The Landscape of Leadership in Environmental Governance

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INTRODUCTION

Recognition that current patterns of human behaviour will radically alter the Earth's environment and impact negatively on human wellbeing (Myers 1996, Steffen *et al.* 2015, World Resources Institute 2005) has led to calls to substantially improve or even transform approaches to environmental governance (Kates *et al.* 2012, O'Brien 2012, Brown 2013). In this context, transformation often refers to significant advances towards more integrated approaches at increasingly larger scales (Olsson *et al.* 2008; Westley *et al.* 2011), which in practice requires the merging of objectives around conservation, development and climate change (see also the Sustainable Development Goals 2015).

The literature on environmental governance transformation is converging around a core set of factors that foster change processes, with leaders (or entrepreneurs) identified as one of the main drivers of significant change (Scheffer *et al.* 2003; Olsson *et al.* 2008; Biggs *et al.* 2010; Westley *et al*. 2011). Often key individuals or 'champions' are identified, who by virtue of their positions (e.g., traditional village chief / City Mayor), personalities (e.g., charismatic) or competencies (e.g., networking skills) garner the authority to drive environmental policy change and action (e.g., Manolis *et al.* 2008; Black *et al.* 2011; see review by Evans *et al.* 2015). For example, research on the transformation of the Great Barrier Reef Marine Park, Australia, focused almost exclusively on the leadership role of the Great Barrier Reef Marine Park Authority and its Chairperson (Olsson et al. 2008).

Emphasising the attributes of individual environmental leaders reflects notions of what is referred to in the field of leadership studies as heroic leadership (Case 2013). Such approaches focus on individual agency and can underplay the important institutional contexts that support the emergence of leaders as well as the potential for more distributed forms of leadership (Carroll *et al.* 2008; Westley *et al*. 2011; Denis *et al.* 2012). Moreover, environmental research on leadership tends to view leaders in a positive or normative light, as those who are aligned to environmental governance and sustainability initiatives (Evans *et al.* 2015; Case *et al.* 2015). Relatively few studies emphasise the potential of leaders and leadership to intentionally (and legitimately) block, disrupt, or co-opt change processes, or inhibit change in a particular direction (for exceptions see Pahl-Wostl *et al.* 2007; Zulu 2008; Njaya *et al.* 2012). By this, we do not only mean the leadership enacted by environmental activists blocking or stalling the activities of big polluters, logging companies or developers (Houck 2010; Martinez-Alier 2014), we mean the leadership shown by community groups, user groups and industry groups, for example, who are involved in negotiating environmental outcomes. Such approaches to understanding the role of leadership in governance transformations arguably misrepresent the complex and potentially contested concepts of environmental governance and sustainable development (Lélé 1991; Redclift 2005).

We bring new insights to environmental governance research from leadership studies where there is a growing recognition that leadership is a process that is enacted through a "web of interactions incorporating both people and objects" (Hawkins *et al.* 2015: 953). Leadership is broadly defined as a process of influence resulting in shared direction and commitment (following Bolden *et al*. 2012 and Haslam *et al.* 2011). To

illustrate what a more nuanced understanding of leadership can look like we employ a deliberately provocative analytical perspective inspired by Actor Network Theory which recognises that societal outcomes are shaped by relations among humans and non-human, including discursive, actants (Latour 2005; Dwiartama and Rosin 2014 and see discussion for detailed examples). We report on an empirical study of Solomon Islands' engagement with the multi-national, multi-objective Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI), an initiative that is labelled as potentially transformative. We aimed to understand how different actors perceive leadership for improved environmental governance in Solomon Islands in practice. First, we determine whether there are sources of leadership *in addition* to key individuals and organisations. We investigate the potential of organisations, policy and legislative instruments, and ideologies or discourses to enact leadership by influencing governance outcomes. Second, we establish how leadership varies across three different, potentially contested CTI goals – food security, biodiversity conservation and climate change adaptation – that in combination are expected to contribute to improved environmental governance. Third, we determine whether leadership can also disrupt or stall progress towards improved environmental governance outcomes. This paper aims to open up a broader debate about leadership research in environmental sciences – the empirical approach and evidence are illustrative rather than definitive.

