AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Revealing the dominant discourses of stakeholders towards natural resource management in Port Resolution, Vanuatu, using Q-method

Andrew Buckwell, Christopher Fleming, Maggie Muurmans, James Smart, and Brendan Mackey

Griffith University, Australia

Contributed paper prepared for presentation at the 64th AARES Annual Conference, Perth, Western Australia 12-14 February 2020.

Copyright 2020 by the Authors. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

1   Revealing the dominant discourses of stakeholders 2   towards natural resource management in Port 3   Resolution, Vanuatu, using Q-method

4   Andrew Buckwell ^a, Christopher Fleming ^a, Maggie Muurmans ^b, James C. R. Smart ^c, and
5   Brendan Mackey ^d.

6   ^a Griffith Business School, Griffith University, South Bank Campus, 226 Grey Street, South Bank,
7   Queensland, 4101, Australia

8   ^b Centre for Coastal Management, SmartWater Centre, Griffith University, Gold Coast Campus,
9   Parklands Drive, Southport, Queensland 4222, Australia

10   ^c Australian Rivers Institute and School of Environment and Science, Griffith University, Nathan
11   Campus, 170 Kessels Road, Nathan, Queensland 4111, Australia.

12   ^d Griffith Climate Change Response Program, Griffith University, Gold Coast Campus, Parklands
13   Drive, Southport, Queensland 4222, Australia.

14   * Corresponding author.

15   **Highlights**

- 16   • Understand constraints & enabling conditions for implementation of ecosystem-based
17   adaptations.
- 18   • Reveal principle discourses within a rural, subsistence-based community in Vanuatu,
19   using Q-Methodology.
- 20   • Gender & community residency statistically relevant to discourse alignment.
- 21   • Interventions will resonate with community if they enable natural resource
22   management, reflect traditional knowledge, provide opportunities for generating
23   income & promote equity in decision making.

24   **Abstract**

25   Communities in Pacific small island states face a range of threats to their management of
26   natural resources, exacerbated by change-related risks, all against the backdrop of social and
27   economic transition. Ecosystem-based adaptation (EbA) describes a class of interventions
28   that manage climatic change-related risks, which is argued to be relevant for such
29   communities. Understanding local constraints and enabling conditions for EbA
30   implementation is important in informing project implementation. We used Q-
31   methodology to reveal principle discourses within a community in Vanuatu and among
32   stakeholders with knowledge of the challenges confronting that community. We analysed
33   stakeholders to determine whether particularly-held discourses correlate with demographic
34   attributes. Our research revealed three principle discourses we called *Strong Kastom*, *Kastom*
35   + *Health* and *Tentative Modernity*. Perspectives from each discourse need to be taken into
36   account when identifying and evaluating adaptation options. Our results suggest adaptation
37   interventions are more likely to resonate with the community if they support customary
38   natural resource management, reflect traditional knowledge, provide opportunities for
39   generating income, and promote gender equity in decision-making. Our results also suggest

40 external practitioners do not necessarily consider income generation as being important to
41 community livelihoods. Ignoring a community's perspectives, values, and priorities risks
42 undermining the viability of EbA projects.

43 **Keywords**

44 Climate change adaptation, discourse analysis, Pacific Islands, natural resource management,
45 gender issues

46

47   **I.   Introduction**

48   While Small Island Developing States (SIDS) have a long history of resilience and
49   adaptation to environmental variability (Barnett, 2001), their communities face a range of
50   chronic threats to the sustainable management of their natural resources. These threats are
51   exacerbated by a rapidly changing climate along with new climate-related risks such as sea
52   level rise. While communities on Tanna Island (hereafter: Tanna), in the Republic of
53   Vanuatu, do not face an existential threat from sea-level rise (as it is an elevated volcanic
54   island), they are archetypal of communities and locations facing similar suites of interacting
55   threats. The increasing impacts on their natural resources from population growth, tourism
56   development, falling agricultural productivity and over-harvested fisheries are being
57   magnified and compounded by climate-related impacts, including more severe tropical
58   cyclones, ocean acidification, coral bleaching, and droughts, along with increasing coastal
59   inundation and erosion hazards.

60   In this paper we identify the range of perspectives on natural resource management,
61   and social and economic transition, in the context of environmental and climate change in
62   Port Resolution, a coastal village community on Tanna. Our purpose is to understand
63   constraints and enabling factors for implementation of ecosystem-based adaptation (EbA)
64   to climate change. Revealing perspectives on natural resource management in the context of
65   social and environmental change is a necessary first step in understanding social and cultural
66   constraints and enabling factors for EbA (Nalau, Becken, & Mackey, 2018).

67   Humans and their immediate environs are integrated in complex ways (Liu et al.,
68   2007), and no more so than on Tanna. The village communities are acutely and directly
69   dependent on ecosystem services (ES) – the flows of benefits human populations derive,
70   directly or indirectly, from ecosystem functions and processes (Braat & de Groot, 2012;
71   Millennium Ecosystem Assessment, 2005). 98% of all Tanna households undertake some
72   form of subsistence food production (Vanuatu National Statistics Office, 2009); in
73   particular, harvesting of provisioning ES provided by coral reef fisheries and by the close-
74   coupled subsistence gardens-forest production systems (Mackey et al., 2017; Secretariat of the
75   Convention on Biological Diversity, 2010). Rural communities in SIDS face tight resource
76   disturbance-supply feedback loops; therefore variability in resource scarcities are more
77   readily noticeable (McMillen et al., 2014). Indirectly, and on a longer-term basis, regulating
78   ES, such as erosion prevention and coastal protection services provided by key habitats, such
79   as coastal coral reefs and tropical forests, also provide foundational services in support of
80   community wellbeing. High-integrity ecological systems provide guardrails against
81   environmental challenges promulgated by climate change (Colls, Ash, & Ikkala, 2009). In
82   addition, and pertinent to Tanna, cultural ES, evidenced by the deep, community-specific
83   spiritual attachment to country, and the management practices and ceremonies that interface
84   with it, are of considerable value (Lindstrom, 1982, 2011; Mackey et al., 2017).

85   EbA describes a potentially fruitful class of interventions for SIDS. It entails the
86   purposeful deployment of ecosystems and the services they provide to assisting communities
87   adapt to the adverse impacts of climate change and is not simply habitat conservation for its
88   own sake (Andrade et al., 2011; FEBA, 2018; Munang et al., 2013; Nalau, Becken, & Mackey,
89   2018; World Bank, 2009). EbA links ecosystem conservation and adaptive natural resource
90   management with broader social and economic development strategies for assisting

91 communities to manage risks associated with climate change impacts in ways that improve
92 community wellbeing. EbA interventions are not rigidly defined, but rather best understood
93 in terms of their position on a continuum from ‘hard’, engineering-based projects such as a
94 concrete sea wall, through ‘soft’ engineering options such as beach enrichment, through to
95 those based entirely on natural ecosystems such as coral reefs (FEBA, 2018, pp. 8–10; Mackey
96 & Ware, 2018). EbA can also be understood as encompassing activities that reduce pressures
97 on ecosystems so that they maintain resilience and are better able to provide the valued ES
98 benefits. EbA also encompasses the capacity building of local communities required to
99 support such actions. EbA is thus an approach that endeavours to work *with* nature and
100 natural processes in ways that are beneficial to people.

101   Particularly for SIDS, EbA presents advantages over hard adaptation approaches.
102 Hard climate change adaptations such as seawalls can satisfactorily manage risks from very
103 specific hazards, such as inundation during storm surges, but can cause untended negative
104 outcomes for neighbouring locations (Mackey & Ware, 2018). EbA tends to manage hazards
105 with less certainty, but conversely helps mitigate a wider range of hazards, whilst also
106 providing numerous co-benefits. As such, EbA promotes social equity, as these co-benefits
107 tend to flow indiscriminately as public goods or common pool resources to the wider
108 community, rather than as a specific, private benefit, which potentially generates a negative
109 externality if the investment happens to have deleterious impacts on nearby habitats and
110 communities. For SIDS, such co-benefits are often the mainstay of agriculture, fisheries and
111 community well-being (Mackey et al., 2017; UNDP, 2010). EbAs are potentially the cheapest,
112 safest and easiest solutions – and sometimes the only feasible solution as they deploy
113 culturally-appropriate technology and can be utilised in locations where specialist
114 engineering capacity can be scarce (Munroe et al., 2011).

115   To identify and assess community perspectives towards natural resource
116 management – a core element in many EbAs – we use Q-methodology (hereafter, Q). Q can
117 be used to uncover the shared mental models, or discourses, of how people individually and
118 collectively view the world (Donner, 2001; Loring & Hinzman, 2018; McKeown & Thomas,
119 1988; Stephenson, 1953). With a few exceptions (Buchel & Frantzeskaki, 2015;
120 Hermelingmeier & Nicholas, 2017; Pike, Wright, Wink, & Fletcher, 2015), Q has thus far
121 been little-deployed in the assessment specifically of ES (Armata, Venn, & Watson, 2014; Sy
122 et al., 2018) and due to logistical and potential linguistic and cultural challenges outlined
123 below, has, to the best of the authors’ knowledge, not yet been used in SIDS.

124   This paper is organised as follows. We first provide a relatively detailed portrait of the
125 community, to enable the reader to appreciate the culture, social relations and
126 preoccupations of the people of Port Resolution. We then provide a short introduction to
127 Q, before describing our approach and justifying implementation decisions in more detail as
128 we explain the phases of our study. We then present results, followed by discussion of our
129 findings, highlighting where our research contributes to the literature. We conclude with
130 summary remarks and implications for practitioners.

131   2.   Study area and social and environmental context

132   The study area is a series of small hamlets, centred on Port Resolution (19°31'30.0"S
133 169°30'14.4"E), in the south eastern corner of Tanna, in the Republic of Vanuatu (Figure 1).

134 The community comprises approximately 280 hectares of land and 150 hectares of inshore
 135 coastal coral reef and in-shore lagoon. The population largely lives in traditional housing, is
 136 agrarian subsistence-based, and retains strong familial and tribal affiliations. Tanna is often
 137 referred to as the stronghold of kastom ¹ – a place where people still know and revere
 138 traditional songs, can trace their lineage, and organise and participate in rituals, community
 139 decision-making processes and ceremonies. Tanna is commonly regarded as an example of a
 140 location in which kastom and modernity can coexist (Lindstrom, 1982, 2011). However,
 141 common to many Pacific islands, customary practices (both social and resource
 142 management-based) are being eroded under the influence of ‘western’ economic systems and
 143 philosophical traditions, such as monetary exchange, economic specialisation, and
 144 individualised expression of self (Brosi et al., 2007; Nalau, Becken, Schliephack, et al., 2018).
 145 Notwithstanding, there is a renaissance of customary practices in the management of
 146 resources across the Pacific (Friedlander, Shackeroff, & Kittinger, 2013). Tanna is a hybrid
 147 system, with formal institutions of representative democracy and the administrative state,
 148 combined with the integration of traditional structures (the Malvatu Mauri, or National
 149 Council of Chiefs, which advises on issues of culture and language), and village-level
 150 decision-making through the Nakamal, the traditional meeting place.

