Synthesising Qualitative and Quantitative Information: Support for Ecosystem over Land Use Approaches to Ecosystem Services Assessments

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Supported by:
The Study Area

Legend
- Ecosystem Services Study Area
- SEQ Catchments Region
The South East Queensland (SEQ) Ecosystem Services Project

Aim:

- To identify, measure and value the ecosystem services provided by SEQ;

the SEQ Ecosystem Services Framework

- To provide the tools for a consistent approach to assessing ecosystem services and incorporating ecosystem services into decision making and natural resource management (theory to practice - mainstreaming).
DRO 4: Natural Resources

Principle

4.3 Protect, maintain and enhance the capacity of the region’s ecosystems to supply ecosystem services.

Policy

4.3.1 Protect areas supplying high levels of ecosystem services from development impacts
Guiding Principle 2
Natural resources supply a range of goods and services. These goods and services are known as ecosystem services and the planning and management of these services is essential for the region’s long term economic, social, cultural and environmental sustainability and community well being.
Three main elements:

1/ Descriptions and definitions of four main components: Ecosystem Reporting Categories (ERCs), Ecosystem Functions, Ecosystem Services and Human Well-being;

2/ A qualitative description of the relationships between these components in the form of matrices (expert local knowledge); and

3/ A series of maps identifying spatially where ecosystem services are being derived from in SEQ.
<table>
<thead>
<tr>
<th>Ecosystem Reporting Category</th>
<th>Ecosystem Function</th>
<th>Ecosystem Service</th>
<th>Constituents of Well-being</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Ocean</td>
<td>1. Gas Regulation</td>
<td>Food</td>
<td>Breathing</td>
</tr>
<tr>
<td>Open Water - Pelagic</td>
<td>2. Climate Regulation</td>
<td>Water for Consumption</td>
<td>Drinking</td>
</tr>
<tr>
<td>Open Water - Benthic</td>
<td>3. Disturbance Regulation</td>
<td>Building and Fibre</td>
<td>Nutrition</td>
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<tr>
<td>Coral Reefs</td>
<td>4. Water Regulation</td>
<td>Fuel</td>
<td>Shelter</td>
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<tr>
<td>Seagrass</td>
<td>5. Soil Retention</td>
<td>Genetic Resources</td>
<td>Mental health</td>
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<td>Rocky Shores</td>
<td>6. Nutrient Regulation</td>
<td>Biochemicals, medicines and pharmaceuticals</td>
<td>Physical Health</td>
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<td>Beaches</td>
<td>7. Waste Treatment and Assimilation</td>
<td>Ornamental Resources</td>
<td>Secure and Continuous Supply of Services</td>
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<tr>
<td>Dunes</td>
<td>8. Pollination</td>
<td>Transport Infrastructure</td>
<td>Secure Access to Services</td>
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<tr>
<td>Coastal Zone Wetlands</td>
<td>9. Biological Control</td>
<td>Air Quality</td>
<td>Security of Person</td>
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<tr>
<td>Palustrine Wetlands</td>
<td>10. Barrier Effect of Vegetation</td>
<td>Habitable Climate</td>
<td>Security of Health</td>
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<tr>
<td>Lacustrine Wetlands</td>
<td>11. Supporting Habitats</td>
<td>Water Quality</td>
<td>Security of Property</td>
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<td>Riverine Wetlands</td>
<td>12. Soil Formation</td>
<td>Arable Land</td>
<td>Family Cohesion</td>
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<td>Rainforests</td>
<td>13. Food</td>
<td>Buffering Against Extremes</td>
<td>Community and Social Cohesion</td>
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<td>Native Plantations</td>
<td>15. Water Supply</td>
<td>Reduce Pests and Diseases</td>
<td>Self - Actualisation</td>
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<td>Regrowth</td>
<td>17. Provision of Shade and Shelter</td>
<td>Noise Abatement</td>
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<tr>
<td>Native and Improved Grasslands</td>
<td>18. Pharmacological Resources</td>
<td>Iconic Species</td>
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<tr>
<td>Shrublands/ Woodlands</td>
<td>19. Landscape Opportunity</td>
<td>Cultural Diversity</td>
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<td>Moreton Island</td>
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<td>Bribie Island</td>
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<tr>
<td>North Stradbroke Island</td>
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<tr>
<td>South Stradbroke and other Bay Islands</td>
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<tr>
<td>Montane</td>
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<tr>
<td>Sugar Cane</td>
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<tr>
<td>Horticulture - small crops</td>
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<tr>
<td>Horticulture - tree crops</td>
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<td></td>
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<tr>
<td>Other Irrigated Crops</td>
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<tr>
<td>Dams</td>
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<td>Hard Surfaces</td>
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<td>Parks and Gardens</td>
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<td>Residential Gardens</td>
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</tbody>
</table>
SEQ ECOSYSTEM SERVICES FRAMEWORK