METHODS

Case-study

We selected the Solomon Islands' engagement with the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security as our illustrative case-study. The CTI is a regional partnership between Malaysia, Philippines, Indonesia, Timor-Leste, Papua New Guinea and Solomon Islands launched in 2009. It is funded by USAID in collaboration with WWF, The Nature Conservancy and Conservation International, the Global Environment Facility through the Asian Development Bank, and Australian Aid. The CTI member states have committed to five goals with the explicit ambition of transforming coastal and marine governance in the region (see Fidelman et al. 2012; Fidelman et al. 2014 for more detailed information). The CTI is now established and supports many new investments and activities aimed at integrating multiple objectives around conservation, development and climate change. It, therefore, provides a rich context to examine processes of influence and integration, in order to highlight the multiple facets of leadership, broadly defined.

We conducted our research in Solomon Islands, one of the six CTI member states in which we have established research connections. In Solomon Islands a multi-agency National Coordinating Committee (NCC) has responsibilities for monitoring, implementing and coordinating the CTI activities in-country. It is co-chaired by the Environment, Conservation, Disaster Management and Meteorology and the Ministry of Fisheries of Marine Resources. The NCC can be considered as a governance network (*sensu* Newig *et al.* 2010), or a field-policy or organizational leadership network (*sensu* Hoppe and Reinelt 2010), in that it was deliberately formed (rather than emergent) to align resources and co-ordinate activities to address the common goals of the CTI.

Data collection

We conducted face-to-face expert interviews with the named representatives of organisations that are members of the Solomon Islands National Co-ordinating Committee (NCC). We aimed to survey all NCC member organisations. The Chair of the Solomon Islands NCC provided the names of the 17 experts who were the regular attendees of NCC meetings who act as representatives of the NCC member organisations. In 2013 we interviewed 12 of these experts; five were unavailable for interview. We asked each respondent to represent the experiences of their organisation. Our sampling approach is consistent with other research employing expert elicitation, network and participatory approaches (e.g., Cohen *et al.* 2012; Game *et al.* 2013) and it aligns with methodological approaches in leadership studies (e.g., Mailhot et al. 2016)

The face-to-face expert interview involved a participatory network mapping activity to map leadership influences on the respondents' organizations. First we asked respondents to identify "*Who* and *what* provides leadership in the work that your organisation does (e.g., activities on the ground, policies your organisation develops, research your organisation undertakes, etc.) related to the three core goals of the Coral Triangle Initiative in Solomon Islands?". The three core goals were food security, biodiversity conservation and climate change adaptation. Following accepted definitions in leadership studies, respondents were asked to consider leadership broadly as influence. To encourage respondents to openly consider the influence of conventional (human) and non-conventional (material and discursive) actants on the activities of their organisations, we asked them to consider four overarching categories

of ‘actants’ that could constitute potential sources of leadership, and we described each in lay terms; a) organisations and networks (i.e., described to respondents as any group of social entities working together), b) donors and funding (i.e., sources of finance), c) policies and strategies (i.e., a document that articulates how actions should or must be taken), and d) beliefs and discourses (i.e.,the over-arching views that people or organisations hold). In each of these four categories we provided a few broad and specific, but standardised, examples to clarify our meaning (Table 1). The specific examples we provided were those organisations, donors, policies and discourses that were frequently mentioned in key CTI documents. *Importantly*, respondents could include or *exclude* the example provided in their network map, and then were encouraged to list any further actants in any of the four categories (Figure 1A). Note, respondents could not nominate themselves/their own organisation. Thus, the leadership influence of any organisation was determined by others. In the network diagrams, responses were recorded as binary figures: a one (i.e., presence of influence) or a zero (i.e., absence of influence) against the list of actants.

TABLE 1

To address our second objective of establishing whether leadership varied across the three CTI goals, respondents ranked the relative influence of different actants in their network for each goal. First, we asked respondents to allocate 100 counters across the three goals according to where the most progress had been made by the CTI in Solomon Islands since it started in 2009. We then asked respondents to consider one CTI goal at a time and to distribute the allocated number of counters across the actants

they felt were influential for that particular goal, i.e., placing more counters on the more influential actant (Figure 1B). For example, if the respondent had indicated relative progress by assigning 60 percentage points to food security, 30 to biodiversity conservation, and 10 to climate change adaptation, they then had 60 counters to distribute across the specific actants influential on food security, 30 across actants influential on biodiversity conservation and 10 on influential climate change adaptation actants. We then asked respondents to discuss why they had identified particular actants as the most influential in each of the three rounds of scoring.

