Impacts of Land Use and Urban Densification

URBAN HYDROLOGY WORKSHOP: WATER IN THE CITY OF TSHWANE

23 – 24 January 2014

Lodie Venter

Outline

- Tshwane policies
- Case Study – BRT Atterbury & Lynnwood Road + Hatfield East
- Eco Based Adaptation
- Business-as-usual approach
- EBA approach to BRT route

Tshwane Policies

Tshwane Vision 2055

In 2055, the City of Tshwane is liveable, resilient and inclusive whose citizens enjoy a high quality of life …….

- **A resilient and resource efficient City**
- **Quality infrastructure development that supports liveable communities**
- **From a land use point of view it means building denser and more liveable cities and towns**

MSDF & RSDF – spatial policies
Tshwane Compaction and Densification Strategy, 2005

- **Densification must contribute to the overall structure and functionality of the metropolitan area**

RSDF 2012 : Densification

CONCENTRATION ZONES

- **<400 m walking distance: density 200 units/ha**

TRANSIT PROMOTION ZONES

- 400 m to 800 m walking distance: density **120** units/ha

LINEAR ZONES (CORRIDORS AND SPINES)

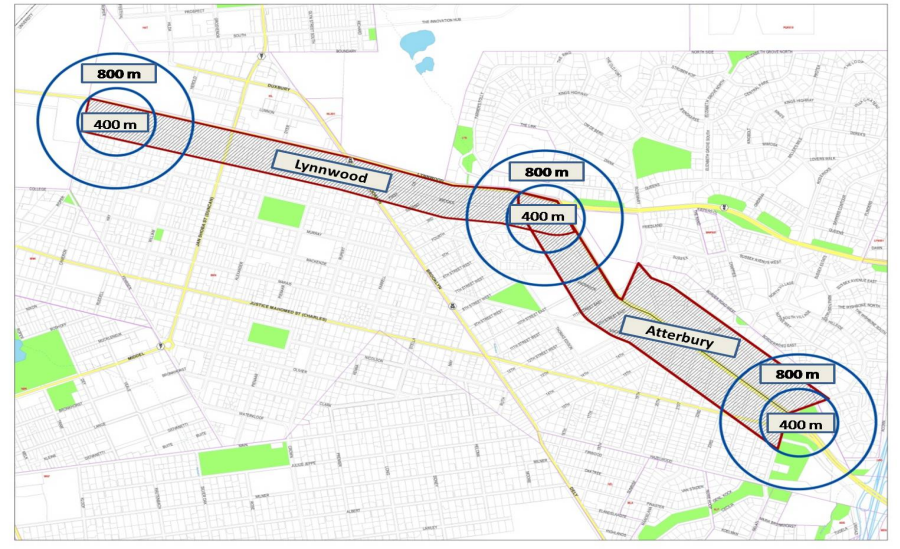
- **(<200 m walking : density in excess of 60 units/ ha)**

Key Message

- Densification
- Compaction
- Public Transport

- Meet your Neighbour

Atterbury & Lynnwood



Atterbury & Lynnwood : Units

	Area - ha	Corridor 60 u / ha	400 m distance 200 u / ha	800 m distance 120 u / ha	TOTAL
Atterbury – Lynnwood to Charles	55	3 300			
Lynnwood – Atterbury to Duncan	45	2 700			
BRT Stations – 400 m distance – 12,8 ha	38.48		7696		
BRT Stations – 800 m distance – 37,2 ha	111.60			13 392	
TOTAL	250	6 000	7696	13 392	27088

People

	Units	1 per unit	1,5 per unit	2 per unit	2,5 per unit	3,5 per unit
60 u / ha	6 000	6 000	9 000	12 000	15 000	21 000
120 u / ha	13 392	13 392	20 088	26 784	33 480	46 872
200 u / ha	7 696	7 696	11 544	15 392	19 240	26 936
TOTAL	27088	27088	40 632	54 176	67 720	94 808

