Recovering the benefits of urban rivers

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Principal Scientist
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‘RIVER CORRIDORS IN THE URBAN ENVIRONMENT: DEVELOPING A VISION FOR THE FUTURE’
The Showroom Cinema, Sheffield
Defining features...
A largely forgotten urban stream...
Turning our backs...
The Westbourne River
Ecological analogies...

Population

Time

Resource limitation

Appropriation of new resources

Natural checks and balances

Self-limitation

Applies to...
- ‘Bugs in the laboratory’
- Wine manufacture
- Species in the wild (complex!)
- Human civilisations (and cities)
  - See Jared Diamond’s book *Collapse*
THE "SILENT HIGHWAY"-MAN
Hurricane Agnes’ floodwaters were within inches of overtopping Sunbury’s flood wall
(Photo courtesy SRBC archives)
The rise of ecosystems thinking

1960s...

1970s...

1980s...

2004/5

- Millennium Ecosystem Assessment

2009-2011

- NEA, NVP, NEF, NEWP, WWP
- Defra Action Plans (2007+10), Lawton Review
- Natural England pilots, National Trust projects
- TEEB, Nagoya

- An overnight success in 25-50 years!
‘What have rivers ever done for us?’

- Intuitive
- Linking people’s needs/economics benefits with ecosystems
- Making the ‘triple bottom line’ understandable and tractable
### The MA ecosystem services classification...

<table>
<thead>
<tr>
<th><strong>Provisioning services</strong></th>
<th><strong>Cultural services</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh water</td>
<td>Cultural heritage</td>
</tr>
<tr>
<td>Food (eg crops, fruit, fish, etc)</td>
<td>Recreation and tourism</td>
</tr>
<tr>
<td>Fibre and fuel (eg timber, wool, etc)</td>
<td>Aesthetic value</td>
</tr>
<tr>
<td>Genetic resources (used for crop/stock breeding and biotechnology)</td>
<td>Spiritual and religious value</td>
</tr>
<tr>
<td>Biochemicals, natural medicines, pharmaceuticals</td>
<td>Inspiration of art, folklore, architecture, etc</td>
</tr>
<tr>
<td>Ornamental resources (eg shells, flowers, etc)</td>
<td>Social relations (eg fishing, grazing, cropping communities)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Regulatory services</strong></th>
<th><strong>Supporting services</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air quality regulation</td>
<td>Soil formation</td>
</tr>
<tr>
<td>Climate regulation (local temp. /precipitation, GHG sequestration, etc)</td>
<td>Primary production</td>
</tr>
<tr>
<td>Water regulation (timing/scale of run-off, flooding, etc)</td>
<td>Nutrient cycling (water recirculation in landscape)</td>
</tr>
<tr>
<td>Natural hazard regulation (ie storm protection)</td>
<td>Water recycling</td>
</tr>
<tr>
<td>Pest regulation</td>
<td>Photosynthesis (production of atmospheric oxygen)</td>
</tr>
<tr>
<td>Disease regulation</td>
<td>Provision of habitat</td>
</tr>
<tr>
<td>Erosion regulation</td>
<td></td>
</tr>
<tr>
<td>Water purification and waste treatment</td>
<td></td>
</tr>
<tr>
<td>Pollination</td>
<td></td>
</tr>
</tbody>
</table>

**Addenda services:**
- Fire, salinity regulation
How do you address ecosystem services in the ‘real world’?

• Time/resources are tight
  - 8,000+ WFD water bodies!
• Established practices/interests
• How to demonstrate the value?
• How to ‘operationalise’?
• Key lessons to put into tools?