Figure 1: Location of Port Resolution, Tanna and the Republic of Vanuatu

154 Port Resolution depends almost exclusively on a combination of subsistence
 155 farming, animal husbandry, and artisanal fishing for sustenance and non-food product
 156 harvesting for building dwellings (Vanuatu National Statistics Office, 2009). Customary
 157 resource management practices rely on the ability of resource users to adaptively manage and
 158 understand generally tight biophysical feedback loops, and to effectively modify
 159 community-wide practices accordingly (Berkes, 2009). These customary practices are
 160 generally built on a foundation of manipulating or supporting ecological processes (Clarke
 161 & Thaman, 1993; McMillen et al., 2014). The farming system typically comprises three
 162 components: (i) a shifting cultivation system; (ii) a perennial plantation cultivation system;
 163 and (iii) a forest and aboricultural system (Blanco, Pascal, Ramon, Vandenbroucke, &
 164 Carrière, 2013; Clarke & Thaman, 1993; Thaman, Clarke, Manner, Decker, & Ali, 1993). The

---

¹ Pronounced ‘custom’ and loosely translated as such, but also encompassing a broader meaning that includes the arrangement of private relations, social and economic systems, ways of being and activities and practices in managing the landscape.

165 productivity of this subsistence system and integrity of the adjoining tropical forests are at
166 the centre of a complex web of interdependencies that have an impact on overall village
167 community well-being and resilience to climate change (Barnett, 2001, 2011). This
168 productivity is reportedly under threat, mostly likely from shortened fallow times in the
169 shifting cultivation system (Mackey et al., 2017). As with the land, the inshore marine areas
170 are subject to customary ownership and allocation of access, and are both economically and
171 cultural important to the Port Resolution community (Hickey, 2008). Marine habitats in
172 the Port Resolution area include significant areas of shallow coral gardens and sea grass beds
173 in some of the more sheltered areas on the lee-side of the reefs. Customary marine fisheries
174 management have evolved to manage social relationships (closures for funerary rights, or
175 managing relations with neighbours), rather than a need to conserve fisheries (Foale, Cohen,
176 Januchowski-Hartley, Wenger, & Macintyre, 2011). There are no permanent freshwater
177 streams in Port Resolution. The village's water source is a single mains pipe, which runs a
178 significant distance (~10km) from a nearby mountain range. The flow from this source is
179 slow but is consistent and reportedly rarely fails completely. In the main village (Ireupuow)
180 there is a groundwater pump, which at the time of our field work was broken. A limited
181 number of rooftop capture-water tank combinations have been installed.

182 Broader economic opportunities and employment specialisation are limited.
183 Although the Ni-Vanuatu (the Indigenous Melanesian population of Vanuatu) face
184 persistent poverty (in terms of income and risk indices), which is linked to increasing
185 environmental and resource pressures, the *rural* Ni-Vanuatu have remained relatively
186 immune from poverty in terms of destitution and food insecurity (Asian Development
187 Bank, 2003), due to continuation of widespread subsistence gardening and fishing activities,
188 and access to customarily-managed land (Gerbeaux, Kami, Clarke, & Gillespie, 2007). Where
189 households receive cash income, the main expenditure items are rice, salt, soap and school
190 fees. Remittances are sent by relatives who take-up employment in Port Vila (the capital) or
191 overseas. Tourism development on Tanna is low-key, but increasing (South Pacific Tourism
192 Organisation, 2016; Vanuatu National Statistics Office, 2018). Port Resolution has three
193 tourism bungalow businesses, overlapping with four basic restaurants, but no equipment
194 hire businesses, or local guiding businesses.

195 Under IPCC climate change scenarios, Tanna faces sufficient within-island climatic
196 variability to require different adaptation actions between the north and the south of the
197 island and between the coast and the uplands, particularly with respect to promoting the
198 resilience of subsistence farming and its corollary, forest management (IPCC, 2014; Mackey
199 et al., 2017, pp. 46–53). In addition to rising temperatures, projections suggest an overall
200 wetting trend (largely associated with summer rainfall), an increase in tropical cyclones under
201 El Niño conditions, sea level rise, warming sea surface temperatures, and ocean acidification.
202 While climate change presents serious threats to the Port Resolution community and
203 ecosystems, it is important to consider these pressures in the context of ongoing
204 environmental changes and the drivers of these changes, particularly population growth,
205 land use change (deforestation) and increasing pressure on the fringing coral reefs from
206 overfishing (Mackey et al., 2017, pp. 54–56). Also important in the context of Port
207 Resolution is the experience of Tropical Cyclone (TC) Pam, a category five cyclone that
208 passed over Tanna in 2015 and severely affected communities on the island. It is estimated

209 that 75% of buildings on Tanna were damaged by high winds and storm surge inundation
210 (Nishijima et al., 2015). In addition, the high winds damaged crops and forests and coral reefs
211 were acutely perturbed. Although the shared memories of the socio-economic and physical
212 impacts of TC Pam are fading, it still remains salient to contemporary decision making.

213 Our research was undertaken as a component of the Pacific EcoAdapt project
214 (hereafter EcoAdapt). EcoAdapt is a multi- and cross-disciplinary program focusing on
215 evaluating the conditions conducive to and merits of EbA in the Pacific (Mackey et al., 2017).

216 3. Methodology

217 3.1. Introduction to Q-method

218 We used Q to identify the range of perspectives on attitudes towards natural resource
219 management and social and economic transition, in the context of environmental and
220 climate change in a subsistence gardening and fishing community. Q is considered both a
221 *quantitative* and a *qualitative*—or a quali-quantillogical— method (Stenner & Stainton
222 Rogers, 2004), based on statistical analysis of a person’s subjectivity (Stephenson, 1953). It
223 sits at the intersection of empirical-analytic methods of knowledge generation, with its
224 emphasis on implied objectivity, replicability, and deduction, and discursive-contextual
225 methods of knowledge, which emphasise personal realities, and a mutual understanding of
226 shared experiences of the world (Gregory, 1978; Robbins & Krueger, 2000). Q demands
227 abductive reasoning, whereby researchers seek the most likely conclusions from an
228 incomplete set of observations (Langston et al., 2019, p. 5). Unlike R-based methods, such as
229 Likert weighting scales, Q looks for correlations amongst subjects’ views, rather between
230 object variables. These correlations reflect mindsets that are analogous to the structure of a
231 discourse. Discourses are considered both external to individuals (they act *on* people) but are
232 also emergent of collective heuristics of people (people and power structures actively shape
233 them) (Dryzek, 1994, 1997). An important assumption behind Q is that there is a limited
234 number of perspectives that exist in a group of people on a given topic (Barry & Proops,
235 1999); that is, people are consistent and coherent in their viewpoints and it is likely that
236 people of a particular mindset think about distinct issues in a consistent way. However, Q is
237 not considered generalisable – it deploys strategic sampling of respondents, rather than large,
238 randomised samples (applicable to R methods), and Q-sets are based on specific contexts
239 (Amin, 2000).

240 Operationally, Q facilitates the ordering of subjective viewpoints into clusters,
241 elicited by asking respondents to sort statements (that are displayed on cards) onto a grid,
242 ranking them from most to least negative, or salient. Commonly, respondents are required
243 to sort the statements in a quasi-normal distribution, so there are fewer statements at the
244 extremes, resulting in the respondent having to apply a higher cognitive load whilst sorting.
245 Therefore, whilst a respondent may resonate positively with all statements, they are
246 nevertheless compelled to consider them in relation to one another; or as Loring & Hinzman
247 (2018) reflected from their fieldwork, a respondent stated: “they’re all really important,
248 but...” (2018, p. 370). The act of sorting statements assumes a necessary level of
249 comprehension in the respondent as to the wider purpose behind task (research), a
250 reasonable level of trust between the survey team and the respondent communities, a degree

251 of literacy, and access to gender-appropriate translators, with the requisite inter-personal
252 skills to capture the qualitative aspects of the data collection.

253 When analysing the card sorts produced by individual respondents, what is
254 important is the relationship between the placement of the statement cards as a whole,
255 particularly those at the extremes. Where there is sufficient correlation between respondents'
256 sorts, this is representative of a factor, which is can be used to generate an 'ideal sort' of the
257 statements for that factor. An ideal sort is representative of a hypothetical respondent who
258 would 100% overlap with the factor in the statement sorting. Typically, a factor should be
259 representative of at least 4 to 5 respondents, but repeated sampling should continue until all
260 new sorts begin to fall into stabilised factors. These ideal sorts are then further subjectively
261 translated into concisely-worded descriptions of the salient features by the analyst to provide
262 rich, contextual insight into the dominant perspectives of a given inquiry. Consistent with
263 the literature on Q our research method is broken in to five phases (Donner, 2001; Dziopa
264 & Ahern, 2011; van Excel & de Graaf, 2005).

265 3.2. *Phase 1: determine the nature of the inquiry and community of interest*

266 The first phase of Q is to set the primer question that elicits responses in the problem
267 domain and then to determine the respondents, who are collectively referred to as the P-set.
268 Through a process of iteration, following conversations with members of the Port
269 Resolution community and members of the project team, we settled on two differently-
270 worded primer questions, depending on whether the respondent was a member of the Port
271 Resolution community or not. To Port Resolution community members, we asked:

272 *What are the most important issues in your community? While there may be lots of*
273 *issues you think are important, which of the issues on these cards are the most important?*

274 For non-Port Resolution respondents, we needed to highlight that their responses should
275 not explicitly be based on what they believed the community were concerned about, but
276 rather what they believed to be the important issues, whether this decision was influenced
277 by their knowledge of the community's opinions or not:

278 *From your knowledge of the Port Resolution community and its people, what do you*
279 *believe are the most important issues facing that community? Do not explicitly put*
280 *yourself in their shoes and state what you think they believe are important issues, but*
281 *instead consider the issues on these cards you believe are important.*

282 Q is so-called as it is an inversion of R methodology. Unlike R methods, whereby the
283 participants represent the sample and the attributes of the survey questions are the variables,
284 in Q, the statements are the sample and the P-set is the variable. Therefore, randomly
285 selecting participants would be the equivalent of randomly selecting variables in a traditional
286 survey (Stevenson, 2015; Watts & Stenner, 2012). For this reason, strategic sampling is
287 acceptable. Selecting a reasonably diverse set of respondents provides greater opportunity to
288 uncover more diverse viewpoints (Nguyen, Boruff, & Tonts, 2018; Webler, Danielson, &
289 Tuler, 2009). Our P-set (Table 1) was sourced from (i) Port Resolution community members
290 of varying demographic attributes; (ii) the EcoAdapt project team members; (iii) inter-
291 governmental and non-governmental organisation staff; and (iv) philanthropic volunteers
292 in the community, all of whom had direct experience of the area, or Tanna (more broadly).