Rainwater Run-off (litres)

	Area - ha	Coverage 30%	Coverage 40%	Coverage 50%	Coverage 60%
Total Area	250	75 ha	100 ha	125 ha	150 ha
1 mm rain		750 000	1000 000	1 250 000	1 500 000
10 mm rain		7 500 000	10 000 000	12 500 000	15 000 000
25 mm rain		18 750 000	25 000 000	31 250 000	37 500 000
50 mm rain		37 500 000	50 000 000	62 500 000	75 000 000
TOTAL – litres		64 500 000	86 000 000	107 500 000	129 000 000

Status Quo

- 433 residential erven
- @ 3.4 = 1472 residents

- Densify = ??

Hatfield – East of Duncan

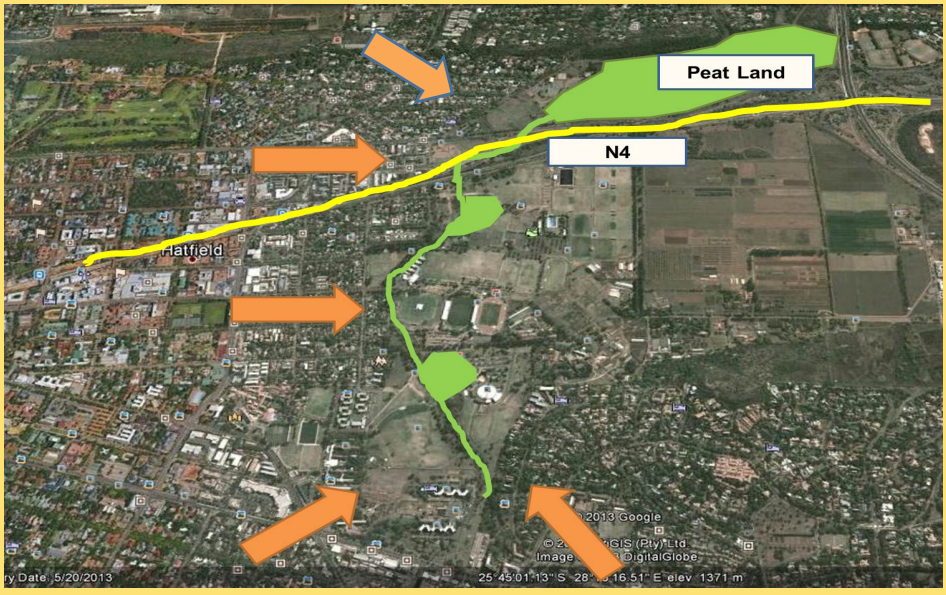
Hatfield : People & Units

	Area - ha	Units -		People (2 / unit)	
Residential	26	2 753		5 507	

Rainwater Run-off (litres)

	Area - ha	Coverage 30%	Coverage 40%	Coverage 50%	Coverage 60%
Total Area	26	7.8 ha	10.4 ha	13 ha	15.6 ha
1 mm rain		78 000	104 000	130 000	156 000
10 mm rain		780 000	1 040 000	1 300 000	1 560 000
25 mm rain		1 950 000	2 600 000	3 250 000	3 900 000
50 mm rain		3 900 000	5 200 000	6 500 000	7 800 000
TOTAL – litres		6 708 000	8 944 000	11 180 000	13 416 000

Atterbury / Lynnwood & Hatfield



Consequence

- Adding more hard surfaces – roofs, paving, road
- Concentrate water run-off towards an open space
- No thought on the long term impact of development on the ecosystem.

