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TROPICAL ECOSYSTEMS hub

NOTE: THESE RESULTS ARE PRELIMINARY AND MAY CHANGE AS MODELLING AND DATA ANALYSIS IS REFINED. CONTACT PROFESSOR NATALIE STOECKL FOR PERMISSION.

Socioeconomic Systems and Reef Resilience

Project 10.2

Social and economic values in the Wet Tropics World Heritage Area

Project 12.3

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PROJECT 10.2 SOCIOECONOMIC SYSTEMS AND REEF RESILIENCE: WHAT DO WE SEEK TO KNOW 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 Wet Tropics Reef World Heritage Area (WTWHA) to residents and visitors

Tells us about what the WTWHA does to/for the economy Project 12.3

(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

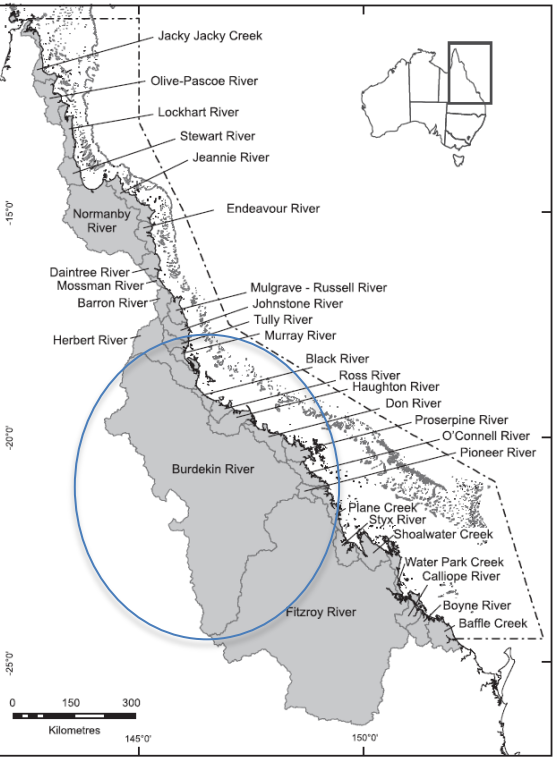
- A continuation of the long-term monitoring of tourists as they leave Cairns airport (which Bruce Prideaux has been undertaking since 2007)

Gives an indication of trends over time

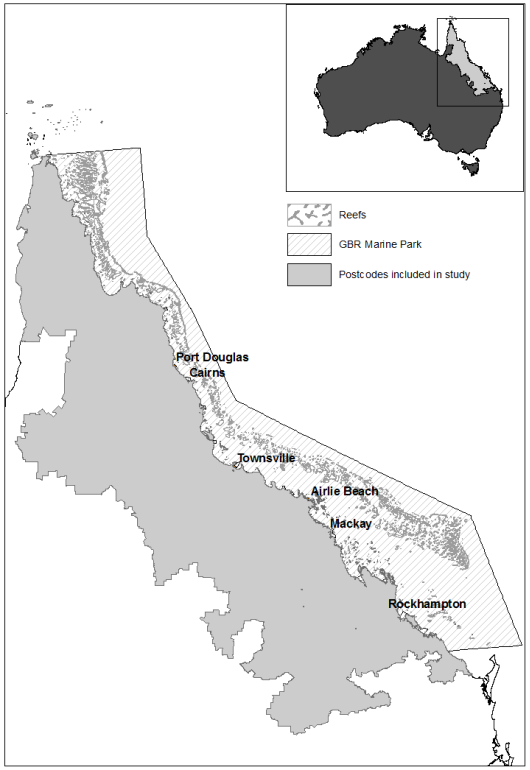
(program also provides opportunity for investigation of 'pressing' issues for industry)

Overview of Project 10.2's data

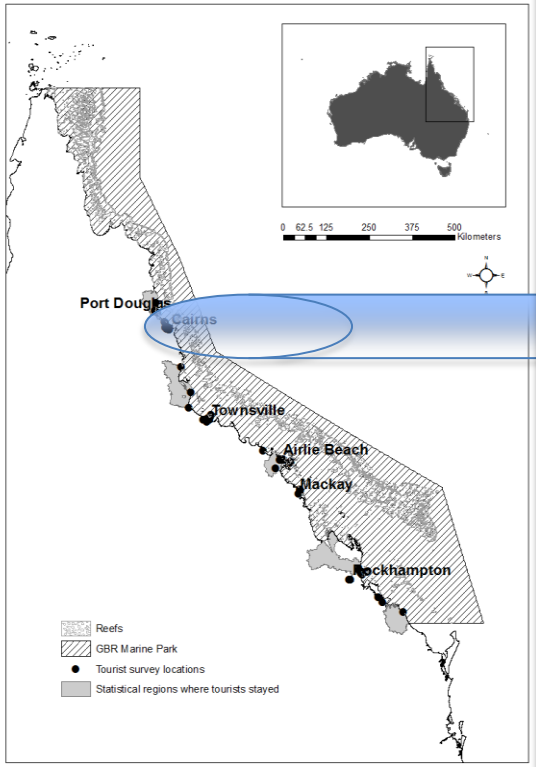
Annual sediment loads, rainfall, extreme events, cattle numbers, price and wage data from 1938 +



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

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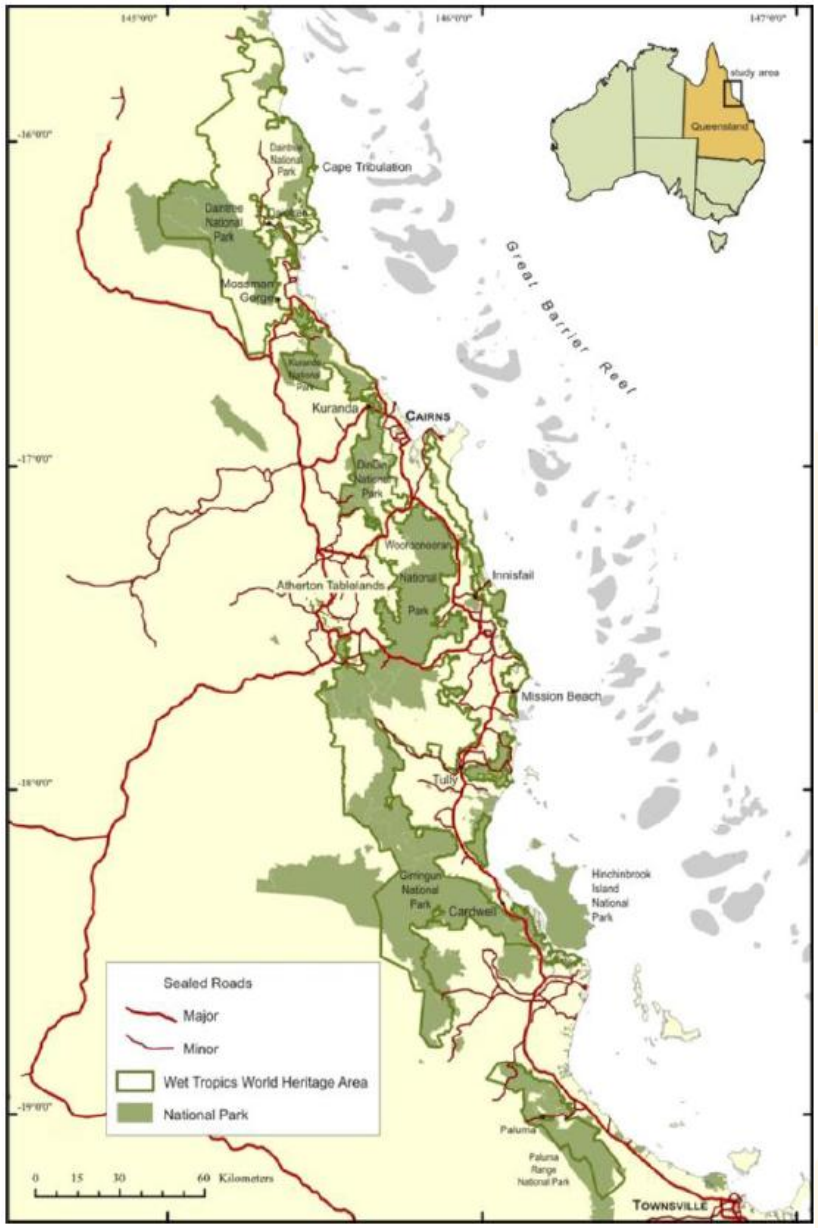
Overview of Project 12.3's data