FIGURE 1

To address our third objective on whether leadership might also inhibit progress towards environmental governance outcomes, we asked the respondent to identify "Who and what hinders, stalls or halts the work that your organisation does?" across all three CTI goals combined. We recorded responses against the established list of actants again using a binary code: one to indicate the presence of influence or zero to indicate the absence of influence. We then asked respondents to discuss why they had identified particular actants as the most influential in hindering, stalling or halting CTI progress.

Data Analysis

Using Ucinet version 6.288, we created two network visualisations representing: a) all identified sources of positive influence on progress of NCC organisations towards the CTI goals combined; and b) all identified sources of negative influence on progress

towards the CTI goals combined. In each network, the actant (i.e., source of influence) is the node. In total, respondents identified 122 actants as influential on CTI progress. Therefore, to create networks in Ucinet we produced 7 x 122 cell matrices (one matrix for positive, and a separate matrix for negative influences), where cells contained either a one or a zero indicating the presence or absence of influence. If we had interviewed more than one respondent from a particular NCC member organisation, their responses were aggregated, therefore, the responses of the 12 respondents were incorporated into seven rows; one for each organisation. The size of the nodes represents the frequency with which respondents identified a particular actant as influential, i.e., in-degree (Degenne and Forsé 1999). To examine the different levels of influence for each CTI goal, we summed and sorted (from highest to lowest) total scores from each of the three rounds of scoring with counters. In Microsoft Excel we organised and analysed supporting qualitative data on why respondents ranked particular actants as the most influential. Qualitative responses were analysed to determine patterns in explanations of the participatory network data (i.e., why particularly actants were highly influential). Given the small size of the NCC network, we do not apply statistics to our network data. Instead, we present this empirical study as illustrative of the potential for a broader approach to environmental leadership research.

RESULTS

Multiple sources of influence on CTI progress

In the participatory network mapping activity respondents identified a total of 54 organisations, 18 donors, 32 policies and 18 discourses (represented as the nodes in the network diagram) as being influential (indicated by the lines in the network diagram, Figure 2A) in progressing the three main goals of the CTI in Solomon Islands. The five most frequently cited actants, in descending order of frequency, were: the National Plan of Action (NPOA), Equality, the Ministry of Environment, Conservation, Disaster Management and Meteorology (MECDM), the Ministry of Fisheries of Marine Resources (MFMR) and The Nature Conservancy (TNC).

The actants ranked as the most influential by respondents (as indicated by the highest number of counters summed) across all three CTI goals combined were: MECDM, NPOA, Poverty, The Nature Conservancy (TNC), and WorldFish (Table 2). The MECDM emerged as the most influential actant with a score almost twice that of other potential sources of influence. Poverty was the most influential discourse overall. It was identified as important in less than 25% of responses but where it was identified it was felt to be highly influential over CTI progress. Similarly, equality was felt to be a very influential discourse by those that identified it.

Different sources of influence on three overarching CTI goals

We disaggregated perceptions of influence by the three overarching goals of the CTI in Solomon Islands. Proportionate ranking by respondents indicated that they perceived that relatively equal progress had been made across the three goals in Solomon Islands as a whole, with slightly higher emphasis on climate change adaptation (37% of total points), than biodiversity conservation (34%), or food security (29%). Importantly,

252 respondents perceived that different actants had been influential for different goals
253 (Table 2). Overall, *organisations* feature as the most important category of actants
254 accounting for 45% of the total points. The MECDM emerged as the most influential
255 actant on all three CTI goals. The NPOA and RPOA were among the top five sources
256 of influence for all three goals. Discourses around poverty, equality and food security
257 were among the most highly ranked influences on progress under the food security and
258 climate change adaptation goals of the CTI.
259
260 TABLE 2
261
262 The MECDM and MFMR hold formal leadership roles as co-chairs of the National Co-
263 ordinating Committee for the CTI, and both are among the four most important
264 organisations influencing CTI objectives overall. MECDM is the most influential
265 organisation for each of the three goals when they are considered separately, whereas
266 MFMR was among the four most influential actants under the biodiversity conservation
267 objective, but was substantially less influential under the climate change adaptation
268 objective (ranked 12th). For both food security and climate change adaptation objectives
269 WorldFish is considered by respondents to be more influential on their on-ground
270 activities than MFMR. For both biodiversity conservation and climate change
271 adaptation TNC is also perceived to be more influential on organisations'
272 implementation practices than MFMR.
273
274 Two other trends to note in these data are, first, the identification of customary rights as
275 a source of influence on food security and biodiversity conservation objectives. Second,

