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Socioeconomic Systems and Reef Resilience

Project 10.2

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Our conceptualisation ... and focus

Economic and environmental systems interrelated ...

- People’s decisions about whether to move to (or stay in) the north
- Broader economy + development priorities and choices
- Values and priorities of residents
- Environment
- Values and priorities of visitors

People’s decisions about whether to visit the north
What did we hope to learn and why?

- The influence of socioeconomic variables (e.g. price, cattle numbers) on water quality/sediment
  
  **Tells us about what the economy does to the GBRWHA**  
  (also provides an indication of whether market based policies are likely to achieve environmental goals)

- The relative ‘value’ (benefit) of the goods and services provided by the Great Barrier Reef World Heritage Area (GBRWHA) to residents and visitors
  
  **Tells us about what the GBRWHA does to/for the economy**  
  (also provides indication of likely environment/economy trade-offs)

- Plus some ‘geeky’ science exploring new ways of estimating the ‘value’ of non market goods and services

- A continuation of the long-term monitoring of tourists as they leave Cairns airport  
  (which Bruce Prideaux has been undertaking since 2007)
  
  **Gives an indication of trends over time**  
  (program also provides opportunity for investigation of ‘pressing’ issues for industry)
Overview of Project data

Annual sediment loads, rainfall, extreme events, cattle numbers, price and wage data from 1938 +

2012 Survey of 1592 residents living adjacent to the GBR

2012/13 Survey of 2743 visitors to the GBR catchment area

2007 – 2014 8050 visitor exit surveys from Cairns airport
Overview of project outputs

- 7 published journal articles
  (with 1 more just accepted ‘subject to minor changes’; 4 more under review and 2 almost ready for submission)

- 1 book chapter

- 2 conference papers

- 1 ‘interim’ report (summarising methods, questionnaires and data collected)

- Numerous factsheets

- (Summarised) data available on e-atlas

- Numerous ‘maps’ (summarising variables by postcode) available on e-atlas

- Final report almost complete
What did we hope to learn and why?

- The influence of socioeconomic variables (e.g. price, cattle numbers) on water quality/sediment

Tells us about what the economy does to the GBRWHA
(also provides an indication of whether market based policies are likely to achieve environmental goals)

Annual sediment loads, rainfall, extreme events, cattle numbers, price and wage data from 1938 +
Insights and implications

1. Extreme events and rainfall are the most significant determinants of sediment loads but cattle prices, gold prices, and wages also matter (with lags).

2. Prices and wages (i.e., economic factors) matter more today than in the mid-1900s.

Policy implications

- Prices matter, so keep an eye on them!
  - Increased cattle prices could put pressure on sediment loads
- Possible policy lever
  - Market-based policies could reduce pressure on sediment loads
    (but don’t know if more/less effective than other strategies)
What did we hope to learn and why?

- A continuation of the long-term monitoring of tourists as they leave Cairns airport (which Bruce Prideaux has been undertaking since 2007)

Gives an indication of trends over time
(program also provides opportunity for investigation of ‘pressing’ issues for industry)
KEY TRENDS FROM LONG-TERM MONITORING AT CAIRNS AIRPORT

- Changing origins

- Changing motivators
What did we hope to learn and why?

- The relative ‘value’ (benefit) of the goods and services provided by the Great Barrier Reef World Heritage Area (GBRWHA) to residents and visitors.

  Tells us about what the GBRWHA does to/for the economy
  (also provides indication of likely environment/economy trade-offs)

- Plus some ‘geeky’ science exploring new ways of estimating the ‘value’ of non market goods and services.

2012 Survey of 1592 residents living adjacent to the GBR

2012/13 Survey of 2743 visitors to the GBR catchment area
Key sections of the resident survey (co-developed with stakeholders)

• Background demographics, activities in the GBRWHA
• Importance of and satisfaction with 18 different goods and services (randomised order)
• Satisfaction with life overall
• Impact of 8 different hypothetical “changes” to different goods and services on overall quality of life:
• WTP (a) for improvements in water quality; (b) to protect top predators; (c) to reduce risk of shipping accidents, plus questions to help contextualise:

Tourism survey similar; included extra questions to assess expenditure and ‘consumer surplus’
Key findings - residents