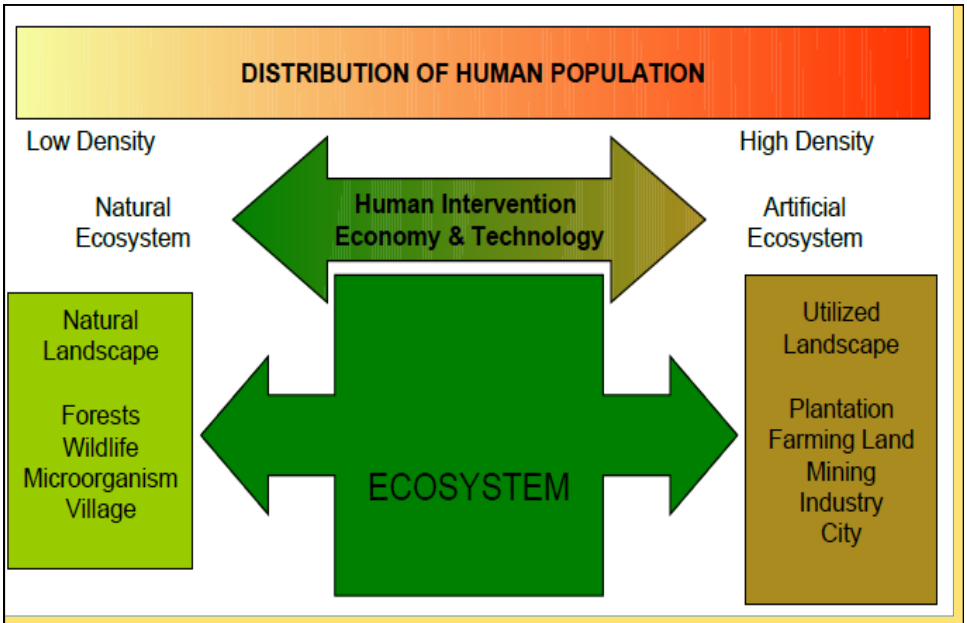
- **Need** to be a direct relationship between planning / development and ecosystems

More people = more consumption

Increase	Consequence
People At present 1 dwelling per 1000m² - will escalate to 6 and 20 units per 1000m²	Electricity Water Sewerage Household waste
Buildings	Temperature rise – heat island
Roofs	Temperature rise Rainwater runoff
Paved areas	Temperature rise Rainwater runoff
Open space	Recreation & Carbon Sequestration

Ecosystem-based adaptation

- Use of **biodiversity and ecosystem services** to adapt to the adverse effects of climate change.
- Approach of planning and implementing climate change adaptation considering ecosystem services and its uses for human well being.
- Plan and develop in harmony with **biodiversity and ecosystem** services.



Adopted from :HermeinRoosita M.M. and BaranoSiswaSulistywan. 2010. Ecosystem Based Spatial planning as a Guidance of Precautionary Approach to Maintain HCV areas. Case in Sumatra & Borneo.International Conference on Oil Palm and Environment 2010, Bali, INDONESIA

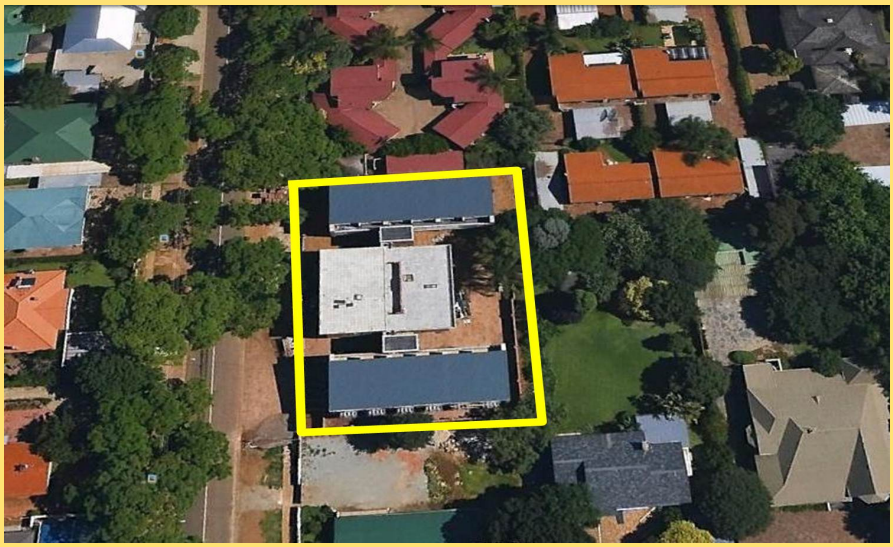
Business-as-usual approach

An example of the current land use conditions – maximum paving (requested by the conditions of approval)

