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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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Evaluation of the design and management of urban parklands to render recreational and ecosystem services, South Africa

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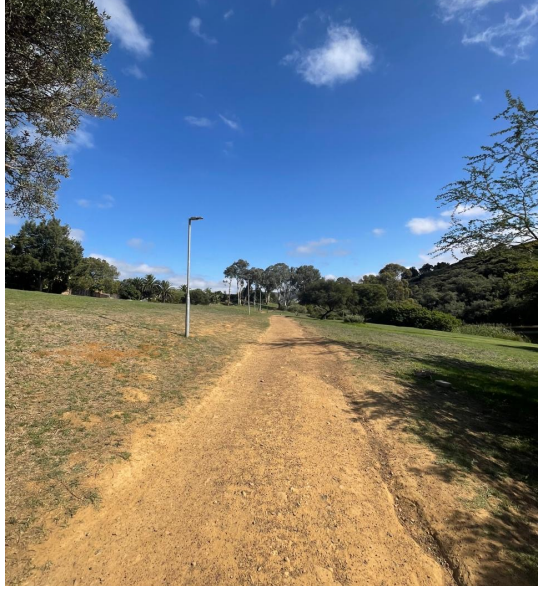
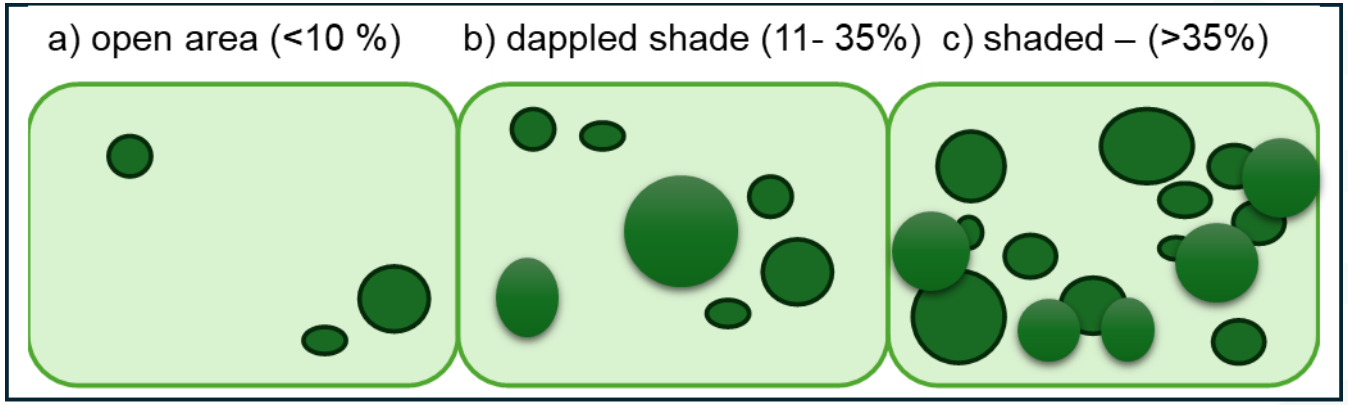
Background

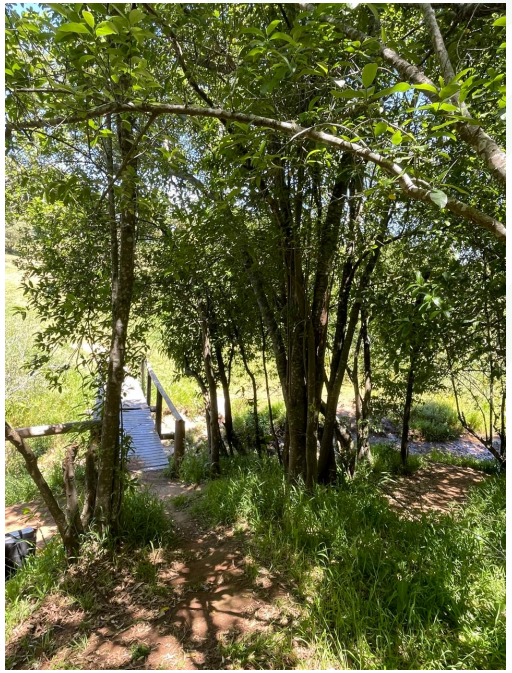
- Urban parklands differ in design, maintenance costs, and ecological function.
- Varying mixtures of dense tree cover and open spaces, affecting their provision of recreational and ecosystem services.
- The goal is to understand the trade-offs between cost, ecosystem services, and community perception to inform better park management.



