Benefits of improving urban green infrastructure in Melbourne’s West

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What is urban green infrastructure?

**Infrastructure:**
- The basic, underlying framework or features of a system

**Green infrastructure:**
- Vegetation systems, natural habitats, rivers and wetlands and the features that support them (e.g., soils and aquifers)
Road transport infrastructure, Melbourne

VicRoads
Green infrastructure of the west in Plan Melbourne
Benefits of green infrastructure

Three main areas of benefit: economic, environmental and social

Economists measure social benefits as improvements in social welfare, including:
• health and well-being
• environmental quality
• access to services
• community connectivity
• cultural richness and tolerance

We investigate how improvements in environmental quality at the local level benefit community health and well-being. Are they cost effective? How well might these local benefits scale up to the regional level?
Stony Creek Rehabilitation – Case study

• **Context:** Redevelopment of an ‘industrial’ site to housing. Stony Creek is currently cement lined, off limits and houses face away from it. The adjacent flood basin is grassed and open to the public.

• **Proposal:** Remove the cement lining, rehabilitate the creek and plant ~4,000 trees.

• **Opportunity:** Greening the West project

• **Investment:** Project costs of $6 – $10 million, ~$10,000 year maintenance costs
Stony Creek case study area
Stakeholder forums

• Research scoping workshop with water utility
  – Health benefits through increased physical activity levels and thermal comfort for visitors
  – High quality green space
• Community forum
  – a lack of recreation and playing areas
  – views of creek with flowing water and trees providing cool and a peaceful environment
### Socio-economic profile of the project beneficiaries

<table>
<thead>
<tr>
<th>Demographic Criteria</th>
<th>Case Study Area</th>
<th>Greater Melbourne</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (973 households)</td>
<td>2,837</td>
<td>3,999,950</td>
</tr>
<tr>
<td>% Low Income Households</td>
<td>27</td>
<td>8</td>
</tr>
<tr>
<td>% With No Formal Education</td>
<td>61</td>
<td>42</td>
</tr>
<tr>
<td>% Unemployed</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>% Born Overseas</td>
<td>44</td>
<td>23</td>
</tr>
<tr>
<td>% Not Fluent in English</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>% With Broadband Connectivity</td>
<td>59</td>
<td>70</td>
</tr>
<tr>
<td>% of Volunteerism</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>% Travel by Car</td>
<td>71</td>
<td>61</td>
</tr>
<tr>
<td>% In Need of Disability Assistance</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>
## Health profile of the project beneficiaries

<table>
<thead>
<tr>
<th>Health Indicators</th>
<th>Sunshine</th>
<th>Greater Melbourne</th>
<th>Victoria</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Physically Inactive</td>
<td>44.2</td>
<td>32.2</td>
<td>32.6</td>
</tr>
<tr>
<td>% Male Overweight</td>
<td>32.1</td>
<td>35.7</td>
<td>35.7</td>
</tr>
<tr>
<td>% Female Overweight</td>
<td>21.4</td>
<td>22.2</td>
<td>22.6</td>
</tr>
<tr>
<td>% Male Obese</td>
<td>16.7</td>
<td>17.0</td>
<td>18.0</td>
</tr>
<tr>
<td>% Female Obese</td>
<td>17.8</td>
<td>15.5</td>
<td>16.0</td>
</tr>
<tr>
<td>% Type 2 Diabetes</td>
<td>4.0</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>% High Cholesterol</td>
<td>5.7</td>
<td>5.3</td>
<td>5.4</td>
</tr>
<tr>
<td>% Fair or Poor Health Status</td>
<td>19.7</td>
<td>13.5</td>
<td>13.5</td>
</tr>
<tr>
<td>% Male with Mental problems</td>
<td>10.4</td>
<td>9.5</td>
<td>9.9</td>
</tr>
<tr>
<td>% Female with Mental problems</td>
<td>12.3</td>
<td>11.4</td>
<td>11.6</td>
</tr>
<tr>
<td>% at Health Risk*</td>
<td>65.4</td>
<td>52.7</td>
<td>53.6</td>
</tr>
</tbody>
</table>
500 m catchment analysis of open spaces

Source: E Daw / Sykes Humphreys Consulting (2008) Brimbank open space and playground policy and plan, p33
500 m catchment analysis of playgrounds

Source: E Daw / Sykes Humphreys Consulting (2008) Brimbank open space and playground policy and plan, p33
Social benefits gained from park visits

Conservative estimate

Visits increase by 13%

Marginal annual value $38 k – $190 k

Net present value $0.65 M – $4.2 M

Active estimate

Visits by 37% residents more than once a week

Marginal annual value $107 k – $432 k

Net present value $2.2 M – $9.8 M

• 37.6% of people in the Sunshine area visit a green space weekly or more often compared to the Victorian average of 50.7% (VicHealth Survey 2011)
• Population above 18 years of age in the study area 2,244 (37% = 830; 50% = 1,122)
• NPV: Social discount rate of 3.5% and project life of 50 years
Avoided health costs of physical inactivity