293 **Table 1:** Key stakeholder groups from which our Q-methodology respondents were drawn

Table 1

294 **3.3. Phase 2: issue discovery, defining the concourse, determining the Q-set**

295 The scope of the issues that will eventually form the set of statements is referred to as
 296 the ‘concourse’, or “domain of subjectivity” (Robbins & Krueger, 2000, p. 638) – the sum
 297 of things people *say* and *think* about a particular issue. The term ‘concourse’ suggests a
 298 crowded public space where (perhaps) a range of voices are attempting to be heard in order
 299 to articulate semi-structured concepts. This is an advised metaphor, as the goal of forming
 300 the concourse is to elicit as many viewpoints as possible, through a deliberative, mixed-
 301 method approach (Kenter et al., 2016; Kenter, Hyde, Christie, & Fazey, 2011). Our concourse
 302 was generated from the following series of activities. Firstly, we audited existing findings
 303 from the project team, gleaned from numerous formal and informal interviews from
 304 previous field trips to the Port Resolution community (between 2016 and 2018) and
 305 subsequent published papers (Hafezi, Sahin, Stewart, & Mackey, 2018; Mackey et al., 2017;
 306 Nalau, Becken, Schliephack, et al., 2018). Secondly, we undertook focus group discussions
 307 (FGD) with the EcoAdapt team (representing ‘expert’ opinion), which included canvassing
 308 judgements on climatic, oceanic and land-use impacts, which described modelled long-term
 309 impacts of climate change, including the likelihood of more extreme weather, sea level
 310 inundation, and coastal erosion. Thirdly, we carried out two FGDs in Port Resolution; one
 311 with the women of the village (n=15) and a second with the men (n=10). The purpose of the
 312 gender-determined nature of the FGDs was to ensure the concerns of women were not
 313 constrained by prevalent gender imbalances in power relations that remain pervasive in the
 314 Pacific (Malvatumauri National Council of Chiefs, 2012; UNFPA, 2011; WHO, 2003). Both
 315 Port Resolution-based FGDs were purposefully facilitator-led, rather than conducted from
 316 the ‘ground-up’ – that is, the concourse from expert opinion (the first two rounds of
 317 discovery) was presented to the groups as a starting point for discussions and the process was
 318 equally focussed on eliciting further issues not so far detected as well as on ensuring language,
 319 tone and phraseology of the existing draft statements were appropriate for subsequent stages.

320 At the conclusion of phase two, we had developed a concourse of 50 statements. We
 321 then further filtered our concourse, taking account of three requirements. Firstly, taking
 322 advice from Donner (2001), we ensured that, from a content perspective, statements avoided
 323 near duplicates, extreme statements, either positive or negative, as it is likely *everyone* will
 324 prioritise this card in the same way, and exact opposites. Secondly, we ensured that
 325 statements represented the range of ES types from each category: (i) provisioning;
 326 (ii) regulating; and (iii) cultural (Haines-Young & Potschin-Young, 2018; UN Statistical
 327 Division, 2018). Thirdly, we ensured our Q-set included at least one statement phrased in a
 328 way to ensure that collectively they could fulfil the elements of a complete discourse,
 329 according to Dryzek & Berejikian (1993) and Ockwell (2008); that is, they included
 330 statements that were: (i) ontological; (ii) referred to agents and their motivations; and
 331 (iii) had assumptions regarding natural relationships between assumed entities. In later
 332 analysis, we also teased-out some of the key metaphors associated with each discourse (see
 333 Table 2).

334 **Table 2:** Elements of discourse represented in our Q-set. To enable a final factor to fulfil the requirements of a
 335 discourse we ensure statements were phrased in such a way as to meet the required elements of a discourse
 336 (Dryzek, 1994; Dryzek & Berejikian, 1993)

Table 2 contents

337   After this process, 34 statements remained. These were translated into Bislama and
 338 alpha-tested with a Ni-Vanuatu subject, from Tanna, known to the authors. Numerous
 339 languages are spoken across Tanna (Nehrbass, 2012), however it was impractical to procure
 340 translation of the statements into the local language. Further, we employed an illustrator to
 341 sketch the key concepts and activities associated with each statement. The sketches were
 342 shown on the statement cards, designed to assist community members with lower literacy
 343 and to perform the role of *aide memoir*, particularly when the respondent needed to shift
 344 statements that had already been placed on the sorting distribution. The illustrations also
 345 contributed towards creating a game-playing aesthetic, not necessarily ‘gamified’ (Deterding,
 346 2012), in an attempt to make the activity accessible and engaging. Our final set of statements
 347 (known as the Q-set) is in Table 3, classified into the following categories: (i) provisioning
 348 ESs; (ii) regulating ESs; (iii) cultural ESs; and (iv) social and health. In this context, we define
 349 cultural ES as either a value that already emanates from the community’s association with an
 350 ecosystem (habitat) or a latent demand from the community for capturing the value from
 351 the natural environment through developing recreation and tourism opportunities. A
 352 selection of our statement cards, showing the illustrations, is in Appendix 1.

353 **Table 3:** The 34 Q-statements used in our Q method study. Our primary categorisation was framed around the
 354 ecosystem services classification scheme from the Millennium Ecosystem Assessment (de Groot et al., 2012;
 355 Millennium Ecosystem Assessment, 2005) in addition to two further categories for ‘Social’ and ‘Health’ issues.
 356 Health was extracted from the Social category as (specifically) health issues were key distinguishing statements in
 357 Factor 2. In our classification, cultural ecosystem services also include issue statements that reflect an affinity to
 358 activities that rely on cultural ecosystem services; namely earning money from tourism based on eco-tourism
 359 principles. The ideal factor score is weight given to that statement (from -4 to +4) if an ideal representative of that
 360 perspective had completed the Q-sort.

Table 3

361 **3.4. Phase 3: Data collection**

362   The majority of our Q-sorts were carried out *in-situ* in Port Resolution using a large
 363 ‘playing mat’ for the sorting (Figure 2). Again, we tried to maintain the game aesthetic. We
 364 undertook additional sorts in Port Vila in Vanuatu and with the project team. Each of the
 365 respondents’ sorts was placed on a quasi-normal distribution containing 34 placements from
 366 +4 to -4 in order of salience. Data collection took place over a period of four days; done by a
 367 team of three. We recruited two (previously known) research assistants from Port Resolution
 368 to act as translators and interlocutors. Recruitment of respondents was done through a
 369 combination of actively seeking-out participants (visiting their house, or school, for
 370 example) and strategically positioning ourselves in a busy location in the main village
 371 (Figures 3 and 4). Additional sorts, for IGO/NGO participants, development workers and
 372 project team members were carried out in more controlled environments, with
 373 appointments made at specific times.

374 An important aspect of Q is the capacity for quantitative assessment through
375 observation of respondents' sorting strategies and asking them to articulate their thought
376 processes. This assists with the formulation of the rich text descriptions of each of the key
377 factors. Whilst the sorting strategies of the respondents could be ascertained through simple
378 observation of the mechanics in laying down the cards, a free-flowing, two-way discussion
379 of the thinking behind the sorts proved difficult. Respondents were generally quiet in setting
380 about their tasks and in most cases discussion could only effectively be made through
381 interpreters. Nevertheless, some useful observations were made, either through watching the
382 card sorting, or from key elements of dialogue captured during the process. Sorting strategies
383 from community members did not vary much. Predominantly, respondents laid all the cards
384 out, read them carefully, then started placement from the most important (+4), working
385 backwards and shuffling cards backwards when fine-tuning their sorts. Non-community
386 respondents were more confident in assessing each card on its merit and placing each card as
387 it arose from the pack. However, as more cards were revealed, their certainty often dissipated
388 and was replaced by wry smiles as the complexity of the task became more apparent.

389
390 **Figure 2:** Q-method scoring board. To serve the game aesthetic, our ranking
391 board was brightly coloured, with clear use of a well-understood colour
392 scheme and use of smiley and sad faces. The ranking board was printed on
393 durable vinyl. It also contained areas for pre-sorting, enabling respondents to
394 sort the cards into generally favourable, generally unfavourable and neutral
395 categories, before more detailed placement.

396
397 **Figure 3:** Undertaking Q-method with the women of Port Resolution.

Figure goes here

Figure 4: Undertaking Q-method with the men of Port Resolution.

3.5. Phase 4: statistical analysis

For our statistical analysis we used the web application Ken-Q Analysis (Banasick, 2018). We calculated the correlations between the participants' Q sorts to create a 'correlation matrix', which is then subject to factor analysis. Considerations of statistical significance should not preclude qualitative judgements about appropriate factor solutions; that is, when using Q, it is feasible, based on expert judgement or from earlier consultative activities, to have *a priori* insight into the likely factors. The factor analysis can produce a number of statistically relevant outputs, however, through an iterative process, which included consistently asking the questions: (i) is the candidate factor statistically relevant, with an Eigenvalue greater than 1; (ii) are there more than two participants who are highly correlated within one factor and no other; and (iii) do the participant clusters agree with qualitative data and observations from interviews and FGDs (Stevenson, 2015). High factor stability is considered to have been achieved when a dozen-or-so respondent sorts load into a factor. Moderate stability is when 6 to 8 load into a sort (Kerr & Swaffield, 2012). Confounding sorts (respondents who load into more than one factor) and null sorts (respondents who do not load into any factor) are discarded, however these sorts are included in the analysis of consensus statements (section 4.2) and low-scoring statements (section 5.3).

4. Results and analysis

We collected 55 responses, 35 from women and 20 from men. Statistical analysis of these responses revealed three dominant factor loadings, with one factor particularly strongly evident and two somewhat less prominent, followed by a long tail, with less significant differences between them (see Figure 5). The three dominant factors were extracted via Varimax Rotation; together these factors explained 40% of the total variation, which meets the threshold of 35%-40% suggested by Kline (1994) (see Table 4). Respondents were assigned into factors with p value of < 0.05 , using Ken-Q Analysis auto-flag function. Of the 55 respondents, 42 loaded into the three rotated factors; 11 were found to be confounding (loading into more than one factor) and a further 2 were discarded for not loading into any factor. Factor 1 contained 18 respondents, however two were split-off into a Factor 1b that was bipolar (that is, the factor is defined by positive and negative viewpoints). Factor 1b was subsequently discarded as it contained only two members. Factor 2 contained 17 respondents and Factor 3 contained nine. The ideal sorts for Factors 1a, 2 and 3 are shown in Figure 3. An ideal sort is the pattern expected if a respondent loads 100% into that factor. (In reality, the

432 highest loading respondent into Factor 1a loaded at 0.8566, Factor 2 at 0.7686, and Factor 3
433 at 0.6572.) The correlation between the each of the three rotated factors is shown in Table 4.

434
435 **Figure 5:** Scree plot of Eigenvalues of principal components from our factor
436 extraction. We retained three factors for Varimax rotation, concluding that
437 within the 'long tail' (from factor 4 onwards), there is insufficient variation
438 and explanatory power.

439 **Table 4:** Results of our Q-methodology factor analysis, showing Eigenvalues, cumulative percent of explained
440 variance, number of defining sorts in each extracted factor (respondents who fit the factor) and the correlations
441 between these factors.

