Catalysing Change Agents through Research for Development

by

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Candidate's Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of the author's knowledge, it contains no material previously published or written by another person, except where due reference is made in the text.

Seona Meharg Date: 12 February 2020

Acknowledgements

This thesis was wrapped up after five years of part time study during a time of enormous upheaval in Australia. Huge tracts of land burnt in a land gripped in drought, people and wildlife died, homes and livelihoods were lost, and Canberra, the nation's capital and my home, was shrouded in thick toxic smoke for weeks on end. The media documented the disaster, including telling stories of the many people doing extraordinary acts to help their communities, complete strangers, and the wildlife. Others are starting public conversations, discussing how we want to live in the future, and what this might mean for the choices we make now. These stories of courage and purpose are providing me with a silver lining to the ongoing devastation. These change agents sometimes worked individually, but often stories were told about people banding together, drawing on their networks, and going above and beyond to action their values.

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Abstract

Billions of dollars are channelled into interventions every year aiming to lift people out of poverty. While there has been much progress towards this goal new challenges are emerging, and old issues are becoming more complex due to the accelerated rate of change associated with globalisation, climate and environmental degradation and technological advances. Positive systemic change requires rethinking interventions and the roles that actors play in these interventions.

Some people, or groups of people, are better able to enact change than others, with growing evidence that the success of interventions is often due to particular individuals or groups involved. These change agents occur across all cultures and domains, and have varying roles, resources, networks and world views. The literature identifies key change agent characteristics associated with values, purpose and concepts associated with mastery and entrepreneurism. However, there is little mentioned about the role change agents play in research for development interventions, particularly interventions focused on helping people and communities adapt to global change. Or how research for development projects can best support and enable these individuals and groups, such as what are the types of competencies, resources and knowledge needed to enact lasting change in adaptation projects.

This research sought to illuminate the necessary and sufficient set of change agent characteristics and competencies using four project case studies, two in Vietnam and two in Indonesia, which allowed for comparisons within and across countries. If agents were critical for systemic change, evidence of change needs to established first. Projects were evaluated at three time intervals, using a mixed methods approach. Potential change agents were identified through the evaluation, then interviewed to gain a better understanding of their personal change drivers, as well as establishing what, if anything, the project did to help them.

Three types of change agents were identified, pre-existing or strong change agents, as well as emerging and prospective change agents. The strong and emerging change agents felt that project activities and outputs including knowledge, networks and capacity building had helped them to enact change. The stronger change agents had values that were already aligned to the project goals and a deep seated sense of purpose including self-mastery traits, and they had developed networks, which were strengthened and broadened by the projects. For those identified as prospective change agents, the projects had lit a spark, but further development and opportunity was needed to enable these people to emerge as change agents.

This research suggests that there are cultural differences about how agents perceive the future and their role in shaping it, although some characteristics were shared across agents regardless of context. These characteristics included a sense of personal responsibility and purpose and the importance of learning in their lives. Change agents also built and maintained strong personal relationships with the research teams and other partners.

R4D adaptation projects help grow all change agent capacities and competencies. Although, like the characteristics, stronger change agents already had many of the competencies, particularly good interpersonal skills and a focus on learning. The R4D projects helped expand change agent knowledge and competencies through building systems thinking, integration, and critical thinking skills.

This research suggests that knowledge and resources are important, however, capacity building is more than technical, it is the development of a set of core competencies that are more important for creating change. Implications are that people matter, and that genuine relationships are needed between researchers, partners and practitioners. Catalytic change requires capacities, a shared normative purpose, reflexivity, cross-scale networks, and windows of opportunity.

Table of Contents

List of Figures

List of Tables

List of Boxes

List of acronyms and abbreviations

ANU	Australian National University
Bappeda	NTB Planning Agency, Indonesia
BLHP	NTB Environmental Research Board, Indonesia
BMKG	Indonesian Bureau of Meteorology and Geoscience
BPTP	Indonesia Agricultural Technology Assessment Agency
CCCO	Can Tho Climate Change Office, Vietnam
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTU	Can Tho University, Vietnam
DFAT	Department of Foreign Affairs and Trade, Australia
DONRE	The Department of Natural Resources and Environment, Vietnam
ERI	Ecoregions Indonesia
GIS	Geographical Information Systems
HUS	Hanoi University of Science, Vietnam
ICEM	International Centre for Environmental Management
IMHEN	Vietnam Institute of Meteorology, Hydrology and Environment
IPCC	Intergovernmental Panel on Climate Change
IUWM	Integrated Urban Water Management
NGO	Non-government organisation
NTB	West Nusa Tenggara, Indonesia
MONRE	Vietnamese Ministry or Natural Resources and Environment
ODE	Office of Development Effectiveness, DFAT Australia
PDAM	Water Supply Company, Makassar, Indonesia
PPE	Pusat Pengelolaan Ekoregion Sulawesi Maluku dan Papua
PTI	Path to Impact
R4D	Research for Development
SUD	Sustainable Urban Development
ToC	Theory of Change
UN	United Nations
UNHAS	Universitas Hasanuddin, Indonesia
UNRAM	University of Mataram, Indonesia
WFP	United Nations World Food Programme
WSSC	Water Supply and Sanitation Company, Can Tho, Vietnam

Chapter 1: Creating systemic change through Research for Development Interventions

1.1 International development

Billions of dollars (USD146.6 billion in 2017[1]) are channelled into development interventions every year to lift people out of poverty, among other objectives. While there has been much progress, as well as debate as to why, with the transition from the Millennium Development Goals (MDGs) to the Sustainable Development Goals (SDGs), there is still much more to be done (United Nations, 2015). The growing field of research for development (R4D) is attempting to improve the rate and extent of positive systemic change in international development. Research for development refers to research projects that aim to both deliver scientific impact and contribute to development outcomes (Williams, 2015) through the development of new knowledge, partnerships and increased human capacity. Critically the *for* differentiates this from more traditional research *about* development by having improved development outcomes as a priority from the research (Roth, 2010, Preston et al., 2015), see Figure 1.

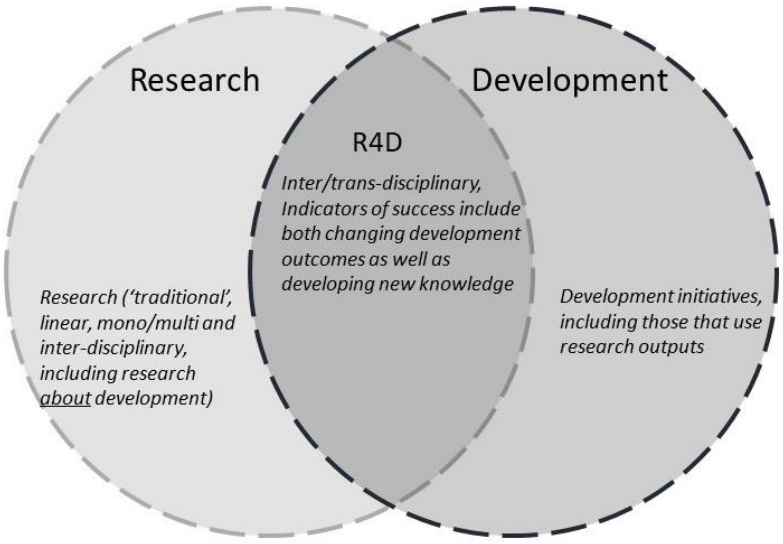


Figure 1: Intersection of research and development, and one of the intersections which is research *for* development

R4D is a broad and evolving domain including many types of sciences, and often taking an interdisciplinary or transdisciplinary approach to addressing real-world challenges, identify options, support planning, as well as guiding investment and implementation (Preston et al., 2015, Foran et al., 2014, Williams, 2018). While there are multiple ways of describing 'research for' activities, there are similar characteristics with a focus on enhancing individual and social learning and reflexivity for research and practice, co-design and implementation of activities with stakeholders, researchers being part of the

[1] https://www.oecd.org/newsroom/development-aid-stable-in-2017-with-more-sent-to-poorest-countries.htm

system, and a need for greater evaluation, all of which aligns with the goals of research for development. These characteristics of research design have also been articulated by researchers working in sustainability science, another related domain which is seeking effective solutions to complex societal problems (Wiek et al., 2014, Burns, 2014).

Despite its intended aims, evaluations by researchers and development agencies working in this space have suggested that much of R4D concludes without creating systemic change, with potential lessons going unheeded (Ramalingam, 2013, White, 2014, Abson et al., 2017).

This knowing-doing gap between the theory and practice of interventions is even wider for those R4D researchers and practitioners focusing on adaptation to global change (climate, environment, land use, social, economy, etc.) due to the newness of the domain, as well as future uncertainty and the long time scales involved. Researchers and practitioners are attempting to bridge this gap by developing new modes of engagement that include capacity building and iterative monitoring, evaluation and learning frameworks. Current academic literature contains few examples of these evaluations or case studies, which means that lessons learnt are not easy to find or shared with others and tested in other contexts (Conway and Mustelin, 2014).

R4D practitioners are not alone in attempting to bridge these gaps by seeking to improve the design and implementation of their projects. This challenge is being addressed by other intervention experts in 'research for', also known as 'research as practice' or 'research through practice', including risk and disaster specialists, medical, teaching, sports, diet and nutrition, organisational change and climate adaptation professionals to name a few (Fazey et al., 2018b, van der Hel, 2018, Preston et al., 2015). Despite a large body of work in each of these fields, and many shared challenges, such as complex contexts, funding timelines, and attempts to influence behaviour, lessons are not always sought or shared, resulting in the reinvention of tools, concepts and approaches, and duplicating others' mistakes. This has led to people like Tony McCaffery suggesting that 'ninety per cent of problems have already been solved in some other field, you just have to find them' (Marks, 2015).

Improving R4D's ability to address societal adaptations to global change is already a large and growing area of research and practitioner interest. It is a priority for development agencies, international donors, NGOs, and perhaps most importantly it is of fundamental interest to in-country decision makers and the communities that we aim to help (Butler et al., 2014). Most of the research in R4D has focused on specific interventions, such as health, food security or livelihoods, with a small (but growing) field exploring the evaluations of these interventions demonstrating that they have the capacity to instigate positive systemic change (Trimble and Plummer, 2018, Wiek et al., 2014, Blundo-Canto et al., 2018, Patton, 2011).

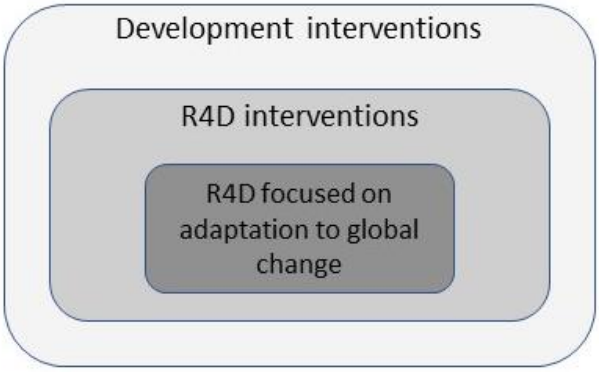


Figure 2: Nested types of development interventions. This thesis will focus on R4D focused on adaptation to global change, although it will also draw on lessons from other types of interventions as appropriate.

An intervention is a set of strategies or activities undertaken by players in a system to achieve a stated goal or vision. In R4D this is often undertaken through projects and collaborations, with Figure 3 outlining an example set of the players in an R4D intervention, including donors, stakeholders and beneficiaries. The 'R4D project' is often a subcomponent including activities undertaken by the foreign research and in-country research teams.

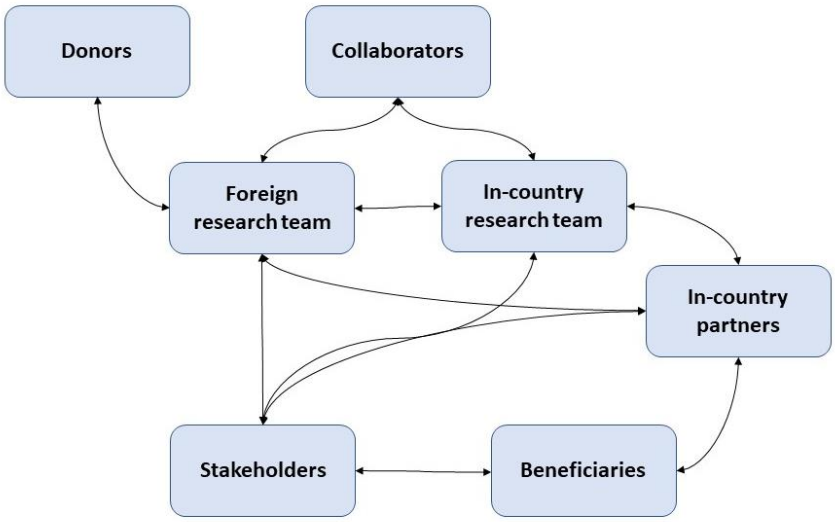


Figure 3: An example set of players in a R4D intervention, highlighting the multiple networks and potential relationships

1.2 Origins of this study

I first started working as a sustainability researcher in 2000. After a brief diversion into research management and university administration, I found myself (in 2007) working for Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) on interdisciplinary adaptation research projects, as well as managing and participating in research for development projects

and programs. Over the past decade, I have watched projects both succeed and fail to achieve on-ground impact, almost independently of the quality of the science delivered. The science impact or lack of it is well documented, with CSIRO's research regularly appraised by an international science review panel (CSIRO, 2019).

The questions that remain unanswered, however, include why our work sometimes has high on-ground impact, and sometimes it has little to no impact, and why sometimes the on-ground impact we achieve dissipates not long after the project wraps up. I became increasingly interested in what makes our work 'stick' over the longer term, how we can improve project design and implementation to improve our path to impact, as well as how to get better at evaluating and learning from that impact. I became a researcher to learn and share what I learn with others, in order to try and help change the world for the better.

As an integration scientist (a philosophy and approach that combines different types of methods and knowledges to answer questions), in collaboration with my colleagues I use my discipline bridging skills to address global change challenges both in Australia and overseas. I feel that my colleagues and I have a responsibility in facilitating adaptation to global change and progressing sustainability around the world. Many of my colleagues also share this view (Butler et al., 2014, Wise et al., 2014, Wiek et al., 2014, Maru et al., 2014). What I have learnt is that facilitating positive social change is one of the hardest aspects of the science of helping socio-ecological systems adapt to global change, and to get better we need to learn from other intervention practices.

