A participatory tool for estimating future impacts on ecosystem services and livelihoods in Torres Strait

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Outline

• Context: Torres Strait
• Research objective
• Participatory workshop process
• Scoring of Ecosystems Goods and Services (EGS) and sensitivity of EGS
  – Cumulative potential impact scoring
• Strengths and limitations of the approach
• Adaptation planning, concluding statement
Torres Strait – Indigenous community with strong connection to land and sea

Key policy stakeholders: Torres Strait Regional Authority

Remoteness: challenge being heard by government
Unique cultural practices, strong leaders, supporting future generations
The Torres Strait is a strategically important region of the Australian coastline.
**Research objective**

“To provide the tools for effective planning and adaptation”

**Focus/requirements:**
- Participatory tool for estimating future impacts on ecosystem services and livelihoods
- Developing a system (holistic) approach
- Social-ecological system
- Work closely with key stakeholders (TSRA)
Participatory Workshop - Locals, policy-makers and researchers

Session 1: What are the drivers of change for livelihoods?

Session 2: What are the desired and possible futures?

Session 3: What impact will the “Business as Usual” future have on well-being?

Session 4: What is the resilience of the community today?

Session 5: What are the priority adaptation strategies to build a resilience?

Responding to climate and human stressors – participatory tool for understanding impacts

Cumulative manipulations of multiple threats upon local EGS

Local communities visualising possible futures
Cumulative manipulations of multiple threats upon local EGS

- **System Drivers and Pressures**
  - Human
  - Climate

- **Ecosystem Assets**
  - Populations
  - Forests
  - Agric. land
  - Reefs

- **Ecosystem Goods and Services**
  - Fruit
  - Water
  - Fish
  - Tourism

- **Constituents of Well-being**
  - Income
  - Food
  - Health
  - Culture

- **Sensitivity and Exposure**

- **EGS Potential impact (-1 to +1)**

- **Volume and Value**

- **EGS well-being Importance (%)**

- **Potential impact on well-being (%)**

**Building assessment**
System Drivers and Pressures

• “Business as usual” pressures

Climate (Scenario A2, medium-high emissions)
  – Temperature, SST
  – Rainfall
  – Sea level rise
  – Acidification

Human (Population growth - current trajectory)
  – Utilisation
  – Land use
  – Pollution

Climate modelling for Torres Strait:
  • Kevin Parnell (JCU)
  • Jack Katzfey (CSIRO)
  • Suppiah Ramasamy (CSIRO)
  • Wayne Rochester (CSIRO)
Ecosystem goods and services

**Agricultural**
- Banana
- Betel nut
- Cassava
- Chickens
- Coconut
- Garden vegetables
- Mangoes
- Pawpaw
- Pigs (domestic)
- Rice
- Sago
- Sweet potato
- Taro
- Yams

**Estuarine**
- Barramundi
- Barramundi (aquaculture)
- Crabs (blue)
- Crabs (mud)
- Crocodiles
- Crocodiles (farmed)
- Finfish coastal (trevally, mullet etc)
- Mangrove timber

**Forest**
- Birds
- Non-timber building material (palms)
- Pigs (wild)
- Rusa deer
- Rusa deer (farming)
- Timber for building/boats/sale
- Wallabies

**Freshwater**
- Finfish (tilapia, snakehead)
- Prawn (Macrobrachyia)
- Saratoga
- Water (fresh and rainwater)
- Water (ground)

**Marine**
- Dugong
- Finfish pelagic (queenfish)
- Mackerel
- Pearlshell (aquaculture)
- Pearlshell (goldlip)
- Prawn (banana, tiger)
- Rock lobster
- Sponge (aquaculture)
- Sponge (wild)
- Tourism (fishing)
- Turtles (flatback)
- Turtles (green)
- Turtles (hawksbill)

**Reef**
- Beche-de-mer
- Clams (Tridacnid)
- Coral lime
- Other molluscs (and from mangrove)
- Reeffish
- Sharks and rays
- Tourism (reef)
- Trochus

55 EGS in total
EGS Values to Well-being

Value of each EGS to the four Constituents of Well-being (CoWBe) scored from (0 – 5)

Reef Fish
- Income: 3
- Social cohesion: 3
- Food security: 4
- Health: 3

Bananas
- Income: 1
- Social cohesion: 2
- Food security: 4
- Health: 3
Sensitivity of EGS to stressors

Sensitivity scored on a scale from:

-1 acutely negatively sensitive with no prospect for natural adaptation
0 acutely positively sensitive and/or full adaptation capacity) to the threat
+1

Literature review
Expert Elicitation

Sensitivity: Degree to which an ecosystem asset is affected by or responsive to a driver/stressor.