the presence of donors in the top sources of influence under climate change adaptation; the objective for which data suggested most progress (37%) had been made over the last five years. Several respondents' comments noted the intense donor focus on climate change, with one respondent suggesting that: "*there are enough* [externally funded] *projects on climate change for everyone*".

Blocking or stalling influences on CTI progress

Actants viewed to be influential in the progress of CTI goals were, in some cases, also considered to be influential in stalling or hindering progress (Figure 2B). Tradition was the most influential factor stalling progress. Respondents related tradition to customary rights and identified land disputes, in particular, as a challenge to progress. One respondent explained that "*When customary rights issues, such as disputes, arise we leave people to sort it out and we walk away. We don't have the capacity to address or solve these issues. That is the responsibility of the community or a mediator. It's frustrating but you have to respect and understand this*". Respondents explained that while these cultural factors were important for guiding the implementation of CTI objectives (i.e., particularly through community-based approaches) they could also significantly stall action.

Despite their formal position as the co-chairs of the NCC, both MECDM and MFMR also feature highly as actants that hindered progress. One respondent suggested that the NCC co-chairs can't fulfil their leadership roles, "[they] *can't implement what they talk about and so stall progress on the ground*". Finally, donors and the government financing department were identified as influences that stalled or blocked progress

under CTI objectives. In particular, respondents perceived that donor agencies impose conditions around the provision of finances that stalled progress resulting in, what respondents viewed as, an administrative burden on management resources. For example, donor funding was viewed as a hindrance to progress because it is often difficult to access, distribution is delayed and it comes with (excessively) high expectations. They used words such as *rigid*, *time-consuming* and *unrealistic* to describe the funding and reporting requirements of certain donors. Some respondents also argued that donors pursued their own priorities not the country's priority needs.

FIGURE 2A AND B

DISCUSSION

Our participatory analysis of a governance network uncovered a landscape comprising multiple human and non-human sources of leadership that are objective specific and operate in ways that can both facilitate and hinder progress. Our data show that over 122 actants have influenced the direction and progress of the CTI in Solomon Islands. Organisations were the most often identified sources of leadership influence, and the NCC co-chairs – MECDM and MFMR – were, as expected, ranked among the most influential actants alongside key supporting NGOs and donors. Nevertheless, more than a third of the sources of leadership identified were not agents or actors in the conventional sense, but non-human material and discursive entities. Four of the most influential sources of leadership overall were discourses, including 'Centre of Biodiversity' – which is an emerging motif of the CTI (CTI Secretariat 2009; Veron *et*

325 *al.* 2009) – 'poverty', 'equality' and 'customary tenure rights'. In Solomon Islands
326 customary tenure is the main form of property right, it is enshrined in the Constitution
327 and, as our data indicate, it both facilitates and hinders progress towards CTI goals.
328
329 Our analysis can be interpreted in different ways. The data could be understood in
330 terms of organisations and donors exhibiting leadership influence within a context of
331 other influential, non-human discursive (e.g., equality) and institutional (e.g., Regional
332 Plan of Action) contextual factors. This would reflect a body of work in leadership
333 studies that argues for more attention to the dialectic relationship between leadership
334 and context i.e., to understand what type of leadership is effective in particular
335 situations and how leadership itself shapes context (Pettigrew 1992; Denis *et al.* 2010;
336 Endrissat and von Anx 2013). Some authors further posit that leaders can lead *through*
337 context as well as through other more direct leadership actions (Endrissat and von Anx
338 2013). In our case, this would mean that discourses and policies are created deliberately
339 by lead agencies to enact more indirect influence over actors within a broad governance
340 context in which direct influence or leadership is not possible (i.e. actors work for
341 different organisations and are not accountable to particular lead agencies).
342
343 Alternatively, our data can be seen to reflect a distributed form of leadership. In this
344 paper, we took a provocative stance to argue that both human and non-human actants
345 can enact leadership influence within a distributed leadership network. This is a
346 reaction to the over-emphasis on individual and charismatic people or single
347 organisations as leaders in much of the environmental sciences literature. We defined
348 leadership broadly as a process of influence resulting in shared direction and