The objectives of this study are to better understand what is involved in catalysing systemic change, particularly through R4D which sits at intersection of research and development and has the dual focus on improving development outcomes and the creation of new knowledge (Figure 1). As a R4D research practitioner, I am interested improving my understanding about , what role change agents play in enabling change within R4D projects, and how to effectively facilitate and cultivate these change agents, as well as gaining insights about how to become a better agent of change myself.

1.2.1 What is systemic change and who is involved?

By systemic change I mean change that is self-sustaining, beyond the project or program, that influences the wider system. It is also often anticipated that the change or intervention impact needs to diffuse across levels and geographies, leading to an ongoing transformation of the wider system and often referred to in the development and intervention community as 'scaling for impact'.

While there is no right or single pathway, historical case studies demonstrate that when systemic change happens, it is often because of an individual, or group of people, who have a shared purpose and work multiple pathways to achieve it (Westley et al., 2009, Brown and Westaway, 2011). R4D, especially in the field of adaptation to global change, focuses on partnering with these 'change agents'

and building their capacity, also known as adaptive capacity, to enable or activate a sought-after change. Brown and Westaway (2011, p.325) define the agency (held by the change agent) as:

> *the capacity of an individual to act independently and to make one's own free choices. One's agency is one's independent capability or ability to act on one's will. This ability is affected by the cognitive belief structure that one has formed through one's experiences, the perceptions held by the society and the individual, and the structures and circumstances of the environment one is in.*

R4D interventions emphasise the role of agency and perceived self-efficacy in achieving adaptation and change (Westley et al., 2013, Fernandez-Ballesteros et al., 2002, Brown and Westaway, 2011). Although, as Brown and Westaway (2011, p.326) note, 'agency remains a "black box" and further exploration is needed especially as it relates to one's own capacity or adaptive capacity'.

Recognising these change agents or collectives and identifying ways to cultivate or facilitate their agency and activities for positive systemic change is an evolving research area that increasingly recognises that people respond and adapt to challenges in different ways due to contextual and temporal elements as well as cognitive and psychological factors (Grothmann and Patt, 2005, Fazey, 2010).

While all people have the capability to enact change some people or groups are key change makers in the system. As William James alleged over 100 years ago, 'men the world over possess amounts of resource which only very exceptional individuals push to their extremes of use' (James, 1911, p.118). What is not well understood is why some people are better able to influence positive systemic change, or how R4D teams could improve their chances of finding and partnering with, or perhaps cultivating, these change agents.

Insights into how and why some agents or collectives are able to 'steer' change, what conditions or contexts enable these people to emerge, and whether researchers and practitioners can facilitate their development would better enable interventions to generate systemic change (Gillard et al., 2016, Hickey, 2013, Aragón et al., 2010). A better understanding of the answers to these questions, and the contexts in which they apply, would not only address an identified gap in the literature (Hickey, 2013, Hinkel and Bisaro, 2015, Scoones, 2016, Butler et al., 2014, Abson et al., 2017, Mapfumo et al., 2015) but would also enable me to develop a better understanding of my own motivations and theories of change (Aragón et al., 2010) in order to become a better researcher (Fernandez, 2016).

1.3 Research questions and approach

This thesis investigates how R4D grows capacity for systemic change, by exploring the nature of change agents, their role in R4D focused on adapting to global change, and how it may be possible to cultivate existing or potential change agents by asking five key questions:

1. What or who are agents of change?
2. What makes a change agent? Do they have characteristics or competencies in common?

3. How is a change agent facilitated or enabled to emerge?
4. What influences the impact that a change agent might have?
    - What are the wider enabling conditions or context, is a critical mass needed?
    - Does it require a shift in cultural or institutional values?
5. How can R4D projects be designed more purposefully towards enabling change agents to facilitate systemic change?

The first three questions were initially explored through the literature. Surfaced insights were then tested together with questions 4 and 5 using a comparative case study design and an adaptive theory approach to gain insights into identifying and catalysing change agents, in order to inform the design and implementation of more impactful projects (Bammer, 2012). Mixed methods were used to understand and evaluate the role change agents had in four projects (Box 1) funded under the CSIRO-DFAT Research for Development Alliance (R4D Alliance).

The R4D Alliance commenced in 2007 as a strategic partnership between Australia's aid agency and CSIRO to improve the impact of aid through undertaking case study projects that tackled important development challenges in the Asia-Pacific region (Lazarow et al., 2015). These projects aimed to improve knowledge of climate, water and energy systems, and to understand people's vulnerabilities and options to adapt and manage their changing natural environment (CSIRO, 2014).

Box 1: Thesis case study projects

Project	Full name	Brief description
Adaptive Livelihoods	Climate Adaptation Strategies for Rural Livelihoods in Nusa Tenggara Province, Indonesia	Focused on adapting rural livelihoods and was undertaken between 2011–2014.
SUD Can Tho	Climate Adaptation through Sustainable Urban Development – Can Tho, Vietnam	Focused on integrated urban water management under a changing climate and was undertaken between 2011–2014.
SUD Makassar	Climate Adaptation through Sustainable Urban Development – Makassar, Indonesia	Focused on integrated urban water management under a changing climate and was undertaken between 2011–2014.
Climate Projections	High Resolution Climate Projections for Vietnam	Focused developing the skills and knowledge for creating climate projections for Vietnam and was undertaken between 2012–2014.

The four case study projects were evaluated for impact over three time slices, in 2014 at the end of the projects, again in 2015 and lastly in 2017. This allowed for an assessment of changing impact over time (post project) and for comparison between the projects (see Appendix 2, p.271). The evaluation process surfaced potential change agents who were then interviewed to gain a better understanding of their characteristics, their context, and what, if anything, the projects had done to enable them. Having four case studies in two countries (Vietnam and Indonesia) at similar stages of development enabled exploration and comparison of the specific and generalisable aspects of change agents associated with different contexts, cultures and research domains.

1.4 Research context

Uncertainty and complexity are features of most international development issues. These challenges are anticipated to grow with the increasing likelihood of a warmer world and rapid globalisation, leading to large-scale changes at unprecedented speed (Pahl-Wostl, 2009). It is anticipated that there will be growing pressure for decision makers to undertake proactive adaptation actions (Park et al., 2012).

1.4.1 Adaptation to global change

Adaptation to global change is a research and practice domain that seeks to understand how the complex web of current and future challenges, including climate change, environmental degradation, population increase, and technology development may play out in the future. This understanding is then used to explore how to intervene in the system to mitigate the worst of the potential future outcomes and make plans and take action for more desirable futures. For example, the Intergovernmental Panel on Climate Change defines climate adaptation as adjustments in human and natural systems, in response to actual or expected climate stimuli or their effects, that 'moderate harm or exploit beneficial opportunities' (IPCC, 2014, p.838). Adaptation research and practice is undertaken across many domains including agriculture, biodiversity, natural resource management, decision and governance science, health, infrastructure, urban and rural community resilience, water and development contexts to name a few.

Conventional explicit and implicit assumptions about the linear cause and effect relationship between interventions (especially development initiatives) and their impacts are increasingly untenable, presenting challenges for the planning and evaluation of future interventions. Ramalingam (2013) outlines some of these questionable assumptions including:

- humans use rational deduction,
- perfect knowledge is possible to make a decision,
- formal relations between actors are most important, and
- change is a direct result of actions.

While increasing in number and diversity documented examples of implementation of adaptation actions, including lessons learnt are still needed especially in developing countries where adaptation responses to climate and global change require integration with human development goals and outcomes. These transition or adaptation pathways necessitate constant review and learning amongst multiple stakeholders to identify and implement adaptive development which is flexible and avoids mal-adaptation and path dependency (Butler et al., 2014).

1.4.2 Adaptation and development effectiveness

Australia's 2017 Aid Evaluation Policy emphasised the need for improved evaluation and creating a culture of continuous learning (Australian Government, 2017). Development banks, the UN and

NGOs have, or are in the process of developing, guidance for adaptation evaluation based on on-ground activities. However, there is still a gap between the theory of evaluating adaptation, including R4D, and its successful practice. An enhanced understanding of evaluating initiatives/interventions in complex systems and the role of change agents would contribute to the improvement of R4D adaptation interventions and their implementation.

The growth in the number of journal papers in the area of societal adaptation to global change has been intense, as demonstrated by Preston et al. (2015). However, Lang et al. (2012, p.26) argue that the literature is 'fragmented and dispersed and lacks good guidance for interested researchers and practitioners'. Ensor and Harvey (2015, p.5) agreed, suggesting that good guidance is provided but that 'findings are often buried within reports that focus on specific initiatives or processes'. In addition to the growing academic literature, there has also been a growth in the practice literature (reports, guides, websites etc.).

1.4.3 Positioning this research

While there has been exponential growth in R4D activities around the world in an attempt to learn how to best respond to some of the most challenging development challenges, insights are still needed at the intersection of climate adaptation and development, and the role that change agents play in this space. . By connecting and sharing this understanding there are opportunities to provide lessons on what are the necessary conditions for supporting positive social change for systemic impact (Aragón et al., 2010), as well as contribute more broadly to the call for more reflexive adaptation research or research on adaptation research (Preston et al., 2015).

This thesis contributes to the rapidly evolving research for development domain, the opportunities for R4D to influence change and the associated role of change agents, and attempts to fill some of the gaps by synthesising relevant literature on adaptation research for development activities and how change agents enable the impacts that projects have, and how projects influence the change agents. Synthesised themes are tested on the four case studies to provide further insights and lessons about approaches to design and implementation of projects for systemic change.

1.5 Thesis overview

The thesis begins by exploring intervention attributes that potentially instigate or contribute to systemic change through research for development projects broadly, and adaptation projects in particular. Chapter 2: explores the themes of co-design, competencies and capacity building and adaptive learning in order to enable change and improve an intervention's path to impact. It introduces that there is no right or single pathway to impact and that in historical case studies when (systemic) change happens, it is often because of an individual, or group of people, who have a shared purpose and work multiple pathways to achieve it. Five key questions are suggested about whether some people or

groups of people are key change makers in the system, people who enable, facilitate, activate, and see windows of opportunity.

Chapter 3: explores who or what are change agents, including what the literature suggests are their characteristics, and how it might be possible to recognise these agents of change or collectives before changes have happened. The review then explores how research for development interventions in adaptation might cultivate agents' capacity or facilitate their activities for positive systemic change.

Chapter 4: outlines the conceptual framework and research design associated with identifying and tracking agents of change, and includes a rationale for the selection of case studies and methods selected both for the evaluations and the subsequent assessment of potential change agents.

Chapter 5: describes the history and context of the Research for Development Alliance between CSIRO and the Australian Aid program. A brief introduction and description are provided for the four R4D Alliance projects that are case studies for this research. This chapter explains the methodology and methods used to evaluate the R4D Alliance projects and provides a synthesis of these activities prior to the work of my PhD.

Chapter 6: to 9 showcase each of the four projects' impact over time (2014–2017), synthesising each project's path to impact and adaptive capacity evaluation data. The results of the potential change agent interviews are reported, with an assessment as to which agents had a stronger role in the project's impact.

Chapter 10: explores the similarities and differences within and between country case study results, including how contextual, research domain and design differences influenced and enabled change agents. Chapter 11: provides a summary and reflection of the research methodology and findings, as well as gaps in the work and opportunities for future work. This chapter concludes with a set of broad principles for improving impact when undertaking research for development projects.

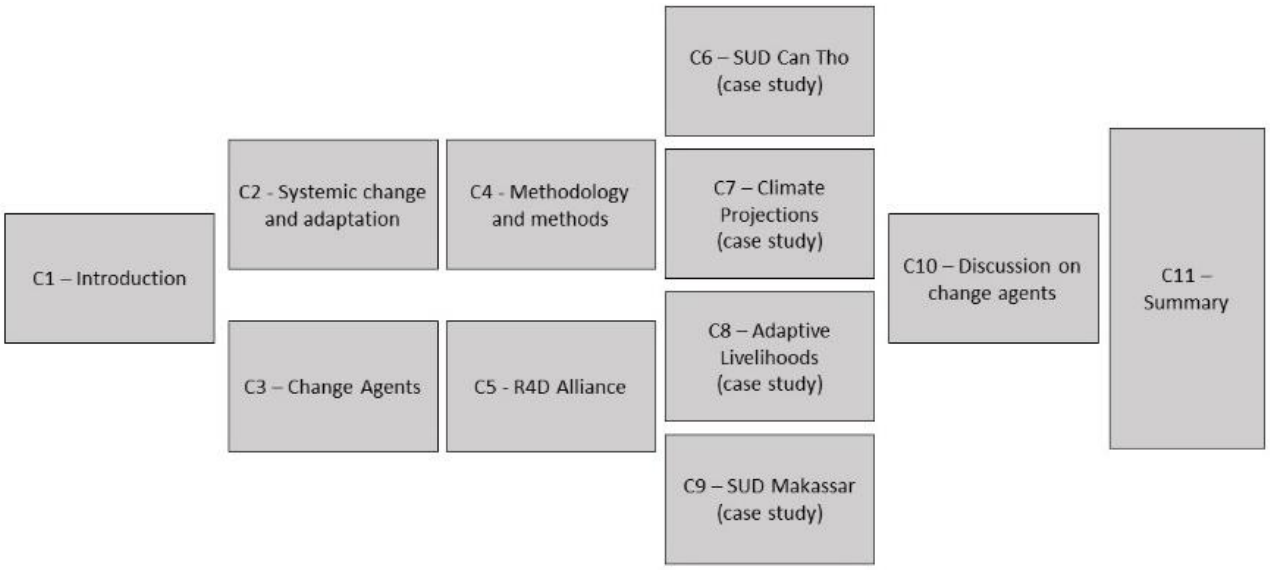


Figure 4: Visual representation of the thesis chapters

Chapter 2: Systemic change and adaptation

2.1 Intervening in a rapidly changing world

The world is an increasingly complex place with rapidly changing contexts due to population growth, environmental degradation, climate change, technology shifts and globalisation. New challenges are becoming evident and old ones more complex and disruptive due to the increasing interconnectedness of individuals, groups and nations, as well as the accelerated rate of change in some domains such as environmental degradation or technological advances (Friedman, 2017). Current structures, beliefs and power relations mean these contexts have existing path dependencies that limit what options and decisions are possible (Arkesteijn et al., 2015). As a result, conventional, simplistic ideas of development that emerged during the past 70 years are giving way to more contemporary concerns and practices.