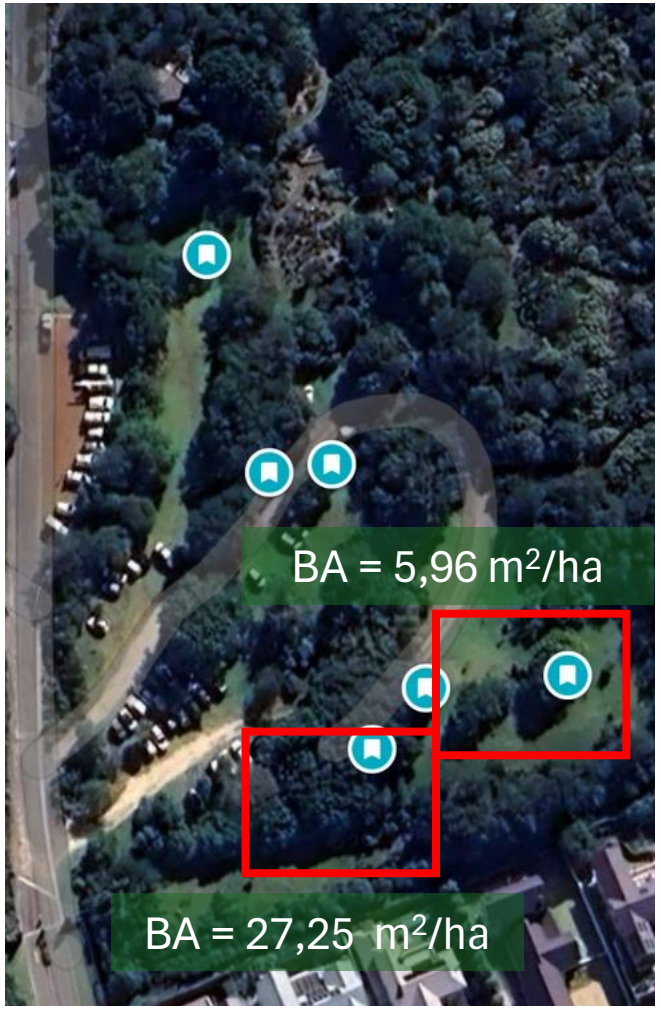


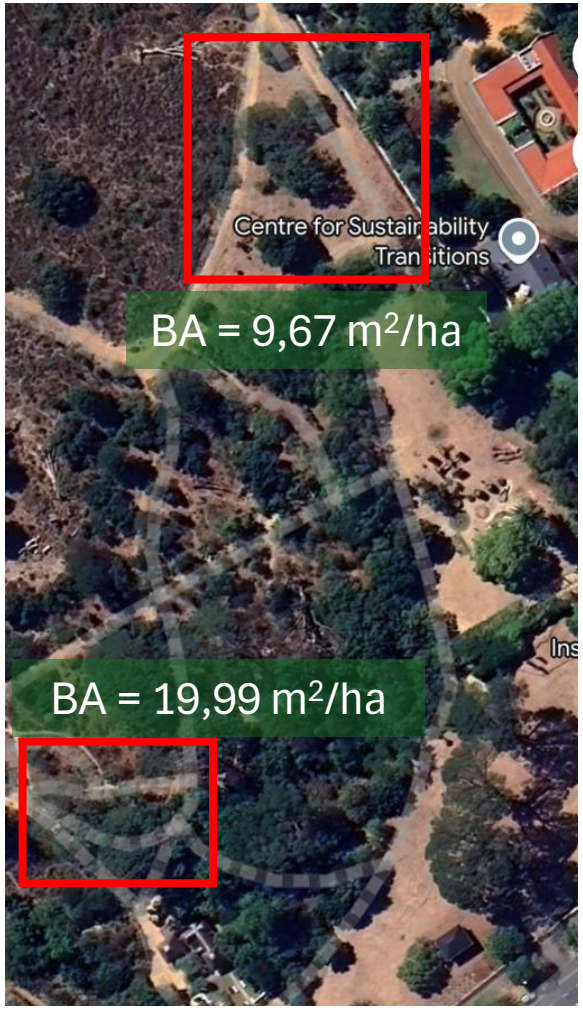

Park Structure: (various mixtures of)

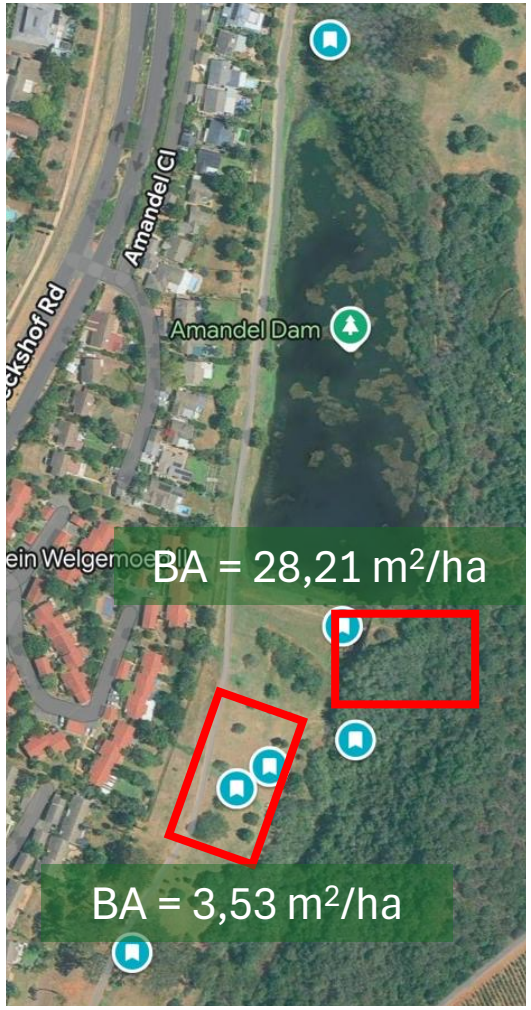