→ Applied case studies
Mayes Brook + Mayesbrook Park regeneration
Mayesbrook Project Phase 1 Landscape Masterplan

Reproduced with the permission of the London Borough of Barking and Dagenham
## Ex ante ecosystem services assessment

<table>
<thead>
<tr>
<th>MA ecosystem service category</th>
<th>Annual benefit assessed</th>
<th>Key elements of benefit (Additional options to improve sustainability)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisioning services</td>
<td>£0</td>
<td>No net provisioning service uplift for this urban river/parkland ecosystem restoration. <em>(Fibre and fuel value can be derived from beneficial uses of tree trimmings and cut grass.)</em></td>
</tr>
<tr>
<td>Regulatory services</td>
<td>£26,504</td>
<td>Substantial regulatory service benefits to public health and flood risk management, enhancing the wellbeing of the neighbourhood. <em>(Additional benefits could be achieved by improved hydrology of buildings and other infrastructure.)</em></td>
</tr>
<tr>
<td>Cultural services</td>
<td>£336,581</td>
<td>Significant benefits arise from recreation, social relations and educational opportunities for the dense adjacent population.</td>
</tr>
<tr>
<td>Supporting services</td>
<td>£30,573</td>
<td>Value derived from nutrient recycling and provision of habitat is significant.</td>
</tr>
<tr>
<td>Gross annual ecosystem services benefits</td>
<td>£393,658</td>
<td>PROVISIONAL FIGURES ONLY – NOT YET VERIFIED OR PUBLISHED!</td>
</tr>
</tbody>
</table>
Ecosystem services case studies

- TAMAR 2000 (catchment restoration)

- ALKBOROUGH FLATS (managed realignment)

- RIVER GLAVEN Sea Trout Restoration Project

- Upper BRISTOL AVON Buffer Zone (just 330 metres)

- The MAYES BROOK RESTORATION in Mayesbrook Park, East London
  - Environment Agency report (in press) ➔ !!!

- Options appraisal for WAREHAM HARBOUR coastal defence scheme
  - EFTEC study (see Defra 2007 An introductory guide to valuing ecosystem services)

- FIVE CASE STUDIES IN EAST OF ENGLAND: Valuing Ecosystem Services in the East of England

- The proposed PANCHESHWAR DAM, India/Nepal
Anglian Waterway economic study  
(Halcrow for the EA)

Economic Evaluation (quantitative and qualitative) of the River Great Ouse, River Nene and River Ancholme

- WATER BASED RECREATION
  - Formal
  - Informal
- BUSINESS ACTIVITY
- PROPERTY PREMIUMS

For the Great Ouse:
- Water-based recreation generates £39 million p.a.
- An average of £250,000 per mile p.a.

- Informal uses (walking, cycling, bird watching, etc.)
  - 750,000 visitors p.a. worth £4.1 million

- An average of approx. £26,000 per mile p.a.
- Jobs and property uplifts
Lessons for applying ecosystem services in practice

1. System-level consideration may lead to different outcomes
   • Very different insights about ‘winners/losers’ in development/restoration

2. Ecosystem restoration maximises value across all ecosystem services

3. Recognition of all stakeholders in decision-making

4. Communicate/engage in socially meaningful terms

5. Local schemes in catchment context can contribute to sustainability

6. Markets have a key role to play
   • Connecting ‘providers’ with ‘users’, often not considered as beneficiaries

7. Mainstreaming systemic perspectives into pragmatic tools

Protecting and restoring ecosystems delivers tangible societal value…
…failing to do so forecloses societal options for the future…
…but this only has ‘teeth’ if it changes Treasury rules!
eThekwini Catchments: A Strategic Tool for Management

- City of Durban, Kwa-ZuluNatal
- Over-use of river corridors likely to limit development
- Potentially limiting ecosystem services:
  - air quality
  - water quality
  - water quantity
  - flood risk
  - sedimentation/erosion
  - loss of biodiversity
  - agricultural production
  - recreational/cultural/educational uses
- Red/orange/green ‘traffic lights’ for each tributary
- Graphic, intuitive, transparent planning tool
- Used routinely since 2002
- Sets a context against which developers can innovate
eThekwini Catchments
A Strategic Tool for Planning

