Sustainable Precincts, Sustainable Cities
Retooling our Infrastructure for a Sustainable Future

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Format of Presentation

• Sustainable Cities and Precincts drivers for change
• How cities are responding to these challenges
  – Carbon Reduction Strategies
  – Sustainable Water Strategies
  – Waste Reduction Strategies
• What are some of the barriers to adoption
• Sustainable precinct case study

Population Growth

Current world population is over 6.8 billion
It is projected by 2050 the world’s population will be 9.4 billion
By 2050 it is predicted 70% of the world’s population will live in urban areas; 40% will be children
Melbourne’s population is predicted to grow from 4 million to 5 million by 2030.

Climate Change – Impacts on Australia

• IPCC 2007 – Report on observed climate change over Australia – reduced rainfall, increase in temperature
• Greatest economic, social and environmental challenges
• Understanding the potential impacts and identifying ways to reduce them, organisations can reduce the economic and social costs to communities. Identify emerging opportunities.
• Plan for higher temperatures, less rain, sea level rise and extreme weather events
The challenge for our cities

Re-align the existing infrastructure of cities to produce a more

• Sustainable
• Liveable
• Economically viable future

Carbon Reduction Strategies for our Cities and Precincts

Demand Side reduction Strategies

The Sustainable Refurbishment of Existing Buildings

• New buildings constructed in the last 5 years have achieved 4, 4.5 and 5 Star NABERS rating.
• However 98% of the existing stock has a NABERS Energy rating of 2.5 Stars or less.
• Greening the built environment offers governments the lowest cost abatement opportunities available

Retrofitting Existing Buildings

Sydney and Melbourne programs

• The City of Sydney has called for tenders to retrofit at least 44 of its buildings as part of plans to cut its energy and water consumption by 20 per cent over the next two years – and ultimately by 75 per cent and 25 per cent respectively by 2030.
• The buildings targeted for a retrofit include Town Hall House, the Cook and Phillip and Ian Thorpe aquatic centres, Customs House and the Woolworths building, as well as depots, libraries, and community and child care centres.

If 1200 existing commercial buildings are retrofitted to improve energy performance by 38 per cent, the potential for greenhouse gas mitigation is 383,000 tonnes of CO2-e per annum. This substantial improvement in energy efficiency will benefit building owners, the industry and the wider community.
**Demand Side Reduction**

Energy Efficient Street Lighting

Campaigners are switched on to change Victoria’s lightbulbs

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**Carbon Reduction Strategies for Precincts**

Moving from Electricity produced from Brown coal

@ 1.34 kg CO2 per kW

Natural Gas @ 0.21 kg CO2 per kW

Renewable Energy from Solar, Wind and Biomass

@ 0 kg CO2 per kW

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**Distributed Generation**

Co-generation and Tri-generation

- Power generated locally using gas with the waste heat used to heat and cool buildings
- Increases fuel efficiency from 30% to 90%

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**District Heating and Cooling**

Building HVAC And DHW System connected to district heating and cooling distribution system

City of Sydney Plans to meet 70% of its power needs using Tri generation by 2030
Waste to Energy
anaerobic digestion plant

- Food Waste and Sewage Solids converted to Bio Gas (CH4 & CO2) in an anaerobic digester
- Biogas used to generate electricity using cogen plant
- Remaining digestate used as fertilizer

Renewable Energy
Photovoltaic panels

Building Integrated Photovoltaic panels
Alan Gilbert Building
Melbourne University
Approx 150 kWh/m² pa

Queens Vic Markets
Roof Mounted PV installation

Approx 200 kWh/m²

Renewable Energy
Solar Thermal

Parabolic troughs or evacuated tube Solar collectors
Can be used to heat hot water directly for DHW, Heating or absorption chillers or can be used to generate power using an Organic Rankin Cycle (ORC) Engine

Enabling Technologies
Smart Grids

Smart Grid
Gives real time feedback on energy and power requirements
Helps cogen and renewables to work together
Smart metering provides feedback on costs and usage
Smart appliances can be programmed to turn on and off depending on energy tariffs at different times of the day
Barriers to carbon reduction strategies for sustainable precincts

- Lack of a price for Carbon
- Regulatory Barriers
  – Connection to the Grid
  – Restrictions on generating and selling energy
- Who will own operate and maintain these local energy plants
- Scalability and financing issues

Sustainable Water Strategies for our Cities and Precincts

The Challenge for us

- Moderate to severe water restrictions
- Impacting on industry, residents, recreation and tourism
- Community is expecting more – using our water resources in a better way to meet our social, economic and environmental needs
- Rethink how we can better use our water resources

Melbourne Water

- Climate change will impact on yield from catchments
- Increase in temperature of up to 2° will result in 35% decrease in water supply – Melbourne Water
The Challenge for us

There is no single solution – it’s not a cookie cutter approach.

We are going to need to develop new strategies and solutions and these need to be evaluated against the triple bottom line (environmental, economic and social).