Tree Density (basal area)







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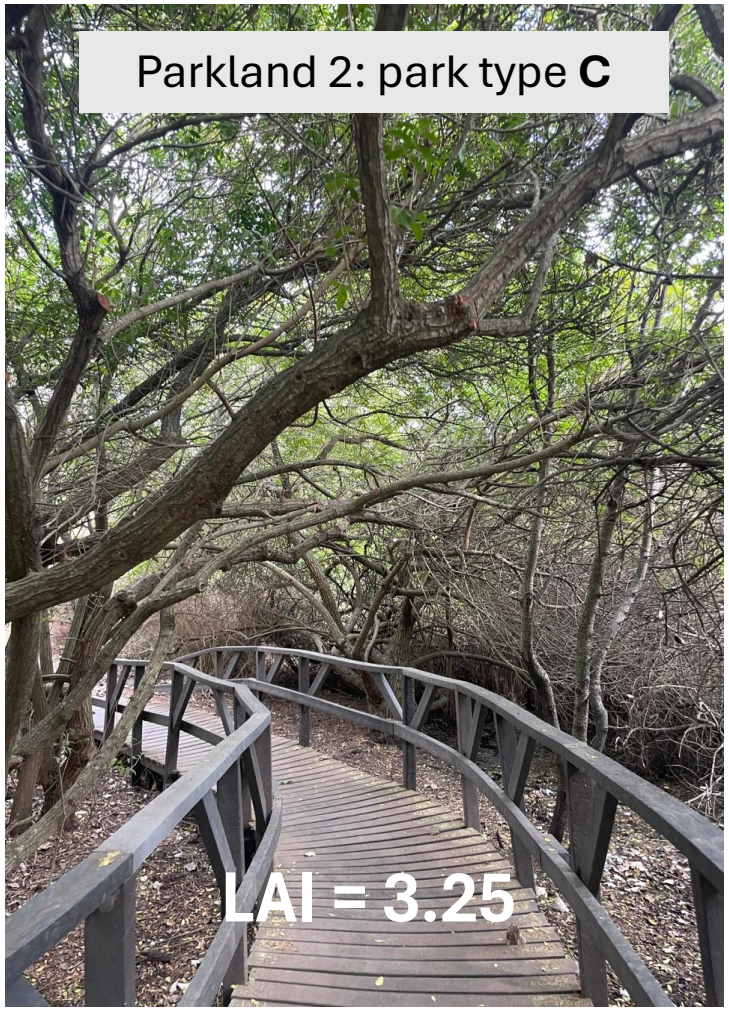
Leaf Area Index (LAI)