Nicci Diederichs, Tony Markewicz, Myles Mander, Anton Martens & Steven Zama Ngubane
ETHEKWINI CATCHMENTS
STATUS QUO REPORT:
JUNE 2002

Tongati
Umdloti
Ohlange
Mgeni
Durban Bay
Umbilo
Umhlatuzana
Umlaas
Mbokodweni / Isipingo
Amanzimtoti
Little Amanzimtoti
Lovu
Umzimbazi
Umgababa
Ngane
Mkhomazi
Mahlongwana
Mahlongwa
**Status Quo Statement: Tongari River Catchment**

The Tongari River catchment is primarily agricultural with little remaining environmental resource asset. Levels of servicing are moderate and confined to the small urban centres in the catchment. The coastal asset is in good condition and is regionally important as a recreational, cultural & aesthetic asset.

**Negative environmental aspects of the catchment include:**
- Diminished river flow and poor water quality in the river and estuary.
- Sandy soils with high erosion risk. Turbulent water and high rates of sedimentation in the estuary.
- Limited access to, capacity & diversity of recreational assets.

**Positive environmental aspects of the catchment are:**
- Wood air quality, although occasionally affected by smoke from cane burning & wood fires.
- Limited flood risk.
- Active agricultural production.
- High quality coastal zone.

**Summary of Conditions**

- **Water Quality:** Poor
- **Loss of Biodiversity:** High
- **Water Quantity:** Moderate
- **Sedimentation & Erosion:** Moderate
- **Recreation, Culture, Education Use:** Moderate
- **Fishing Risk:** Low
- **Air Quality:** Good
- **Agricultural Production:** Good

**Catchment Size and Description**

- Tongari River Catchment: 42,380 ha

**Land Use and Population**

- Urban: 1%
- Industrial: 1%
- Agricultural: 89%

**Service Levels**

- Electric: 100%
- Waste: 100%
- Water: 100%
- Solid Waste: 100%

**Environmental Service Assets**

- Open space (2.5% of catchment)
- Water bodies (0.5% of catchment)

**Environmental Services**

- Floodplain, wetland & peatland restoration & enhancement
- Coastal & estuarine enhancement & enhancement
- Agricultural & land use management
- Biodiversity conservation & enhancement
- Water quality enhancement
- Coastal & estuarine enhancement

**Environment Agency**

Tongari River Catchment
<table>
<thead>
<tr>
<th>Theme</th>
<th>Status Quo Indicators</th>
<th>Pressure</th>
<th>Condition</th>
<th>Driver(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air quality</strong></td>
<td></td>
<td>Poor</td>
<td>Visual money indicates no real air quality problem.</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good</td>
<td>No breathing in my quality because no air quality monitoring system.</td>
<td>None</td>
</tr>
<tr>
<td><strong>Water quality</strong></td>
<td>Poor</td>
<td>High</td>
<td>High</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>None</td>
</tr>
<tr>
<td><strong>Pollution</strong></td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>None</td>
</tr>
<tr>
<td><strong>Riparian Area</strong></td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>None</td>
</tr>
<tr>
<td><strong>Soil quality</strong></td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>Moderate</td>
<td>Moderate</td>
<td>None</td>
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**Tongati River Catchment**

Environment Agency
Putting the rules in the tools…

- There is a need for new tools…
  - Durban/eThekwini
  - Modelling service flows
  - Interactive decision-making

- But we can re-contextualise the old…
  - EIA, SEA, Flood Defence
  - River Basin Planning for WFD
  - Environmental Stewardship/CAP
  - Screening of planning applications

Photo © Ed Shaw
Economic and social progress, ecosystem capacity and urban rivers

• Support or limitation?
  - Durban/eThekwini
  - Mayesbrook Park
  - Quaggy (Lewisham)
  - Cheong Gye Cheon (Seoul)
  - The River Don

• The choice
  - “Big Yellow Taxi”
  - ...or proactive planning?
Selected further reading..


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