ANIMAL WASTE

HAZARDOUS WASTE

SOLID WASTE

HUMAN WASTE

Up-stream/down-stream recycling industries

Pyrolysis (High-temperature “Big Burn”)

Intense heat by-product

POWER GENERATION

Clean disposal of waste

Attracts industries needing heat

Attracts industries needing cooling

Gas by-product

Intense organic farming

Attracts industries

New local economic prospect

Transport of waste into the system and its components within the system

Terra-forming Developable land

Specialised Landfill

Residual Landfill

Ash as engineered fill

Bio-digester

Urine as a liquid 5:3:1 industry

‘MAN’ure as a Fertilizer industry

Clean disposal of waste

Attracts industries needing heat

Attracts industries needing cooling

Into grid

Off grid

Attracts industries

Attracts industries

Attracts industries needing gas

Attracts industries

New local economic prospect

New local economic prospect

New local economic prospect

New local economic prospect

New local economic prospect

New local economic prospect

New local economic prospect

New local economic prospect
It's a whole new economic base for the Outer West

THE WASTE PARK AT NTSHONGWENI

It's not just a catalyst for several new bits of local economic prospect...
sustainable development goals
Bleeding Edge (BE)
Existing Paradigms

Sustainability and Innovation (S&I)

Leading Edge (LE)
Best Practice (BP)

Mobility
Energy
Water
Sewer
Solid waste
Ecology
Green industries

Business as Usual (BAU)

SHADES OF GREEN

Graphical representation showing the progression from existing paradigms to sustainability and innovation with various sectors such as mobility, energy, water, sewer, solid waste, ecology, and green industries. The graph indicates a shift from business as usual to leading edge practices.
<table>
<thead>
<tr>
<th><strong>business as usual</strong></th>
<th><strong>sustainability &amp; innovation</strong></th>
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<tbody>
<tr>
<td><strong>mobility:</strong> traffic generated from the development of the balance of the urban core triggers a further upgrade of Kassier Road with additional lanes and the construction of the N3/Kassier Road interchange with a capital cost, in addition to the shopping centre requirements, of R144m, the completion of this additional infrastructure would be sales driven</td>
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<td>• the full development of the urban core triggers the following road upgrades:</td>
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<td>• further upgrade of Kassier Road R103 to N3, 2+2 lanes (R 80 million)</td>
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<td>• Kassier Rd / N3 interchange: bridge over the M13 4+3 lanes + bridge upgrade + access loop (R 64 million)</td>
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<td>• mostly unchanged, however the introduction of a sustainable public transport system and central parking structures would reduce the traffic demand both on the bulk (potential saving of R16m) and internal road networks respectively. The parking structures costs and revenue have not be included in the financial models, but would result in reduced up front capital expenditure and ultimately revenue for the development. This leads to:</td>
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<td>• reduced requirements for the upgrade of the bridge over the M13 4+3 lanes + bridge upgrade + access loop (R 48 million)</td>
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<tr>
<td><strong>energy:</strong> the total electrical demand of urban core is 38MVA, or 28MVA connected due to diversity factor. eThekwini Electricity presently have an additional 19MVA available from the Assagay substation, however this supply is under pressure due to the growth within the Hillcrest area. This supply can be secured by commencing the power application in June 2018, with a payment of R 102 million. Electricity will only be available to the site in February 2024.</td>
<td><strong>energy demand and consumption will be reduced through the use of best practice energy saving technologies, though not within the full control of THD, these initiatives ’can’ (and should) be implemented by individual property developers. At the urban scale, it will be done in the following ways:</strong></td>
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<td><strong>though not actually needed for the full urban core stage (triggered by the development of the Kassier Road North precinct), the full electrical demand for the complete development will have to be instructed at this stage, with an additional R 283 million to be paid for Eskom to provide the first phase (85MVA, with a further R 135.7 million to unlock the remainder of the 120MVA, substations, etc.) of supply however this will only be available in 2027/30. It is noted that the R 20 million paid to eThekwini Electricity for the 8MVA and the R 102 million to Eskom for the 19MVA supply will effectively be an abortive cost to the development</strong></td>
<td><strong>the expansion of the district cooling system further reduces the electricity requirements in the urban core from 28MVA to 24.5MVA (refer to table 2 for the costing)</strong></td>
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<td><strong>by utilising the electricity supply of 8MVA from eThekwini Electricity provided for the shopping center, and introducing alternative energy generating initiatives (refer to table 2 for the costing) such as:</strong></td>
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<td><strong>1MVA – landfill gas to energy, Enviroserv (target date 2022, R25million, pay back period 5 years)</strong></td>
<td><strong>6.7MVA – hazardous waste to energy, Enviroserv (target date 2024, R250million, pay back period 7 years)</strong></td>
</tr>
<tr>
<td><strong>domestic solid waste waste to energy will constitute the remaining electrical requirements, implemented on an incremental approach, with 8 modules of 5.5MVA planned over the next 16 years. All alternative energy technologies will create revenue for the development, with healthy a return on investment of between six (6) and seven (7) years. This allows for off-balance sheet financing potential</strong></td>
<td><strong>site-scale energy production, photovoltaic systems (PV) on individual buildings and further renewable energy production will be managed by a precinct-wide smart grid with data backbone rolled out throughout the precinct</strong></td>
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<td><strong>water:</strong> the water supply infrastructure installed for the shopping center, as described above, will be adequate to supply the water requirements for the balance of Urban Core</td>
<td>unchanged as the temporary supply for the shopping centre is sufficiently sized to service the full Urban Core precinct, however in order to create resilience within the development the principle of ‘sponge city’ has been reviewed and these costs have been included within the internal costs of the financial models under section 3. This allows for infiltration of stormwater run-off deep into the geology under the urban core for seasonal storage; abstraction; treatment to potable standard and supplied to end user. The sale of water will generate revenue to the development and is also dealt with under section 3, subject to the conclusion of a detailed geo-hydrological study</td>
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<td><strong>sewer:</strong> the sewer generated by the balance of the Urban Core, will conveyed to the Umhlatuzana Wastewater Treatment Works (UWWTW) via the constructed 750mm diameter trunk sewer as described above. The trunk sewer will only be available from January 2023.</td>
<td>by incrementally expanding the package wastewater treatment plant in 1MI/day modules, the plant will ultimately be sized to 3 MI/day to service the full urban core. Each module, at a cost of R10mil, contributes to the deferred Capex and this is highlighted under section 3.</td>
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<td>it should be noted that the ultimate proposal for sewer treatment for the full development is a modular, centralized works and to be constructed during the roll-out of future precincts (Kassier Road North) of the full development. This could include various energy producing technologies such as anaerobic digestion (AD) and uplift anaerobic sludge blanket (UASB). The package wastewater treatment plant could be relocated to the Assagay Precinct if required.</td>
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<td>urine diversion at source will allow for reduced treatment costs and urine would be collected, stored and re-used for the nursery.</td>
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<td>• <strong>ecology:</strong> typical water-wise but irrigated landscape installation</td>
<td>• creation of naturally shaded walkways within the landscape</td>
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<td>• introduction of bio-swale within the public realm landscape to infiltrate rainwater and attenuate stormwater</td>
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<td>• indigenous species and water-wise landscape requiring no irrigation system in place, manual irrigation required during establishment period</td>
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<tr>
<td></td>
<td>• use of landscape to actively shade and cool hard surfaces</td>
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<td></td>
<td>• use of indigenous species only to promote biodiversity and resilience</td>
</tr>
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</table>
business as usual

