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Integrated Water Management, Nyungar Cultural Associations and Regional Sustainability in Urban Developments

A Presentation for the International Conference of the Network of Regional Governments for Sustainable Development
Fremantle, Western Australia - 17-19 September 2003.
On 17th September 2003 by Dr Martin Anda, Research Manager, ETC

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where is the etc?
1.7 hectare operational research and teaching environment landscaped on permaculture principles
WALLYALUP BOORDJA

September 19, 2003

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over 40 environmentally sustainable technologies and examples of sustainable living
new buildings next to existing classroom funded by WA Centres of Excellence program
Nyungar smoking ceremony, welcome, opening and...
Naming theme: Nyungar bird names

New buildings:
Waalitj mia - main office and reception
Dilaboort mia - sampling laboratory
Wardung mia - analysis laboratory
Wiark mia - research offices (relocated transportable)

Existing buildings:
Yerderap mia - MUPETS site office
Djidi djidi mia - classroom
official announcement of UNEP-IETC Asia-Pacific Cooperation Centre by Director Dr Steve Halls and WA Premier Geoff Gallop
5th January 2002

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Environmental Technology for sustainable urban design:

• Water (Integrated Urban Water Management)
• Energy (Sustainable Energy Management)
• Food (Permaculture)
• Shelter/Materials (Sustainable Construction)

These must be integrated with each other and with community and cultural development to achieve sustainable development.

Each sector has its wastes which must integrated back into production systems so as to “close the loop” and achieve sustainable development.
Typical Urban Water Management: Unsustainable open loop systems

Source: UNEP
Integrated Water Management:

Two aspects of this approach are integration across:

**catchment** = *Integrated Water Resources Management*,

or

**urban area** = *Integrated Urban Water Management*. 
Integrated Urban Water Management: “Closing the loop” for sustainability

Source: UNEP
Integrated Urban Water Management:

- Regional scale
- Estate scale
- Cluster scale
- Unit lot scale
IUWM Perth Regional Scale Strategies

- Expression of wetlands and regional **groundwater** by Regional Greenway connected through urban developments via road reserves, POS, and remnant bushland;

- Expression of regional **wetlands** associations and Nyungar cultural heritage through POS themes and interpretive public art and information;

- **Groundwater** for Urban Greenway;

- Treated **wastewater** effluent for bush regeneration and urban forestry - subsurface irrigation.

Photo 1 source: Jeff Kenworthy
SBV IUWM Estate Scale Strategies

- Single residential and multi-residential generate greywater to central plant pumping to subsurface irrigation area in POS and house yards with winter surplus to constructed wetland or Ecomax then lake then infiltration basins in POS;
- Greywater irrigation by subsurface drip;
- Top up groundwater pumped to central greywater tank;
- Stormwater road drainage pipework supplemented by local infiltration soakwells, roadside vegetated swales and basins;
- Stormwater road runoff: majority to POS infiltration basins after lake top-up;
- Recharge protects groundwater quality.
Greywater collection network

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Greywater Distribution Network

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SBV IUWM Estate Scale Strategies

Greywater treatment components

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SBV IUWM Estate Scale Strategies

Household Unit Primary Strainer

Greywater treatment components

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IUWM Lot Scale Strategies

- Each residential home to be fitted with internal AAA minimum water efficient appliances for *scheme water*;
- Each single residential to be fitted with *rainwater* tank connected to toilet cistern and washing machine (communal in group dwelling sites);
- All yard irrigation by subsurface drip from central *greywater* and *groundwater* plant – sprinklers or spray only for hanging baskets, home nurseries;
- All *stormwater* runoff infiltrated on site;
- Houses protected from *groundwater* by pads 1.5m above Annual Average Maximum Groundwater Level.
Aquacycle for Water Balance

- **Aquacycle** is a daily urban water balance model;
- Developed by the CRC for Catchment Hydrology (2000);
- Permits analysis of scenarios involving:
  - climatic cycles
  - seasonal supply & demand analysis (shortfall/surplus)
  - import/export of site water
  - stormwater harvesting
  - wastewater re-use
  - aquifer storage and recovery
  - rainwater tanks
# IUWM Scenarios for 500 dwellings

<table>
<thead>
<tr>
<th>Scenario #</th>
<th>Water Sources</th>
<th>Water Savings (kL/day)</th>
<th>Additional Cost ($)</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scheme/scheme/bore/bore</td>
<td>100</td>
<td>40,000</td>
<td>Y</td>
</tr>
<tr>
<td>2</td>
<td>Scheme/bore/bore/bore</td>
<td>180</td>
<td>270,000</td>
<td>YY</td>
</tr>
<tr>
<td>3</td>
<td>Scheme/scheme/grey/bore</td>
<td>100</td>
<td>300,000</td>
<td>YYY</td>
</tr>
<tr>
<td>4</td>
<td>Scheme/scheme/grey/grey</td>
<td>100</td>
<td>340,000</td>
<td>YYY</td>
</tr>
<tr>
<td>5</td>
<td>Scheme/grey/grey/grey</td>
<td>180</td>
<td>610,000</td>
<td>YYYY</td>
</tr>
<tr>
<td>6</td>
<td>Scheme+rain/grey/grey/grey (bore backup)</td>
<td>180 summer 220 winter</td>
<td>650,000</td>
<td>YYYY</td>
</tr>
<tr>
<td>7</td>
<td>Scheme+rain/grey/black/grey (bore b/up) - region black</td>
<td>180 summer 220 winter</td>
<td>820,000</td>
<td>YYYYY</td>
</tr>
</tbody>
</table>

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IUWM Research

1. Consultations with **Nyungar community**;
2. Select trial site in Perth eg Ranford Road;
3. Water balance modelling;
4. Aquacycle modelling;
5. Apply different scenarios to each stage within the estate;
6. Apply different strategies at the unit lot, estate and regional scales in partnership **Nyungar community**;
7. Monitor the outputs;
8. Evaluate the outcomes;
9. Monitor over a 3-year PhD;
10. Evaluate over a subsequent PhD.