Table 4

442 **4.1. Phase 5: Factor qualification**

443 Factor analysis is a qualitative process of interpreting and describing the rotated
444 factor arrays. This can be based on assessments of shared positive, negative or neutral sorts,
445 particularly at the extremes. We also consider distinguishing statements for each factor –
446 those statements that load into one of the factors in a position that is significantly different
447 from the other factors. Distinguishing factors are labelled in Figure 6. To assist with our
448 determination of the key attributes of each factor we displayed each factor in a spie chart
449 showing the position-derived score given by respondents in each of the statement categories
450 in Table 3 – for provisioning ES, regulating ES, cultural ES and more general social issues (see
451 Figure 7). In our process of analysis, two social issue statements (S26 and S32) associated
452 specifically with health were further isolated, demonstrating Q's capacity to reveal non-
453 hypothesised concepts. These two statements were particularly prevalent in Factor 2 and also
454 generated a significant point of difference with Factor 1a (S32 was a distinguishing
455 statement). Our qualitative assessment and description of each of the factors is below. For
456 each statement we deploy the approach of Dryzek (1997) in summarising the key elements of
457 a discourse.

Figure goes here

Figure 6: The ideal sorts from each of our three rotated factors. An ideal sort is the sort expected if a respondent loads 100% into one of the factors. (In reality, the highest loading respondent into Factor 1a loaded at 0.8566, Factor 2 at 0.7686, and Factor 3 at 0.6572.). Distinguishing statements are labelled and marked with * where the distinguishing significance is at $P < 0.05$ and ** where the distinguishing significance is at $P < 0.01$. Distinguishing statements are also marked with a ◀ where their score is lower than in all other factors and a ▶ where their score is higher than in all other factors.

Figure goes here

Figure 7: Factors represented as spie charts, indicating the representation of each statement in our initial categorisation of (i) provisioning ecosystem services; (ii) regulating ecosystem services; (iii) cultural ecosystem services; (iv) health; and (v) social issues. The relative share of the pie is a representative of the number of statements in each category. The concentric scale is representative of the score given to that statement in each of the factors. So that all values are positive, the scores have been re-assigned as: -4 = 1; -3 = 2; ... +3 = 8; +4 = 9.

4.1.1. Factor 1a

Respondents associated with this perspective emphasise traditional and customary practices and a preoccupation with concerns around the sustainability of provisioning ecosystem services and, to a slightly lesser extent, regulating services. All statements placed in the +2, +3, and +4 positions are in some way associated with kastom decision-making and kastom resource management. The statements connected with passing natural resources, knowledge, and customs down to future generations (S12, S13, and S15) and concerns around garden productivity and managing fisheries were highly salient. Conversely, Factor 1 places low emphasis on economic development opportunities associated with monetising cultural ESs and the infrastructure that supports this, and with further elements of modernity, such as access to financial services, electricity and voting and health. Statements related to childhood education were ranked neutrally. For these reasons we labelled this factor as *Strong Kastom*.

489 **Box 1:** Discourse analysis of Strong Kastom

Box 1

490 4.1.2. *Factor 2*

491 Respondents who hold this perspective again emphasise traditional and customary
492 preoccupations but have a generally lower concern with the sustainability of provisioning
493 ecosystem services. However, importantly, they demonstrate a strong affiliation with the
494 two statements associated with modern health care (S₃ and S₄) and the two associated water,
495 sanitation and health ('WASH') statements (S₂ and S₃). A single economic development
496 statement appears at +2, indicating this perspective is a little more open to exploring income-
497 generating opportunities, but not strongly so. This factor placed the highest salience on
498 concern for extreme weather, associated with climate change. Three key kastom-related
499 statements associated with sustaining traditional practices in the management of resources
500 and practices remained salient (S₁₂, S₁₃ and S₁₈). Similar to *Strong Kastom*, respondents
501 show less affiliation with statements associated with broader social change, such as access to
502 information and financial services, economic development and voting. Statements related to
503 childhood education were ranked neutrally. Given broader similarities to *Strong Kastom*
504 and the strong association with health and sanitation statements, we labelled this factor as
505 *Kastom + Health*.

506 **Box 2:** Discourse analysis of Kastom + Health

Box 2

507 4.1.3. *Factor 3*

508 Our third factor still demonstrates a strong affinity to certain elements of kastom and
509 customary management of resources, with both +4 positions occupied by kastom statements
510 (S₁ and S₁₅). However, one of these kastom-related statements (S₁₅) is related to more
511 ceremonial cultural practices associated with retaining knowledge of dances and songs, rather
512 than social relations between contemporaries. Distinguishing this factor is the greater affinity
513 with cultural ES, demonstrating a desire to capture monetary value from nature, through
514 tourism opportunities. The one outlier to this was S₂₈ (borrowing money to invest in
515 tourism services or for monetising fisheries). The two health-related statements together also
516 ranked relatively highly. In addition, and importantly, two female emancipatory statements
517 (S₂₀ and S₃₄) are ranked highly. The emancipatory statements are associated with further
518 influencing decisions in the village and with a concern for greater gender equality in the share
519 of domestic work. Regulating services are generally ranked lower. The affinity to economic
520 development and emancipatory concepts signifies a desire for modernisation towards an
521 exchange-based economy, however, the connection to kastom shows this affiliation is
522 tentative. Statements related to childhood education were ranked neutrally. We labelled this
523 factor *Tentative Modernity*, intending to convey the openness of this factor to concepts of
524 monetary exchange and economic specialisation, and a resistance to determining ones' role

525 in the community based on gender, whilst retaining a tendency towards traditional cultural
526 practices and a pre-occupation with concern for kastom forests.

527 **Box 3:** Discourse analysis of Tentative Modernity

Box 3

528 **4.2. Consensus statements**

529 Consensus statements are statements shared by all factors within a single score of each
530 other. Consensus statements are relevant as they can represent potential starting points for
531 community engagement and project development; in lieu of advocating for potentially
532 strongly-held (by some), but nevertheless more divisive, views. Our analysis revealed six
533 consensus statements, of relatively diverse subject matters (see Figure 10 for factor score
534 congruence as a guide). The most highly ranked of these were S8 (protecting reefs by catching
535 fish further out to sea) and S2 (access to sufficient drinking water). Other consensus
536 statements (in order of increasing mean z-score) were S27 (costs of secondary school), S7
537 (non-biodegradable waste disposal), S33 (personal safety) and S28 (access to micro-finance).
538 Whilst we could not decipher any particular general sentiment common to these consensus
539 statements, individually they represent opportunities for potentially useful and discreet
540 community development projects in support of EbA, such as improving sea-faring
541 capabilities and drinking water facilities; implementation of which could benefit from
542 consensus support (from within the community and across the wider stakeholder group).

543 **5. Discussion and emerging issues**

544 Our paper seeks to reveal the range of perspectives on natural resource management
545 in the context of environmental and social change in rural communities on Tanna in order
546 to understand potential constraints and enabling factors for implementation of EbA. In this
547 section we analyse our discourses vis-à-vis a series of demographic attributes, then look
548 specifically at how climate change-related statements (adaptation-based and impact-based)
549 are positioned in each factor, so that we can make a judgement on the prospects for EbA. We
550 also look at broader emerging issues, including assessing specific low-scoring cards and,
551 finally, we reflect on our methodological approach in a SIDS context.

552 **5.1. Correlations based on demographic features**

553 Limited demographic information was collected from each respondent, but this data
554 nevertheless provides valuable additional insight into the propensity for different attributes
555 to correspond to each factor. We collected information on the participants' gender, whether
556 they earned *some* income, and whether they lived in the Port Resolution community.
557 Income for Port Resolution community members is earned from either owning a tourism
558 establishment (restaurant or holiday bungalows), working at the school or as a medical
559 professional, or from casual employment from labouring. To understand the propensity of
560 each of these attributes to be associated with each factor, we normalised the value of
561 membership of each factor by calculating how many respondents would load into each factor
562 if the sample was equal for each pairing (male/female, waged/non-waged and community

member/non-community member); that is, if the respondent set contained 27.5 men and 27.5 women, for example, how would each discourse be constituted. The results are in Table 5. This represents a *ceteris paribus* predisposition for a demographic attribute to belong to each factor; on the assumption that each demographic variable is independent of each other. Notwithstanding the generally small samples inherent in Q, we also tested both the significance of these relationships and any interdependencies, using a multinomial logit regression, with factor membership as the dependent variable (all independent variables are categorical in nature)². The predictive capacity and significance of the regression results are discussed in the relevant sections below.

Table 5: Weighted factor membership for selected demographic information. The scores are weighted as such to indicate how many respondents would load into each factor if the number of respondents in each factor was equal (27.5).

Table 5

5.1.1. Gender

By gender, *Strong Kastom* was significantly skewed towards men (M:F | 12.4:5.5); *Kastom + Health* was weighted relatively equally; and *Tentative Modernity* was skewed towards women (M:F | 1.4:6.3). This infers that men have a higher affinity to traditional and kastom aspects of village life, and women have a greater affinity towards change and the opportunities economic development presents. To further explore this dichotomy, we undertook additional categorisation of our statements and placed them into three new categories: (i) traditional; (ii) economic development and emancipatory; and (iii) others. We then mapped these categories in a spie chart (see Figure 8). Statements categorised as ‘others’ were put aside for the purposes of this analysis. Though all discourses showed an affinity towards tradition, *Strong Kastom* had a significant skew towards traditional statements (unsurprisingly) and very low affiliation with economic development and emancipatory statements. Conversely, *Tentative Modernity* had a greater affinity with economic development and emancipatory statements. Gender differentiation in tasks, access to resources and community decision-making is still prevalent in Tanna and the role of kastom in arbitrating community outcomes is not considered universally positive (Malvatumauri National Council of Chiefs, 2012; UNFPA, 2011; WHO, 2003). This is particularly relevant in Tanna where men dominate community and household decision-making and hold many entitlements to traditional stories and knowledge of traditional weather indicators, while women do most of the gardening, food preparation, and water collection (Nalau, Becken, Schliephack, et al., 2018). Without overplaying the role of researchers as emancipatory agents, an ethical trade-off exists where researchers must remain objective observers (to enable method replication), but at the same time must ask probing questions to tease out concerns and then test individual preferences that may lay hidden behind power relations, and which may create the potential for change. The dual qualitative-quantitative and deliberative-

² This represents a similar approach to that used to identify potential individual specific characteristics as drivers of preference group membership in latent class analysis of choice experiment data (Hensher & Greene, 2010; Roeder, Lynch, & Nagin, 1999).

600 individual nature of Q can begin to open some cultural norms to discussion and potential
601 change (Rubin, 2016). We conject that women see economic activity associated with
602 monetising the comparative advantages of Port Resolution's cultural ES as an emancipatory
603 strategy, which could potentially recalibrate their role in the community. However,
604 attachment to the tenets of kastom still remain influential in this factor. In our multinomial
605 logit regression, gender was a driver of factor membership of *Tentative Modernity* over both
606 *Strong Kastom* and *Kastom + Health*, though it was only statistically significant ($p=0.077$)
607 in the case of the former.

608 Our research revealed activities that support economic development and further
609 female emancipation, which *might* challenge some elements of kastom, may experience
610 differences in community support based on gender. This suggests a gender-based fault line
611 between the discourse of emancipation from traditional decision-making and divisions of
612 labour through the vehicle of economic development, and the contrasting preoccupation
613 with kastom and kastom management of natural resources as a discourse in the service of
614 maintaining pre-existing power structures. Though our Q did reach definitive or
615 comprehensive conclusions through a regression model (this was not the objective; Q uses
616 strategic sampling), it does, at least, point to potentially critical inter-sectional perspectives
617 that demand further investigation in research or in project development.

