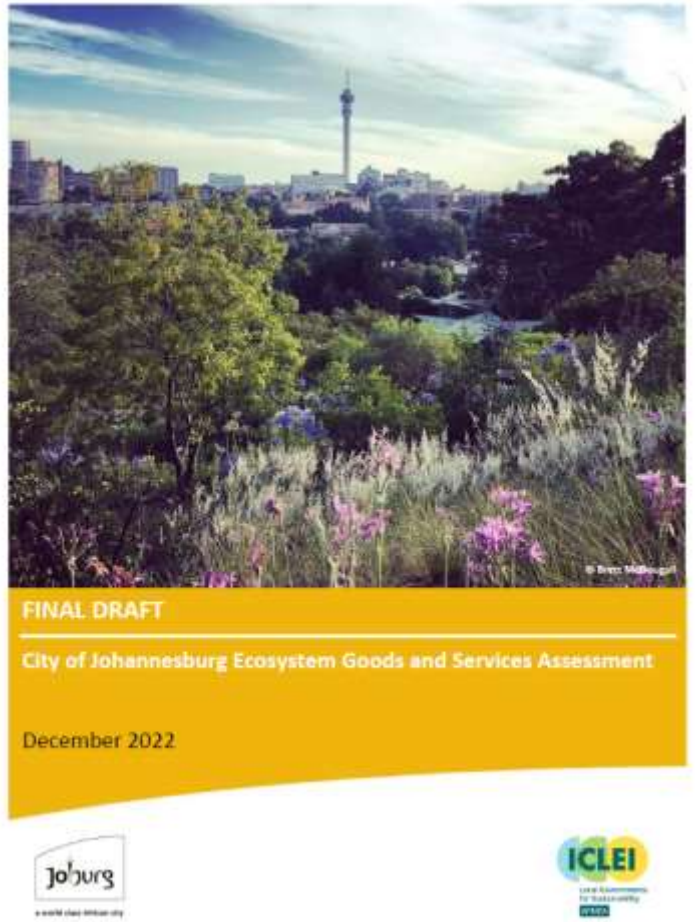


Why an Ecosystem Goods and Services Assessment?

- In order to meet the growing needs of society, it is important that urban planners and policymakers account for and integrate the ecosystem goods and services into decision making processes and funding streams.

- Ecosystem services assessments can help policymakers understand the role of ecosystems in achieving development priorities, supporting service provision and justify public spending on ecosystem restoration.

- This assessment: Commissioned by the City's Environment and Infrastructure Services Department



What is in the Ecosystem Goods and Services Assessment?

- Assessment is arranged to reflect major ecosystems in the City: Trees, Green Open Space, Urban Agriculture, Aquatic Ecosystems, Grasslands and Bushveld and Man-made ecosystems.
- Each chapter outlines specific ecosystem services, their intrinsic value and where possible, their economic value as well as local and global challenges and management practices.
- Three chapters, namely Trees (heat mitigation), Green Open Space (impact on property values) and Grasslands and Bushveld (flood mitigation), received further in-depth economic analysis of selected ecosystem services.
- The Assessment concludes with recommendations for improved governance, including financial and policy aspects.

The world’s largest man-made forest

- Johannesburg’s extensive suburban forest: Street trees and trees in and around city parks, open spaces and trees in private and public gardens - approximately 10 million planted trees.

- The urban forest of Johannesburg covers an area of approximately 38 822 ha, about 23.6% of the City’s surface area > popular claim that Johannesburg is the largest man-made urban forest in the world.

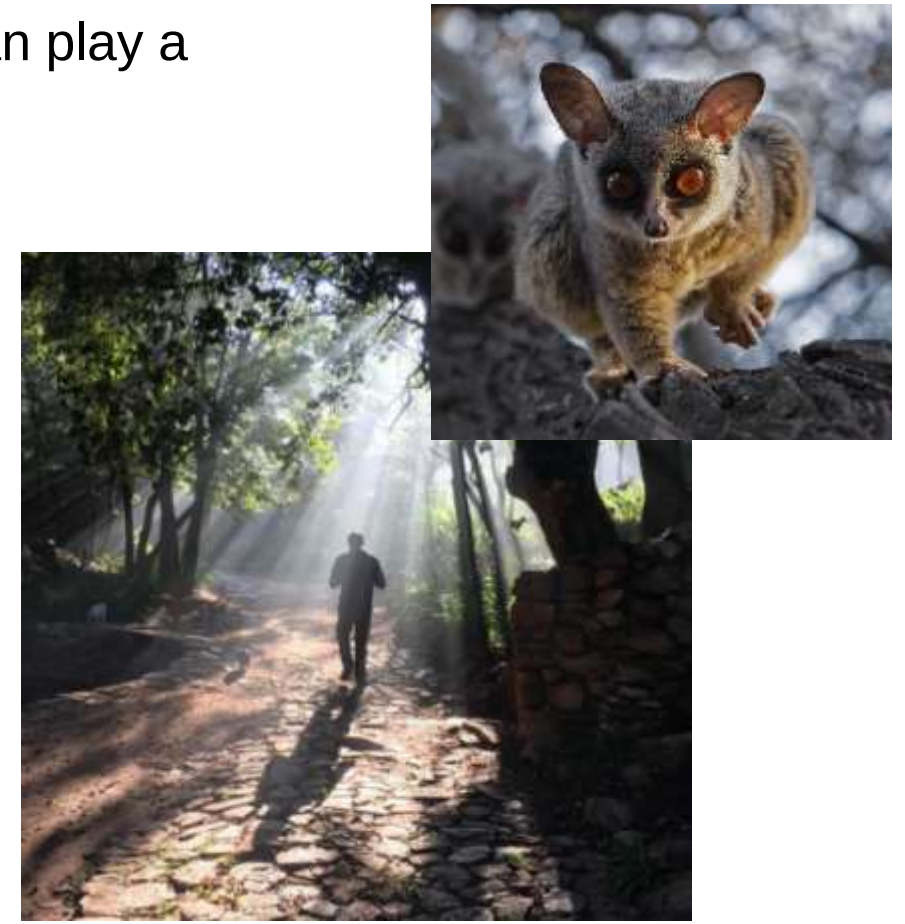
- Trees were planted initially to support the mining industry (from 1880s) but from early 1900s, trees were planted for a bigger range of benefits.