Many authors have suggested that the rapidly changing context will require thinking differently about development interventions and the role that actors play in these interventions (Fazey et al., 2016, Fischer and Newig, 2016, Helbing, 2013). Within the wider intervention space the emerging field of research for development is attempting to address the growing need for humanity to adapt to ensure a sustainable world (Scoones et al., 2018, Abson et al., 2017, Fazey et al., 2018a, Lonsdale, 2015).

Research suggests that international development, including R4D, has failed to create systemic change due to the linear nature of interventions (Van Kerkhoff and Lebel, 2015, Fernandez, 2016, Clarke, 2016), or due to interventions addressing tangible but weak leverage points (Abson et al., 2017, Meadows, 1999). Adaptation activities within the development space face the additional challenge of implementation over what can be very long time frames, which means it is hard to evaluate success. Further compounding the challenge is the increasing competition between practitioners and researchers, tight project time frames, and the low or constrained capacity of participants, leading to many interventions remaining at the 'stage of policy and strategic development' (Conway and Mustelin, 2014, p.340).

Current thinking proposes that R4D has a better chance of encouraging decisions and action that lead to systemic change by focusing on areas of influence in the complex and messy global system through building relationships with the people in the system at multiple levels, understanding and addressing their needs and concerns, challenging current world views and practices, while encouraging learning and an adaptive mindset (Wise et al., 2014, Butler et al., 2014, Van Kerkhoff and Lebel, 2015, Conway and Mustelin, 2014, Frediani, 2010). Understanding the key heuristics, principles, enabling conditions, capacities, incentives and governance structures that have worked in past R4D development interventions has the potential to inform other systemic social interventions (Helbing, 2013, Fazey et al., 2018b).

By blending theory and practice through mutual learning (praxis), there is potential to build a culture of impact in 'research for' interventions and associated organisations (Blundo-Canto et al., 2018). Praxis can be facilitated by the incorporation of social and integration sciences, although Hinkel and Bisaro (2015) argue that this needs to be expanded from the current focus on descriptive or explanatory approaches to actually enable adaptation. Others have added that in order for research to expand socially relevant options and foster decisions that support systemic change, research culture needs to transform to enable a change in the design and implementation of associated interventions (ISSC/UNESCO, 2013, Blundo-Canto et al., 2018, Cundill et al., 2018).

2.1.1 Intervention contexts

Understanding the context matters. Not just in terms of deciding why, where and how to intervene in the system, but also who to intervene with. Interventions that do not account for context can limit their effectiveness and create unforeseen consequences (Adger, 2016). An awareness of context includes capacities, governance and institutional arrangements, power and politics, values and perspectives, cultures and history, as well as having a base level understanding of who the other players are intervening in the same system (Scoones, 2016, Weber and Khademian, 2008, Abercrombie, 2018, Fritz et al., 2009, Taylor and Clarke, 2008).

Having an improved understanding of the context should lead to better designed and implemented interventions that take into account actor and stakeholder histories, capacities, and resources, as well as previous programs that might have led to distrust or participation fatigue (de Vente et al., 2016, Ison, 2018). While the context is constantly evolving, developing a sufficient understanding can also inform how transferable any insights will be to other locations, levels or conditions (Cvitanovic et al., 2015, Westley et al., 2009, Brown and Westaway, 2011, Vogel, 2012, Gifford et al., 2011, Hall, 2017, Blamey and Mackenzie, 2007).

Nevertheless, most research for development interventions have neither the time nor the resources to properly understand the context in which they are operating (Ramalingam, 2013). Time and resource constraints are compounded by the fact that researchers often come from very different cultures, and hold different types of knowledge and world views to the context they are attempting to intervene in (Conway and Mustelin, 2014, Cundill et al., 2018). A number of issues have been identified as driving this, including a lack of understanding or awareness by donors and researchers themselves, short project timelines, limited funding and a need to demonstrate results in the short term (Blundo-Canto et al., 2018, Temple et al., 2018, Cundill et al., 2018, Cvitanovic et al., 2015, Williams, 2018).

Similarly, there are many powerful actors with a vested interest in the system that seek to maintain or change the current state for their own reasons, and therefore may resist changes sought by other interventions (Solecki et al., 2015). If an intervention fails to account for these other actors, institutions

and power dynamics in the system, then any projects undertaken may be inappropriately designed and therefore unlikely to achieve the impact they seek.

Another key aspect of the context is the capacity of a state or region to act. This is determined by the people, networks and organisations within the system, how power is structured, and the emergent combination that enables activities to be managed successfully and cope with surprises and change (Hickey, 2013, Taylor and Clarke, 2008, Jones et al., 2013). A community's capacity to cope largely depends on the collective openness and willingness to learn, and the ability to engage (Tschakert and Dietrich, 2010, Lebel et al., 2010), although this will vary across time and context (Jones et al., 2013).

Research has found that designing context-appropriate initiatives that take into account institutions, resources, values and norms can create an environment that is more amenable to behaviour change and the implementation of new ideas and practices (Gifford et al., 2011). However, it is the people who proactively make change happen, whether anticipating or reacting to situations, even without an enabling environment, that capture the imagination. This raises the question of what makes these individuals or collective 'change agents' persevere despite difficulties and obstacles, and whether these traits can be enhanced or developed in others. A better understanding of these individuals and groups, their individual and collective characteristics, and what enables them would help intervention teams plan more effectively for impact in the face of complex and changing contexts.

2.1.2 Agents within a context

Change agents are found throughout the system, across cultures, age groups, genders, and positions in society. They have different values, world views, knowledge, expectations and choices (Roux and Foxcroft, 2011, Wals, 2007b), as well as different risk perceptions and motivations to act. Albert Bandura, the father of social cognitive theory, suggests that efficacy beliefs are core to this. These beliefs influence what action people choose to pursue, the goals they set and their commitment to them in spite of obstacles in their way (Bandura, 2006b). Previous research has shown that 'socio-cognitive factors have done a better job of explaining adaptive behaviour than objective socio-economic factors' (Grothmann and Patt, 2005, p.209).

Research has demonstrated that these change agents gain motivation to act from their positive beliefs in their ability to undertake activities and enact change, and when combined with the ability to self-regulate this means they can influence the choices they make and the goals that they set themselves (Bandura, 2006a, Fernandez-Ballesteros et al., 2002). Goal pursuit is furthered by feelings of energisation, responsibility and perceived clarity of activities needed (Kappes and Oettingen, 2014). Emotions are a fundamental part of this sense-making process (Maitlis and Christianson, 2014).

Individuals are embedded within networks, where the collective ability to enact social change is often more than the sum of its members. Goals and values can be offset by participants' relative risk perception, therefore being part of a group or community means that individual risk is lower (Grothmann

and Patt, 2005). However, the opposite is also true, that if individuals or groups underestimate their ability to act this can become a bigger barrier to social change than a lack of resources, knowledge or enabling institutions (Grothmann and Patt, 2005).

This raises the question of whether catalysing or developing change agents is one way for research for development interventions to achieve systemic change. Health interventions suggest that it is possible, providing examples where change agents, known as positive deviants, have shared their insights within their community, resulting in wider changes. Countless interventions have come across these people or groups of people, yet struggle to understand how to cultivate and assist them (Ramalingam, 2013, Green, 2016, Westley et al., 2009). For adaptation interventions there is an opportunity to learn from different research and practice fields in order to identify and facilitate these agents of change, widening windows of opportunity for systemic change. Windows of opportunity are defined in this thesis as decisions 'that that can either limit or enhance the ability to create physical, behavioural or political space for proactive adaptation' (Brown et al., 2017, p.4-5).

2.2 Who are these change agents?

While all people have the capability to enact change, some people or groups of people are key change makers in the system, people who enable, facilitate, activate, and 'see' windows of opportunity. Because individuals are producers of experiences and shapers of events, they have the capacity to play an independent causal role in history (Bandura, 2006b); however, their characteristics and values are largely unknown.

Individuals or groups that 'make change happen' are found throughout the system and have many labels depending on context and framing of the authors, and while these are not always equivalent they are often used interchangeably in research for development interventions, with examples outlined in Box 2. Preston et al. (2015) suggest that interventions will be less effective if they fail to take into account the agency of the participants. Others highlight needing to understand what skills, knowledge and coalitions potential agents bring, as well as what inspires them to undertake the necessary changes or prioritise one set of activities over others that they are involved with (Fritz et al., 2009, Dutra et al., 2015). In this thesis, I define change agents as those who take an active role in promoting or shaping the change sought through research for development interventions focused on climate adaptation.

These change agents or change networks are part of the dynamics of adaptation rather than the heroic figure leading the charge (Westley et al., 2009) and may (arguably) have a definable set of characteristics, capacities and roles that enable them to act whereas others do not. These are not fixed in time or context, with people becoming an agent for a particular task or purpose, and then easing out of the role (Green, 2016). Similarly, these agents are not change agents in all aspects of their lives, they might be an agent of change at home, at work, or in their community, but not necessarily all or at the same time.

Box 2: Diversity of names used to describe change agents in the literature

Change agents	References
Actors	(Edwards and Jones, 2008)
Advocates, brokers, champions	(Fritz et al., 2009, Mapfumo et al., 2015)
Change agents	(Weick and Quinn, 1999, Westley et al., 2013, Meadows, 1999, Taylor and Clarke, 2008)
Decision makers, facilitators, innovators	(Westley et al., 2009)
Entrepreneurs (institutional, systems, social, policy)	(Westley et al., 2009, Gundry et al., 2011, Wiering et al., 2018)
Inspirers, interpreters, knowledge carriers, leaders	(Dutra et al., 2015)
Mavericks, positive social deviants	(Ramalingam, 2013, Pascale et al., 2010)
Problem solvers, sense makers	(Maitlis and Christianson, 2014)
Stewards, transition managers, translators	(Jones et al., 2013)
Visionaries	(Olsson et al., 2004, Wiering et al., 2018)

2.2.1 Products of their environment

Enabling change is based on the capacity and characteristics of the individuals in the system, their relationships with others through networks and coalitions, and the ability to make agreements and enact them (Hickey, 2013). Change is therefore brought about by people in their contexts, so while understanding agents' characteristics is important, it is also important to understand their roles and positions in the social structure, their access to resources and power, and their relationships, networks and ability to form coalitions (Hay, 2000, Leftwich, 2007).

Change agents are products of their environment, meaning that they both shape and are shaped by their context. Change agents may have multiple agendas, and reasons to keep the status quo, including the current structures and institutions that an intervention is attempting to shift or change (Lonsdale, 2015), while other agents may have an agenda that aligns with the sought-after change, or be more open to different ideas and practices (Meadows, 1999), and may help form a bridge to other levels, geographies or outliers who are needed to spark innovation and change (Regeer et al., 2016, Ramalingam, 2013).

Change is not the product of a single individual or collective, but rather it is the interplay between them and their context (Voß et al., 2007, Westley et al., 2013). However, despite facing similar challenges and constraints, some people find better solutions to their problems than others (Pascale et al., 2010). Some people are better able to make sense of the system they are in, and the change that is

already underway, and have behaviours and strategies to re-frame, re-design and steer (Weick and Quinn, 1999, Adger, 2016). Ramalingam (2013) describes this type of leadership as 'gaming the system', where first an agent understands how things work, and then how to do things that matter in spite of it.

2.2.2 Intervention focus

A growing awareness of the role of change agents has led to increased interest in the agency of individuals and collectives, and how they shape interventions (Westley et al., 2013). Some scholars question whether it is possible to deliberately set out conditions or circumstances for intentional change through catalysing agency or motivating types of capacities and action in order to aid specific interventions (Roberts and Lacey, 2008, Weick and Quinn, 1999). As mentioned in Chapter 1, for research for development interventions focused on sustainability or global change, improving agency focuses on increasing individual and collective adaptive capacity developed through specific training and awareness, reflection and the creation or strengthening of networks (Butler et al., 2017).

Capacity building is helped by potential change agents who are more likely to seek information and engage with issues (Harris et al., 2011). Other desirable attributes include potential change agents who maintain and cultivate social networks, enabling them to access support or assistance or to spread the adoption of new ideas and practices developed through R4D activities (Garud and Karnøe, 2005, Edwards and Jones, 2008, Gifford et al., 2011). It has been argued that these agents are 'effective at addressing the problem in the context' (Andrews, 2016, p.11), and therefore have the capacity to connect through 'broader structural, socio-political and institutional factors' (Wyborn, 2015, p.3). This is also likely to mean R4D collaborators, and especially change agents, have the capacity to reflect and act in ways other than those prescribed by social rules, institutions and cultural norms and values (Edwards and Jones, 2008).

While R4D interventions traditionally focus on capacity building they also seek to cultivate new knowledge and grow or improve access to resources. These three core features *capacity, knowledge and resources* are explored in more detail below. This is followed by consideration of potential change agent characteristics in Chapter 3:.

2.2.2.1 *Knowledge*

The Oxford English Dictionary defines knowledge as 'facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject' (OED, Online version). Knowledge can be facts, principles and abstract concepts, and it can also include narratives or stories which help humans make sense of their lives (Baumeister et al., 2016). Knowledge creation is often considered the most important output or contribution from R4D interventions, for example, the creation of climate downscaling data for vulnerability assessments, the development of new crops for improved food security, or how to make governance arrangements more effective for local or national

governments. However, to be useful and usable this knowledge has to be salient, legitimate and credible, and particularly in decision making under uncertainty there is value in including a diversity of knowledge cultures (Brown and Lambert, 2012, Cash et al., 2003, Tschakert et al., 2018, Tschakert et al., 2016). Knowledge is also subjective, and encumbered with power, not only around whose knowledge counts, but also what questions are allowed or prioritised to be asked, and how any new knowledge is shared and used (Taylor and Clarke, 2008).