Figure goes here

618
619
620
621
622
623
624
625
626
627

Figure 8: Factors represented as spie charts, indicating the propensity for traditional and economic development / emancipatory statements to be associated with each extracted factor. Traditional / Kastom statements are: 6, 12, 13, 15, 16, 17, 18 and 23. Economic development / Emancipatory statements are: 14, 20, 21, 22, 24, 25, 26, 28, 31, 33, and 34. The relative share of the pie is representative of the number of statements in each category. The concentric scale is representative of the score given to that statement in each of the factors. So that all values are positive, the scores have been re-assigned as: -4 = 1; -3 = 2; ... +3 = 8; +4 = 9.

628 *5.1.2. Income*

629 The second demographic attribute we examined was whether earning income led to
630 a propensity to load into a particular factor. In this instance we used a very basic measure of
631 earning *some* income, regardless of its quantum, or whether this income was permanent. In
632 Table 5, only *Kastom + Health* revealed any potential association with this attribute, with
633 respondents who earn some income dominating this factor. *Tentative Modernity*, with its
634 generally greater focus on economic development through monetising cultural ES, was
635 slightly better representative of purely subsistence members of the community. Putting these
636 two relationships together we can conject that members of the community who already have

637 some income are ambivalent about further economic development or emancipatory
638 concepts, seemingly enjoying the best of both worlds. In our multinomial logit regression,
639 income was not a significant driver of the allocation of respondents to factors.

640 5.1.3. *Community status*

641 The third demographic attribute we examined was the contrast between community
642 members and respondents from outside the community (from NGOs, IGOs, and academia).
643 Community members had a substantially stronger affiliation to *Strong Kastom* than non-
644 community members, whilst non-community members had a conversely stronger affiliation
645 to *Kastom + Health*. However, most significantly, there were no non-community members
646 identifying with *Tentative Modernity*. This suggests there is a discord between outsiders'
647 understanding of the view community members (especially women) take on the role
648 economic development plays in improving well-being. This suggests non-community
649 members (including external experts and programme officers from IGOs/NGOs) are
650 reluctant to consider prosaic economic development pathways towards a cash-based, labour-
651 specialised exchange system as a completely positive pathway. In our multinomial logit
652 regression, non-community membership was a significant driver of factor membership of
653 *Tentative Modernity* over *Strong Kastom* ($p < 0.001$) and over *Kastom + Health* ($p < 0.001$).
654

655 Whilst the propensities for particular sorts referred to above provide evidence that different
656 classes of respondents load into factors, using Q we cannot necessarily deduce with
657 significant statistical certainty that this will be the case in all instances. Whilst we learned that
658 *Strong Kastom* and *Kastom + Health* weighted towards men, we also learned there is a
659 significant gender-based discourse that is sympathetic to the economic development
660 opportunities that can capture cultural ES benefits provided by the attractive natural
661 ecosystems of Port Resolution and which has an affinity towards emancipatory concepts.
662 We also learned there is a potential blind spot amongst non-community members for this
663 discourse and that programme design in support of community development that is
664 dominated by the views of 'experts' risk ignoring the role of economic development and, by
665 virtue of this, ignoring opportunities for women. Though Q is not considered generalisable
666 (the statements are often specific to the P-set), our multinomial logit regression analysis did
667 suggest that auxiliary regression analysis of Q-derived discourses could be a potentially useful
668 approach for identifying predictors of discourse membership for a wider population, based
669 on a broader set of demographic and attitudinal attributes. Therefore, notwithstanding
670 strategic sampling, using Q, can (and did) lead us to form useful hypotheses on which further
671 research can be based (see Conclusions section).

672 5.2. *Constraints and enabling factors for ecosystem-based adaption*

673 Our research demonstrated that there is an affinity towards provisioning and
674 regulating ES across the dominant discourses. The role of ES in community well-being on
675 Tanna is well documented and confirmed (Mackey et al., 2017). As such, *prima facie* EbA
676 would not likely face social and cultural constraints in the Port Resolution community and
677 EbA implementation would simultaneously address ecosystem adaptation and livelihood
678 improvements (Nalau, Becken, & Mackey, 2018). In Figure 9, we identify and plot

679 statements that are aligned explicitly with EbA (n=5) and statements that suggest a pre-
680 occupation with climate change impacts, such as a warmer and drier climate and more
681 extreme weather events (n=3). *Strong Kastom* shows the most positive alignment for climate
682 change concerns and EbA. *Tentative Modernity* shows the least alignment.

683 Q is not designed to determine preferences for specific adaptations at a project level,
684 however it does reveal the coherent discourses present amongst stakeholders, which can be
685 used to start to define constraints and enabling factors, and thus the feasibility and utility, of
686 EbA projects. For example, a statement card that ranked highly in any or all of the factors
687 should not necessarily be used in isolation as a template for the design of projects. In our
688 study, there is a reasonable level of congruence between the factors in the (high) ranking of
689 statement S1 (protecting forests from being cut to make way for gardens). This suggests that
690 project design for a climate adaptation project should be cognisant of the role that customary
691 management of forests plays in each of the discourses and could potentially use this as a
692 starting point for engagement with the community. In addition, as suggested in the previous
693 section, program design that considers the role of economic development through tourism
694 is likely to appeal to women as a pathway towards greater engagement in shaping the
695 community's future.

696 Based on our Q results, EbA projects at Port Resolution should consider income
697 generating activities and guard against solutions that maintain the exclusion of women in
698 decision-making. These findings are supported by Djoudi & Brockhaus (2011) who argue
699 that women can be hindered from realizing the potential of any new economic development
700 opportunities in developing world contexts (Djoudi & Brockhaus, 2011, p. 123) that point to
701 women's vulnerability to climate change increasing in the short-term; however, if economic
702 activities can be harnessed, and power and resource entitlements follow, the longer-term
703 prognosis is more positive.

704 Fundamentally, however, our research shows that interventions must be sensitive to
705 the importance of kastom resource management and knowledge. Knowledge is contested
706 between multiple stakeholders in complex social-ecological systems across scales. If project
707 implementers are to succeed in development activities, it must be understood that
708 knowledge is held by different stakeholders with a range of motivations, aspirations,
709 concerns and frames of reference, which, if not coordinated, can lead to zero-sum outcomes
710 (Langston et al., 2019; van Noordwijk, 2017). We recognise Indigenous Traditional
711 Knowledge (ITK) remains important to Tanna communities and can be employed
712 successfully in responding to climate threats (Nalau, Becken, Schliephack, et al., 2018). If the
713 view is taken that ITK is one, albeit rich, layer in "nested knowledge systems" (Nalau,
714 Becken, Schliephack, et al., 2018, p. 851), our Q research lends itself to the concept of co-
715 produced knowledge, as envisaged by Díaz et al. in the Intergovernmental Science-Policy
716 Platform on Biodiversity and Ecosystem Services framework (2015, 2018). As ITK is held and
717 accumulated collectively, EbA has potential to be fully integrated into the community
718 actions and interests – a common factor of success.

Figure goes here

Figure 9: Sentiment towards climate change adaptation statements and climate change impact statements for our three factors. Adaptation statements were S1, S8, S9, S10, and S11. Impact statements were S3, S4, and S19.

5.3. Low scoring statements

Whilst the purpose of Q is not to consider statements in isolation (as if it were a R-type survey) the process of doing so can elicit useful information. Two statements scored consistently low: S11 (cooking with an alternative to firewood) and S22 (free to vote in elections), which had mean z-scores of -1.28 and -1.68 respectively. In addition, there was relative consensus in this low scoring (see Figure 10). The very low mean score associated with voting in elections suggests there is little interest in the formal institutions of representative government in being able to meet the challenges faced by rural, subsistence communities. Local decision-making, at the *Nakamal*, the traditional village civic meeting place, is of greater importance. For example, the area's roads are dirt tracks not maintained by the Provincial government and are sometimes impassable even to 4-wheel drive vehicles, yet the community feels empowered to make the decision to fix the road with their own labour, at the time of their choosing. However, from prior field trips taken just after national elections in 2018, the authors noted localised concern, particularly amongst village matriarchs, for the lack of fairness and openness in the voting process.

Figure goes here

Figure 10: Factor score congruence for statements. Statements (x axis) are ranked in order of standard deviation (lowest on the left to highest on the right) of the mean score from each factor. The y axis is the mean score for each factor for that statement. Statements to the left of the chart have high congruence, statements to the right have low congruence between the factors. Therefore, statement 28 has the highest level of congruence between the factors, but has a generally negative salience. Factor 2 has a third ranked congruence and has a generally positive salience.

748 5.4. *Reflections on carrying out Q-method on Tanna*

749 We conclude that Q is a viable method of enquiry for SIDS and less-economically
750 developed communities, more broadly. Participants exhibited a high level of interest and
751 comprehension, even though literacy levels are low, resulting in successful data collection
752 from community stakeholders. Our use of a game-playing aesthetic (see Appendix 1), proved
753 engaging for both community and non-community participants. During sorting,
754 respondents felt fully-comfortable swapping cards if they felt they needed. However,
755 occasionally, after prompting for conformation, they reflected again on the purpose of
756 shifting cards more than one unit of scale (generally backwards), simply because that was
757 where the gaps remained. Women in the village felt fully engaged and universally were
758 comfortable in fulfilling the task. However, groups of women participating tended to
759 demotivate men from joining-in and vice versa. Men were initially more sceptical, but once
760 the statements were absorbed, their engagement and care with placement increased. In
761 general, levels of Bislama literacy was strong. As anticipated (and mitigated by the
762 deployment of the illustrations) a few of the older women (adjudged to be more than 40
763 years old) heavily relied on the spoken translations and supervision of the female research
764 assistant. As an aside, the productivity of the data collection in the community increased each
765 day, as word-of-mouth spread and our presence and the activity became progressively
766 demystified. On reflection, the main limitation of our study is typical of the principle
767 weakness of Q in its necessity to reduce often complex and nuanced issues down to single
768 statements. Q is, by nature, discursive in its execution and unless there is sufficient shared
769 understanding of statement meaning, the explanatory power of Q is eroded. In this instance,
770 this reduction is potentially amplified by the discursive, cultural and linguistic distance
771 between the interviewer and the respondent.

772 6. Conclusion

773 Our study set out to identify the range of perspectives towards natural resource
774 management and social and economic transition, in the context of environmental and
775 climate change in rural communities on Tanna, to understand constraints and enabling
776 factors for implementation of EbA. By using Q, we approached this research problem
777 indirectly, using discourse analysis of stakeholders. We identified three dominant
778 perspectives ('discourses'), which explained 40% of all variance in our sorts: (i) *Strong*
779 *Kastom*; (ii) *Kastom + Health*; and (iii) *Tentative Modernity*. In each of these perspectives,
780 there was a strong affinity to provisioning and regulating ES that reflected the omnipresent
781 role of kastom in arbitrating social relations and customary management of natural
782 resources. However, *Tentative Modernity* had significantly greater openness to economic
783 development opportunities associated with monetising cultural ES, which was noticeably
784 absent from *Strong Kastom* and *Kastom + Health*. Whilst our Q did not reveal any strong
785 weighting towards specific climate change concerns, it did reveal that attitudes in the
786 community will likely be receptive to EbA, as it supports community reliance on
787 provisioning ES and kastom-related ecosystem functions.