- Describes plant canopy structure
- Quantifies the amount of leaf material in a canopy
- LAI is unitless because it is a ratio of areas - total amount of leaf area (m^2) in a canopy per unit ground area (m^2)

- *For example, a canopy with an **LAI of 1** has a **1:1** ratio of leaf area to ground area. A canopy with a **leaf area index of 3** would have a **3:1** ratio of leaf area to ground area*



Light Interception

Using LAI and Beer's Law

Intercepted radiation = $Q_o[1- e^{-(k*LAI)}]$

So, what does this mean?

80% and **41%** of light is being intercepted by the tree canopy

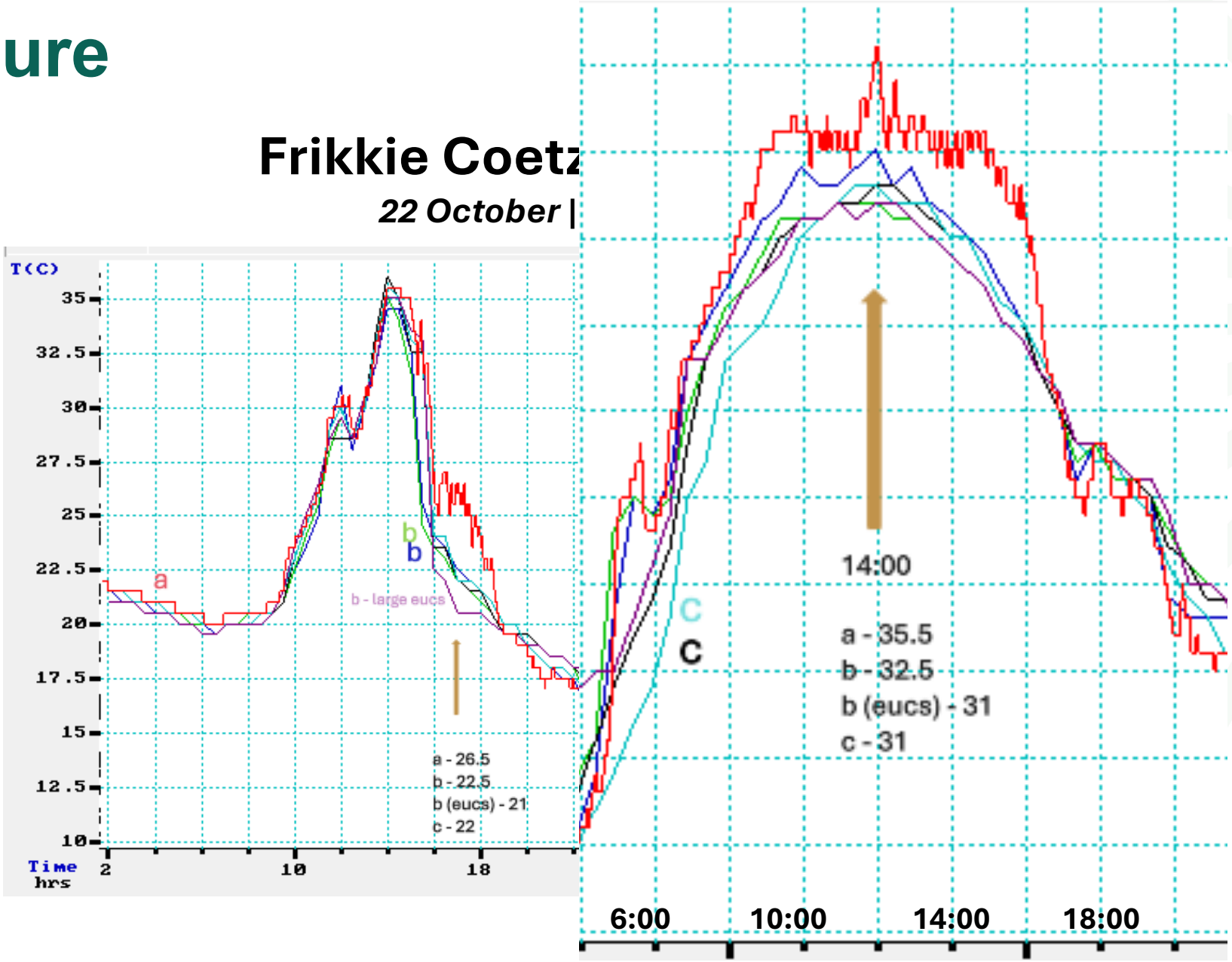
Temperature

Legend

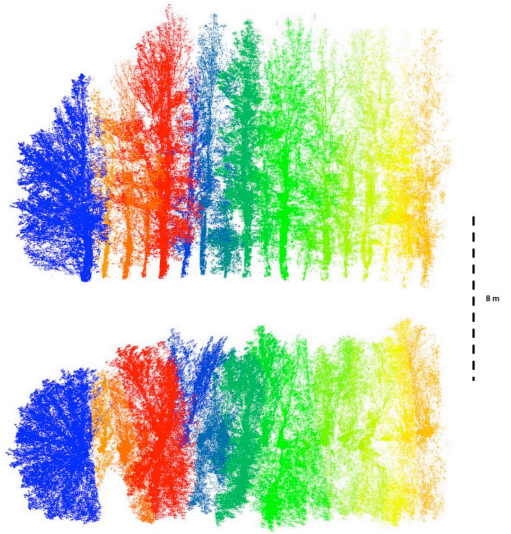
a - open

b - dappled shade

c - closed canopy



Using Terrestrial Lidar Scanning (TLS) to estimate biomass and C sequestration in urban parks



- TLS offers a non-destructive method to estimate stem and branch volume

Example of agroforestry windbreak scanned by Reckziegel, 2022 →

- Volume coupled with wood density estimates (from literature or from small tree cores) can be used to determine biomass and carbon content of the woody parts

→

- LAI can be used to estimate biomass of the foliage (very accurate if specific leaf area can be determined)

- Expansion factors can be used to estimate the below-ground biomass using above-ground biomass as input

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Still to come

- **Economic Assessment**

- Consult local municipality on maintenance costs to benchmark costs

- Estimate maintenance costs for each park type and mixed types

Public Perceptions

- Quantify the public perceptions of urban parklands

- *Do people make use of urban parklands?*
- *Are people aware of the ecosystem services these spaces provide?*
- *Which 'park type mixtures' do people prefer and why?*

Ecosystem Services

- Quantify carbon sequestration with Terrestrial Lidar Scanning

- Temperature data: Summer and Winter 'campaign'

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Conclusion

- Work in progress…

- Results we would like to present:

  Example

  Park type 'b':
  - *Park type preferred by the public because of listed reasons*
  - *Public perception rating for selected recreational activity types*
  - *Maintenance cost of R X*
  - *Reduces temperatures by X ˚C during the hottest times of the day compared to park type 'a'*
  - *Maintains a consistent temperature during a day compared to park type 'a'*
  - *Sequesters X tons of carbon per ha*

Thank you

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