Accounts for factors such as tolerance thresholds (some marine species have acute thresholds e.g. corals and other species have a broader threshold e.g. crocodiles).
## Matrix representation of components

<table>
<thead>
<tr>
<th>Driver/Stressor</th>
<th>EGS</th>
<th>EGS Potential Impact</th>
<th>Cumulative potential impact</th>
<th>EGS Wellbeing Importance (%)</th>
<th>Potential well-being impact (%)</th>
<th>Overall well-being impact (%)</th>
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EGS Impact (2030) - Masig

EGS well-being importance (%)

EGS Potential impact (-1 to 1)

Climate change
- Temperature increase
- Rainfall change
- Sea level rise
- Ocean acidification

Human population growth
- Exploitation
- Land conversion
- Pollution
Overall potential impact on well-being

Masig Impacts

- Temperature increase
- Rainfall change
- Sea level rise
- Ocean acidification
- Exploitation
- Land conversion
- Pollution
- Climate change

Human population growth

Cumlative Well-being Impact (%)

Sum Across EGS

2030 2060 2100
Limitations of approach

Subjective process
- Scoring of sensitivity
- Inevitable compromises with the breadth of factors

Uncertainty
- Future projections
- System dynamics

Openly discussed through verbal acknowledgement
<table>
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<th>Strengths of approach</th>
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<tr>
<td><strong>Transparent</strong></td>
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<tr>
<td>• EGS valuing defined by participants in workshop</td>
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<tr>
<td>• Well-being impact calculated in real-time at workshop</td>
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<tr>
<td><strong>Relevant</strong></td>
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<tr>
<td>• Outputs designed for helping formulate strategies</td>
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<td>• “System approach” based on all natural resources used by communities</td>
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<td><strong>Replicable</strong></td>
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<tr>
<td>• Methods and assumptions well documented</td>
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<td>• Complexity low enough for rapid assessment</td>
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<td><strong>Credible</strong></td>
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<td>• Scrutiny-potential from peer community of stakeholders</td>
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<td>• Outputs that is clear and understood by participants</td>
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Co-learning framework

Involvement of locals and policy makers
- Workshops with locals and TSRA

Viewpoints elicited through expert knowledge
- Delphi approach

Valuation of local ecosystem goods and services
- Four constituents of well-being (CoWBe)

Iterative decision-making
- Revising ideas/policies as we continue to learn which outcomes are more likely

Engagement to allow for scrutinising
- Peer-scrutiny
Knowledge Integration

**Scientific**
- Socio-economic trends
- Downscaled climate projections
- Ecosystem services model
- Livelihood typology
- Ecosystem services impacts
- Adaptation strategy examples

**Shared Knowledge**
1. Drivers of change for Torres Strait communities and their livelihoods?
2. Desired and possible futures for Torres Strait communities?
3. Impact of business as usual future on human well-being?
4. Adaptive capacity of Torres Strait communities today?
5. Vulnerabilities of Torres Strait communities?
6. Priority adaption strategies to build resilient Torres Strait communities?

**Stakeholder knowledge**
- Pre-workshop evaluation
- Perceptions of drivers of change
- Future scenarios and thresholds
- Valuing ecosystems services for human well-being
- Adaptive capacity assessments
- Vulnerability assessments
- Adaptation strategies
- Research priorities
- Post-workshop evaluation

**Socio-economic trends**
**Downscaled climate projections**
**Ecosystem services model**
**Livelihood typology**
**Ecosystem services impacts**
**Adaptation strategy examples**
‘No regrets’ adaptation strategies

‘No regrets’ strategies bring benefits under any future conditions of change

Regional workshop

- Marine resource conservation
- Promote tourism and sponge aquaculture
- Climate-change proof terrestrial EGS against sea level rise

Masig community workshop

- Cultural renewal strategy
- Build community financial management capacity, including eco-tourism
- Improve turtle and dugong management to control over-harvesting
- Improve garden food production, including hydroponics
- Meetings to improve community communication
- More coordination among central islands, which face same issue

Capacity for communities and stakeholders to avoid mal-adaptive strategies
Support the development of TSRA community planning
Workshop Evaluation – Masig Community

Question: “What is the greatest challenge that Masig will face in the future”

Before: Coastal erosion most frequent (54%)

After: Loss of cultural values most important (37%) Climate change increased to 27%

Question: “Is Masig resilient to future change”

Before: 62% agreed 38% didn’t know

After: 91% agreed 9% didn’t know

Workshop process Broaden participants perceptions Community’s views of the future
Building "query" platform

Why:
Is it relevant?

When:
Should we be preparing?

Alternatives:
Is there different options?

Who:
Is responsible?

What:
Is the impact?

Bringing together of stakeholders should not be undervalued and is empowering for locals to allow their voice to be heard by policy makers
Conclusion – Community benefits

• Empowering locals through accommodating local community social and cultural values
• Set the platform for effective adaptation planning
  – Interactions between locals, policy makers, and researchers
  – Uptake: Relevant information that locals find useful to sustaining their livelihoods
  – Create/trial innovative ways to increase adaptative capacity

• Build deeper linkages and conversations – guide the way forward
Thanks - ESSO

Acknowledgments – thanks to workshop participants