The wide conceptualisation of what knowledge is highlights that while knowledge 'enables reality to be understood and explained' (Walmsley, 2004, p.5), perceptions and biases can undermine effective knowledge exchange (Cvitanovic et al., 2015), creating confusion and barriers to decision making or even lead to maladaptive or status quo options being chosen. It is also important to note that while many R4D interventions seek to expand participant knowledge in order to improve decision making, much like skills and capacities, people participating in interventions bring their own knowledge with them based on past experiences and practices, reflecting their context and interests (Reed et al., 2014).

Interventions often fail to acknowledge that knowledge is laden with power, such as the power of knowing or not knowing, the idea of some types of knowledge being worth more than others (science versus common) or that power can be driven by whose knowledge counts, what knowledge counts and how it counts (Eriksen et al., 2015, Ramalingam, 2013). Access to information and knowledge can also be limited by power (information asymmetries), although access to knowledge can be limited for other reasons, including not being available in the first place, which is often a reason for an R4D intervention to be undertaken (Hinkel and Bisaro, 2015).

Knowledge produced through research and practice is contextual and 'embedded within broader social relations and development processes' (Sultana, 2007, p.382). This means that science (especially western science) is shaped by power and interests as well as by the values and norms of the researchers, as evidenced by the problem framing, methodology chosen and how the results are shaped and shared (Van Kerkhoff and Lebel, 2015, Eriksen et al., 2015, Clarke, 2016, Hay, 2000, van der Hel, 2018). The contextual aspect of knowledge means that it can be contested across different cultures or historic contexts (Eriksen et al., 2015), may not be stable over time, and will always be 'interpretive and partial' (Sultana, 2007, p.382).

Power can be invisible, entrenched in existing institutions and knowledge structures (Leith et al., 2014) and therefore difficult to see (Heald, 2017). This is why Taylor and Clarke (2008) suggest that power is everywhere, embedded in the way we see and think, and therefore is critical to consider when designing and implementing interventions in order to address unequal power relations and develop a sense of agency in participants (Tschakert et al., 2016). Because new knowledge and practices can threaten existing status and power relations, people may be reluctant to master new competencies, especially those who have low status or power (Bandura, 1997). Still, knowledge can be enabling and empowering if people let go of outdated beliefs or practices (Sutcliffe et al., 2006), especially as Ensor and Harvey (2015,

p.11) argue if ‘those in positions of power are called upon to reconsider the primacy of their own ways of knowing and acting’.

The intersection of knowledge and power is particularly prevalent in adaptation or sustainability transformations, as there is potential to change access to and control over resources (Eriksen et al., 2015). This can manifest in defining what are ‘good’ and ‘bad’ trajectories, the selection of ideas and implementation of actions, as well as who can speak and who cannot (Eriksen et al., 2015, Alam et al., 2013, Scoones, 2016, Preston et al., 2015).

For those attempting to catalyse change agents this suggests that understanding where power is held in a system is important, as is the ability to connect, collaborate and share with others, and the proficiency and skills to apply new knowledge and information in context (Harris et al., 2011, Westley et al., 2009, Fernandez, 2016). Change agents who connect to various networks may do so through charm or trust, they may have the ability to work well with others, and perhaps have a reputation as knowledgeable or have a specific role that deals in information (Checkland and Poulter, 2010). Agents with limited means or insecure status are less likely to be able to afford to take risks, and they may wait until new knowledge or innovations are proven beneficial by early adopters (Bandura, 1997). However, as Lankelly-Chase (2018) reminds us, no one person holds the whole truth and a lack of information is not necessarily what is holding people back; see also Lonsdale (2015).

2.2.2.2 *Resources*

Another critical aspect for interventions is a change agent’s ability to access and have control over resources. These resources impact on an individual’s or society’s ability to adapt. Resource requirements at the national, regional, or even intervention scale can be broadly categorised by the seven assets or capitals outlined in Box 3.

The first five capitals (natural, built, financial, human and social) are often the targeted output of an R4D intervention, while political and cultural capitals form key contextual constraints and enablers for impact. Leat (2005) outlined how resources are a powerful incentive to change, just as lack of resources can be a powerful disincentive. As a result, competition for resources can often be intense, which if not taken into account can impact on an intervention’s ability to achieve impact (Westley et al., 2013).

Resources are suggested to be the basis of an individual’s ability or power to act (Grothmann and Patt, 2005, Adger et al., 2005), and a lack of availability or access to resources can hinder or limit adaptation (Paul et al., 2016, Spires et al., 2014, Jones et al., 2010, Nguyen et al., 2017). Being able to access resources is an important contributor to how constrained an agent is in all aspects of their lives, not just during a change process.

Box 3: Seven assets or capitals (McCrea et al., 2014, Cundill and Fabricius, 2009)

Capital	Description
Natural	location specific and can include resources such as water or minerals, amenity, natural beauty, biodiversity and the weather
Built or physical	infrastructure (roads, telecommunications, sanitation systems), health and caring facilities, and community attractions such as parks
Financial	the ability to access money and credit, support business and entrepreneurship, as well as the ability to build built and human capital, and protect or exploit natural capital
Human	the skills, abilities and attributes of people, as well as the ability to access and retain resources, knowledge and education
Social	networks, collectives, communities, institutions and organisations, and includes both formal and informal relationships, shared identity, purpose, cooperation and capacity for social learning and trust
Political	measures of transparency, trust and the ability to influence standards, rules, decision making and enforcement
Cultural	the way people know their world, its history, norms, values and how power is structured. Culture relates to the different world views, social classes, values and the way people think

By contrast, socio-economic advantage provides individuals with a stronger sense of self-efficacy, and communities with a stronger sense of collective efficacy (Fernandez-Ballesteros et al., 2002). This resource advantage enables more effective coping with adversity or shocks, higher aspirations, and the ability to mobilise social or political pressure (Bandura, 2000, Brown and Westaway, 2011). Gifford et al. (2011), however, suggest that access to resources can also be a detractor for change, as socio-economical advantaged individuals' and communities' prior investments, such as a car, make other choices such as public transport difficult or less desirable.

Bandura (1997) agrees that resources do not predetermine what individuals will do in given situations, suggesting that social networks can help provide resources for personal development. Resources, such as money, can potentially erode social cohesion and trust within communities, changing the social dynamics (Fazey et al., 2016). However, Butler et al. (2015) advocate that social networks can create a bridge for resource sharing across levels and scales, and Scoones (2016) argues that it is therefore important that interventions pay attention to how resources are distributed, given that one person's scarcity is abundance for another. For those seeking to catalyse potential change agents it is important to understand what resources or networks agents already have access to, as well as identifying what an intervention might be able to contribute to address any perceived or real lack of resources.

2.2.2.3 *Capacity building*

Many R4D interventions include elements of capacity building with partners, stakeholders and beneficiaries in order to increase potential change agents' ability to enact change. The skills that are imparted can be thought of as tools for change, whether that change is specific to the individual, or a collective ability to undertake and engage in social change (Roberts and Lacey, 2008, Petzold and Ratter, 2015). Different situations and problems will require different skills; these can be pre-chosen or shaped around emergent events (Edwards and Jones, 2008). While skills are important for interventions, they can be highly specific to the task at hand and rather than create a long list of potential skills required this section will focus on the necessary competencies for adaptation and sustainability interventions in general. Specific skills for the four case studies are outlined in the case study chapters.

Most people learn best from experience. However, due to the long time frames involved in adaptation and development, people rarely directly experience the consequences of key decisions (Senge, 1990), although the ability to connect present, past and future makes it 'possible for people to sustain effort on tasks even when disinclined, and to resume work after interruptions' (Baumeister et al., 2016, p.8). Therefore, Andrews et al. (2013, p.234) have suggested creating an 'authorising environment for decision making that encourages positive deviants and experimentation', rather than implementing a rigid intervention plan.

One suggested way to nudge an authorising environment is to expand the competencies of actors in the system, such as enhancing systems thinking or lengthening anticipated planning horizons; and helping actors to see patterns and opportunities that they can act on that they would not otherwise have seen (Sterman, 2002). Persistence and conscientiousness can be facilitated to encourage learning and resilience through meaning and motivation (Mezirow, 1990), creating a positive and reinforcing learning loop that has the potential to further develop capacities and competencies. Hickey (2013) notes that is important to ensure that capacities and capabilities developed are sustainable and not maladaptive over the longer term.

This literature review defines capacities and capabilities along the lines of Brown and Westaway (2011) where capacities are one's ability to perform a task, learn and develop, and generate an outcome, while capabilities are a set of resources that are physical, mental, and social – that a person might command, which give rise to various 'functionings' – the things a person values doing or being (Figure 5).

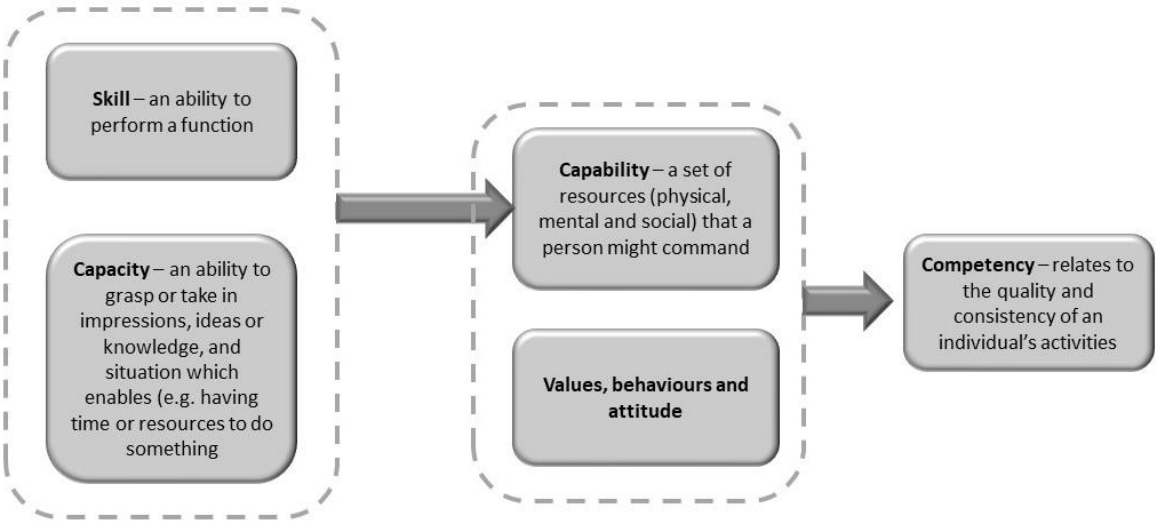


Figure 5: Skills, capacity and competency (OED, Online version)

A potential change agent's capacity and associated capability is tied to their individual and social context, their history and culture, sometimes their gender, age and socio-economic status. An individual will have more or less capacity depending on their ability to access formal and informal knowledge, education and training. As such, poverty can be defined not only as a lack of resources, but also as a deprivation of capabilities (Brown and Westaway, 2011).

In addition to capacities, capabilities and skills, interventions require certain competencies, combining skills with abilities, behaviours and values to create a certain 'know-how', which may be more about the quality and consistency with which someone uses their skills and capacities in the real world. Marope et al. (2017, p.27) define competencies as the 'developmental capacity to interactively mobilize and ethically use information, data, knowledge, skills, values, attitudes, and technology to engage effectively and act across diverse 21st century contexts to attain individual, collective, and global good'.

For sustainability and problem solving, Wiek et al. (2011) have outlined five interconnecting core competencies, with others proposing a similar set of competencies in research for development (Patton, 2011, Westley et al., 2009, Patterson et al., 2016, Aragón et al., 2010) and for adaptation (Wyborn, 2015, Walker and Salt, 2012, Patterson et al., 2016, Lebel et al., 2010). This suggests there is a similar set of competencies needed for solving complex problems such as adaptation and sustainability interventions across multiple domains.

Wiek et al.'s (2011) five interconnecting core competencies include *systems thinking competence*, *anticipatory competence*, *normative competence*, *strategic competence*, and *interpersonal competence*. *Systems competency* includes an understanding of feedback, time delays and nonlinearity, or mindset competencies, and system orientation (Armitage et al., 2008, Lonsdale, 2015, Sterman, 2002). *Anticipatory competency* aligns with what others call skill-set competency, creative thinking, thinking

differently or the ability to look ahead (Edwards and Jones, 2008, Buchanan, 2004, Brown and Lambert, 2012, Lonsdale, 2015).

Normative competency is sometimes called sense-making (Maitlis and Christianson, 2014), and can take on an informing or disseminating function (Jones et al., 2013). Bandura (2006b) describes having high-order self-regulatory skills in a similar light, with agents being able to set goals, plan, diagnose tasks and evaluate courses of action.

All planning or intervening processes call for some form of *strategic competence* in the form of context mapping, theories of change, evaluation, etc. Arguably, *interpersonal competencies* is the least acknowledged and is often ignored in practice, but is one of the most fundamental for initiating, maintaining and creating a successful intervention (Lonsdale, 2015). Others advocate for the need for similar competencies such as respect, empathy (Sterman, 2002), leadership, persuasion and social skills (Edwards and Jones, 2008), match-making, relationships and trust (Jones et al., 2013), or heart-set competencies (Lonsdale, 2015).

In addition to specific sustainability competencies, Wiek et al. (2011) propose that *regular competencies* are also important, but suggest that these are addressed by traditional education and therefore do not require special attention. Examples of these regular competencies include critical thinking and communication skills. However, in research for development, it would be a mistake to assume that these regular competencies are already present. In some situations, they will be, but in others they will form a gap that may be a barrier to participation or implementation. Other than a lack of training, one reason for these missing competencies is that people are more likely to develop competencies that are socially relevant or valued in their context, and not those valued by other social groups or contexts such as western researchers (Ryan and Deci, 2000).

For adaptation interventions it has been suggested that additional competencies or *adaptive capacities* might be needed (Armitage et al., 2009, Plummer et al., 2017). Adaptive capacity includes competencies that span some of the others, including understanding and developing scenarios and adaptation pathways, willingness to experiment (Plummer, 2009), and an ability to integrate, or 'make whole' various pieces of information that may not be comparable (Brown, 2018).

In Table 1 the nine competencies outlined above required by potential change agents or collectives for enabling change can be loosely clumped into three broad overlapping and interconnected themes:

- Good with people
- Learning or mastery skills
- Adaptation competencies.