2013 Survey of residents
- 386 mail-out responses
- 160 from Indigenous households (partnership with RAP)

2013/14 Survey of tourists at lagoon and airport
- 621 responses

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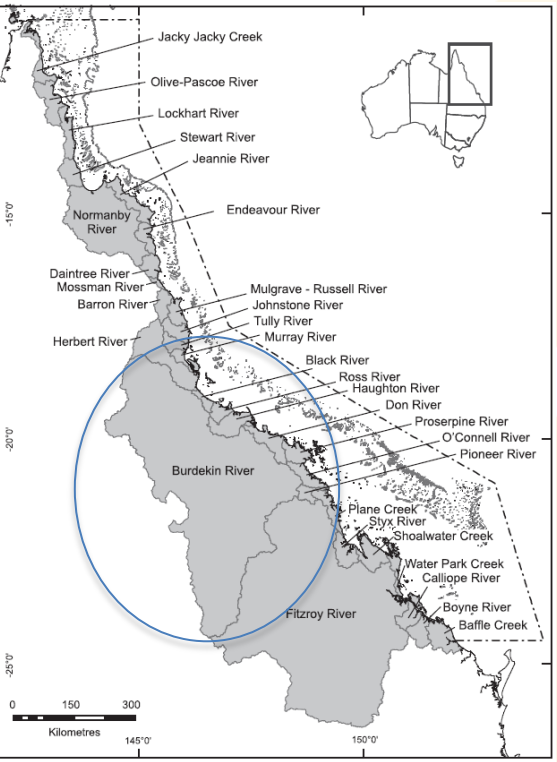
Annual sediment loads, rainfall, extreme events, cattle numbers, price and wage data from 1938 +



OF WHAT IMPORT IS THE PRICE OF BEEF TO THE GBR?

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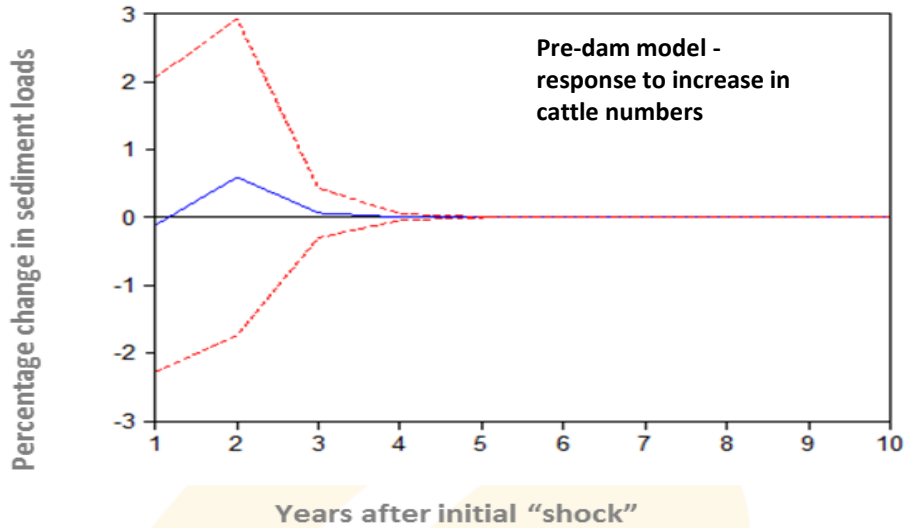
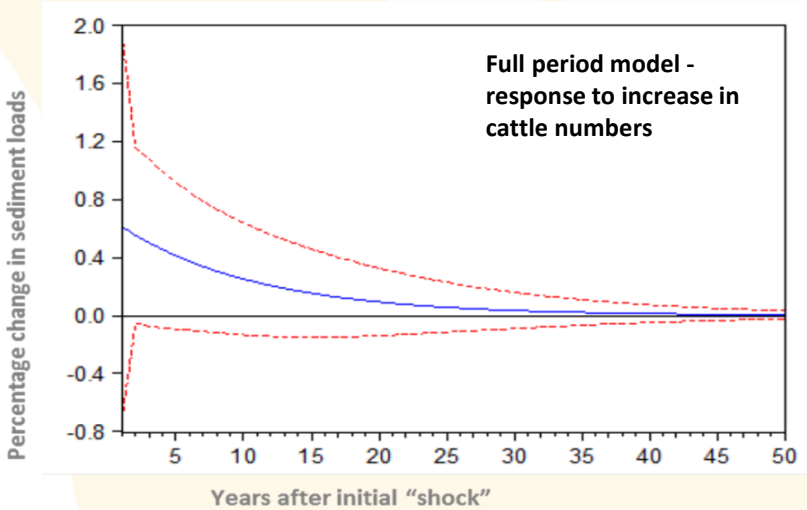
THE PRICE OF BEEF AND SEDIMENT

Jarvis et al. (2013); Chaiechi et al (in review)

- One can use econometric techniques to model stream-flow rainfall relations and ***vector auto-regressions*** to model economy-environment interactions
- Rainfall, extreme events, cattle numbers and various prices have impacted sediment loads in the Burdekin over the last 100 years or so





- Rainfall and extreme events most significant drivers, but changes in the price of beef and gold affect the environment
- Prices may be having a more significant impact nowadays than 50 years ago

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KEY MESSAGES…

- Prices (and costs) matter
  - May need to monitor macroeconomic trends
- Price-based environmental policies could be effective but …
  - Unsure which types of policies (e.g. price/market based or others) most effective; likely to depend, in part, on 'values'.

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PROJECTS 10.2 AND 12.3
WHAT DO WE SEEK TO KNOW 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 (a) the GBRWHA; and (b) the WTWHA to residents and visitors

Tells us about what these two world heritage areas do 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)

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ONE WAY OF LOOKING AT THE RELATIVE 'VALUE' OF VARIOUS GOODS AND SERVICES …