0 = no relationship
1 = very weak performance
2 = weak performance
3 = strong performance
4 = very strong performance
5 = most important

2/ A qualitative description of the relationships between these components in the form of matrices
Ecosystem Reporting Category Maps

3/ A series of maps identifying spatially where ecosystem services are being derived from in SEQ
Process and Key Components

- Geographic Location
- Ecosystem Reporting Categories
- Ecosystem Functions
- Ecosystem Services
- Constituents of Well-being (Ecosystem Service Benefits)
- Value or Relative Importance of Benefits

Mapping Procedures
- Biophysical Working Group
- Benefits Working Group
- Sub-regional Community Workshops
Aim: Synthesise Qualitative and Quantitative Information

3 Analyses

1/ Presence/Absence?
   Do ERCs present for an EF overlap with that EF map?

2/ Data overlays = high function?
   Do more data layers mean more function?

3/ Relative Magnitude of Scores?
   Is the relative magnitude of the scores represented spatially?
Methodology

Analysis 1: Presence/Absence
- Reclassified ERC scores - 0 = absence: 1,2,3,4,5 = presence
- Reclassified EF maps to presence/absence i.e. 1 data layer = present
- Overlayed and calculated % of each ERC covered by each of the EFs according to the maps

Analysis 2: Multiple Layers
- Quartiled EF maps – accepted top 2 quartiles
- Extracted the ERC map with the new quartiled EF map i.e. the top 2
- Calculated % total SEQ region covered by each quartiled EF map – the benchmark %
- Calculated the % high quartile area covered by each ERC with a high score – the observed 1 %
- Calculated the difference between observed1 % – benchmark %
- Calculated the %difference in terms of the benchmark

Analysis 3: Panel Scores
- Calculated % total SEQ region covered by each quartiled EF map – the benchmark %
- Calculated the % ERC covering the area of high EF quartile – observed2 %
- Calculated the difference between observed2 % – benchmark %
- Calculated the %difference in terms of the benchmark
Riverine Wetlands: EF 3 Disturbance Regulation

Areas where no Disturbance Regulation occurs in this ERC
83% of relationships showed consistency!

- **99% of Natural Terrestrial ERCs** (9 – islands disaggregated)
  Differences: - *Locational factors*

- **75% of Human-Modified ERCs** (10)
  Differences: - *Mapped mostly by land use*
  - *Human management activities*

- **77% of Coastal / Marine ERCs** (9)
  Differences: - *Comparatively fewer data sets*
  - *Vertical ERC overlap*
Results: Analysis 2 – Multiple Layers

High overlap = Strong EF provision
(many “pathways” for delivering function)

BUT...

Low overlap ≠ Weak EF provision
(fewer “pathways” but may still be significant)
Results: Analysis 3 – Panel Scores

<table>
<thead>
<tr>
<th>EP Score</th>
<th>Linear Relationship</th>
<th>Observed relationship (Scaled percentages)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>80%</td>
<td>83%</td>
</tr>
<tr>
<td>3</td>
<td>60%</td>
<td>54%</td>
</tr>
<tr>
<td>2</td>
<td>40%</td>
<td>44%</td>
</tr>
<tr>
<td>1</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td>0</td>
<td>0%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Key Findings

- Confidence/uncertainty
- Land use vs ecosystem approaches
e.g. inherit history
- High data layers does equate to high magnitude of function
e.g. reducing complexity for developing policy making (map)
- Relative magnitude scores represent a linear increase
- Definitional issues e.g. dunes and soil retention
- Limited marine and coastal information
- Flows –temporal/geographic scales
Current Use of Framework

- Statutory regional planning document
- NRM Plan - targets
- Local Govt Planning Schemes and Community Plans
- State of Region/State of Environment
- Offsetting Policy/Compensatory Mitigation
- Climate change mitigation sites
- Business sustainability
- Nature Conservation and Water Resource Strategies
Website - Reports 2011