Table 1: Combined list of interconnected competencies

Competencies		Overview and connections to change	Links to, and descriptions in the literature
Good with people	Interpersonal	Social skills that enable connection to others, help build trust, networks and social learning	• Interpersonal competence for sustainability (Wiek et al., 2011) • Informing function (Jones et al., 2013) • Ability to smooth out conflicts and facilitate learning (Vignola et al., 2017) • Agreeableness and extraversion (Stajkovic et al., 2018) • Social skills – ability to motivate others (Edwards and Jones, 2008) • Mutual trust, mutual respect, inclusive language (Brown and Lambert, 2015) • The cultivation of a transdisciplinary attitude and vision (Clarke, 2016) • Enable collective contribution (Westley et al., 2013) • Political and interactional skills, bargaining and brokering skills (Westley, 2013) • Co-productive capacity (Van Kerkhoff and Lebel, 2015) • Social networks and social learning (Plummer et al., 2017, Butler et al., 2016a)
	Entrepreneurial skills	Communication and influencing skills, including ability to engage with politics and understand the institutions that support innovation	• Employ leveraging strategies aimed at capturing resource flows and establishing new institutions to support innovation (Westley, 2013) • Communication and influencing skills (Wiek et al., 2011)
Learning or mastery skills	Learning	Learning orientation and having the skills to do so, including social learning, critical reflection and reflexivity	• Reflective consciousness (Aragón et al., 2010) • Critical reflection (Tschakert and Dietrich, 2010) • Reflective learning (Wals, 2007a) • Self-reflectiveness and self-regulatory skills (Bandura, 2006b, Bandura, 2018) • Critical reflection and processes of social learning (Eriksen et al., 2015) • A braided rope consisting of reflection, system orientation, integration, negotiation and participation, thus drawing together human agency, individual and collective learning, and processes of change (Armitage et al., 2008) • Reflective capacity and awareness of self and others (Lonsdale, 2015) • Autonomy here refers to the understanding, skills, and disposition necessary to become critically reflective of one's own assumptions and to engage effectively in discourse to validate one's beliefs through the experiences of others who share universal values (Mezirow, 1997) • Open mindset – learning linked to openness (Dweck, 2006)
	Openness to new or other things	The cultivation of an open mind, open to new or different world views, values, ideas and processes. Enables agents to see opportunities that others do not.	• Openness (Ahvenharju et al., 2018, van der Hel, 2018, Brown and Westaway, 2011) • Open mind (Brown and Lambert, 2015, Dweck, 2006) • Openness shifts perceptions of demands into challenges to be tackled, broadening task engagement and self-efficacy (Stajkovic et al., 2018)

			• Open mind is the capacity to suspend old habits of judgement – to see with fresh eyes. An open heart is the capacity to empathise and look at a situation through the eyes of somebody else. An open will is the capacity to 'let go' of the old and 'let come' the new (Scharmer, 2018) • Appreciative inquiry (Andrews, 2016) • Analytic serendipity or beginners mind (Lawley and Tompkins, 2008)
Adaptation competencies	Normative (values, sustainability, justice etc.)	The values, principles and goals of individuals and groups, such as having concern for others, thinking socially or environmentally. To enable social change an agent first needs to be aware of their own norms and values	• Normative competency– values, principles, goals and targets – justice, ethics, equity and how to get things done so includes political understanding and context (Wiek et al., 2011) • Normative and political dimensions (van der Hel, 2018) • Concern for others (Ahvenharju et al., 2018) • Thinking socially (World Bank, 2015) • World view – aligns with values and influence vision of the future (Patterson et al., 2016) • How people perceive, value and interact with the world (Abson et al., 2017) • Pro-environment specific attitudes (Gifford et al., 2011) • Norms and beliefs (Taylor and Clarke, 2008) • Cultural world view or social paradigm (Wals, 2007a) • Involve a concern with issues of power, culture, institutions, world views and values (Armitage et al., 2008)
	Future thinking or anticipatory	Anticipatory skills which help people think about the future and make practical judgements	• Anticipatory competence (Wiek et al., 2011) • Future consciousness (Ahvenharju et al., 2018) • Forethought and anticipatory self-guidance (Bandura, 2018) • Continuity and stakes in the ground (Fincher et al., 2014) • Envisioning alternative futures and scenarios of change (Chaffin et al., 2016) • Thinking about the future (mental contrasting, indulging, dwelling and reverse contrasting) (Kappes and Oettingen, 2014) • Visioning (Westley, 2013) • Back casting for creating transition strategies and anticipatory governance (Wiek et al., 2011) • Ability to look ahead and to make practical judgements (Edwards and Jones, 2008) • Imagining (Brown and Lambert, 2015)
	Strategic	Planning and self-regulation skills. Identifying and then actioning steps to implement, including addressing any barriers	• Strategic competence (Wiek et al., 2011) • Time perception (Ahvenharju et al., 2018) • Planning (implementation intentions) (Fujita, 2011) • Self-reactiveness – self-regulation of motivation and action (Stajkovic et al., 2018) • Implementation intentions (Kappes and Oettingen, 2014) • Opposite of thinking automatically (World Bank, 2015) • Opposite of mindless action (Scharmer, 2018) • Personal critical cues for habitual behaviour (Adriaanse et al., 2010) • Knowledge on how to implement change in practice (Fazey et al., 2018a)

	Critical thinking skills	Critical thinking skills include reasoning skills, flexible thinking and the capacity to shift from one perspective to another	• Thinking with mental models (Jones et al., 2011) • Cogitative capacities for information retrieval and flexible thinking, including both original and range of ideas (Brown and Westaway, 2011) • Selective retention i.e. the ability to analyse and reason logically (Brown and Westaway, 2011) • Critical thinking (Fazey, 2010) • Sociological imagination – the capacity to shift from one perspective to another (Heald, 2017) • Adaptive heuristics – the development and use mental shortcuts to identify acceptable options quickly, with a minimal amount of necessary information (Hinkel and Bisaro, 2015) • Regular competencies – critical thinking skills (Wiek et al., 2011)
	Systems thinking	Understanding of connections, feedback loops, drivers and scenarios of change. Enables agents to better understand the context they are operating in, see the connections between things, and identify intervention points.	• Systems thinking competence (Wiek et al., 2011) • Systems perception (Ahvenharju et al., 2018) • Systems dynamics and link to personal beliefs (Fazey, 2010) • Understanding complex systems requires mastery of concepts such as feedback, stocks and flows, time delays, and nonlinearity (Sterman, 2002) • Capacity to 'see' the system and its dynamics and to identify emerging windows of opportunity (Westley et al., 2013)

2.2.2.4 *Summary of intervention focus and why it is important*

This chapter briefly outlined the changing context of development interventions and the role of research for development. An overview was provided of the three core focus areas of R4D interventions: knowledge, resources and capacity building, with further exploration into the competencies needed for building adaptive capacity for change in complex systems. This connects to the deeper dive in Chapter 3: which explores the individual and collective qualities and characteristics of agents, seeking to better understand why some individuals and groups are more likely to enable change.

Chapter 3: Change Agents

In Chapter 2, I explored the context of development interventions, highlighting the role of change agents within the system and identifying how interventions seek to engage and empower potential change agents through knowledge, resources and capacity building, including adaptive capacity competencies. This chapter explores the characteristics of change agents (current, emerging and prospective), including their values, sense of mastery and efficacy, their levels of entrepreneurship and autonomy, and what roles they play. These characteristics influence what competencies a person might have or develop, and as suggested by Brian Little (2017) what competencies a person develops will in turn influence their characteristics (Figure 6).

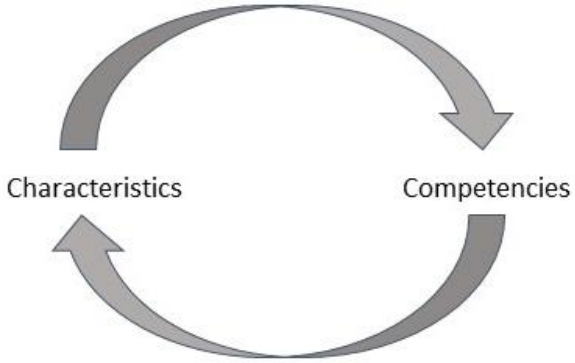


Figure 6: Characteristics influence what competencies a person might have or develop, and what competencies a person develops will influence their characteristics

3.1 What makes a change agent?

People judge the world according to their mental models of how things *should* be. These assumptions are often implicit and form the basis of an individual's confirmation bias and world view (Jones et al., 2011). Individuals can hold multiple competing or contradictory mental models and the selection of model they use depends on the decision context that they are operating in. Shared mental models make up culture and influence individual social choices.

Multiple models combine with a person's values and preferences to shape their world view, their view of how the world works. This world view influences their vision of a desirable future (Patterson et al., 2016, Stirling, 2018), as well as filtering their perceptions and what options they see as available (Mezirow, 1990, Voß et al., 2007, Kahneman, 2011). These can be seen in the use of heuristics or broad principles, with people often choosing the first option that comes to them that meets their requirements and that aligns with their values and beliefs (Hinkel and Bisaro, 2015).

3.1.1 Personal values, beliefs and attitudes

Personal beliefs and attitudes often stem from a sense of purpose and a set of core values which provide guiding principles for life and associated world views. Values, beliefs and attitudes go part way to explaining agents' behaviour (Hinkel and Bisaro, 2015) as well as guiding action (Baumeister et al., 2016, Bandura, 1997), and are shaped by and shape the context that agents are in (Abson et al., 2017), often through social comparison and norms. Schwartz (2012) suggests that there are ten basic personal values which are clustered into four higher-order values: openness to change, self-enhancement, conservation and self-transcendence (see Figure 7).

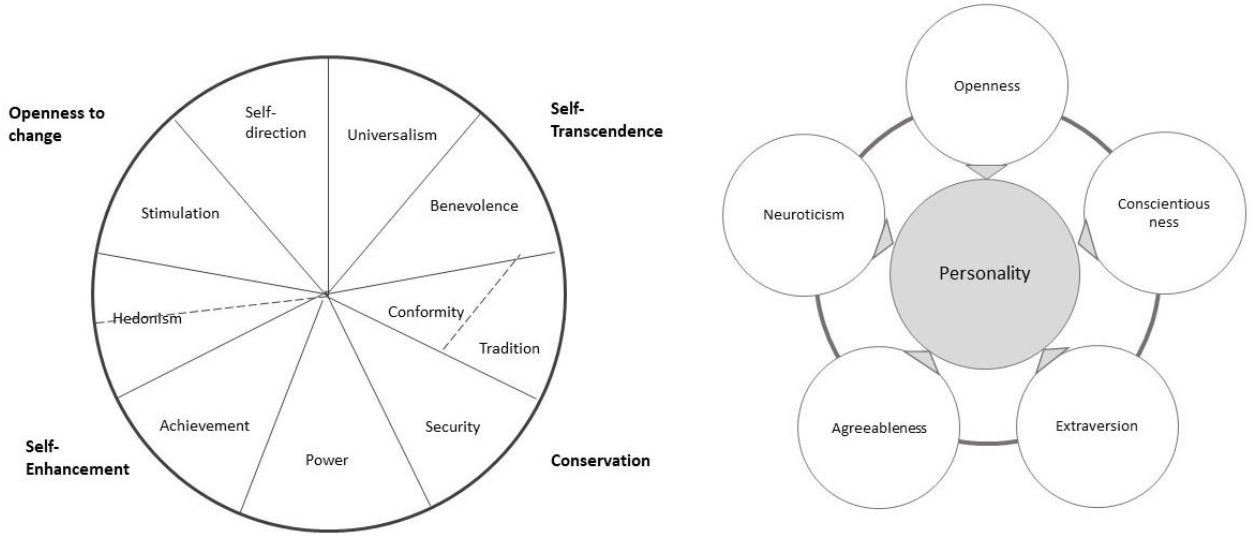


Figure 7: Schwartz Theory of Basic Human Values and the Big Five personality traits (redrawn from Schwartz (2012) and Render (2019))

These values complement the 'big five' personality traits: openness to experience, conscientiousness, extraversion, agreeableness and neuroticism (Dobewall et al., 2014, Leutner et al., 2014, Li and Armstrong, 2015). Vecchione et al.'s (2019) research suggests that while values did not affect trait development, traits had some influence on the development of values. Importantly for adaptation and development interventions, high levels of *agreeableness* predict increasing importance of benevolence values and high levels of *openness* predict the importance of self-direction values (Vecchione et al., 2019). Little (2017) offers a different perspective, suggesting that values tend to be stable over time or change slowly, but that behaviours, traits and world views are amenable to more rapid change, particularly through interventions or shifting personal projects and societal goals.

Little's (2017) premise is important given that research has shown that a high degree of threat or risk does not change behaviour (Thaker et al., 2016, Adger, 2016), which makes being able to cultivate desired values and traits in potential agents and influence the personal projects that people choose for themselves an important aspect for R4D intervention teams to consider.

Changing behaviour or cultivating personal projects is challenged when individuals have goals and values that are incompatible, such as the need or want to improve their current standard of living potentially at the cost of others or the environment. So while people can agree with the goals of an intervention, their behaviours do not always match as they are addressing higher-order values or goals such as livelihoods (Gifford et al., 2011). However, if the threat is significant enough that identity is threatened, people can respond by re-examining their world views, values and behaviours (Maitlis and Christianson, 2014).

A positive or optimistic outlook can be predictive of intent, with people believing they have support for their behaviour (Little, 2017). However, optimism is not a predictor of success, as underestimating risk can hinder anticipatory action (Gifford et al., 2011, Grothmann and Patt, 2005). Baumeister et al. (2016) suggest that both optimism and pessimism (or awareness of risk) are needed, the first to sustain effort, and the second to figure out what needs to be overcome. This balance becomes more important for challenges like adaptation, where there is often time lag between cause and effect (Adger, 2016).

Therefore, it may be easier for R4D teams to partner or engage with change agents if the activity or project they are promoting is associated with agent's world view and value system (Wiek et al., 2011, Bandura, 1997, Bandura, 2006b). While agents with alternative mental models may block intervention choices, the alternative view can also allow an entry point for interventions by exposing individuals to new knowledge that gets them to question their own assumptions and offer alternative ways of thinking (Sterman, 2002, World Bank, 2015, Jones et al., 2011). .