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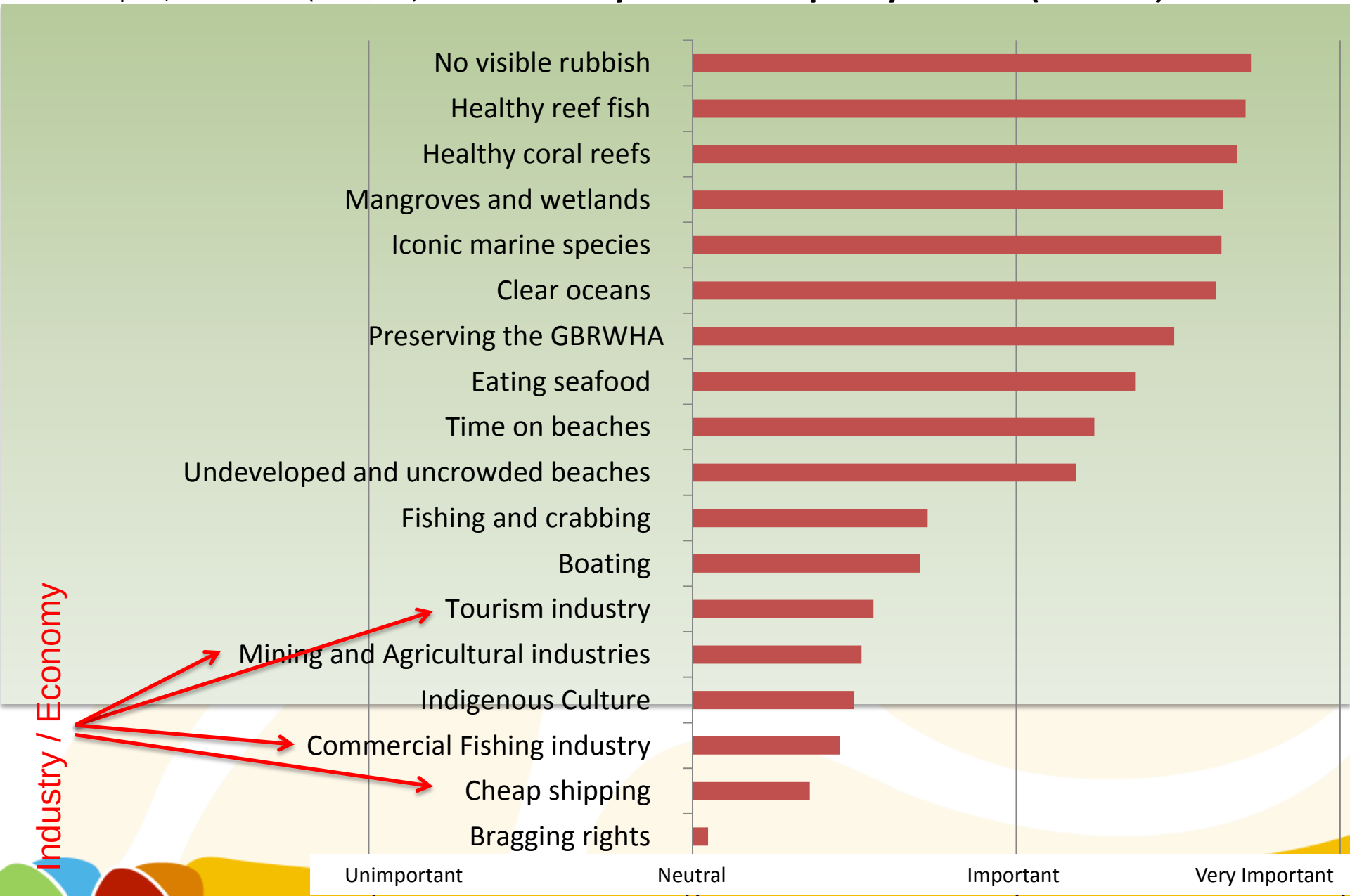
Interim report; Larson et al (in review)

GBR Residents – How important are each of the following to your overall quality of life ? (N=1001)



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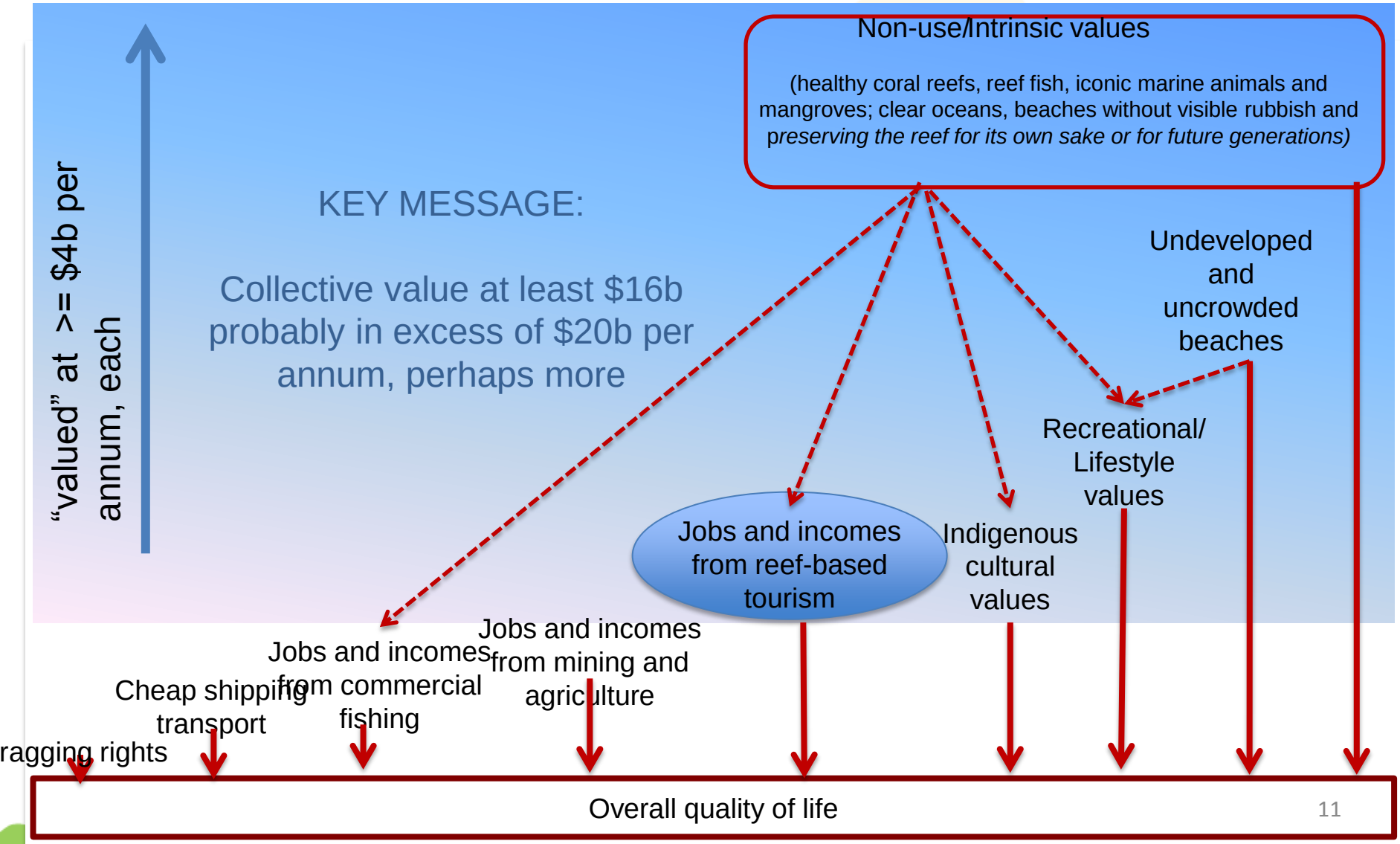
Stoeckl et al., (in review)

Relationship between values (GBR Residents)



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KEY MESSAGES…

- Family and friends likely most important of all.
- After that, widespread agreement that ‘intrinsic’ (environmental) values are more important (to quality of life, or as a reason to visit the region) than other things.
- Recognition (even if only implicit) of important inter-relationships
- GBRWHA (and WTWHA) likely to be ‘worth’ significantly more than just the $ associated with tourism revenues

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BUT ITS ABOUT MORE THAN JUST 'IMPORTANCE' ....