Innovation will need to be encouraged in order to develop our knowledge and understanding.

“Our present practices of supplying water to our cities will not be enough to meet the water needs in the future.”

Total Watermark – City as a Catchment Strategy

Key strategy is access to a diversity of water sources underpinned by a diversity of centralised and decentralised infrastructure.

Suite of Opportunities

End Use

Toilet, other indoor uses, garden,Non-potable

Wastewater

Greywater

Rainwater

Potable

Greywater

Stormwater

Energy

Materials

Green House

Gases

Social

Acceptance

Ecological

Footprint

Objectives

• Minimise potable water use
• Maximise harvesting and reuse of stormwater
• Maximise use of recycled water
• Minimise discharge to environment
• Protect and improve biodiversity

Outcome

• Lot, neighbourhood & estate scale
• Dependent on density, economic, environmental and social considerations, space available, and surrounding infrastructure.

Opportunities
**Potable Water Reduction Opportunities**

- Demand management – internal and external
- Water efficient appliances & fittings
- Rainwater & stormwater harvesting
- Lot scale – 2, 5 & 10KL, neighbourhood scale – 100KL & 200KL
- Aquifer storage and recovery, increasing groundwater availability
- Improved biodiversity

**Wastewater Opportunities**

Recycled water use – Toilet, Laundry and external
Low infiltration sewers

"Agriculture is addicted to mined phosphates and would be threatened by a peak in phosphate"

Wastewater separation at the source – urine and solid
Increased NPK to be recycled and used

**Community Education and Feedback**

Monitoring Water Use Targets – Household & Commercial Scale

Automated Meter Reading (AMR)

**Navigating The current system**
Possible Solution
Combined Water Cycle at Lot or Precinct scale

<table>
<thead>
<tr>
<th>Water Source</th>
<th>Potential Uses</th>
<th>Proposed Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycled Water</td>
<td>Toilet, garden, car washing (Laundry)</td>
<td>Hot water Toilet, garden, laundry</td>
</tr>
<tr>
<td>Rainwater</td>
<td>Kitchen, cold water to bathroom and Laundry</td>
<td>Potable water All uses</td>
</tr>
</tbody>
</table>

Potential Uses
- Reduce consumption
- Bulk purchase
- Local food supplies
- Local recycling
- Composting
- Shared resources
- Waste as a resource
- Waste to energy
Waste Hierarchy

Efficient handling and recovery of Waste and RECYCLABLES
- Bulking of Waste and Recycling for Transport efficiency
- Improve Resource Recovery
- Proximity Principle for Waste Infrastructure

Innovative Recycling & Waste Collection Systems
- Pneumatic Collection

Waste & Recyclables Collection
- Above and below ground collection solutions for urban precincts
Forum - Barcelona

Waste & Recyclables Collection

- Ports of Stockholm - Sweden
- Kuala Lumpur Airport - Malaysia
- Shenzhen Athletes Village, China, (August 2011 Universiades Games)
- Barcelona Airport - Spain
- Wembley Stadium and Residential – United Kingdom

Self Emptying Litter Bins – Stockholm Sweden

- Mariaberget district in Stockholm Sweden
- Vacuum System
- Self-emptying litter bins
  - No more overflowing litter bins
  - Cleansing staff free to undertake other duties
Organics Waste Treatment Systems
- Windrow Composting
- Small scale In-vessel Composting
- Home Composting
- Large Scale In-Vessel Composting
- Mechanical Biological Treatment Anaerobic Digestion

Sustainable Landfill – Bio Reactors
- Managing Waste Decomposition in a controlled manner to capture Landfill Gas for electricity generation

Sustainability Assessment tool and a Sustainable Precinct Case study

Outputs:
- Demand side measures/initiatives at precinct scale
- Supply side solutions at precinct level
- Costs: capital and running, precinct and household
- GHG per dwelling
- Basis for discussion with suppliers – a common language at last!
- Infrastructure planning

KPIs: reporting
- onsite energy
- embodied CO2
- greenhouse gases
- water
- potable water
- transport
- total affordability
- housing diversity
- vehicle hours travelled
- stormwater

PRECINX™: Landcom’s new neighbourhood sustainability assessment tool
Redevelopment of Coburg, Victoria, Australia

35 ha of Central Coburg
- Best practice sustainable buildings
- A precinct scale central energy plant
- Extensive use of renewable energy

The Coburg Initiative Concept Plan produced after extensive community engagement and design Charette

Redevelopment of Coburg

- Precinct scale rain water collection and reuse and WSUD
- Improving access to public transport and making Coburg bike and pedestrian friendly
- Designing places for people
- Precinct scale waste strategy

Summary

There is much that can and is being done to make our cities more sustainable and prepare for population growth and the effects of climate change. We need to think differently about the infrastructure that serves our cities, how it is designed, financed and operated, and to work toward overcoming the regulatory, financial and public perception barriers which are currently preventing the more widespread adoption of more sustainable infrastructure.

Thank you for your attention.