3.1.2 Mastery

Mastery is about the focus on self-development through lifelong learning and practice, being reflective and reflexive, and can include a personal long-term vision and purpose (Bandura, 1997). The practice of mastery builds competence and confidence, and often a desire to share insights with others (Garrin, 2014). This building of competencies and skills stems from a sense of self-efficacy, which can in turn generate a wider array of options that expands freedom of action and agency (Bandura, 1997). Mastery attributes can expand the influence of an intervention by linking personal projects with new knowledge, learning and behaviours which act as an entry point to change (Fernandez, 2016, Fazey, 2010).

Mastery is an iterative process that requires persistence and determination. As a purposeful practice, mastery is goal directed, building on existing knowledge, and requires failure and problem solving, as well as making use of patterns and adjusting to changing contexts (Ramalingam, 2013, Lawley and Tompkins, 2008, Brown et al., 2014). Mastery can be applied to many aspects of people's lives; however, mastery associated with sustainability or public good centres on 'taking responsibility' and 'enabling'. Or, as Frederick Hayek said in his Nobel Prize

speech, 'cultivating growth by providing the appropriate environment, in the manner in which the gardener does for his plants' (Ramalingam, 2013, p.135). Sterman (2002) suggests mastery requires humility about the limitations of knowledge, personal views and decisions, while having the courage and openness to learn 'though all our maps are wrong'.

The process of attaining mastery requires an agent to have both perseverance of effect and consistency of interest (Credé et al., 2016) as this helps agents focus on long-term goals, and try harder or try something new after setbacks. Grit is a characteristic of mastery, with Duckworth et al. (2007, p.1087) defining grit as 'perseverance and passion for long-term goals'. However, Credé et al. (2016) note that high levels of grit may not be adaptive unless it is accompanied by reflection and self-monitoring, and the openness to seek help or try something new.

Mastery also has an openness or emergent quality, with a focus on ongoing learning, curiosity, novelty and discovery that may lead to serendipity (Lawley and Tompkins, 2008), with serendipity here aligning to Louis Pasteur's idea that 'chance favours the prepared mind'. Change agents who practise mastery are likely to be open minded and able to cope with the state of not knowing. Focusing on learning can trigger different chains of thought and action, creating a sense of possibility, creativity and purpose (Brown et al., 2014, Meadows, 1999, Frankl, 1985). As suggested in the competencies section in Chapter 2, this is especially important for adaptation, where potential long-term solutions will not be found using current knowledge, but rather require new mindsets (Meadows, 1999, Dweck, 2006, Ramalingam, 2013, Mezirow, 1997).

To develop mastery requires self-efficacy, while at the same time, the practice of mastery grows self-efficacy. Bandura (2006) indicates that having a stronger sense of self-efficacy will lead to greater perseverance and an increased likelihood of success. However, in order for mastery to be driven by intrinsic motivation, an agent needs to have a sense of autonomy as well as competence (Ryan and Deci, 2000). Powerful mastery experiences can produce transformational personal changes that manifest across diverse aspects of a person's life (Bandura, 2006a), and present an enticing and under-researched possibility for change agent capacity building in adaptation interventions (Credé et al., 2016).

3.1.3 Efficacy

3.1.3.1 *Self-efficacy*

Self-efficacy is one's belief in one's ability to succeed in specific situations or accomplish tasks (Bandura, 1977). Efficacy beliefs influence whether people think strategically or erratically, are optimistic or pessimistic, and play a key role in human functioning through goals, aspirations, outcome expectations, inclinations, perceptions of barriers and opportunities (Bandura, 2006b, Bandura, 2000). Efficacy also shapes personal perception of external social factors and reflects an individual's understanding of what skills they can offer in a group setting.

Box 4: Types of efficacy (Bandura, 2000)

Self-efficacy (personal efficacy) – individual belief that desired effects can be produced by their actions

Collective efficacy – shared belief in collective power. More than the sum of efficacy beliefs, it has an emergent group property

Proxy efficacy – the ability to influence change through others

Concepts of efficacy are instrumental to agency, whether they are personal, proxy or collective (Bandura, 2000) as self-efficacy is a precursor to motivation and self-regulation, which makes it an important factor in intent (Bandura, 2006b). Efficacy beliefs are concerned with perceived domain, function or context-specific capability, something someone thinks they can do, not necessarily something they will do (Thaker et al., 2016, Fernandez-Ballesteros et al., 2002). Judgements of personal efficacy are related to the support or hampering people receive from others, peer expectations and other group dynamics, such as seeing someone else achieve and believing you could do it too (Bandura, 2006b, Brown and Westaway, 2011). However, since efficacy is perception rather than action, assessing efficacy of adaptive behaviour is a challenge, and compounded by people having a stronger sense of their ability to influence personal or collective problems over societal ones (Hinkel and Bisaro, 2015, Fernandez-Ballesteros et al., 2002).

Self-efficacy can be shaped by many things. The main source of self-efficacy is a person's own experience or habits of expectation (Di Stefano et al., 2016, Mezirow, 1990). Erosion of self-efficacy is also possible with negative experiences, and together with perceptions of powerlessness, can result in a lack of action or, as Adger (2016) suggests, adaptive capacities not used or realised.

Age is a factor in perceptions of efficacy, with younger people judging themselves less efficacious than older people in personal matters such as work, relationships and financial matters. This perception is reversed when considering social change, where younger people judge their sense of efficacy more highly (Fernandez-Ballesteros et al., 2002). There are differences between men and women, with men having a higher sense of efficacy than women when contributing to solutions to social problems (Fernandez-Ballesteros et al., 2002), although men and women do not differ in their perceived efficacy in their personal lives, suggesting that as opportunities and roles of women improve this efficacy gap may narrow (Fernandez-Ballesteros et al., 2002).

As noted earlier, agents are part of a wider system suggesting that cultivating collective and proxy efficacy are just as important. Organisations, groups or communities made up of individuals with strong self-efficacy beliefs enable collectives to believe they can effect societal change. As Fernandez-Ballesteros et al. (2002) suggests, a group plagued with self-doubts about their capabilities to perform their roles will achieve little.

3.1.3.2 *Collective and proxy efficacy*

Perceived collective efficacy is a group's shared belief in their collective power (Bandura, 2000). It influences the type of futures a group will seek to achieve, how well they use their resources, their resilience to adversity, and how much effort and staying power they put into an endeavour (Fernandez-Ballesteros et al., 2002).

Collective efficacy is more than the sum of personal efficacy; it includes shared beliefs, knowledge, skills, and other contributions such as supportive structures and interactions between people (Bandura, 2000). Of particular relevance to international development and adaptation, this sense of collective efficacy can facilitate resilience and perseverance in the face of collective challenges (Bandura, 1997, Thaker et al., 2016).

Like personal efficacy, collective efficacy also varies across domains, functions and levels (Fernandez-Ballesteros et al., 2002). Also, like personal efficacy, an individual's perception of their collective efficacy can increase their motivation to act and set ambitious goals. A strong sense of collective efficacy in a community will encourage participation in activities, with Thaker et al. (2016) showing that collective efficacy is significantly and positively associated with community adaptation responses, with prosocial orientation characterised by cooperativeness, helpfulness and sharing (Bandura, 2000).

Proxy agency is where 'people try to get other people who have expertise or wield influence and power to act on their behalf to get the outcomes they desire' (Bandura, 2000, p.75). This is an aspect of influence and politics and relates to an agent's levels of interpersonal and entrepreneurial competencies as outlined in Chapter 2.

While efficacy beliefs differ in generality, strength, and level they are applicable across cultures, although culture shapes what they are focused on and how they are developed (Bandura, 2000, Bandura, 2006a). Socio-economic status can have an effect on perceived self-efficacy, with those who have access to resources and opportunities perceiving themselves as more efficacious than those who have fewer resources and options (Fernandez-Ballesteros et al., 2002). However, this effect is not as strong when considering collective efficacy, as people perceive that there is strength in acting together. Socio-economic status also influences people's perceptions of being able to solve personal problems over those of social change (Fernandez-Ballesteros et al., 2002).

Efficacy beliefs are linked to other change agent characteristics, including mastery and openness to learning. People with strong efficacy beliefs will persevere for longer and in spite of difficulties; this connection to mastery can be further strengthened through learning and capacity building (Bandura, 2006b, Brown et al., 2014, Thaker et al., 2016). Efficacy shares a learning orientation with adaptive co-management and is an essential motive to learn and keep going in spite of difficulties. Perceived personal, collective and proxy efficacy is required for positive systemic change and can be catalysed and grown through capacity building activities, making it

vital that intervention programs consider how to best account for efficacy when designing initiatives.

3.1.4 Entrepreneurship

Entrepreneurship is the ability to include a positive (not naive) open mindedness to possibilities, and a systems perspective that enables pattern recognition, with an ability to recognise windows of opportunity or serendipity. Entrepreneurship is often associated with leadership; however, entrepreneurship often goes further to encompass institutions and agents within them who are persuaders and connectors, allowing for the prospect of cross-scale interactions (Westley et al., 2013).

These types of entrepreneurs have interpersonal competencies that inspire, influence and persuade others, such as through politics, policy development or within communities, where they may be able to facilitate brokering, resolve conflicts, combine different types of knowledge and build trust (Petzold and Ratter, 2015, McAllister and Taylor, 2015). These skills are not always associated with one person, which means these agents(s) may need to leverage, network and build coalitions to achieve their goals (Westley et al., 2013).

Entrepreneurs also have the capacity and competencies associated with sense-making and resourcefulness, particularly associated with the learning that underlies innovation (Westley et al., 2013, Maitlis and Christianson, 2014). By belonging to a variety of social networks and being aware of, and having an understanding of, the system one is operating in, this pattern recognition and resourcefulness helps entrepreneurs to identify windows of opportunity as they emerge and capitalise on them through their networks (Chaffin et al., 2016, Alam et al., 2013, Lawley and Tompkins, 2008, Westley et al., 2013). Therefore, interventions often seek to cultivate or partner with people who have entrepreneurship traits.

3.1.5 Roles

Roles position agents within social networks. A change agent may have many formal and informal roles and functions within their communities and organisations. These roles will shift over time, and in different contexts, and shape the power, resources and autonomy an agent may have to act (Andrews et al., 2013, Mapfumo et al., 2015, Fischer and Newig, 2016).

R4D interventions often seek participation from people with roles aligned to the institutions, organisations or communities they are trying to influence. Without adequate stakeholder mapping interventions may not have appropriate participation from institutional affiliations in order to integrate the work into the real world or for the strategies and lessons to translate across levels and boundaries (Nelson et al., 2015). By looking at the roles and associated behaviours of agents in the system, R4D intervention teams are better able to engage with stakeholders and target interventions (Jones et al., 2013). Change agents' position in their social network, their access to

resources and power, as well as their interest and ability to remain in their role all affect their ability to engage while the intervention is being carried out (Dutra et al., 2015, Westley et al., 2013).

Ideally, R4D interventions seek to catalyse change agents by getting them to reflect on their own roles and practices and make any adjustments they see are required. By doing this, change agents are able to inspire and assist others to do the same (Maitlis and Christianson, 2014), and it is often why senior or influential agents are selected (but not always successfully) by R4D teams and funders to participate in projects or interventions.

While involving influential people can lead to significant change, there is also the possibility that they care more about what the intervention will do for them personally, or conversely they may be more interested in blocking change to maintain the status quo (Lonsdale, 2015, Dutra et al., 2015, Fritz et al., 2009). These goal inconsistencies can have wider implications for the intervention, with participants or stakeholders from other areas seeing these agents as insincere or hypocritical (Weick and Quinn, 1999). In order to positively influence an intervention, Chambers (2013) suggests these influential agents or 'uppers' may need to transform their behaviours, attitudes and roles from dominators to become enablers of others.

Structure and institutions can also prevent agents from using new knowledge and practices learnt through an intervention. Even if a participant's views and competencies have been positively impacted by a project, they can relapse into old roles and ways of working when they are back in their usual context (Arkesteijn et al., 2015, Fischer and Newig, 2016). Personal agency is often not sufficient to address this relapse. Actors need to be reflexive, which can be encouraged through intervention capacity building processes designed to reflect on the rules and relations underlying their existing practice, role, and structures (Arkesteijn et al., 2015, Van Mierlo et al., 2010). Others suggest that relapsing of roles can be mitigated by the creation of networks or communities of practice and that this has the added advantage of enabling agents to continue to grow their knowledge and competencies, while potentially changing roles (Fischer and Newig, 2016, Butler, 2017). Therefore, R4D teams need to consider including participants with a wider diversity of roles.

3.1.6 Autonomy and Networks

While roles are important, as outlined above, they can also be constraining. Change agents are more likely to try new things or engage in 'deviant behaviours' if they have some level of autonomy in their contexts (Hay, 2000, Pascale et al., 2010). Mezirow (1997, p.8) suggested that for change agents to be autonomous they needed the 'understanding, skills, and disposition necessary to become critically reflective of one's own assumptions'. This is consistent with Ryan and Deci (2000, p.74) who suggest that 'autonomy refers not to being independent, detached, or

selfish but rather to the feeling of volition that can accompany any act, whether dependent or independent, collectivist or individualist'.

Autonomy allows individuals to integrate new ideas and values or transform existing ones, facilitating their intrinsic motivation to act (Ryan and Deci, 2000). Autonomy also strengthens an agent's perception of their locus of control or efficacy, as well as their flexibility and adaptability in anticipating and responding to future outcomes and the associated implementation of actions (Bandura, 2006b, Taylor and Clarke, 2008).

However, it is essential to note that people do not operate in a vacuum. As outlined in section 3.1.1 behaviour, attitudes and values are personal characteristics, but they are also shaped by social structure and the networks that people engage or are embedded within (Hay, 2000, Jones et al., 2013). A sense of relatedness with others within their network can constrain or enable individuals' choices; their own perceptions of self-efficacy are, in part, a function of how they are supported by others. Therefore, personal and collective agency is determined by relationships as well as abilities (Brown and Westaway, 2011, Fernandez-Ballesteros et al., 2002). This connectedness and wanting to belong facilitates social learning and motivation to act in ways that support the community or network, suggesting that this everyday level of connection is a powerful pathway for change to occur (Ryan and Deci, 2000, Weick and Quinn, 1999), although it is also a powerful reason to maintain stasis. However, it is also possible for agents to be more independent and courageous or, as Brown (2017) suggests, some individuals have the ability and willingness to sit with discomfort and vulnerability.