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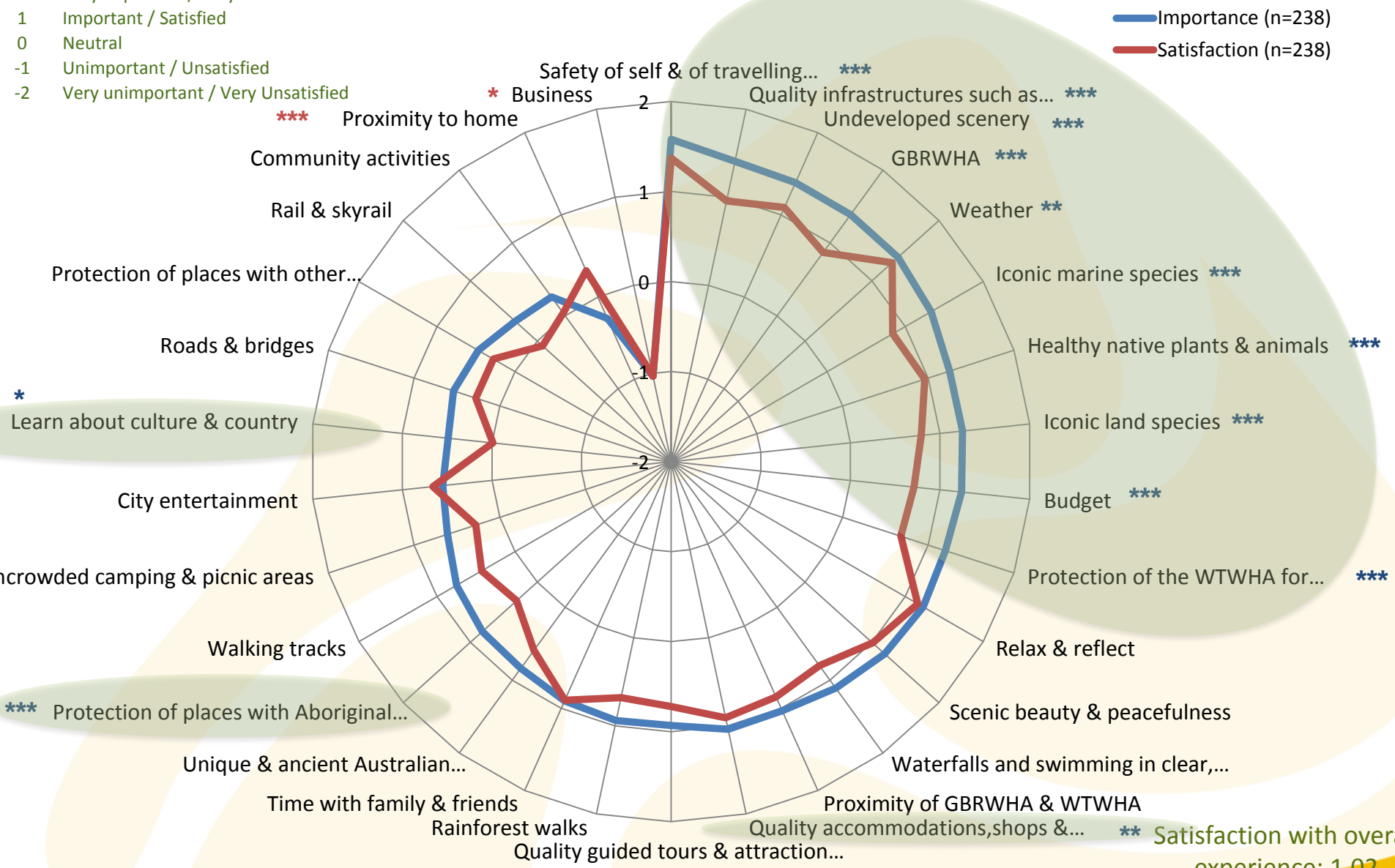
Importance & Satisfaction WT Tourists

2 Very important / Very satisfied
1 Important / Satisfied
0 Neutral
-1 Unimportant / Unsatisfied
-2 Very unimportant / Very Unsatisfied



Satisfaction with overa experience: 1.02 (n=578)

***'s indicate statistically significant differences**

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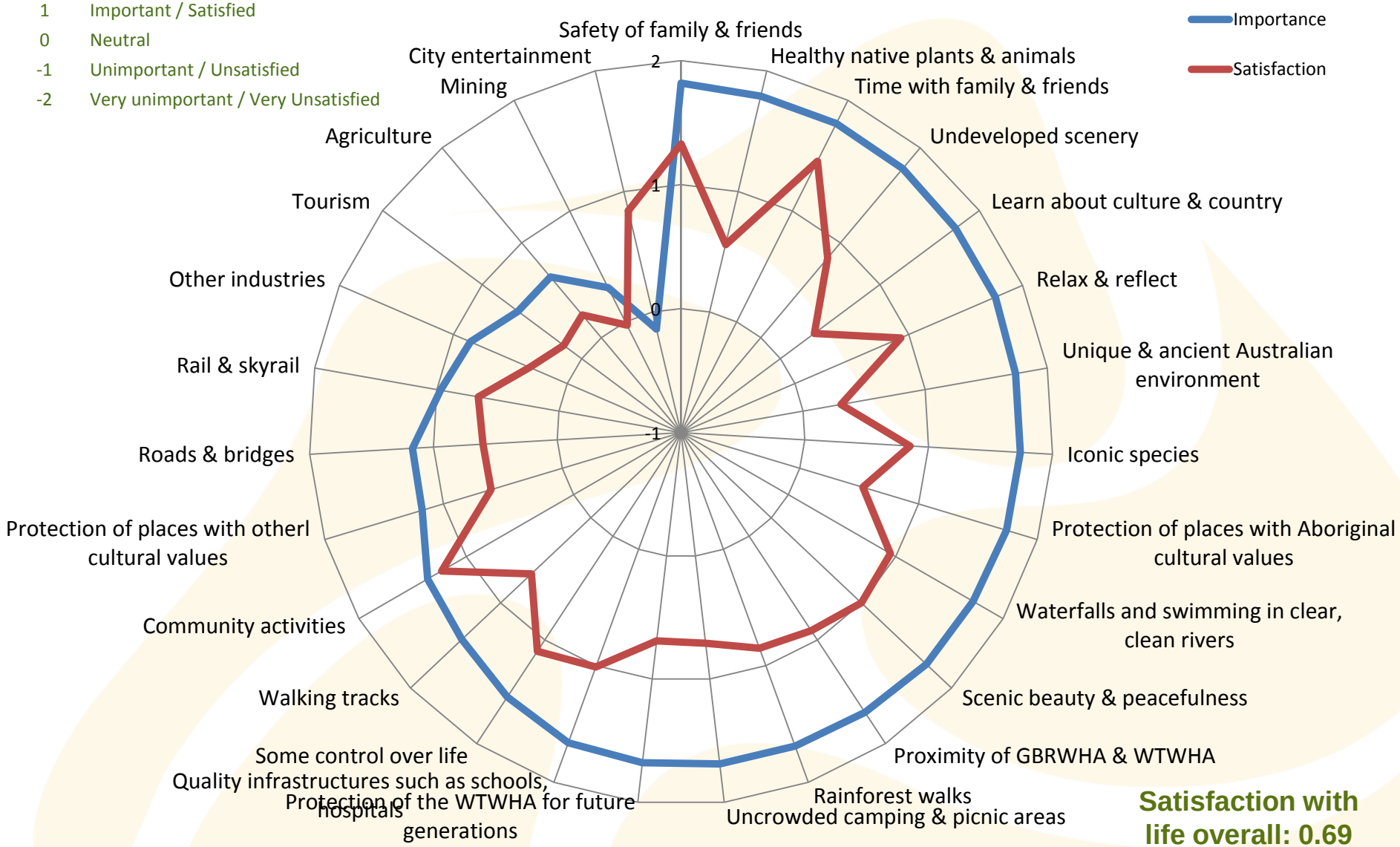
Importance & Satisfaction Indigenous WT Residents