- Residents feel that environmental ‘values’ are more important to overall quality of life than the jobs and incomes from a range of different industries.
- General finding confirmed with other methods ....
Key findings - residents

- Many (GBR) ecosystem services ‘inseparable’
- Collective value of ecosystem services provided by the GBRWHA at least $16b probably in excess of $20b per annum

Overall quality of life

Primary benefits
- Coral reefs, reef fish, iconic habitats, mangroves; clear ocean water, no rubbish, existence/bequest

Undeveloped

Recreation
- Eating seafood, boating, fishing, beaches

Indigenous culture

Reef tourism

Mining and agriculture

Commercial fishing

Shipping

Bragging rights

“valued” at >= $4b per annum, each
Insights and implications

- The environment very important to residents of the GBR catchment; not just for income/livelihoods (minor) but for lifestyle (moderate) and simply ‘for being’ (major)

The ‘average’ resident is likely to prefer developments that do not substantially degrade the ecosystem services provided by the GBRWHA.
Key findings - residents

- Residents react more negatively to prospect of environmental degradation than to higher prices.

![Bar chart showing residents' reactions to various environmental changes and economic impacts. The bars represent the percent of respondents for each scenario.]

- Twice as many tourists
- Half as much chance of catching fish
- Local prices rise by 20% compared to baseline
- Half as many fish and less variety of species
- Half as much live coral
- Ocean changed from clear to murky
- Twice as much rubbish on the beach
- Twice as many oil spills, groundings

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Percent of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twice as many tourists</td>
<td>100%</td>
</tr>
<tr>
<td>Half as much chance of catching fish</td>
<td>80%</td>
</tr>
<tr>
<td>Local prices rise by 20% compared to baseline</td>
<td>60%</td>
</tr>
<tr>
<td>Half as many fish and less variety of species</td>
<td>40%</td>
</tr>
<tr>
<td>Half as much live coral</td>
<td>20%</td>
</tr>
<tr>
<td>Ocean changed from clear to murky</td>
<td>0%</td>
</tr>
<tr>
<td>Twice as much rubbish on the beach</td>
<td>0%</td>
</tr>
<tr>
<td>Twice as many oil spills, groundings</td>
<td>0%</td>
</tr>
</tbody>
</table>

Key findings - residents react more negatively to prospect of environmental degradation than to higher prices.
Key findings - residents

- People living in different places, have different ‘values’
- And feel differently about life in general
Key findings - residents

- The contribution which environmental ‘values’ make to overall quality of life varies spatially

Preserving the GBRWHA relatively more important contributor to quality of life for residents

Income relatively more important contributor to quality of life for residents
Insights and implications

‘Values’ of current residents of the catchment, likely to differ from those of people elsewhere.

Decisions and changes occurring today, will impact the ‘values’ of tomorrow’s residents; this will impact the decisions made tomorrow.

People’s decisions about whether to move to (or stay in) the north

Values and priorities of residents

Environment

Values and priorities of visitors

Northern development priorities and choices
‘Simulated’ finding - residents

- Households dependent upon different industries for their income have different ‘values’. So change in economic structure => change in ‘values’

![Bar chart showing current distribution of values](chart.png)

- Current distribution of 'values':
  - Non-Use
  - Recreation/Lifestyle
  - Industry
  - Indigenous
  - Bragging

- If proportion of households dependent upon tourism increases by 10 percentage points
- If proportion of households dependent upon mining and manufacturing increases by 10 percentage points
Key findings - Tourists

- Tourism contributes more than $4b to regional economy (Deloitte Access Economics, 2013)
- Tourists spend most money on accommodation and food
- Business visitors spend less than others (mainly because they don’t stay as long)

![Bar chart showing mean expenditure per person per trip ($AUD) for business and non-business visitors.]