commitment (Haslam *et al.* 2011; Bolden *et al*. 2012) and suggest that influential discourses and policies can engender as much of a shared vision as organisations or charismatic individuals can. We show that actants, in addition to conventional agents, can direct and motivate the activities of the key CTI implementing organisations (i.e., the NCC) and influence processes and outcomes in different ways, thereby enacting leadership broadly defined.

Our approach follows an emerging stream of research in leadership studies on the role of people *and* objects/artefacts in distributed leadership (Spillane *et al*. 2004; Bryson *et al.* 2009; Oborn *et al.* 2013; Mailhot *et al.* 2016). Some scholars analyse how human agents employ objects (i.e., concepts, committees or technologies) to achieve outcomes through their leadership practice (Mailhot *et al.* 2016). Other scholars take a slightly more 'radical' approach which views the objects themselves as *performative,* meaning the objects have their own agency and can frame interactions and recruit other actors to their 'cause', even in the absence of particular human agents who created, mobilised or utilise the object (Mailhot *et al.* 2016). Spillane et al. (2004: 27) state that "the practice of leadership is stretched over leaders, followers, and the material and symbolic artefacts in the situation". Similarly, Bryson *et al*. (2009: 200) identify artefacts or objects including strategy maps "that changed the minds of their producers and guided subsequent action across time and space" as influential actants in inter-organisational collaboration. In the context of public policy making, Oborn *et al.* (2013) highlight that socio-material configurations of human agents and objects (such as data and communication technologies) can resolve conflicts and legitimise re-thinking of leadership outcomes. They too emphasise that "these materials are not passive

mediators or neutral channels for leadership but are consequential". Yet, the agency of these objects emerges in relation to different actors and specific practices or activities, rather than being inherent in a material's properties (Oborn *et al*. 2013). In our case, agency emerges through the interactions between the NCC organisations and the human and non-human actants they identify as influential on their policy and implementation practices.

This approach to leadership research falls within the pluralist tradition of the leadership studies literature which focuses on the "combined influence of multiple leaders in specific organisational situations" or, in our case, inter-organisational situations (Denis *et al.* 2012: 211). The pluralist approach is at the forefront of leadership studies and informs numerous strands of enquiry into how leadership emerges and plays out in group settings and through group processes (Hoppe and Reinelt 2010; Haslam *et al.* 2011; Denis *et al.* 2012). As Oborn and colleagues (2013) argue, taking an inclusive view of distributed leadership is appropriate for understanding how leadership emerges in complex policy contexts involving diverse stakeholder groups with multiple conflicting interests, as is characteristic of environmental governance transitions.

Recognising leadership as distributed and contested is rare in environmental leadership research and our study took this broad approach to distributed leadership to respond directly to these critiques. In doing so we consider leadership broadly, we unpack environmental governance into component and potentially contested objectives, and we explicitly examine forms of leadership that may block or stall particular trajectories. In addition to showcasing how leadership influence can be widely distributed among the

human and non-human, we also show that actants that may block and stall progress are not necessarily "devious" but can be limited by the mandates that guide them, competing priorities, limited capacity to act or indeed active disagreement with the direction a particular initiative is taking. We hope that our study has highlighted why these different aspects of leadership must be considered in future efforts that seek to explain the function and performance of leadership in environmental change processes.

We recognise that our inclusive approach may be too broad for some analysts. While Grint (2005, pace Gallie, 1955/56) notes that leadership is an 'essentially contested concept' which will frustrate any attempt by researchers to nail-it-down in definitional terms, he also attempts to articulate what is 'sacred' about the leadership concept. Grint (2010: 89) observes that "in attempting to escape from the clutches of heroic leadership we now seem enthralled by its apparent opposite—distributed leadership: in this post-heroic era we will all be leaders so that none are". Grint refers to a spectrum of distributed leadership from leadership as moderately shared to more radical interpretations where leadership is unnecessary or so widely shared it dissipates altogether. Even with its broad focus on human and non-human agents we suggest that our study falls into the former category: it does not preclude the role of individuals and organisations, but aims to highlight a much broader platform on which to situate further environmental leadership research.