788 A key step in adaptation projects is identifying a candidate set of adaptation
789 interventions for an identified climate risk. The dominant perspectives captured by *Strong*
790 *Kastom*, *Kastom + Health* and *Tentative Modernity* suggest that for this case study,

791 interventions are more likely to resonate with the community if they enable natural resource
 792 management, reflect traditional knowledge of ecosystems and related Kastom practices,
 793 provide opportunities for generating income, and promote equity in decision making. Our
 794 results also suggest that external practitioners do not necessarily prioritise the need for
 795 income generation, such as through eco-tourism, reflected in the *Tentative Modernity*
 796 discourse, as being as important to community livelihoods. Ignoring a community's
 797 perspectives, values and priorities risks undermining the integrity of EbA projects.

798 Acknowledgements

799 This research was undertaken through a research MOU with the Tafea Provincial
 800 Government and Vanuatu research permit, dated 17 May 2018. We are grateful to the Port
 801 Resolution community for their permission to undertake this research and for their
 802 cooperation, generosity, humour, and hospitality. In particular, we thank our research
 803 assistants in Port Resolution, Esther Karrahi and Alfred Iouma. For the creative illustrations,
 804 we thank Sarah Engelhard. This research was supported by a grant from a private charitable
 805 trust that wishes to remain anonymous to avoid unsolicited requests for funds. The donor
 806 had no influence on any aspect of the design, execution or documentation of this research.

807 References

- 808 Amin, Z. (2000). Q methodology—a journey into the subjectivity of human mind. *Singapore Medical Journal*, 41(8), 410–414.
- 809 Andrade, Á., Córdoba, R., Dave, R., Girot, P., Herrera-F, B., Munroe, R., ... Vengara, W. (2011). Draft principles and guidelines for
 810 integrating ecosystem-based approaches to adaptation in project and policy design: A discussion document. Retrieved from
 811 <https://portals.iucn.org/library/efiles/documents/2011-064.pdf>
- 812 Armatas, C. A., Venn, T. J., & Watson, A. E. (2014). Understanding Q-methodology to select and define attributes for non-market
 813 valuation: A case study from Northwest Wyoming, United States. *Ecological Economics*, 107, 447–456.
- 814 Asian Development Bank. (2003). *Priorities of the People: Hardship in Vanuatu*. Manila. Retrieved from
 815 <https://www.adb.org/sites/default/files/publication/29744/hardship-vanuatu.pdf>
- 816 Banasick, S. (2018). Ken-Q Analysis. Retrieved April 6, 2019, from <https://shawnbanasick.github.io/ken-q-analysis/>
- 817 Barnett, J. (2001). Adapting to climate change in Pacific Island countries: the problem of uncertainty. *Regional Environmental*
 818 *Change*, 29(1), 977–993.
- 819 Barnett, J. (2011). Dangerous climate change in the Pacific Islands: Food production and food security. *Regional Environmental*
 820 *Change*, 11(1), 229–237.
- 821 Barry, J., & Proops, J. (1999). Seeking sustainability discourses with Q Methodology. *Ecological Economics*, 28(337–345).
 822 [https://doi.org/10.1016/S0921-8009\(98\)00053-6](https://doi.org/10.1016/S0921-8009(98)00053-6)
- 823 Berkes, F. (2009). Indigenous ways of knowing and the study of environmental change. *Journal of the Royal Society of New Zealand*,
 824 39(4), 151–156.
- 825 Blanco, J., Pascal, L., Ramon, L., Vandenbroucke, H., & Carrière, S. (2013). Agrobiodiversity performance in contrasting island
 826 environments: The case of shifting cultivation in Vanuatu, Pacific. *Agriculture, Ecosystems & Environment*, 174(1), 28–39.
- 827 Braat, L., & de Groot, R. (2012). The ecosystem services agenda: Bridging the worlds of natural science and economics, conservation
 828 and development, and public and private policy. *Ecosystem Services*, 1(1), 4–15.
- 829 Brosi, B. J., Balick, M. J., Wolkow, R., Lee, R., Kostka, M., Raynor, W., ... LEE LING, D. (2007). Cultural erosion and biodiversity:
 830 Canoe-making knowledge in Pohnpei, Micronesia. *Conservation Biology*, 21(3), 875–879.
- 831 Buchel, S., & Frantzeskaki, N. (2015). Citizens' voice: A case study about perceived ecosystem services by urban park users in
 832 Rotterdam, the Netherlands. *Ecosystem Services*, 12(1), 169–177.
 833 <https://doi.org/https://doi.org/10.1016/j.ecoser.2014.11.014>
- 834 Clarke, W., & Thaman, R. (1993). *Agroforestry in Melanesia*. United Nations University Press.
- 835 Colls, A., Ash, N., & Ikkala, N. (2009). *Ecosystem-based Adaptation: A Natural Response to Climate Change* (Vol. 21). Gland:
 836 IUCN.
- 837 de Groot, R., Brander, L., van der Ploeg, S., Costanza, R., Bernard, F., Braat, L., ... Beukering, P. (2012). Global estimates of the value
 838 of ecosystems and their services in monetary units. *Ecosystem Services*, 1(1), 50–61.
- 839 Deterding, S. (2012). Gamification: designing for motivation. *Interactions*, 19(4), 14–17.
- 840 Diaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., ... Báldi, A. (2015). The IPBES Conceptual Framework—
 841 connecting nature and people. *Current Opinion in Environmental Sustainability*, 14, 1–16.
- 842 Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R. T., Molnár, Z., ... Shirayama, Y. (2018). Assessing nature's
 843 contributions to people. *Science*, 359(6373), 270 LP – 272. Retrieved from
 844 <http://science.sciencemag.org/content/359/6373/270.abstract>
- 845 Djoudi, H., & Brockhaus, M. (2011). Is adaptation to climate change gender neutral? Lessons from communities dependent on

livestock and forests in northern Mali. *International Forestry Review*, 15(2), 123–135.

Donner, J. C. (2001). *Using Q-sorts in participatory processes: An introduction to the methodology*. *Social Development Papers* (Vol. 36). Citeseer. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.607.4701&rep=rep1&type=pdf#page=30>

Dryzek, J. (1994). *Discursive democracy: Politics, policy, and political science*. Cambridge, UK: Cambridge University Press.

Dryzek, J. (1997). *The Politics of the Earth: Environmental Discourses*. Oxford: Oxford University Press.

Dryzek, J., & Berejikian, J. (1993). Reconstructive democratic theory. *American Political Science Review*, 87(1), 48–60. <https://doi.org/10.2307/2938955>

Dziopa, F., & Ahern, K. (2011). A Systematic Literature Review of the Applications of Q-Technique and Its Methodology. *Methodology*, 7(2), 39–55.

FEBA. (2018). *Making Ecosystem-based Adaptation Effective*. Retrieved from https://www.iucn.org/sites/dev/files/feba_eba_qualification_and_quality_criteria_final_en.pdf

Foale, S., Cohen, P., Januchowski-Hartley, S., Wenger, A., & Macintyre, M. (2011). Tenure and taboos: Origins and implications for fisheries in the Pacific. *Fish and Fisheries*, 12(4), 357–369.

Friedlander, A. M., Shackeroff, J. M., & Kittinger, J. N. (2013). Customary marine resource knowledge and use in contemporary Hawai'i. *Pacific Science*, 67(3), 441–461.

Gerbeaux, P., Kami, T., Clarke, P., & Gillespie, T. (2007). *Shaping a Sustainable Future in the Pacific: IUCN Regional Program for Oceania 2007 - 2012*. Suva, Fiji. Retrieved from https://www.iucn.org/sites/dev/files/import/downloads/iucn_strategic_priorities_1.pdf

Gregory, D. (1978). *Ideology, Science and Human Geography*. London: Hutchinson and Company.

Hafezi, M., Sahin, O., Stewart, R., & Mackey, B. (2018). Creating a novel multi-layered integrative climate change adaptation planning approach using a systematic literature review. *Sustainability*, 10(11), 4100.

Haines-Young, R., & Potschin-Young, M. (2018). Revision of the Common International Classification for Ecosystem Services (CICES V5.1): A policy Brief. *One Ecosystem*, 3, e27108.

Hensher, D. A., & Greene, W. H. (2010). Non-attendance and dual processing of common-metric attributes in choice analysis: a latent class specification. *Empirical Economics*, 35(2), 413–426.

Hermelingmeier, V., & Nicholas, K. A. (2017). Identifying five different perspectives on the ecosystem services concept using Q methodology. *Ecological Economics*, 136, 255–265. <https://doi.org/https://doi.org/10.1016/j.ecolecon.2017.01.006>

Hickey, F. R. (2008). Nearshore fisheries and human development in Vanuatu and other parts of Melanesia. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*, 24(1), 9–18.

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. (R. Pachauri, M. Allen, V. Barros, J. Broome, W. Cramer, R. Christ, ... P. Dasgupta, Eds.). Bonn: IPCC.

Kenter, J., Bryce, R., Christie, M., Cooper, N., Hockley, N., Irvine, K., ... Watson, V. (2016). Shared values and deliberative valuation: Future directions. *Ecosystem Services*, 2(Part B), 358–371.

Kenter, J., Hyde, T., Christie, M., & Fazey, I. (2011). The importance of deliberation in valuing ecosystem services in developing countries—Evidence from the Solomon Islands. *Global Environmental Change*, 21(2), 505–521.

Kerr, G. N., & Swaffield, S. R. (2012). Identifying cultural service values of a small river in the agricultural landscape of Canterbury, New Zealand, using combined methods. *Society & Natural Resources*, 25(12), 1330–1339.

Kline, P. (1994). *An Easy Guide to Factor Analysis*. London: Routledge.

Langston, J., McIntyre, R., Falconer, K., Sunderland, T., Noordwijk, M., & Boedhihartono, A. (2019). Discourses mapped by Q method show governance constraints motivate landscape approaches in Indonesia. *PLoS ONE*, 14(1), e0211221.

Lindstrom, L. (1982). Leftmap Kastom: The political history of tradition on Tanna, Vanuatu. *The Australian Journal of Anthropology*, 15(4), 316–329.

Lindstrom, L. (2011). Naming and memory on Tanna, Vanuatu. In *Changing Contexts, Shifting Meanings: Transformations of Cultural Traditions in Oceania* (pp. 141–156). Honolulu: University of Hawai'i Press.

Liu, J., Dietz, T., Carpenter, S. R., Alberti, M., Folke, C., Moran, E., ... others. (2007). Complexity of coupled human and natural systems. *Science*, 317(5844), 1513–1516.

Loring, P. A., & Hinzman, M. S. (2018). "They're all really important, but...:" Unpacking how people prioritize values for the marine environment in Haida Gwaii, British Columbia. *Ecological Economics*, 152, 367–377.

Mackey, B., & Ware, D. (2018). Limits to capital works adaptation in the coastal zones and Islands: Lessons for the Pacific. In *Limits to Climate Change Adaptation* (pp. 301–323). Cham: Springer.