- Trees not uniformly distributed, dominating Johannesburg’s historically wealthy northern suburbs while tree coverage in the poorer southern section of the City is more sparse.

Relief from urban heat: Johannesburg's trees

Urban trees provide a range of goods and services that can play a significant role in making towns and cities more liveable:

- Ameliorate stormwater runoff
- Reduce erosion
- Improve air quality (reducing particulate matter pollution)
- Cooling
- Noise and dust reduction
- Habitat for biodiversity
- Carbon storage
- Enable recreation, enhancing human health and well-being
- Increase property values



Why so hot?

- Cities store heat due to sealed surfaces, in buildings and anthropogenic heat release factors (from industry, cars, air conditioning etc.). Cities typically have temperatures considerably higher than their less urban surroundings. (i.e. the Urban Heat Island Effect or ‘UHI’)

- High urban temperatures: A major public health concern, especially during heat waves, can lead to severe health problems including an increased number of heat-related deaths.

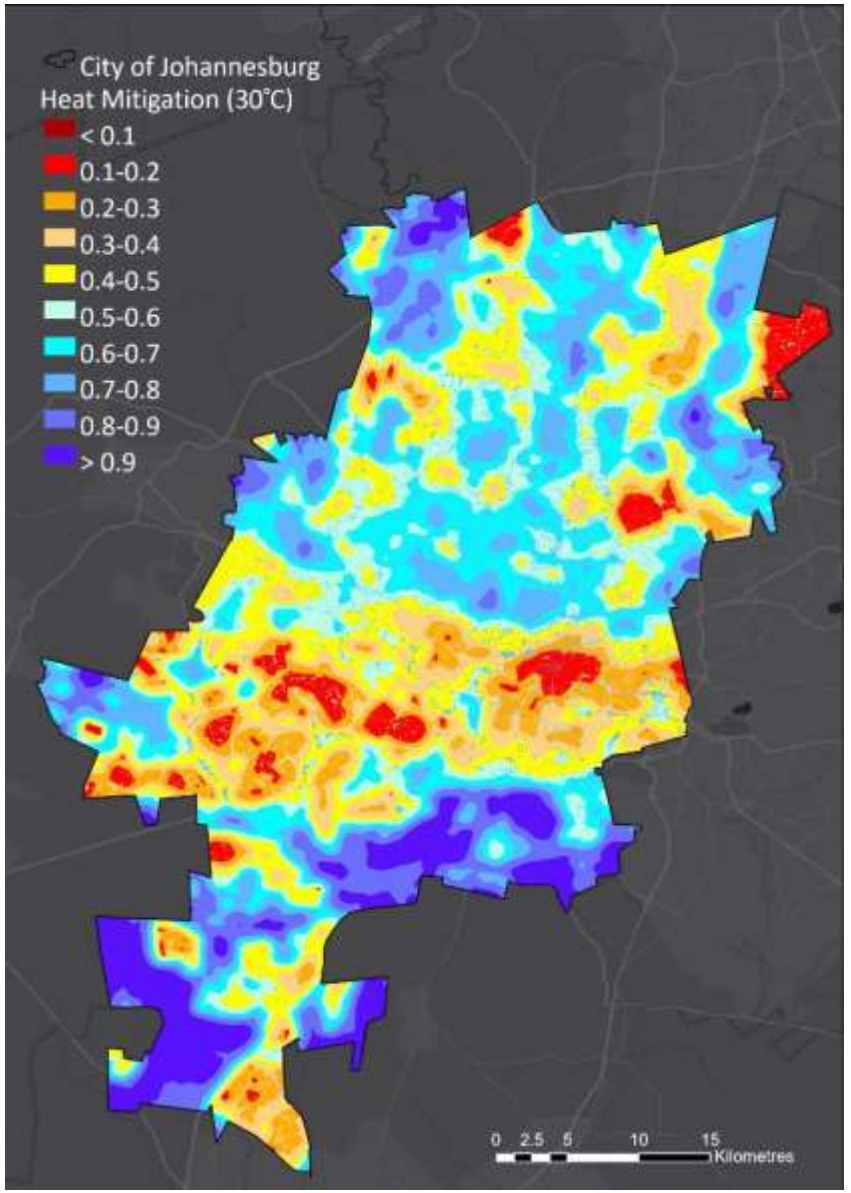
- The City of Johannesburg will most likely experience more frequent heat waves in the future. Urban vegetation can help to mitigate this effect.