Moreover, we acknowledge several key limitations to our empirical study. First, the NCC network we analysed gave a small sample size that precludes statistical analysis of the data. Nevertheless, we suggest that the relative ranking of actants (i.e., to the

extent that several non-human actants feature in the top ten sources of leadership overall and that some new actants are recognised in the top ten sources of leadership for particular objectives) is important and sufficient to illustrate the potential of broader approaches. Second, by defining leadership as influence we facilitate a more open view of leadership processes than may result from using more specific terms such as leader. Third, we did not comprehensively assess *how* the different human and non-human actants *actively* influence, stall or alter trajectories of progress in the CTI over time. Our network data provide the foundations for an interesting extension of this research. For example, further research could use longitudinal and ethnographic methods to investigate in more depth how different actants influence the concepts, mandates, approaches and actions of the NCC organisations; in particular, how non-human entities like policies and discourses act as sources of influence independently of the human actors and organisations that formulate or construct them.

CONCLUSION

Environmental governance needs to be transformed to address resource over-exploitation, poverty and inequality, and climate change. Our study shows that there are subtly different sources of influence underpinning multiple objectives communicated under the rubric of regional conservation and development initiatives. This is a challenge for governance but also indicates multiple potential entry points for bolstering Coral Triangle Initiative outcomes and similar global initiatives that seek to be transformative. As such, strengthening leadership may not be limited to a focus on

key individuals, which can make system change and progress vulnerable to loss of these individuals, but may consider investment in a web of reinforcing actants that, in combination, constitute ‘leadership’ and both facilitate and direct collective action.

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Compliance with Ethical Standards:

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REFERENCES

Biggs R., Westley F. R. and Carpenter. S. R. (2010). Navigating the back loop: fostering social innovation and transformation in ecosystem management. Ecology and Society 15(2): 9.

Black S. A., Groombridge J. J. and Jones C.G. (2011). Leadership and conservation effectiveness: finding a better way to lead. Conservation Letters 4(5):329–339.

Bolden R., Gosling J. O'Brien A. Peters K. Ryan M. and Haslam A. (2012) Academic leadership: Changing conceptions, experiences and identities in higher education in UK universities. Final Report, Research & Development Series. Leadership Foundation for Higher Education, London.

Brown K. (2013). Global environmental change I: A social turn for resilience? Progress in Human Geography 38(1): 107-117.

Bryson J. M., Crosby B. C. and Bryson J. K. (2009). Understanding strategic planning and the formulation and implementation of strategic plans as a way of knowing: The Contributions of Actor-Network Theory. International Public Management Journal 12(2): 172-207.

489 Carroll B., Levy L., and Richmond D. (2008). Leadership as practice: Challenging the
490 competency paradigm. Leadership 4(4): 363–379.
491 Case P. (2013). Review essay: Grint, K. The Arts of Leadership and Leadership.
492 Leadership and the Humanities 1(1): 59-62.
493 Case P., Evans, L. S., Fabinyi, M., Cohen, P. J., Hicks, C.C., Prideaux M., and D.
494 Mills. (2015). Rethinking environmental leadership: The social construction of
495 leaders and leadership in discourses of ecological crisis, development, and
496 conservation. Leadership 11(4): 396-423.
497 Chapin F. S., Carpenter S. R., Kofinas G. P. Folke C., Abel N., Clark W. C., Olsson P.,
498 Smith D. M. S., Walker B., Young, O. R., Berkes, F., Biggs R., Grove J. M.
499 Naylor R. L., Pinkerton E., Steffen W., and Swanson F. J. (2010). Ecosystem
500 stewardship: sustainability strategies for a rapidly changing planet. Trends in
501 Ecology & Evolution 25: 241-249.
502 Cohen P. J., Evans, L. S. and Mills M (2012). Social networks supporting governance
503 of coastal ecosystems in Solomon Islands. Conservation Letters. 5: 376-386.
504 CTI Secretariat. (2009). Regional Plan of Action; Coral Triangle Initiative on Coral
505 Reefs, Fisheries and Food Security (CTI-CFF). Interim Regional CTI
506 Secretariat, Manado.
507 Degenne A., and Forsé M. (1999). Introducing social networks. Sage Publications,
508 London.
509 Denis J-L., Langley A., and Sergi V. (2012). Leadership in the Plural. The Academy of
510 Management Annals 6(1): 211-283.
511 Denis J-L., Langley A., and Rouleau L. (2010). The Practice of Leadership in the
512 Messy World of Organizations. Leadership 6(1): 67–88