Mackey, B., Ware, D., Nalau, J., Buckwell, A., Smart, J., Fleming, C., ... Hallgren, W. (2017). *Ecosystem and Socio-economic Resilience Analysis and Mapping (ESRAM) and Associated Works at Multiple scales in Vanuatu*. Apia, Samoa. Retrieved from https://www.griffith.edu.au/_data/assets/pdf_file/0023/528080/vanuatu-ecosystem-socio-economic-resilience-analysis-mapping.pdf

Malvatumauri National Council of Chiefs. (2012). *Alternative Indicators for Well-being in Melanesia*. Port Vila, Vanuatu.

McKeown, B., & Thomas, D. (1988). *Q-Methodology*. Newbury Park, CA: Sage Publications Inc.

McMillen, H., Ticktin, T., Friedlander, A., Jupiter, S., Thaman, R., Campbell, J., ... others. (2014). Small islands, valuable insights: Systems of customary resource use and resilience to climate change in the Pacific. *Ecology and Society*, 19(4), 44.

Millennium Ecosystem Assessment. (2005). *Ecosystems and Human Well-being: Current State and Trends*. Washington DC.

Munang, R., Thiaw, I., Alverson, K., Mumba, M., Liu, J., & Rivington, M. (2013). Climate change and ecosystem-based adaptation: A new pragmatic approach to buffering climate change impacts. *Current Opinion in Environmental Sustainability*, 5(1), 67–71.

Munroe, R., Doswald, N., Roe, D., Reid, H., Giuliani, A., Castelli, I., & Moller, I. (2011). Does EbA work? A review of the evidence on the effectiveness of ecosystem-based approaches to adaptation. *Policy Brief*.

Nalau, J., Becken, S., & Mackey, B. (2018). Ecosystem-based Adaptation: A review of the constraints. *Environmental Science & Policy*, 89, 357–364.

914 Nalau, J., Becken, S., Schliephack, J., Parsons, M., Brown, C., & Mackey, B. (2018). The role of Indigenous and Traditional
915 knowledge in ecosystem-based adaptation: A review of the literature and case studies from the Pacific Islands. *Weather,*
916 *Climate, and Society*, 10(4), 851–865.

917 Nehrbass, K. (2012). *A Comprehensive Comparison of Lexemes in the Major Languages of Tanna, Vanuatu* (SIL eBook). SIL
918 International. Retrieved from
919 [https://www.researchgate.net/profile/Kenneth_Nehrbass/publication/265068678_A_Comprehensive_Comparison_of](https://www.researchgate.net/profile/Kenneth_Nehrbass/publication/265068678_A_Comprehensive_Comparison_of_Lexemes_in_the_Major_Languages_of_Tanna_Vanuatu/links/552686910cf21e126f9df44f/A-Comprehensive-Comparison-of-Lexemes-in-the-Major-Languages-of-Tanna-)
920 [_Lexemes_in_the_Major_Languages_of_Tanna_Vanuatu/links/552686910cf21e126f9df44f/A-Comprehensive-](https://www.researchgate.net/profile/Kenneth_Nehrbass/publication/265068678_A_Comprehensive_Comparison_of_Lexemes_in_the_Major_Languages_of_Tanna_Vanuatu/links/552686910cf21e126f9df44f/A-Comprehensive-Comparison-of-Lexemes-in-the-Major-Languages-of-Tanna-)
921 [Comparison-of-Lexemes-in-the-Major-Languages-of-Tanna-](https://www.researchgate.net/profile/Kenneth_Nehrbass/publication/265068678_A_Comprehensive_Comparison_of_Lexemes_in_the_Major_Languages_of_Tanna_Vanuatu/links/552686910cf21e126f9df44f/A-Comprehensive-Comparison-of-Lexemes-in-the-Major-Languages-of-Tanna-)

922 Nguyen, B. N., Boruff, B., & Tonts, M. (2018). Indicators of mining in development: A Q-methodology investigation of two gold
923 mines in Quang Nam province, Vietnam. *Resources Policy*, 57, 147–155.

924 Nishijima, K., Mori, N., Yasuda, T., Shimura, T., Gogon, J. T., Gibson, D., & Jockley, F. (2015). *DPRI-VMGD Joint Survey for*
925 *Cyclone Pam Damages* (Vol. 20). Port Vila, Vanuatu. Retrieved from [http://www.taifu.dpri.kyoto-u.ac.jp/wp-](http://www.taifu.dpri.kyoto-u.ac.jp/wp-content/uploads/2015/05/DPRI-VMGD-survey-first-report-Final.pdf)
926 [content/uploads/2015/05/DPRI-VMGD-survey-first-report-Final.pdf](http://www.taifu.dpri.kyoto-u.ac.jp/wp-content/uploads/2015/05/DPRI-VMGD-survey-first-report-Final.pdf)

927 Ockwell, D. (2008). 'Opening up' policy to reflexive appraisal: A role for Q methodology? A case study of fire management in Cape
928 York, Australia. *Policy Science*, 41(4), 263–292.

929 Pike, K., Wright, P., Wink, B., & Fletcher, S. (2015). The assessment of cultural ecosystem services in the marine environment using
930 Q methodology. *Journal of Coastal Conservation*, 19(5), 667–675.

931 Robbins, P., & Krueger, R. (2000). Beyond bias? The promise and limits of Q method in human geography. *The Professional*
932 *Geographer*, 52(4), 636–648.

933 Roeder, K., Lynch, K. G., & Nagin, D. S. (1999). Modeling uncertainty in latent class membership: A case study in criminology.
934 *Journal of the American Statistical Association*, 94(447), 766–776.

935 Rubin, D. (2016). *Qualitative Methods for Gender Research in Agricultural Development*.
936 Secretariat of the Convention on Biological Diversity. (2010). *Global Biodiversity Outlook 3*. Montreal.

937 South Pacific Tourism Organisation. (2016). *Annual Review of Visitor Arrivals in Pacific Island Countries 2016*. Suva, Fiji. Retrieved
938 from [https://corporate.southpacificislands.travel/wp-content/uploads/2017/02/2016-Annual-Visitor-Arrivals-](https://corporate.southpacificislands.travel/wp-content/uploads/2017/02/2016-Annual-Visitor-Arrivals-ReviewF.pdf)
939 [ReviewF.pdf](https://corporate.southpacificislands.travel/wp-content/uploads/2017/02/2016-Annual-Visitor-Arrivals-ReviewF.pdf)

940 Stenner, P., & Stainton Rogers, R. (2004). *Q Methodology and Qualiquantology: The Example of Discriminating Between*
941 *Emotions. Mixing Methods in Psychology*. London: Routledge.

942 Stephenson, W. (1953). *The Study of Behavior; Q-technique and its Methodology*. Chicago: University of Chicago Press.

943 Stevenson, H. (2015). Contemporary Discourses on the Environment-Economy Nexus. *SPERI Paper*, (19).

944 Sy, M. M., Rey-Valette, H., Simier, M., Pasqualini, V., Fiquières, C., & Wit, R. De. (2018). Identifying consensus on coastal lagoons
945 ecosystem services and conservation priorities for an effective decision making: A Q approach. *Ecological Economics*, 154,
946 1–13.

947 Thaman, R., Clarke, W., Manner, H., Decker, B., & Ali, I. (1993). *Agroforestry in the Pacific Islands: Systems for Sustainability*.
948 Tokyo: United Nations University Press.

949 UN Statistical Division. (2018). System of Environmental-Economic Accounting (SEEA). Retrieved May 30, 2018, from
950 <https://unstats.un.org/unsd/envaccounting/seea.asp>

951 UNDP. (2010). *Evaluation of UNDP Contribution to Environmental Management for Poverty Reduction: The Poverty-*
952 *Environment Nexus*. Retrieved from <https://erc.undp.org/evaluation/evaluations/detail/4784>

953 UNFPA. (2011). Vanuatu National Survey on Womens' Lives and Family Relationships. Retrieved from
954 http://countryoffice.unfpa.org/filemanager/files/pacific/pacific_vaw/day2/2.6_vwc_meeting_on_vaw_in_fiji.pdf

955 van Excel, J., & de Graaf, G. (2005). Q-methodology: A sneak preview. Retrieved August 4, 2018, from www.jobvanexcel.nl/

956 van Noordwijk, M. (2017). Integrated natural resource management as pathway to poverty reduction: Innovating practices,
957 institutions and policies. *Agricultural Systems*, 172, 60–71.

958 Vanuatu National Statistics Office. (2009). *National Population and Housing Census*. Port Vila, Vanuatu. Retrieved from
959 <https://vnso.gov.vu/index.php/census-and-surveys/census/censuses>

960 Vanuatu National Statistics Office. (2018). International Arrival Statistics (IAS) - February 2018. Retrieved May 30, 2018, from
961 <https://vnso.gov.vu/index.php/economic-statistics/tourism-news>

962 Watts, S., & Stenner, P. (2012). *Doing Q Methodological Research: Theory, Method & Interpretation*. London: Sage.

963 Webler, T., Danielson, S., & Tuler, S. (2009). *Using Q Method to Reveal Social Perspectives in Environmental Research*. Retrieved
964 from <http://www.seri-us.org/pubs/Qprimer.pdf>

965 WHO. (2003). WHO Multi-country study on Women's Health and Domestic Violence against Women. Retrieved from
966 https://who.int/gender/violence/who_multicountry_study/fact_sheets/Samoa2.pdf

967 World Bank. (2009). *Convenient Solutions to an Inconvenient Truth: Ecosystem-based Approaches to Climate Change*. Retrieved
968 from https://siteresources.worldbank.org/ENVIRONMENT/Resources/ESW_EcosystemBasedApp.pdf

Revealing the dominant discourses of stakeholders towards natural resource management in Port Resolution, Vanuatu using Q-method

Andrew Buckwell, Christopher Fleming, Maggie Muurmans, James C. R. Smart, and Brendan Mackey.

Figure 1: Location of the Republic of Vanuatu, Tanna and Port Resolution.

Table 1: Key stakeholder groups from which our Q-methodology respondents were drawn

Stakeholder group	Sub-group	Description
Port Resolution community	Subsistence	Subsistence farmers and fishers.
	Fixed income workers	Fixed-income employees, such as nurses and teachers.
	Business owner	Port Resolution community members who run businesses, such as restaurants and holiday bungalows.
	Temporary waged workers	Occasional waged labourers, but majority subsistence gardens
International organisation		Professionals working in Vanuatu or Tanna for quasi-governmental organisations who had familiarity with Port Resolution or Tanna.
Development worker		Philanthropic development workers who had repeated visits to the Port Resolution.
Independent scientist		Australia-based scientists and social scientists with significant knowledge of the Port Resolution community

Table 2: Elements of discourse represented in our Q-set. To enable any factors to fulfil the requirements of a discourse we ensure statements, as a whole, were phrased in such a way as to meet the four required elements of a discourse, in addition to key metaphors deployed

Element of discourse	Description	Exemplar statement or key term
Ontological	The basic entities respondents recognise (institutional or individual).	Kastom knowledge of resource use and the land is being forgotten. Our forests, freshwater and marine resources are important to kastom. It's important that we can hand them down to our children and grandchildren in good condition
Motivational	Respondents' understanding of basic motivations of themselves or others.	Neighbouring tribes sometimes encroach on our kastom land and marine resources without permission. I worry that young people don't want to stay in the village, as there are more opportunities in Lenakel and Port Vila
Agency	Respondents' understanding of the degree of agency institutions or individuals have.	It is important for me to influence decisions about the village. People should vote for who they want to in elections.
Assumptions regarding natural relationships	What are the understood relationships between respondents, institutions or the environment	If more tourists stayed in Port Resolution, or came on a cruise ship, I worry that there would not be enough food, water, and waste facilities to cope with them. I would be able to spend more time in my community if there was a more equal share of housework between men and women.
Key metaphors	Metaphors and rhetorical devices deployed or understood	Tourists as 'outsiders' coming into the community. 'Our forests' and reefs as customary land and resources 'belonging' to the tribe. Kastom as a nebulous term that can define communitarian parochial social relations, as well as adaptive management of natural resources.