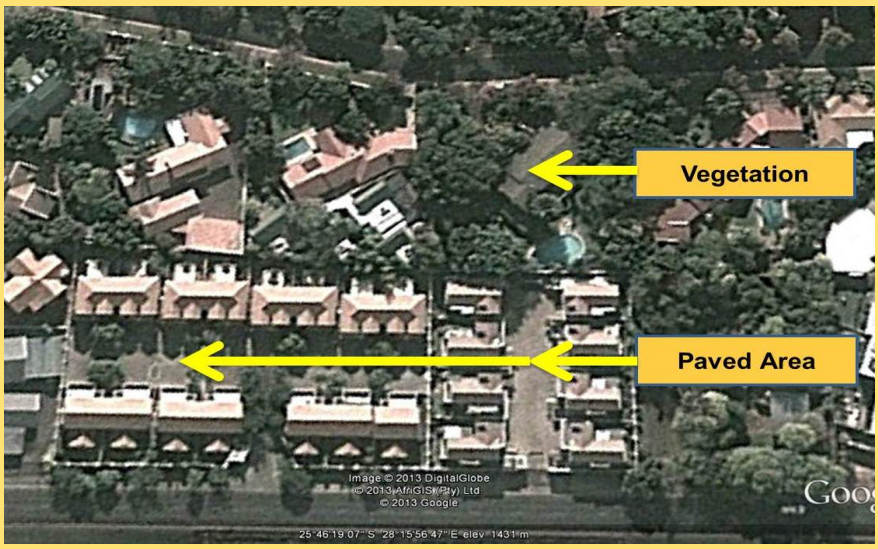
Consequence – generates heat & water run-off