2	Very important / Very satisfied
1	Important / Satisfied
0	Neutral
-1	Unimportant / Unsatisfied
-2	Very unimportant / Very Unsatisfied



Satisfaction with life overall: 0.69 (n=140)

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Larson et al (in review)

Socioeconomic determinants of 'importance' (I) and of the Gap between 'importance and satisfaction' (IDS) – GBR Residents

	Non-Use (I, IDS)
Male	-, -
Education	+, +
Single	
Age	
Household income	
Indigenous	
Born in QLD	
Main household income from:	
Mining	
Fishing	
Government	°, +
Tourism	
Agriculture	

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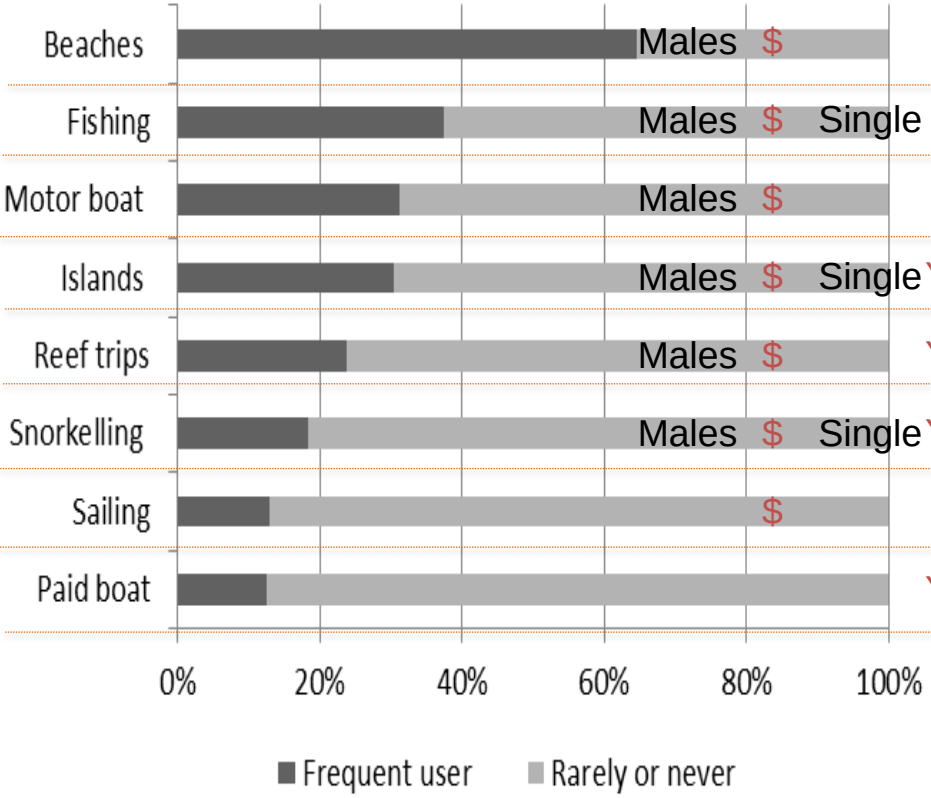
Larson et al (2014)

Which type of people engage in with the environment most/least frequently? – GBR Residents



Characteristics of most frequent users					
Beaches	Males	$	Indigenous	Degree	Not Mining; Tourism
Fishing	Males	$ Single	Indigenous	No Degree	QLD Born	Tourism or Fishing
Motor boat	Males	$			Tourism or Fishing
Islands	Males	$ Single	Young	Not Indigenous	Non QLD	Not M or Ag; F
Reef trips	Males	$	Young	No Degree	Tourism or Fishing
Snorkelling	Males	$ Single	Young	Non QLD	Not M; Tourism or Fi
Sailing	$		Degree	Not M; Tourism or Fi
Paid boat	Young	Not Indigenous	Non QLD	Not M; F

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Key Messages…

- GBR and WT – significant gaps between importance and satisfaction for Intrinsic /environmental values for tourists and residents
- Gap relatively small for tourists, larger for non-Indigenous residents; largest for Indigenous residents
  - A case of different or shifting baselines?
- Likely to get changes in 'values', 'concerns' and activities
  - If attitudes of existing population change
  - As population grows (different demography and/or economic focus)

Which is likely to have most significant impact ?

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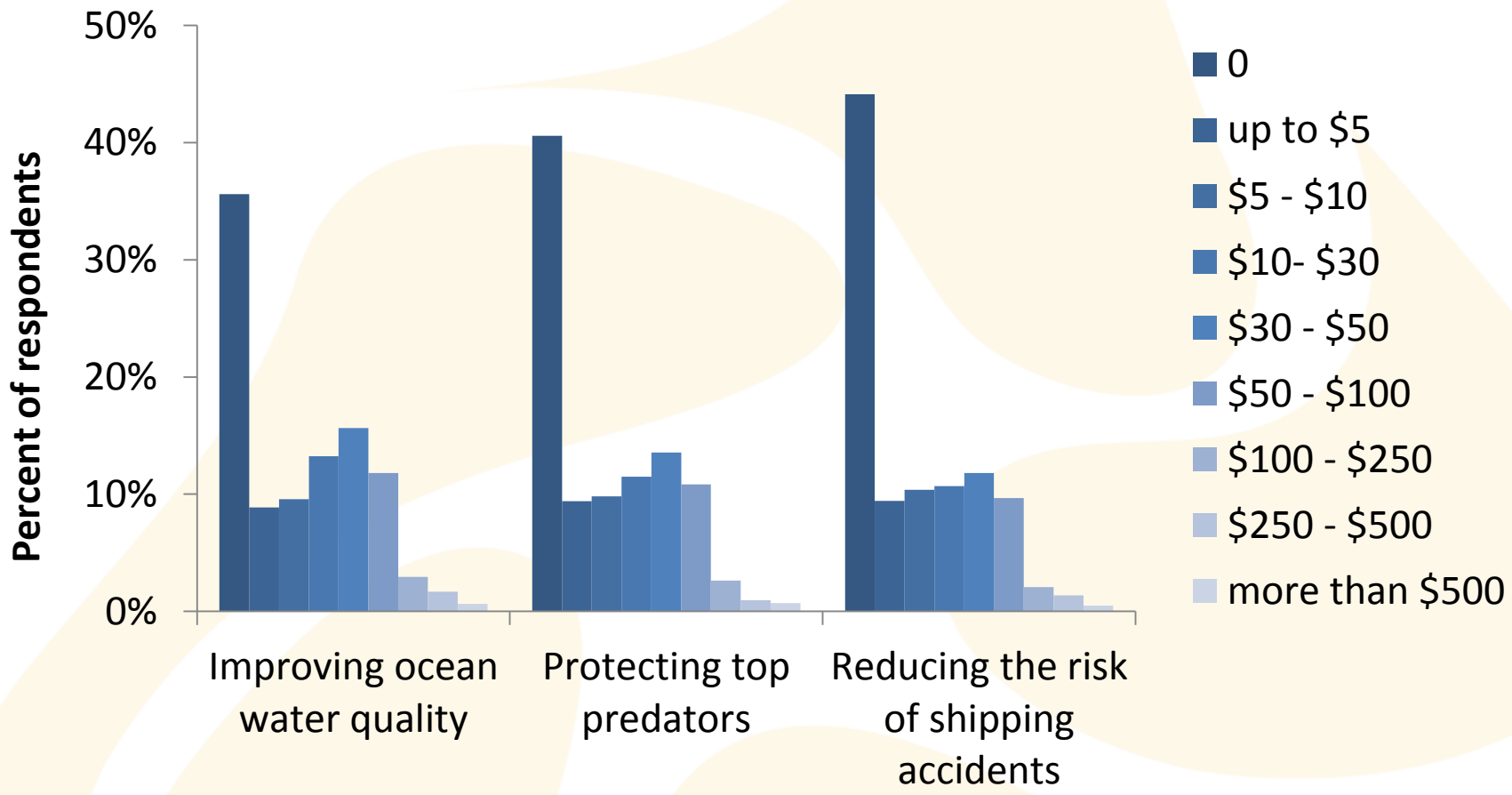
Are people willing to pay to help improve the things they 'value'?