- Typically, urban green spaces (forests, parks, cemeteries, riverine corridors etc.) are between 1°C and 3°C cooler than their built-up surroundings.

- An analysis of remote sensing data found that Johannesburg’s mean night-time urban temperatures were 2-3.5°C higher than in surrounding vegetated areas, with the highest differential in the urban centers and high-density residential settlements.

Vegetation mitigates heat

- A heat mitigation index (HMI) was modelled for the City of Johannesburg.
- The map shows that the UHI effect is mitigated based on shade and evapotranspiration (of vegetated areas) and albedo (a measure of the reflection of solar radiation) of all land surfaces, and their distance from different types of buildings in the city.
- Red = low/no cooling effect and Blue = Urban Heat Island effect eliminated. The greatest HMI values (i.e. cooling effect) were found to be in the natural open space in the peri-urban fringe in the southern parts of the City of Joburg (areas around Ennerdale and Kibler Park). The lowest were around large mine dumps (bare ground) around Vlakfontein and on the Reef, as well is in parts of the CBD, Ivory Park, Diepkloof and Alexandra, where there are fewer large trees and green open space.
- Using conservative assumptions and an energy cost value of close to R1/KWh in 2019, the total energy savings (avoided consumption) as a result of the cooling effects of vegetation and wetlands was estimated to be about R8 to 11 million per annum for the City of Johannesburg.



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Challenges and opportunities

- Some woody exotic trees can be invasive: opportunity for secondary industries
- Some tree species use substantial amounts of water, for example *Eucalyptus,* 'gum' species
- trees can increase fire hazard leading to loss of property, life and soil erosion.
- Maintenance costs: Trees have to be watered, tended and pruned
- Pathogens and diseases. The arrival of the shot hole borer beetle, causing substantial tree deaths in the City of Johannesburg.

- Nevertheless, often the social benefits provided by urban forests outweigh the environmental and economic costs of maintaining them. A Californian study for example, estimated that urban trees can deliver $5.82 in benefits for every $1 spent on tree planting and maintenance. For Johannesburg, the (cooling) return on investment for tree planting, for an additional $500 thousand annually in street tree planting, more than 100,000 people could have a reduction of 1.5° C in summertime temperatures.

- Leveraging funding for maintaining and expanding urban forests depends critically on society's ability to allocate financial and moral value to the benefits provided by urban trees. This can be achieved by linking the nature-based contributions of urban forests to municipal planning to mitigate urban heat, reduce flooding, reduce air pollution and enhance the amenity value of urban green space. Policy and regulatory instruments can also be adapted to support and encourage tree planting as part of residential, business and industrial development through by-laws applicable to public trees.

- Financial mechanisms include public funds, partnerships with NGOs, private sector and civic action groups such as the Johannesburg Urban Forest Alliance. In addition, greater effort should go towards exploring options to leverage health funding, since the contribution of trees to mental and physical health is economically significant – and this link is supported by science.

Challenges and opportunities (continued..)

- The operational aspects of tree planting in the city is guided by the City of Johannesburg's Complete Streets Design Guideline (n.d.), which stipulates the need for low-maintenance landscapes with hardy trees and following ecological principles when landscaping. The selection of new tree plantings must consider the City's recommended tree species list, the aesthetic effect, climatic concerns, potential for disease and pests, maintenance requirements, space available for root growth, and the eventual size of the mature tree.

- Major urban tree-related challenges for the City of Johannesburg:

1. Promoting collaboration between different City departments who do tree planting and greening, e.g. City Parks, Johannesburg Development Agents, Johannesburg Roads Agency and Joburg Water.
2. Lobbying for and access to funding where grey infrastructure is typically the 'flagship' infrastructure rather than green infrastructure.

Resources

Download the full Ecosystem Goods and Services **Assessment** here

https://africa.iclei.org/resource/city-of-johannesburg-goods-and-services-assessment/

And the **infographic** here:

https://africa.iclei.org/resource/the-value-of-ecosystems-in-the-city-of-johannesburg/

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Thank You.

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