10% increase in physically active residents
Within 500m = $43,711 per year
Within 1km = $75,049 per year

- 65.4% of people in Sunshine suffer from at least one health risk: smoking, alcohol, physical inactivity, obesity (Social Health Atlas of Australia 2011)
- 44.2% of population in Sunshine physically inactive (Social Health Atlas of Australia 2011)
- Average annual cost per physically inactive person in Australia: $756.66 (Dedman 2011)
Potential increase in property values

Within 500 m radius of project park

• Private benefits $2.3 million to $18.2 million

• Increased council revenue $6,000 to $46,000 per year (2012–13 rate schedule)

• Federal government may receive capital gains tax of $1 million – $9 million
Other benefits

• Increased thermal comfort for visitors in summer
• Carbon sequestered – 22 tonnes per year
• Biodiversity and habitat benefits
• Flood reduction services
• Potential for linked bike/walking paths, whole-of-creek water quality strategy
Living Brooklyn assessment of welfare costs of air pollution

Almost 18,000 people assessed as being effected

Total social cost per annum of air pollution from the precinct is equivalent to: $40 million ranging from $30 million to $67 million.

While this dwarfs direct health costs and costs of maintenance, suppression and compliance, removing air pollution as part of an integrated urban water system strategy would deliver these costs as social benefits to be accrued over the long term.

Jones and Ooi (2014) Living Brooklyn: Baseline report on the economics of the urban water cycle in the Brooklyn Industrial Precinct, Victoria University
Attributes of green infrastructure

- Quality – how healthy and (bio)diverse is it?
- Connectivity – how well are different places linked?
- Permeability – how accessible are different parts of the urban form for nutrients, water, plants and animals?
- Structure – how physically diverse is it?
- Longevity – how sustainable is it over time?

Combined, these attributes describe the resilience of green infrastructure.
Climate is changing now, not some undefined date in the future

Days of extreme heat in Melbourne’s west are already at the level project for 2030 (Jones et al., 2013)
# Health and well-being profiles

## Active participation
- Biking, running, community events, family gatherings
  - High personal health, community connectivity and diversity

## Passive participation
- Low-energy exercise, community contact, contemplation, higher mental wellbeing
  - Increased community contact and mental wellbeing

## Inactivity
- Lack of open space, limited walking and exercise areas, driving culture
  - Lack of community connectedness, reduced welfare, lowered mental wellbeing

## Morbidity
- Low open spaces, many roads, low connectivity, limited walking paths
  - Disease, higher health costs, stress, loss of personal and community welfare

## Mortality
- High exposure to heat and cold, poor built infrastructure
  - Economic (productivity) loss, lowered community, welfare
# Urban green infrastructure profiles

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully connected</td>
<td>Mix of amenity, ecology and activity; integrated grey and green infrastructure.</td>
</tr>
<tr>
<td>- Cool cities, highly integrated built and green infrastructure, high biodiversity emerging in urban setting</td>
<td></td>
</tr>
<tr>
<td>Coverage &amp; diversity</td>
<td>High quality ‘people’ and ‘nature’ spaces, strong links between</td>
</tr>
<tr>
<td>- Open spaces within walking distance, high flora and fauna diversity in open spaces</td>
<td></td>
</tr>
<tr>
<td>Patchy quality</td>
<td>Some high-quality spaces; other areas mixed quality</td>
</tr>
<tr>
<td>- Drive-to high quality areas, mixed spaces within walking distance, degraded ecosystems with good spots</td>
<td></td>
</tr>
<tr>
<td>Poor quality</td>
<td>A few low-quality open areas, lack of facilities, weedscapes</td>
</tr>
<tr>
<td>- Quality open areas are few and drive-to, rest poor quality, weedy creeks and poor water quality</td>
<td></td>
</tr>
<tr>
<td>Weeds in pavement</td>
<td>Little open space, hard surfaces, weedy open spaces</td>
</tr>
<tr>
<td></td>
<td>- High heat island effect, no recreational space, few species, concrete drains</td>
</tr>
</tbody>
</table>
Links between urban green infrastructure and social welfare

- Active participation
- Passive participation
- Inactivity
- Morbidity
- Mortality

Increasing benefit

Avoided loss

High quality GI

Low quality GI

Fully connected

Coverage & diversity

Patchy quality

Poor quality

Weeds in pavement
Measuring social welfare benefits of GI: policy snakes and ladders

Snakes
• Dollar-equivalent values of social welfare are not seen as important as ‘real’ dollars
• Development of GI is responsibility of many players and benefits are highly diffuse
• People do not understand how funds are allocated to different purposes (GI funding and benefits not transparent)

Ladders
• Communities really do value these assets
• Communities with these assets do not look back with regret but communities who lose them often do
• Benefits accrue over long periods of time therefore can be substantial (and do feed back into the economy)
Conclusions

Two assessments suggest that the site-based benefits of urban green infrastructure can provide substantial returns in social welfare. These assessments do not include a wide range of added benefits from other ecosystem services. A full economic analysis could be used to contrast the benefits of investing in urban green infrastructure compared to other forms of infrastructure.
Thank you

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