WILLINGNESS TO PAY (WTP), PER ANNUM, FOR IMPROVEMENTS …

GBR RESIDENTS



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Farr et al (in review)

WHICH GBR TOURISTS ARE WTP TO IMPROVE WATER QUALITY (WQ)?

WTP linked to a variety of factors:

- Questionnaire design
- Socio-economic and demographic variables
  - Income +ve
  - Age –ve
  - Education +ve
  - Origin: –ve if from China
  - Plans to return to the region: +ve
- Feelings of 'equity' and fairness
- Perceptions of the importance, and satisfaction with, water quality

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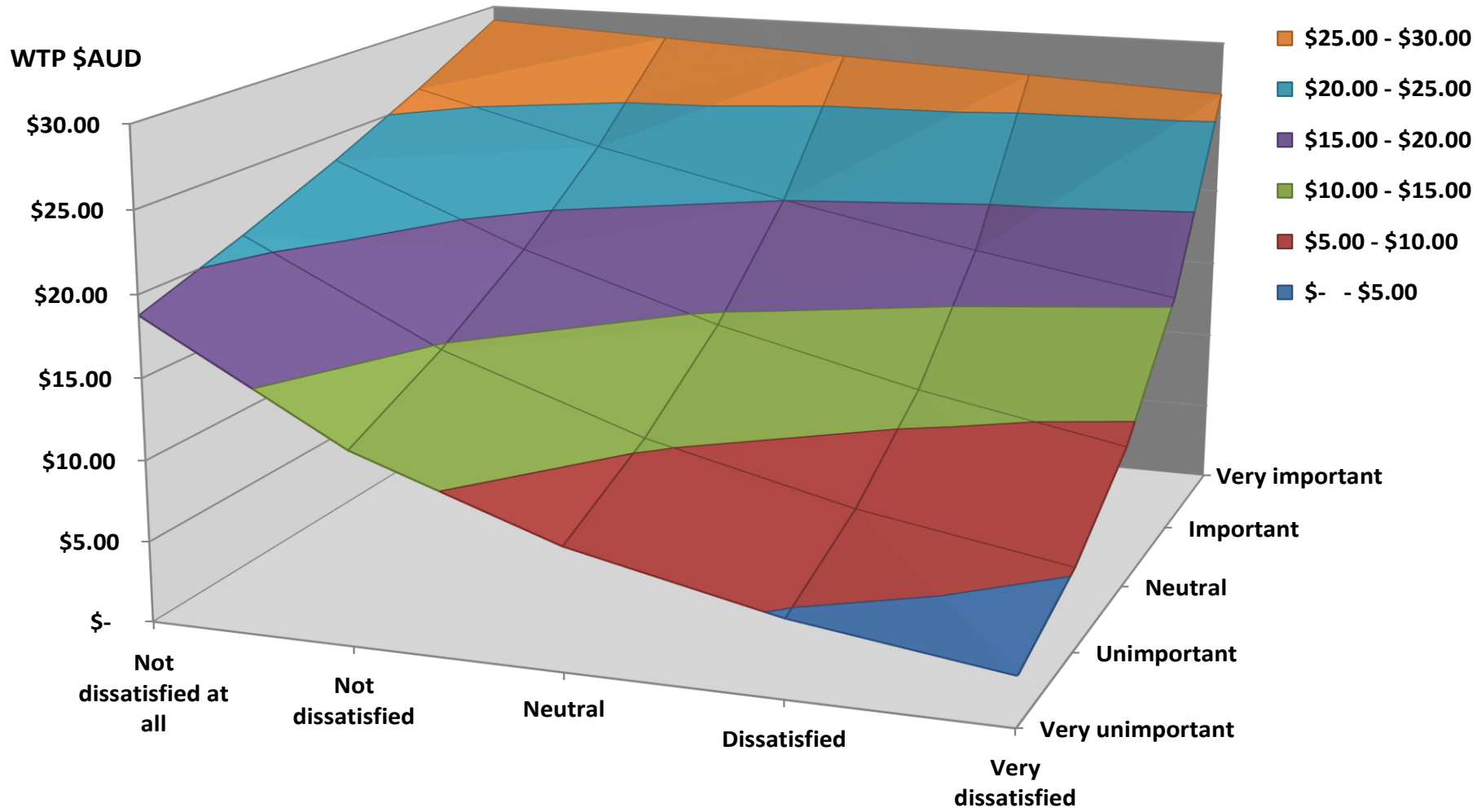
Farr et all, (in review)

The link between WTP, Importance and satisfaction



KEY MESSAGES…

- WTP linked to income, questionnaire design, and many other things --- but also linked to 'importance' and to perceived (not actual) satisfaction with state of environment.

- Many people not WTP anything to protect environment:

  Many *'not wanting to pay unless others pay too'*

  A la Adam Smith's 'pure' public goods and the important role of government (for collective funding and protection)

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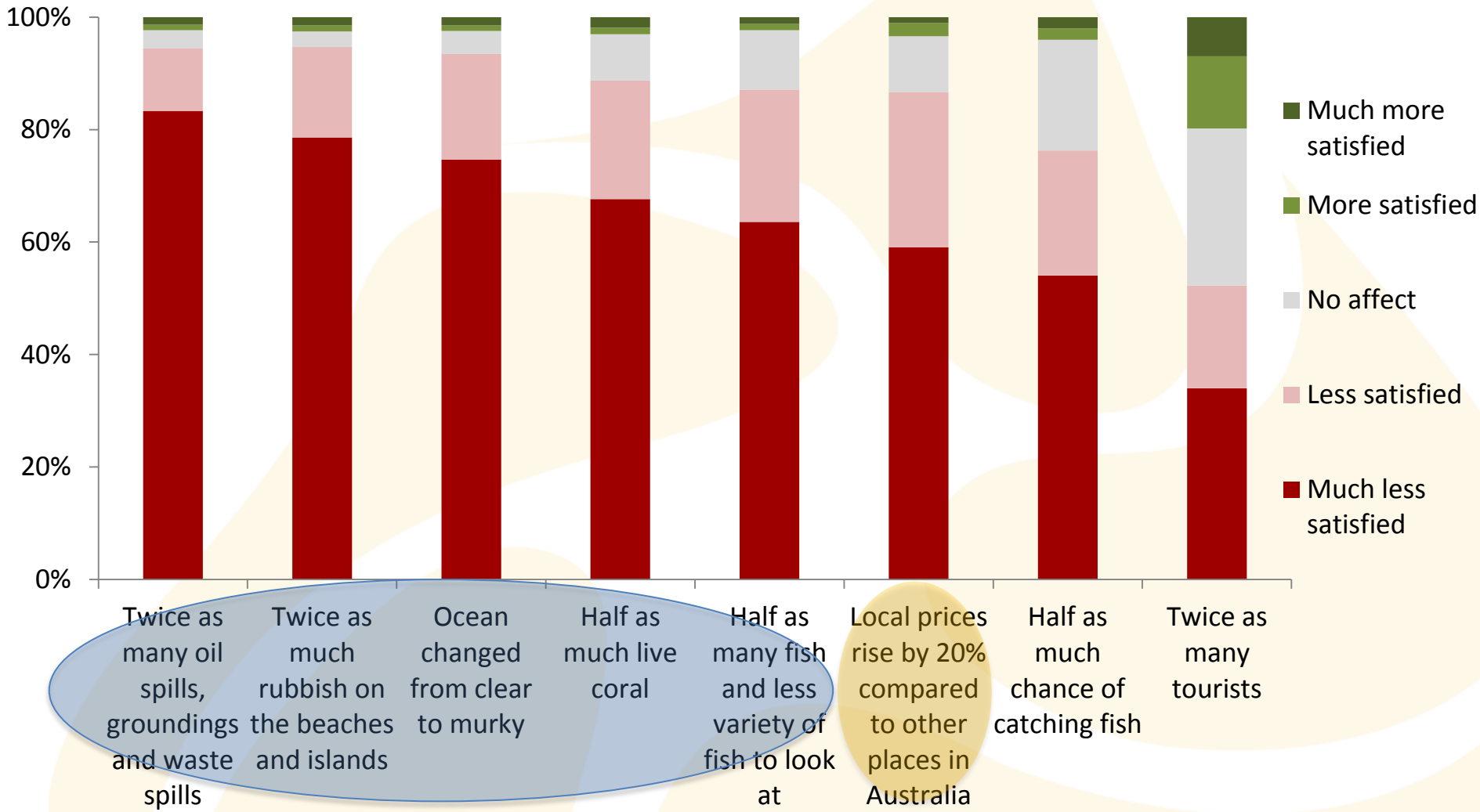
So how would people react if the things they value deteriorated?