Research has demonstrated that it is important for intervention experts to understand the formal and informal relationships or networks of actors in systems; their potential power; resources; collective competencies; agency and emergent properties that are not present in their component parts (Wals, 2007a, Fernandez-Ballesteros et al., 2002, Ramalingam, 2013).

There are many types of networks, formal, informal, visible and invisible. Interventions often focus on the networks they can 'see', whether they are formal or informal. However, it is sometimes the shadow networks that can prepare a system to change (Pahl-Wostl, 2009). It is hard to recognise these shadow networks, even for the agents themselves, although they can facilitate learning, knowledge sharing and open opportunities that otherwise would not happen (Taylor and Clarke, 2008). Shadow networks are often populated by boundary people, people who 'can bridge or create alignment between different worlds', whether those different worlds are within an organisation or between networks, or bridge societal levels (Regeer et al., 2016, p.22, Andrews et al., 2013).

Together, visible networks, shadow networks and boundary people are particularly important for social change as change agents can use them to build institutional and social alliances or coalitions across levels and sectors (Mapfumo et al., 2015, Hickey, 2013). Building stronger relationships and networks is likely to be more effective with a diverse team, where team

members complement each other, especially interpersonal competencies, and connect their varied networks (Wiek et al., 2011). Bandura (2000, p.76) uses the metaphor of the differences between connecting networks as those between a gymnastics team and a soccer team, where 'the accomplishments of a gymnastics team are the sum of successes achieved independently by the gymnasts, whereas the accomplishments of a soccer team are the product of players working intricately together'.

Interventions can use networks to grow or scale adaptive capacity through adaptive co-management practices that bridge social relations, institutions and organisations (Plummer and Armitage, 2007). These networks draw on Bandura's concept of collective efficacy, where communities that foster 'stronger perceptions of collective capabilities among [their] members are more likely to collectively organize actions and to overcome obstacles and setbacks, which can increase the odds of group goal attainment' (Thaker et al., 2016, p.31).

The interpersonal skills needed to create and operate in a network align with the interpersonal and entrepreneur competencies (see Table 1). Two agent characteristics that are particularly relevant to networks and worth highlighting are friendly optimism and trust. Someone who is open and enjoys meeting other people tends to make connections more easily and broadly, and having a sense of optimism may help them make friends (Baumeister et al., 2016). However, as Brown and Westaway (2011) suggest, the resilience of networks depends on trust; while the 'connectors' are the social glue, they also need to have established a high level of personal trust (Gladwell, 2006, Blomqvist, 1997, Paul et al., 2016, Brown and Lambert, 2015). Therefore, interventions not only need to establish trust, they also need to seek those autonomous connectors who can help bridge networks.

3.1.7 Summary of change agent characteristics

The literature suggests that potential change agents are enabled by their world view, values, sense of efficacy, roles and relatedness to others. While an agent's world view is shaped by their context and values reinforcing existing ways of doing things, it can change over time (Ramalingam, 2013). Creating a list of the combination of characteristics of change agents for an R4D adaptation intervention would help teams identify potential partners and emerging or potential change agents.

R4D adaptation interventions can use collaborative processes designed to test and possibly shift world views and perceptions of participating agents. Through capacity building, social learning and reflexivity, participants can question existing models or paradigms, even meaning and identity (Cundill, 2010). Once identified, potential change agents could be cultivated using the knowledge, resources and competencies outlined in section 2.2.2.

3.2 Cultivating change agents

In order to connect with and engage potential change agents within systems, interventions are often designed to build relationships with partners and in-country stakeholders. This engagement in the process of change builds agents' motivation to act and sustain a process of transformation (Mapfumo et al., 2015). These relationships can take multiple forms, including the co-design and implementation of the intervention itself, which facilitates the sharing and co-generation of knowledge.

Research has shown that effective engagement and the building of relationships is more likely developed through internalised motivation and through autonomous extrinsic motivation (Ryan and Deci, 2000). These insights have been reinforced by researchers looking into how intrinsic forms of motivation and agency (capacity for people to make their own choices) are needed to initiate social action for change (Brown and Westaway, 2011, McCrea et al., 2014, Patterson et al., 2016). This poses a challenge for R4D teams seeking to build effective relationships and engagement, and suggests that it would be important to find, at least initially, change agents with motivations that already align.

Context also plays a part in motivation, with social capital and networks supporting and encouraging people to act. As Brown and Westaway (2011) suggest, agency and ability are affected by experience and belief structures, which in turn are shaped by culture, institutions, society and the environment. For R4D adaptation interventions, capacity building may be used to help motivate potential change agents to attempt many different paths requiring connection across a variety of networks to reach their desired goals (Credé et al., 2016, Ryan and Deci, 2000).

As mentioned in section 2.2.2 capacity building is a common aspect of interventions. Capacity building has the ability to build relationships and cross-scale networks; cultivate knowledge and competencies required for change; and start the process of scaling out the influence of the intervention. The following section will explore how R4D teams can cultivate agents in the system based on agents' characteristics, and how the intervention team can become better agents of change themselves.

3.2.1 Relationships

R4D practitioners often design and implement interventions and associated research with partners; see Figure 3 for an example of the types of groups involved. This collaborative or co-designing and implementation process is becoming a core feature of research for development, often including transdisciplinary and participatory action research approaches which are intended to promote legitimacy and ownership for the intervention through combining knowledges, shared learning and reflection (Lang et al., 2012, Popa et al., 2015, Trimble and Plummer, 2018). In addition, in-country partners are regularly expected to provide local knowledge and contextual analysis, identify intervention barriers and constraints given the resources available, and make

necessary links to existing institutions and networks (Harris et al., 2011, Hinkel and Bisaro, 2015, Butler et al., 2017). These expectations are often assumed and not always a shared understanding with partners who come into the arrangements with a different set of expectations to the donors and primary research team (Cundill et al., 2018, Cundill et al., 2019). Relationships for co-design and implementation are habitually being built at the same time as the project or intervention is rolled out, evolving unpredictably, and can be both time consuming and challenging, making it difficult for those who want certainty. However, when done well they have the potential to increase motivation while expanding networks, world views and possibilities considered in the intervention (Chambers, 2013, Rosenbloom, 2017, Abercrombie, 2018, Pahl-Wostl, 2009, Scoones et al., 2018).

As the intervention diagram (Figure 3, p.22) indicates, in addition to having co-design collaborative project teams, many R4D projects also seek active participation of a wider set of stakeholders, including other researchers, governments, NGOs and communities. Participatory approaches commonly attempt to incorporate knowledge from diverse sources and perspectives to generate new understanding that is context appropriate (Brown, 2007). Surfacing beliefs, assumptions and values can be approached through reflexive practice, as well as reflecting on what has gone before. Participation can improve project planning, encourage incorporation of local knowledge, modify power dynamics, and reduce conflicts associated with the outcomes or results of the intervention, allowing a clearer pathway to implementation (Marschke and Sinclair, 2009, Wiek et al., 2014, Abson et al., 2017). However, choosing whom to work with and how to work with them is highly political and shaped by the world view of the intervention team and funding agents (Milkoreit et al., 2015). Participation also has the potential to accentuate inequality in a region as it can favour participation from those already better able to engage, which can lead to certain people or world views prevailing (Chambers, 2013, Eriksen et al., 2015, Frediani, 2010).

Partnerships formed for the purpose of an R4D intervention do not always have to be collaborative; sometimes they are focused on implementing or dispersing project activities and results. These partnerships, as well as those of project collaborators, often provide an opportunity to connect the R4D intervention team to existing social networks and create new networks (Cundill et al., 2018, Lazarow, 2016). Networks can be used to connect to different levels (i.e. community, regional, and state) in a system, and for building and connecting to relevant skills, knowledge or power. Networks can also be used as a way of rippling out the new knowledge or behaviours created by the project or opening up processes to wider participation (Wise et al., 2014, de Vente et al., 2016). However, the ability for these networks to have impact is determined by the strength of relationships and trust developed, as outlined in section 3.1.6.

Both the collaborative and participatory natures of R4D facilitate social learning and capacity building in several ways, from mentoring to training and everything in between. However, like participation, to be able to collaborate is a capability that not everyone has, due to historical and

contextual roots, with van Van Kerkhoff and Lebel (2015) noting that historical experiences are reflected in existing social and political institutions, either formally or informally. Nevertheless, if done successfully, building networking capacity can address some of the power issues associated with an intervention (Wals, 2007b).

3.2.2 Capacity building

Projects can be deliberately designed to build the capacities and competencies of participants, enabling wider engagement as well as building trust. However, this takes time and requires that R4D practitioners develop an understanding of how power influences the design, participation and implementation of the project (Wyborn, 2015). As outlined in section 2.2.2 some R4D interventions focus on cultivating specific skills, such as climate modelling, agricultural practice or policy development. Adaptation interventions may build particular skills while at the same time seeking to build the broader adaptive capacity of agents and decision makers through strengthening competencies and networks (Wiek et al., 2014). This section outlines how capacity building can change the characteristics of potential change agents within the system through cultivating skills and competencies.

3.2.2.1 *Design of capacity building within the intervention*

Capacity building interventions can include specific training for skills, formal and informal mentoring as well as social learning activities. Capacity building activities are often designed and implemented by R4D intervention teams that have a completely different world view and associated theories of change to the people whose capacity they are attempting to build (Rhodes, 2014). It is important to remember that people who participate in an R4D intervention do not arrive as a blank slate, they come with a pre-existing set of skills or learned capacity. Interventions that fail to take into account these different and existing skills, capacities and competencies either end up wasting everyone's time or fail to maximise opportunities. A lack of context understanding can lead to capacity traps and negatively influence relationships with a perceived colonial approach to interventions, disengaging the very people with whom an intervention seeks to engage (Andrews et al., 2013).

There are many skills that are required for almost all interventions including project planning, people skills, data and knowledge management, self-reflection, and learning, to name a few. Frequently participants will be missing some of these foundational skills, which limit their ability to engage with the intervention and therefore develop their adaptive capacity (Van Kerkhoff and Lebel, 2015, Noveck and Glover, 2019). This was not always understood or appreciated by their partners, who may have assumed that they already had these skills, and therefore not allowed the time, resources or even have the skills to address this gap (Wiek et al., 2011).

Skills can also be lost, either unintentionally through an R4D intervention (such as traditional skills lost through blindly implementing 'best practice' out of context) or subsequent to an intervention when capacity building exercises are not designed to be sustainable (Cundill, 2010). Building the capacity of only a small number of partners/participants can also be problematic if those participants are offered roles in other organisations or communities due to their new skills. While this can be of benefit to the individual and their family, it has the potential to create skills deterioration or a gap in the original organisation (Cundill and Fabricius, 2010).

Capacity building can support broader change by enabling more than the development of skills and competencies. Less visible or tangible aspects for supporting social change can include the influence of 'values, legitimacy, identity and self- confidence' (Aragón et al., 2010, p.91). This shaping and enabling of identities and interactions can lead to enhanced efficacy and agency which 'primes' agents for future opportunities and decisions (Edwards and Jones, 2008). This type of capacity can be enabled by information, formal and informal mentoring, as well as encouraging reflection and reflexivity of values, beliefs and norms. Reflection and capacity building through relationships has been shown to affect critical thinking and practices, as well as the construction of meaning and identity (Cundill, 2010, Arkesteijn et al., 2015, Aragón et al., 2010). Few R4D teams are trained in these reflective learning and capacity building processes, which need to be embedded in initiatives if change is to be transformative and overcome path dependency (Arkesteijn et al., 2015, Mapfumo et al., 2015).

3.2.2.2 *R4D building adaptive capacity*

While training in skills and processes are important, R4D adaptation interventions often address capacity gaps by facilitating social learning and action through the co-creation of shared visions, trust building, networks and knowledge exchange. Social learning empowers potential change agents by increasing self and collective efficacy, expanding options and opportunities, and catalysing motivation which can mobilise a broader support for change and lift the capacity of all the participants in the intervention (Lebel et al., 2010, Grothmann and Patt, 2005, Folke et al., 2002, Ensor and Harvey, 2015).

Much is known about how learning can catalyse active agents rather than passive victims (Tschakert and Dietrich, 2010), although there is still a gap between theory and practice as to the best way to influence these agents and further enable their goals. For adaptation interventions capacity building may include training in the specific competencies outlined in Table 1, such as: systems thinking; anticipating the future and associated implications; adaptive co-management and planning; and monitoring evaluation and learning. Building agents' capacity and competencies in this way, as well as developing their understanding of the interdependencies between institutions, values and knowledge and how to change these through Theory of Change or

adaptation pathways approaches, can empower agents to address future issues (Wise et al., 2014, Gorddard et al., 2016).

Growing thinking and planning competencies within agents is particularly important in adaptation interventions, as initiating systemic changes to highly inert systems is difficult to justify politically or economically and is often delayed (Wise et al 2019). These planning approaches stress fostering reflection and multi-loop learning (see Figure 8) which can activate and improve implementation as they allow decision makers to be more open to, and ready for, serendipity or windows of opportunity to arise (Wollenberg et al., 2007, Cundill and Fabricius, 2009, Aragón et al., 2010).