Table 3: The 34 Q-statements used in our Q method study. Our primary categorisation was framed around the ecosystem services classification scheme from Millennium Ecosystem Assessment (de Groot et al., 2012; Millennium Ecosystem Assessment, 2005) in addition to two further categories for ‘Social’ and ‘Health’ issues. Health was extracted from the Social category as (specifically) health issues were key distinguishing statements in Factor 2. In our classification, cultural ecosystem services are defined as issues that reflect an affinity to activities that rely on cultural ecosystem services; namely earning money from tourism based on eco-tourism principles. The ideal factor score is weight given to that statement (from -4 to +4) if an ideal representative of that perspective had completed the Q-sort.

Category	Statement and number		Ideal factor score (Section 4.1)		
			1a	2	3
Regulating ecosystem services	1	We need to better protect our forests better, as they are being cut down to make way for gardens.	+4	+2	+4
	3	There are more natural disasters happening now, like Cyclone Pam.	-1	+1	-4
	5	We do not have enough toilet, washing and cleaning facilities for all the people in the village.	0	+3	-4
	7	Our community lacks a place to throw away rubbish, like bottles, cans, and plastic.	0	0	-1
	19	Our rivers and streams are drying-up more frequently.	+1	-1	-3
Provisioning ecosystem services	2	In my community I do not get enough good drinking water.	+1	+2	+1
	4	The changing weather makes it too warm and dry, and sometimes too wet, to grow our usual crops, like sweet potato, cassava and manioc.	+1	0	-1
	6	If more tourists stayed in Port Resolution, or came on a cruise ship, I worry that there would not be enough food, water, and waste facilities to cope with them.	-2	-2	0
	8	I would like to catch fish further out to sea, to reduce pressure on the reef fisheries.	+2	+1	+2
	9	My garden is producing less food than it was before.	+3	+1	-2
	10	It is important to get more cattle, pigs and chickens into the village to provide more food.	0	-3	-2
	11	I would like better ways to cook food, so I don't have to use firewood from the forest.	-2	-2	-3
	16	Neighbouring tribes sometimes encroach on our kastom land and marine resources without permission.	+2	0	+1
	17	There are less traditional medicinal plants than there used to be.	+2	-1	0
	18	Kastom knowledge of resource use and the land is being forgotten.	+3	+2	+1
Cultural ecosystem services	31	I would like to earn a bit more cash by selling food I grow, of fish that I catch.	0	-3	-1
	12	Our forests, freshwater and marine resources are important to kastom. It's important that we can hand them down to our children and grandchildren in good condition.	+4	+3	+3
	13	We should do more to prevent kastom places from falling into disrepair.	+3	+4	+1
	14	Tourism offers many good opportunities for small businesses in Port Resolution.	-1	+2	+3
	24	Improving the road to the volcano will bring new tourism business opportunities.	-4	0	+2
Social	25	Building an airport near to Port Resolution will bring opportunities to earn more money.	-3	-3	0
	28	If I could borrow a small amount of money, I would be able to invest in a small business, such as holiday bungalows, or selling fish.	-3	-2	-3

	15	It is important to pass down kastom knowledge of dances, songs and ceremonies to my children and grandchildren.	+2	0	+4
	20	It is important for me to influence decisions about the village.	+1	-1	+2
	21	I would like to know more about what is happening in Vanuatu and the rest of the world.	-1	-4	0
	22	People should vote for who they want to in elections.	-3	-4	-2
	23	I worry that young people don't want to stay in the village, as there are more opportunities in Lenakel and Port Vila.	-2	0	-2
	27	The costs of secondary school make it difficult for me to send my children there (fees, books, equipment).	0	+1	+1
	29	Sending children away to secondary school causes a lot of disruption to family life.	-1	-2	-1
	30	I would like to use electricity for lights, cooking and refrigeration.	-4	+1	0
	33	I worry about my personal safety in my home and in my community. †	0	-1	-1
	34	I would be able to spend more time in my community if there was a more equal share of housework between men and women.	+1	-1	+3
Health	26	If the road was improved, we would have better access to Lenakel hospital for childbirth and health emergencies.	-1	+4	+2
	32	I would like better access to modern medicines.	-2	+3	0

Figure 1: Q method scoring board. To serve the game aesthetic, our ranking board was brightly coloured, with clear use of a well-understood colour scheme and use of smiley and sad faces. The ranking board was printed on durable vinyl. It also contained areas for pre-sorting, enabling respondents to sort the cards into generally favourable, generally unfavourable and neutral categories, before more detailed placement.

Figure 2: Undertaking Q method sorts with the women of Port Resolution

Figure 3: Undertaking Q method sorts with the men of Port Resolution

Figure 4: Scree plot of Eigenvalues of principal components from our factor extraction. We retained three factors for Varimax rotation, concluding that within the ‘long tail’ (from factor 4 onwards), there is insufficient variation and explanatory power.

Figure 6: The ideal sorts from each of our three rotated factors. An ideal sort is the sort expected if a respondent loads 100% into one of the factors. (In reality, the highest loading respondent into Factor 1a loaded at 0.8566, Factor 2 at 0.7686, and Factor 3 at 0.6572.). Distinguishing statements are labelled and marked with * where the distinguishing significance is at $P < 0.05$ and ** where the distinguishing significance is at $P < 0.01$. Distinguishing statements are also marked with a ◀ where the z-score is lower than in all other factors and a ▶ where the z-score is higher than in all other factors.

a) Factor 1a

-4	-3	-2	-1	0	1	2	3	4
***◀ 30	28	11	* 3	***▶ 10	4	8	18	***▶ 12
***◀ 24	25	23	14	7	34	15	13	1
	22	***◀ 32	29	33	19	***▶ 16	9	
		** 6	** 21	5	2	17		
			***◀ 26	27	** 20			
				31				

b) Factor 2									
-4	-3	-2	-1	0	1	2	3	4	
21	31	* 6	** 19	7	* 8	14	** 32	26	
22	10	28	33	23	** 3	1	12	13	
	25	29	34	*** 15	9	2	** 5		
		11	** 17	4	27	18			
			** 20	24	30				
				* 16					

c) Factor 3									
-4	-3	-2	-1	0	1	2	3	4	
** 5	28	23	29	** 21	2	26	14	** 15	
** 3	*** 19	22	4	25	*** 13	*** 20	*** 34	1	
	11	10	33	* 32	27	8	12		
		*** 9	7	30	*** 18	24			
			31	6	** 16				
				17					

Table 4: Results of our Q-methodology factor analysis, showing Eigenvalues, cumulative percent of explained variance, (both for reported unrotated factors), number of defining sorts in each extracted factor (number of respondents who fit the factor) and the correlations between these factors.

Factor	Unrotated		Varimax rotated			
			Correlations between factor scores			
	Eigenvalues	Cumulative % of explained variance	Number of defining sorts variables	Factor 1a	Factor 2	Factor 3
Factor 1a	12.86	23	16	1	0.3947	0.319
Factor 2	5.04	32	17		1	0.3168
Factor 3	94.26	40	9			1

Box 1: Discourse analysis of Factor 1a: Strong Kastom

Basic entities recognised or constructed • Kastom and taboo • Natural cycles of resource management • The tribe	Agents and their motives • Homogenous communities • Co-operative local tribes • Parochial communitarianism

Assumptions about natural relationships

- Traditional roles of men and women in decision making, income generation, domestic activities
- Pragmatic approach to community decision-making; no radical changes
- Outside world of limited value

Box 2: Discourse analysis of Factor 2: Kastom + Health

Basic entities recognised or constructed	Agents and their motives
• Kastom and taboo • Natural cycles of resource management • The tribe	• Homogenous communities • Co-operative tribes • Parochial communitarianism
Assumptions about natural relationships • Traditional roles of men and women in decision making, income generation • Pragmatic approach to decision making; change is expected, but should be slow, on our own terms • An outside world that adds some value to our community, specifically through health services	

Box 3: Discourse analysis of Factor 3: Tentative modernity

Basic entities recognised or constructed	Agents and their motives
• Kastom and tradition • Economic specialisation and exchange	• Parochial communitarianism
Assumptions about natural relationships • Women's roles not defined by men, but based on utility	

Figure 7: Factors represented as spie charts, indicating the representation of each statement in our initial categorisation of (i) provisioning ecosystem services; (ii) regulating ecosystem services; (iii) cultural ecosystem services; (iv) health; and (v) social issues. The relative share of the pie is a representative of the number of statements in each category. The concentric scale is representative of the score given to that statement in each of the factors. So that all values are positive, the scores have been re-assigned as: -4 = 1; -3 = 2; ... +3 = 8; +4 = 9.

Figure 8: Factors represented as spie charts, indicating the propensity for traditional and economic development / emancipatory statements to be associated with each extracted factor. Traditional / Kastom statements are: 6, 12, 13, 15, 16, 17, 18 and 23. Economic development / Emancipatory statements are: 14, 20, 21, 22, 24, 25, 26, 28, 31, 33, and 34. The relative share of the pie is representative of the number of statements in each category. The concentric scale is representative of the score given to that statement in each of the factors. So that all values are positive, the scores have been re-assigned as: -4 = 1; -3 = 2; ... +3 = 8; +4 = 9. The factor score is provided adjacent to the two relevant segments.

Table 5: Weighted factor membership for selected demographic characteristics. The scores are weighted such as to indicate how many respondents would load into each factor if the number of respondents in each category of each of the characteristics was equal, i.e. if there were 27.5 members from each of the pairings.

	Male / Female		Subsistence status		Community status	
	Male	Female	At least some wage	Purely subsistence	Non-community	Community
Strong Kastom	12.4	5.5	9.6	7.2	3.9	8.6
Kastom + Health	9.7	7.9	13.0	6.5	15.7	7.4
Tentative Modernity	1.4	6.3	3.2	5.0	0	5.1

Figure 9: Sentiment towards climate change adaptation statements and climate change impact statements for our three factors. Adaptation statements were S1, S8, S9, S10, and S11. Impact statements were S3, S4, and S19.

Figure 10: Factor score congruence for statements. Statements (x axis) are ranked in order of standard deviation (lowest on the left to highest on the right) of the mean scores from each factor. The y axis reports the mean score for each factor for that statement. Statements to the left of the chart have high congruence, statements to the right have low congruence between the factors. Therefore, statement 28 has the highest level of congruence between the factors, but has a generally negative salience. Factor 2 has a third ranked congruence *and* has a generally positive salience.