Impact of Hypothetical changes on overall quality of life … GBR Residents



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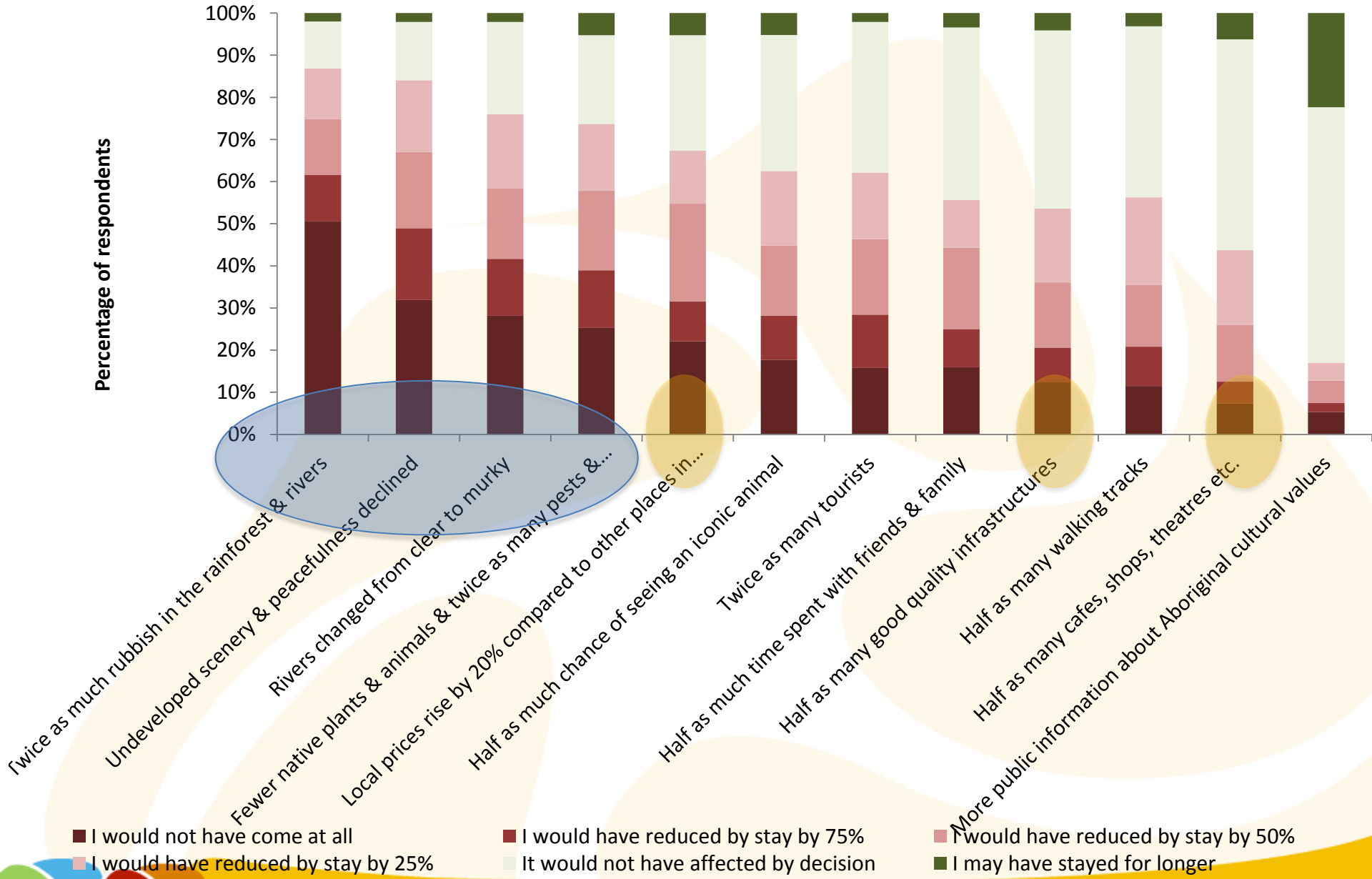
Impact of Hypothetical changes on Decision to come to the region - WT Tourists



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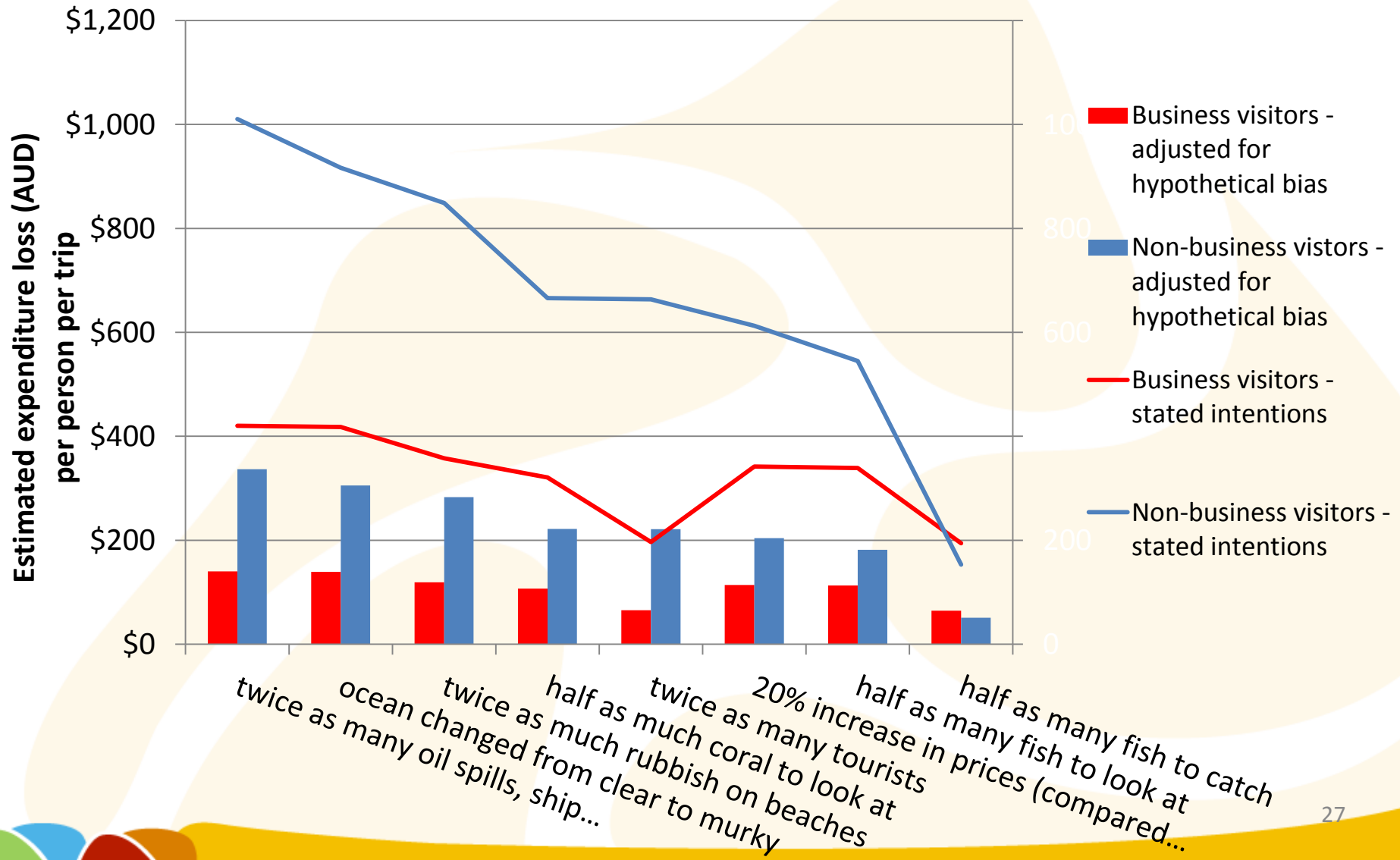
Mustika et al (in prep)