513 Dwiartama A., and Rosin C. (2014). Exploring agency beyond humans: the
514 compatibility of Actor-Network Theory and resilience thinking. Ecology and
515 Society 19(3): 28
516 Evans L. S., Hicks C.C., Cohen P. J., Case P., Prideaux M., and Mills, D. J. (2015).
517 Understanding leadership in the environmental sciences. Ecology and Society
518 20(1): 50.
519 Endrissat N., and von Arx W. (2013). Leadership practices and context: Two sides of
520 the same coin. Leadership 9(2): 278–304.
521 Fidelman P., and Evans LS. and Foale S. Weible C. von Heland F. and Elgin D. (2014).
522 Coalition cohesion for regional marine governance: A stakeholder analysis of
523 the Coral Triangle Initiative. *Ocean & Coastal Management* 95: 117-128
524 Fidelman P. Evans LS. Fabinyi M. Foale S. Cinner J. Rosen F. (2012). Governing
525 large-scale marine commons: contextual challenges in the Coral Triangle.
526 *Marine Policy*. 36: 42–53
527 Game E. T., Fitzsimons J. A., Lipsett-Moore G., and McDonald-Madden E. (2013).
528 Subjective risk assessment for planning conservation projects. *Environmental*
529 *Research Letters* 8: 045027.
530 Grint K. (2010). The Sacred in Leadership: Separation, Sacrifice and Silence.
531 Organisation Studies 31(1): 89-107.
532 Haslam S. A., Reicher S. D. and Platow M. J. (2011). The new psychology of
533 leadership: Identity, influence and power. Hove. Psychology Press.
534 Hawkins, B. (2015). Ship-shape: Materializing leadership in the British Royal Navy.
535 Human Relations 68(6): 951-971.

536 Hoppe B., and Reinelt C. (2010). Social network analysis and the evaluation of
537 leadership networks. The Leadership Quarterly 21: 600-619.
538 Houck O. A. (2010). Taking back Eden eight environmental cases that changed the
539 world. Washington, DC, Island Press.
540 Kates R. W., Travis W. R., and Wilbanks T. J. (2012). Transformational adaptation
541 when incremental adaptations to climate change are insufficient. Proceedings of
542 the National Academy of Science United States of America 109(19): 170-182.
543 Latour B. (1996). On actor-network theory. A few clarifications plus more than a few
544 complications. Soziale Welt 47**:** 369-381.
545 Lele S.M. (1991). Sustainable Development: A critical review. World Development
546 19(6): 607-621.
547 Mailhot C., Gagnon S., Langley A., and Binette L-F. (2016). Distributing leadership
548 across people and objects in a collaborative research project. Leadership 12(1):
549 53–85.
550 Manolis J. C., Chan K. M., Finkelstein M. E., Stephens S., Nelson, C.R., Grant, J. B.
551 and Dombeck M. P. (2009). Leadership: a New Frontier in Conservation
552 Science. Conservation Biology 23(4): 879-886.
553 Martinez-Alier J. (2014). The environmentalism of the poor. Geoforum 54: 239–241.
554 Myers N. (1996). The biodiversity crisis and the future of evolution. Environmentalist
555 16(1): 37-47.
556 Njaya F., Donda S., and Béné C. (2012). Analysis of power in fisheries co-
557 management: experiences from Malawi. Society and Natural Resources 25(7):
558 652-666.