Development along Park Street 135 u/ha – minimal open space

Farenden Street - 105 units



Atterbury Road - 40 u/ ha

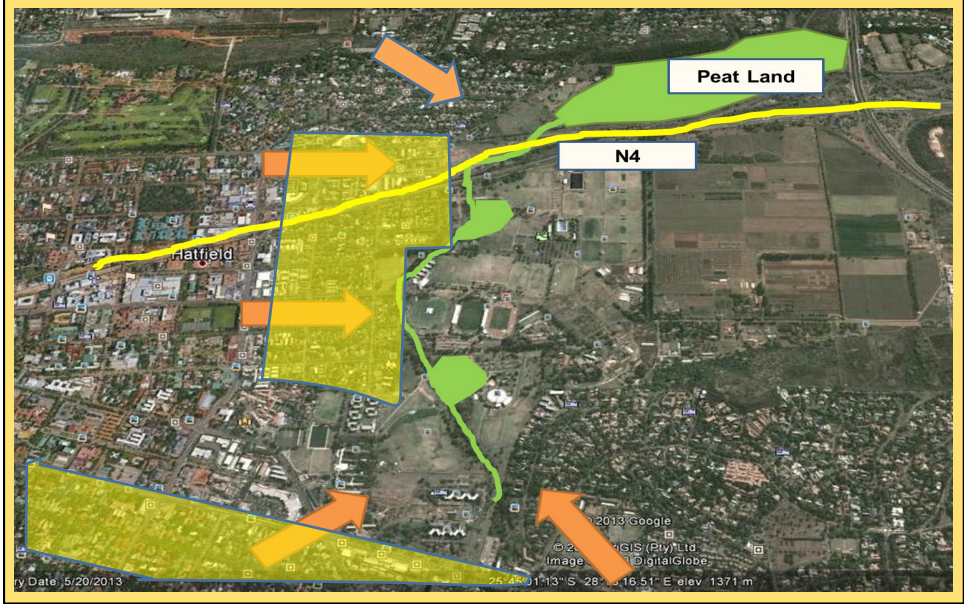


EBA Approach to BRT Route

- **Mandatory building and land use regulations**
  - Renewable energy = PV, Solar Geysers
  - Water harvesting = Gardens, Toilets
  - Waste recycling = separate at source
  - Pedestrian & Cycle routes
  - Housing Typologies = Elderly and Affordable
  - Open Space = Children, Carbon sequestration
  - Research by Jenny J. Roe and Catharine Ward Thompson, et al (2013) on green space and stress proved that there is **direct relationship** between open space and the reduced stress of residents.

- Research by Giles-Corti and Ryan Foster (2012) on increasing density in Australia.
- **Density** (and, more broadly, living conditions) may affect **child development**, mental health and physical health, restricting their physical activity, independent mobility and active play. The evidence indicates that **high-rise living** may be associated with **behavioural problems**

Atterbury / Lynnwood & Hatfield



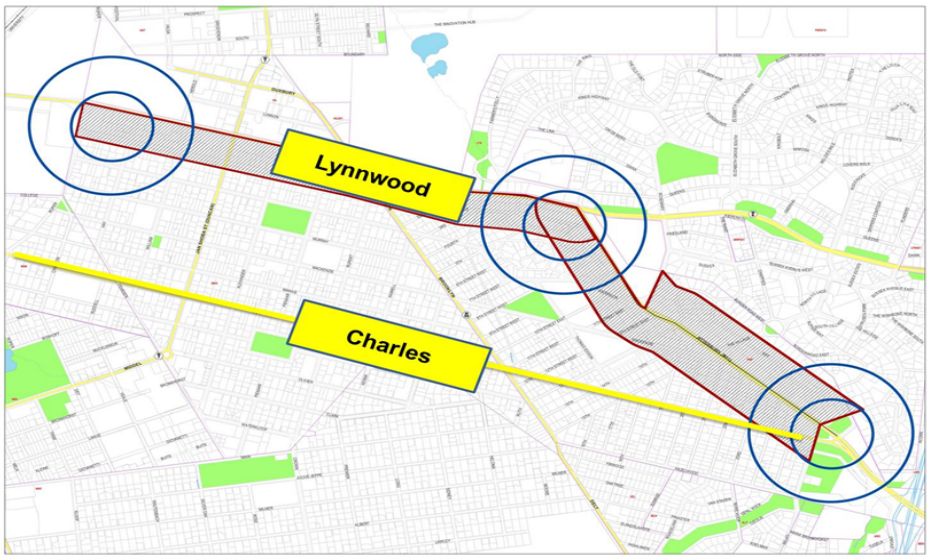
- A direct consequence of the rising population numbers and a reduction in water will be severe food shortages.
- Vancouver solution = “eat the city” – or an edible city programme.
- Vancouver a blueprint for an edible city.

- **Food strategy in a high-density urban environment**
- **edible landscaping,**
- **community vegetable gardens,**
- **green walls,**
- **rooftop greenhouses,**
- **green jobs based in a local food economy**

Urban food is the centrepiece of the green economy and the central element of community participation and community building when neighbours share knowledge over garden space community development relations and friendships are developed.

Urban food production in Vancouver contributes to urban revival - old buildings are converted into vertical farms where food is produced

An Alternative



Alternative

- Extend the area from Lynnwood to Charles
- Consolidate erven
- Minimum erf sizes – i.e. 5000m²
- Relationship of Open space, Building Height and Floor area
- Average Units / ha of 60
- Integrate WSUDS principles in development

Faerie Glen - 1990

Thank you