- Accommodation
- Cafés and restaurants
- Groceries
- Ferries and boat trips*
- Fuel
- Car hire
- Other attractions*
- Fishing charters
- Souvenirs

- Business visitors (Total expenditure = $1290)
- Non-business visitors (Total expenditure = $1758)
Key findings - tourists

- Tourists feel that environmental factors are more important regional ‘draw-cards’ than a range of other factors.
- Importance of the environment confirmed with other methods ....
Key findings - Tourists

Changes to the environment likely to influence choices about whether to return

**Satisfied tourists more likely to return**

**Amongst other things, satisfaction depends on:**

- Rainfall: negative
- Water Turbidity: negative

Could potentially ‘lose’ up to $400k per annum in tourist revenues (across entire GBR catchment) if a 10% increase in turbidity

**Satisfaction also depends on**

Temperature
Insights and implications

• (Perceptions of) environmental quality affects tourist satisfaction and decisions to visit, or return

People’s decisions about whether to move to (or stay in) the north

Values and priorities of residents

Environment

Values and priorities of visitors

People’s decisions about whether to visit the north

Northern development priorities and choices

‘Development’ impacts tourism directly, and indirectly, through the environment
Key findings - Tourists

- Like residents, visitors in different regions ‘value’ the environment and are likely to respond to changes in the environment in different ways.

- Reduced number of fish for catching relatively more concerning for tourists further south.

- Environmental degradation relatively more concerning for tourists in the north.
Key findings - Tourists

- Moreover, different types of visitors (even within the same region) respond differently to changes in the environment.

![Bar Chart]

- Estimated loss of regional expenditure per visitor

- Hypothetical scenario
  - Business visitors - adjusted for hypothetical bias
  - Non-business visitors - adjusted for hypothetical bias

- Key findings
  - Half as many fish to catch
  - Half as many fish to look at
  - 20% increase in prices (compared to elsewhere)
  - Twice as many tourists
  - Half as much coral to look at
  - Twice as much rubbish on beaches
  - Ocean changed from clear to murky
  - Twice as many oil spills, ship groundings, & waste spills

- Moreover, different types of visitors (even within the same region) respond differently to changes in the environment.
Key findings - tourists

- Perceptions about environmental quality (here, water quality), influence values and willingness to pay to help improve the environment.

The ‘average’ visitor captures about $550 in *consumer surplus* (extra ‘value’ of their visit above and beyond what they spend).
Key findings - Tourists

- And different types of visitors willing to pay different amounts to protect the environment.

![Graph showing willingness to pay for different environmental reasons and visitor origins.](#)
‘Values’ of current visitors to the catchment, likely to differ from tourists in other parts of the world.

People’s decisions about whether to move to (or stay in) the north.

Environment

Values and priorities of residents

Northern development priorities and choices

‘Development’ or environmental changes which alters the ‘mix’ of tourists to the region will change tourist values and priorities.

Values and priorities of visitors

People’s decisions about whether to visit the north.
Summary: What did we learn?

- Dynamic models linking economy with environment work. Prices and wages can affect sediment loads (as does the weather) – with lags.

- Spatial models linking economy with environment work.

- The ‘values’ of current residents and tourists indicate strong preferences for developments that preserve the recreational and non-use values of the GBRWHA

- But the dynamic nature of the system indicates that this is not a ‘given’. Changes to the
  - quality of the environment
  - economic structure of the region
  - demographic make-up of the region’s population
  - mix of tourists to the region
  will affect values, and thus preferences

- This could make it either easier or harder for
  - Managers to protect the values for which the GBR obtained world heritage status
  - Tourism operators to attract people to visit the region
  - Businesses and other organisations to attract people to come and live in the region
Socioeconomic Systems and Reef Resilience

Project 10.2

Thank you

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What did we learn?

- The influence of socioeconomic variables (e.g. price, cattle numbers) on water quality/sediment

  Price changes can affect water quality in GBRWHA
  (market based policies may be able to help achieve some environmental goals)

- The relative ‘value’ (benefit) of the goods and services provided by the Great Barrier Reef World Heritage Area (GBRWHA) to residents and visitors

  Residents and Visitors perceive the ‘productive’ values of the GBRWHA and catchments to be less important than non-productive values
  (suggests strong preference for developments that keep those non-productive values intact)

  Developments which alter the ‘mix’ of tourists or residents, will impact tomorrow’s values

- We have improved some traditional ‘non-market’ valuation methods & trialed new methods

- A continuation of the long-term monitoring of tourists as they leave Cairns airport
  (which Bruce Prideaux has been undertaking since 2007)

  Changing mix of visitors, with changing motivators and activities