559 Oborn E., Barrett M. and Dawson S. (2013). Distributed leadership in policy
560 formulation: A sociomaterial perspective. Organization Studies 34(2): 253–276.
561 O'Brien, K. (2012). Global environmental change II: From adaptation to deliberate
562 transformation. Progress in Human Geography 36(5): 667-676.
563 Olsson P., Folke C., and Hughes T.P. (2008). Navigating the transition to ecosystem-
564 based management of the Great Barrier Reef, Australia. Proceedings of the
565 National Academy of Science United States of America 105(28): 9489-9494.
566 Pahl-Wostl C., Craps M., Dewulf A., Mostert E., Tabara D., and Taillieu T. (2007).
567 Social learning and water resources management. Ecology and Society 12(2): 5.
568 Pettigrew A.M. (1992). On Studying Managerial Elites. Strategic Management Journal
569 1(winter): 163–82.
570 Redclift M. (2005). Sustainable development (1987-2005): an oxymoron comes of age.
571 Sustainable Development 13(4): 212-227.
572 Rosen F. and Olsson P. (2013). Institutional entrepreneurs, global networks, and the
573 emergence of international institutions for ecosystem-based management: The
574 Coral Triangle Initiative. Marine Policy 38: 195-204.
575 Scheffer M., Westley F., and Brock W. (2003). Slow response of societies to new
576 problems: causes and costs. Ecosystems 6: 493-502.
577 Spillane J.P., Halverson R. and Diamond J.B. (2004). Towards a theory of leadership
578 practice: a distributed perspective, Journal of Curriculum Studies 36(1): 3-34.
579 Stafford-Smith M., Horrocks L., Harvey A., and Hamilton C. (2011). Rethinking
580 adaptation for a 4°C world. Philosophical Transactions of the Royal Society B
581 369(1934): 196-216.

582 Steffen W., Richardson K., Rockstrom J., Cornell S. E., Fetzer I., Bennett E. M., Biggs
583 R., Carpenter S. R., de Vries W., de Wit C. A., Folke C., Gerten D., Heinke J.,
584 Mace G. M., Persson L. M., Ramanathan V., Reyers B., and Sorlin S. (2015).
585 Planetary boundaries: Guiding human development on a changing planet.
586 Science 347(6223).
587 United Nations Department of Economic and Social Affairs. (2010). The Millenium
588 Development Goals Report 2010, New York.
589 Veron J., Devantier L. M., Turak E., Green A. L., Kininmonth S., Stafford-Smith M.,
590 and Peterson N. (2009). Delineating the coral triangle. Galaxea, Journal of
591 Coral Reef Studies 11: 91-100.
592 Walker B., Holling, C. S., Carpenter S. R., and Kinzig A. (2004) Resilience,
593 Adaptability and Transformability in Social-ecological Systems. Ecology and
594 Society 9(2): 5.
595 Westley F., Olsson P., Folke C., Homer-Dixon T., Vredenburg H., Loorbach D.,
596 Thompson J., Nilsson M., Lambin E., Sendzimir J., Banerjee B., Galaz V., van
597 der Leeuw S. (2011). Tipping toward sustainability: emerging pathways of
598 transformation. Ambio 40(7): 762-780.
599 World Resources Institute. (2005). Millennium Ecosystem Assessment: Ecosystems
600 and Human Well-being: Synthesis. Washington, DC.
601 Young O. R., Osherenko G., Ogden J., Crowder L. B., Ogden J., Wilson J. A., Day J.
602 C., Douvere F., Ehler C. N., McLeod K. L., Halperin B. S., and Peach R.
603 (2007). Solving the crisis in ocean governance: Place-based management of
604 marine ecosystems. Environment 49(4): 20-32.

605 Zulu L.C. (2008) Community forest management in southern Malawi: solution or part
606 of the problem? Society and Natural Resources 21(8): 687-703.
607

608 **Figure 1.** A schematic of the participatory method use with respondents to identify
609 different sources of leadership and their relative influence on the three CTI goals; (A)
610 illustrates the initial map of actants considered to be influential (data used for the
611 quantitative network diagrams), and (B) depicts how respondents ranked the relative
612 influence of actants on the three different CTI goals (data in table 2).
613

614 **Figure 2.** Network diagrams illustrating the relative frequency (indicated by the size of
615 the point) that different actants (individual points) were identified by respondents as
616 being influential on (indicated by lines) CTI goals: (A) positive influences and (B)
617 negative influence. Respondents' organisations are indicated by triangles; the arrows
618 point towards the actants that respondents identified. Categories of leadership are
619 indicated by different colours; black = organisations and networks, blue = donors and
620 funding, red = policies and fora, and green = beliefs and discourses.
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