Potential financial impact of 'changes' on GBR Tourism Industry



Key Messages…

- Deterioration of WHA's could have bigger impact (on quality of life of residents or decisions of tourists to visit region) than a 20% increase in prices

- Deterioration thus likely to have regional economic impact due to
  - Fewer tourists
  - More difficult to attract skilled labour to the region?

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And for those uncomfortable With 'hypothetical' scenarios ....

Jarvis et al (in review)

WATER CLARITY AND THE (GBR) TOURISM INDUSTRY …

Probability that a tourist will RETURN, depends on

- Their origin(North America, Asia or Europe: negative)
- The number of previous visits to GBR: positive
- Trip satisfaction: positive

Trip satisfaction depends on:

- Tourist income: positive
- Spent 1 or less nights: negative
- Tourist visited reef at least once: positive
- Belief that lost wallet would be returned: positive
- Intensity of construction works: negative
- Rainfall: negative
- Water Turbidity (predicted value*): negative

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

* To control for endogeneity, we used predicted values from the regression of water turbidity (at specific time and location) against rainfall + TSS from closest river + wind speed

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Jarvis et al (in prep)

'Bequest' values and satisfaction with life overall – GBR Residents

Factors associated with a higher level of satisfaction with overall quality of life

- Age : positive
- Gender: Female - positive
- Marital status: Married positive
- Education: University degree - positive
- Income: Higher - positive
- Satisfied that the GBRWHA will be there for future generations to enjoy: positive.

As you move from south to north

- Income becomes less important, and 'bequest' more important

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Key Messages…

- Analysis of ‘non hypothetical’ data confirms importance of environment.
- Specifically establishing a link between
  - environmental quality and tourist satisfaction
  - (perceptions of) ‘bequest’ values and resident life-satisfaction

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Overall Empirical punchlines

Multiple lines of evidence to suggest that

- "Intrinsic" environmental values are significant for tourists, non-indigenous and indigenous residents in this region.

But …. there are differences

- Between socioeconomic and demographic groups
  - Age, gender, Indigeneity, education and industry matters.
- Between regions
  - the further north one goes, the stronger are environmental values
- Over time
  - Suggestions of 'shifting' baselines
  - Trends evident from Cairns Airport exit surveys

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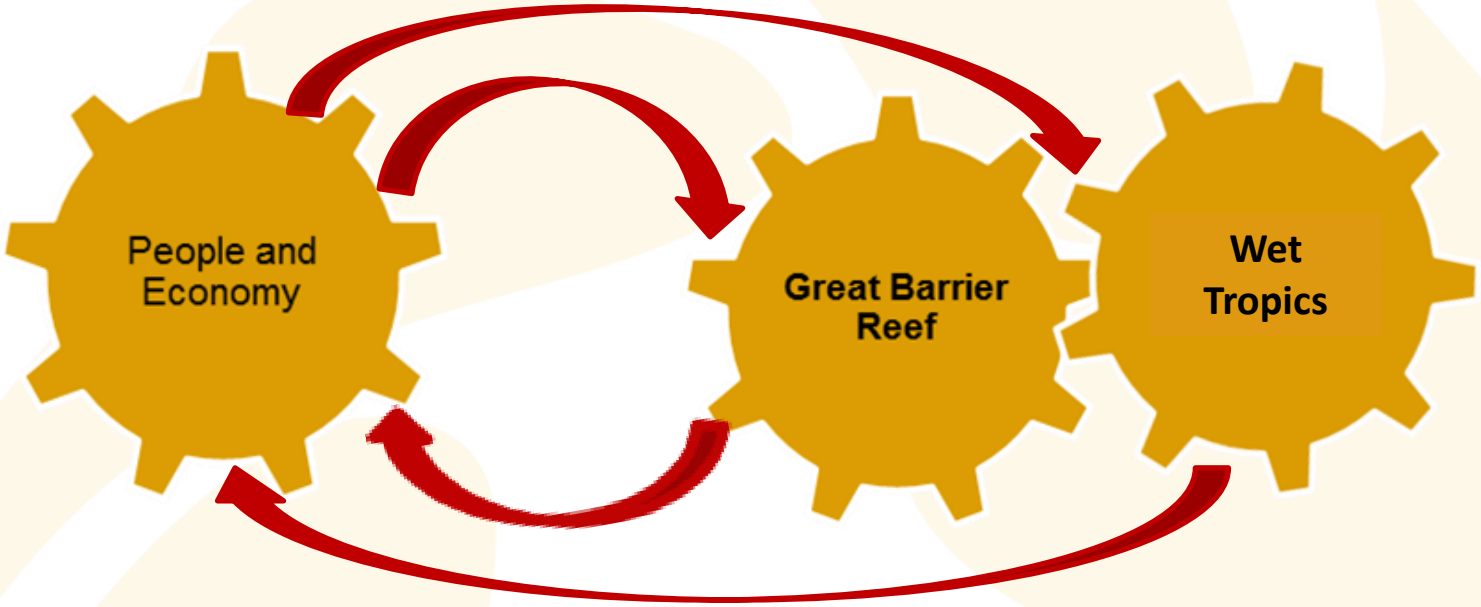
Natural and Economic Systems Truly dynamic and interlinked

Changes in the economy affect the environment.
These changes feed back and affect people and economy

Changes in one part of the economy can impact other parts of the economy and/or multiple environments



Social and environmental values are important to people: deterioration thus has a real impact on the economy and on well-being.

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SCIENTIFIC PUNCHLINES

- Emerging body of literature on life satisfaction offers promising new way of 'valuing' non-market goods, assessing
  - Total values (how important is x compared to, say, y?)
  - Marginal values (how would a change in x affect you?)
- Irrespective of whether or not these values have $ attached, these quantitative measures likely to be useable in integrated modelling exercises
- But need long term data across the region- ideally 'matched' to biophysical data so can do 'proper' (spatial and dynamic) integrated modelling

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THANK YOU
COMMENTS, IDEAS AND SUGGESTIONS WELCOME ☺

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