- energy: the total electrical demand of urban core is 38MVA, or 28MVA connected due to diversity factor. eThekwini Electricity presently have an additional 19MVA from the Assagay substation, however this supply is under pressure due to the growth within the Hillcrest area. This supply can be secured by commencing the power application in June 2018, with a payment of R 102 million. Electricity will only be available to February 2024.

- only available but needed 2020

- And then, going forward, just to get supply (let alone paying for consumption)

- Paid now

sustainability & innovation

- energy demand and consumption will be reduced through the use of best practice energy saving technologies, though not within the full control of THD, these initiatives ‘can’ (and should) be implemented by individual property developers. At the urban scale, it will be done in the following ways:

- the expansion of the district cooling system further reduces the electricity requirements in the urban core from 28MVA to 24.5MVA (refer to table 2 for the costing) For R 20 million

- by utilising the electricity supply of 8MVA from eThekwini Electricity provided for the shopping center, and introducing alternative energy generating initiatives (refer to table 2 for the costing) such as:

  - 1MVA – landfill gas to energy, Enviroserv (target date 2022, R25 million, pay back period 5 years)
  - 6.7MVA – hazardous waste to energy, Enviroserv (target date 2024, R250 million, pay back period 7 years)
  - domestic solid waste waste to energy will constitute the remaining electrical requirements, implemented on an incremental approach, with 8 modules of 5.5MVA planned over the next 16 years. All alternative energy technologies will create revenue for the development, with healthy a return on investment of between six (6) and seven (7) years. This allows for off-balance sheet financing potential

- site-scale energy production, photovoltaic systems (PV) on individual buildings and further renewable energy production will be managed by a precinct-wide smart grid with data backbone rolled out throughout the precinct
It is clear that old paradigms, which may well have been sensible at a point, have not only taken us as far as we can go - they're actually leading us up an urban cul-de-sac.

In particular, the old paradigms make it increasingly harder to find social and economic inclusion.
Possibly the greatest finding in searching out new paradigms is the clear indication that emphasis on ‘multi-disciplinary design’ is misdirected.

It has to be a matter of “inter-disciplinary design”
While this ambitious vision is unprecedented in Africa, it is totally within reach.

The real question is: why shouldn’t we?