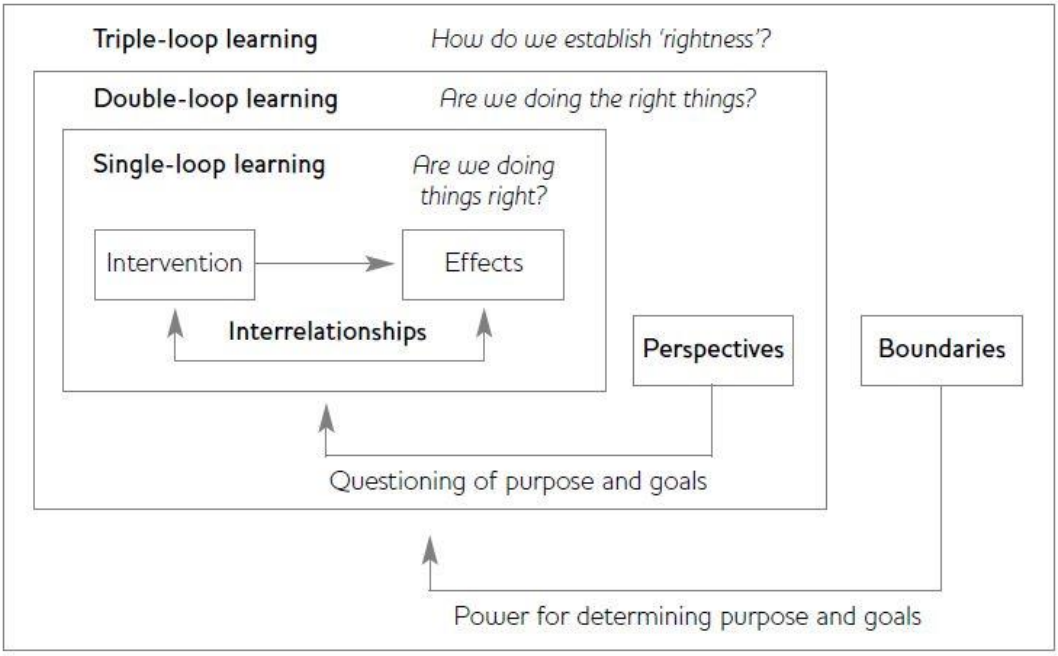


Figure 8: Types of learning (Hummelbrunner, 2015)

While many R4D adaptation interventions seek impact through new policy or governance options, these often occur beyond the life of the project. These R4D interventions should rather be seen as a 'window of opportunity' that create the enabling conditions and skill sets required for proactive adaptation decision making, future serendipitous opportunities and for other windows to open or be opened (Armitage et al., 2008, Brown et al., 2017).

Raising agents' awareness of new opportunities, increasing their flexibility, and strengthening or creating new networks, enhances collective efficacy which can lead to collective agency and the growing ability to work across levels (Brown and Westaway, 2011). New knowledge and networks can result in personal 'light bulb' moments for agents, which have the potential to reinforce or shift their values and world views, catalyse emotion to change, internalise the challenge and create motivation to act (Marshall et al., 2017).

3.3 Researchers and practitioners as agents of change

Undertaking capacity building through social learning processes will require R4D research intervention teams to acquire different skills, personalities and mindsets than those that have been traditionally expected of them (Butler, 2015). Adaptation and social learning interventions require flexible approaches, sometimes called 'muddling through', where multiple adjustments to activities and processes may be required (Wiek et al., 2011). This flexibility, while costly and not always supported by funding organisations, enables interventions to take advantage of opportunities and adapt to the changing context, ensuring that the intervention is engaging with the right people and building the capacity needed (Wals, 2007a, Wiek et al., 2011).

Researchers traditionally have been seen, and often saw themselves, as impartial and objective experts observing a system, and therefore frequently fail to understand that they are also agents of change. Perspectives about what a researcher's role is have been evolving over the past 20 years, with growing awareness and debate suggesting that this role can be anywhere between 'truth seeker' and 'change maker' (Milkoreit et al., 2015). Or, as Lonsdale (2015, p.23) suggests, researchers can 'do a combination of three things: act as visionaries, as change agents or merely as "good consultants"'.

Some researchers and practitioners resist the notion of being a change agent while others argue strongly that change is personal and depends on your perspectives and world view (Blundo-Canto et al., 2018).

> *'for change to be effective and lasting, those who lead change must first change themselves' Barbara Trautlein (Abercrombie, 2018, p.15)*

Wherever they sit on the spectrum, all researchers and practitioners play a role in the system. Researchers and practitioners need to establish for themselves where they fit in the picture, their relationships with the actors in the system, and their own motivations, values, world views and theories of change (Aragón et al., 2010, Fernandez, 2016).

Li (2007) proposes that those who fail to reflect on their roles can end up doing more harm than good (Williams, 2018); this is in part due to the (often western) values that shape problems or challenges in development, and as such influence the research that is commissioned (Fernandez, 2016). Foreigners are part of the development and research for development context; sometimes they fail to recognise that they are part of the system that they are attempting to change, at times contributing to systemic stability (Arkesteijn et al., 2015). Researchers and practitioners have significant power in providing positive examples, both for the change itself, but also through their facilitating learning, constructive behaviour and respectful relationships (Cundill, 2010, Fernandez, 2016, Armitage et al., 2008). By recognising that they are embedded and have a role as one of the many actors in a complex system, researchers and practitioners are better able to respond to emergent findings (van Kerkhoff, 2014, Ramalingam, 2013).

Regardless of orientation towards being an agent, researchers are generally not equipped or supported by their organisations to enact practical change that leads to impact, as this often requires different characteristics and skills from what enables researchers to succeed academically (Cundill et al., 2018, Reed, 2017). The capacity gap is compounded by the increasingly complex context that researchers operate in, due to increasing competition for grants and funding, and the growing tension between the academic publication imperative and producing materials that are useful, useable and timely for stakeholders. In addition research organisations, often encouraged by a change in funders' priorities, are moving towards a culture of impact, requiring researchers to produce world class science or innovation while at the same time achieving societal impact (Cundill et al., 2018, Blundo-Canto et al., 2018, Larson et al., 2016, Reed, 2016).

Therefore, if a researcher makes the choice to be more than a good consultant they must change the way they view themselves and their role. Ramalingam (2013, p.279) describes this as 'getting those people whose self-image is wrapped up in being the person who knows the answer to become the ones who know the questions'. This issue goes to the heart of seeking change, that wanting to change others means accepting a profound change in oneself (Westley et al., 2009, Mapfumo et al., 2015). Personal change can be unplanned and unexpected, making self-reflection an important but sometimes difficult aspect of interventions. Emerging new behaviours can model the change for others including from within their home organisations, and have the potential to encourage others in the wider intervention team to shift their own mindset and therefore participate more effectively in the transformation process (Weick and Quinn, 1999).

3.4 Conditions and contexts that enable the cultivation of change agents

If change agents can surface through all aspects of an R4D intervention, including in the research and practice intervention teams, targeting the 'right' people means working with individuals and collectives who are already acting as change agents (or have the potential to be active), noting that some change agents will have a conflicting set of world views, goals and behaviours to the R4D intervention and each other.

Connecting to potential change agents has many challenges for R4D teams who are attempting to intervene in a system that includes many actors, both in the country and outside of it. A number of these actors may be invisible to the intervention team, but 'nonetheless are essential for much of the system to work: local non- governmental organisations, civil society movements, local government' (Ramalingam, 2013, p.5).

Change agents from 'the periphery' often benefit less from the existing system and can be less constrained by existing rules and structures, but may lack the power and resources to enable change to happen (Abson et al., 2017, Andrews et al., 2013). In order to address the political nature of transformation, Scoones et al. (2018) advise using an enabling approach that focuses on

actor agency and capacities to open up opportunities and create alliances. This approach is associated with the participatory co-generation of knowledge outlined earlier, including multiple knowledges, in order to ethically address complex societal problems (Lang et al., 2012).

3.4.1 Knowledge co-production

Participation in knowledge co-creation is also influenced by power (Chambers, 2013); balancing the power relations in a project or intervention is a particular challenge for researchers, requiring 'care and sensitivity' (Cundill, 2010). While new knowledge and capacity building can help, it is not uncommon for people to acquire new knowledge and still not change behaviour (White, 2014). This is why knowledge production in R4D interventions must move beyond the traditional linear approach of knowledge transfer if the goal is to cultivate change agents, to become more collaborative and ideally transdisciplinary in nature so that any new knowledge is owned and ideally shared by the targeted decision makers (Lang et al., 2012, Bammer, 2012).

3.4.2 Knowing-doing gap

Most people would be aware that it is far easier to have an intention to do something, such as exercise more, recycle, or spend less, but actually actioning the behaviours is a lot harder. This is also true for R4D adaptation interventions. Participants in adaptive capacity building programs may form an intention to think or behave differently, sometimes called adaptation intention, but for a variety of reasons fail to carry out actual adaptation behaviour (Grothmann and Patt, 2005). Reasons usually given for this include lack of agency, resources, knowledge or social and institutional support.

However, a growing body of research by Gabriele Oettingen and her colleagues suggests that for individuals to move from intention to action, they need to specify personal cues for behaviour (Adriaanse et al., 2010). Helping change agents bridge this 'intention-implementation' or 'knowledge-doing' gap requires that they learn to mentally contrast their wishes for the future followed by the present reality that must be overcome, while developing a plan that has a reasonable expectation of success (Kappes and Oettingen, 2014). The order that a person thinks through the steps matters, as reverse contrasting (problems before vision) does not activate action (Sevincer and Oettingen, 2013). This suggests that advanced planning capacity could be added to R4D adaptation interventions to facilitate action and reinforces the importance of the competencies listed in Table 1, particularly the strategic planning competencies.

Little's (2017) concept of 'personal project' offers a complementary idea for moving from intention to action whereby agents create salient and meaningful personal projects aligned to an intervention's theory of change that has the potential to change both the individual and the context that they are in. Combining reflection with competencies including advanced planning skills, as well as clear personal projects associated with an intervention, could enable change agents to more effectively achieve systemic change. This aligns to the priming, or preparing the system to change,

which can be achieved by integrating critical reflection into an action plan (Tschakert and Dietrich, 2010).

Cultivating change agents requires R4D adaptation intervention teams to partner with a variety of stakeholders who either have the characteristics outlined earlier, or who can be empowered through new knowledge, improved access to resources and increased capacities and competencies as outlined in Chapter 2. Cultivating individuals is often not the end point on an R4D adaptation intervention, which almost always aim to have impact beyond the specific project or program. This wider impact often requires diffusion or scaling. The following section will briefly explore how change agents can help an intervention scale for impact.

3.5 Scaling interventions through agents

Collaboration, networks and capacity building are designed into interventions to enable impact, and ideally to prime for diffusion of the intervention's processes, tools and knowledge (Clarke, 2016). For systemic change to truly occur, the impacts of interventions need to be durable and to diffuse across levels and geographies (Ramalingam, 2013, Williams, 2018). This is often referred to in the development community as scaling up, scaling out, scaling deep and scaling in (Figure 9).

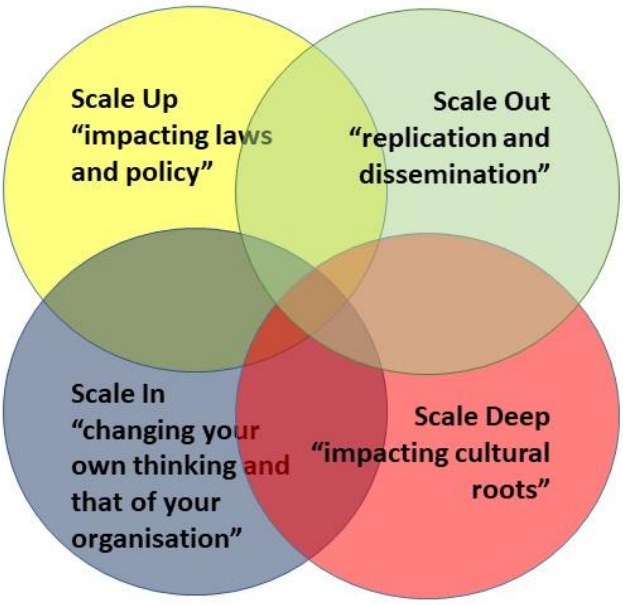


Figure 9: Scaling out, scaling up, scaling deep and scaling in (adapted from Riddell and Moore (2015) and Abercrombie (2018))

It is often assumed that if a project is done well it will be possible to transfer any lessons to other contexts and scales, 'like producing a cake by using the same recipe'; however, this assumption is often false (Westley et al., 2009, p.207). There are many challenges associated with transferability, especially for adaptation interventions which are often highly contextual, meaning that there are no guarantees that what worked in one area will work in another (Armitage et al., 2008). Historical attempts to transfer or import solutions from one context to another have

frequently failed ‘as in the human world nothing ever happens twice in exactly the same way’ (Checkland and Poulter, 2010, p.202, Wals, 2007b). Inappropriate transferring can lead to interventions being blocked or simply not supported by the wider system that they operate within, or interventions could have been unknowingly or unintentionally designed to address ‘weak’ leverage points with limited potential for transforming the system (Abson et al., 2017, Scharmer, 2018, Andrews et al., 2013). It is also possible that researchers, practitioners and donors have unrealistic assumptions, hoping that previous experiences will translate across different cultural or socio-political contexts, requiring less time and resources for impact in the next project (Clark et al., 2016, Armitage et al., 2008). Andrews (2016) suggests that experienced research practitioners know that there are no guarantees and that answers often need to be found within the changing system.

Nevertheless, positive expanding feedback loops do happen, and small changes can lead to remarkable effects that transcend levels and geographies (Lee and Krasny, 2015, Buchanan, 2004). Agents can facilitate information flow between layers and contexts through communication and relationships (Regeer et al., 2016). These networks have the power to create emergent properties and behaviours that lead to systemic change (Aragón et al., 2010, Ramalingam, 2013), although it is also important to note that systemic change isn’t an end point; it is only the beginning of the next cycle. Therefore what is important is a set of ongoing principles or ideas, which if not held too tightly can be adapted to suit the evolving system (Checkland and Poulter, 2010, Leith et al., 2014, Riddell and Moore, 2015).

Change agents who have an appropriate mix of competencies, motivations and connections, and who can use and modify ideas, principles and practices to span contexts and frontiers, are the boundary spanners best placed to maximise opportunities when presented and facilitate systemic change (Gladwell, 2006, Ramalingam, 2013, McAllister and Taylor, 2015, Regeer et al., 2016).

It is important for R4D adaptation intervention teams to select or cultivate appropriate partners that can act as these boundary spanners or change agents. More case studies of how agents influence R4D project success and how to cultivate these agents are needed, because as Elizabeth Shove states, we need to learn more about ‘how practices circulate and travel’, and how ‘practices intersect to form clusters or bundles connected to each other in time and space’ (Shove, 2010, p.283).

3.6 Change agents in R4D projects

Change agent characteristics and competencies identified through the literature review (Figure 10) will be tested for applicability on four R4D case study projects, exploring which, if any, characteristics and competencies are more important. The case studies will also seek to establish whether this more nuanced understanding of potential change agents can enable

improved consideration of the context and system that R4D teams are intervening in, and what capacity building activities are likely to catalyse change in the system.

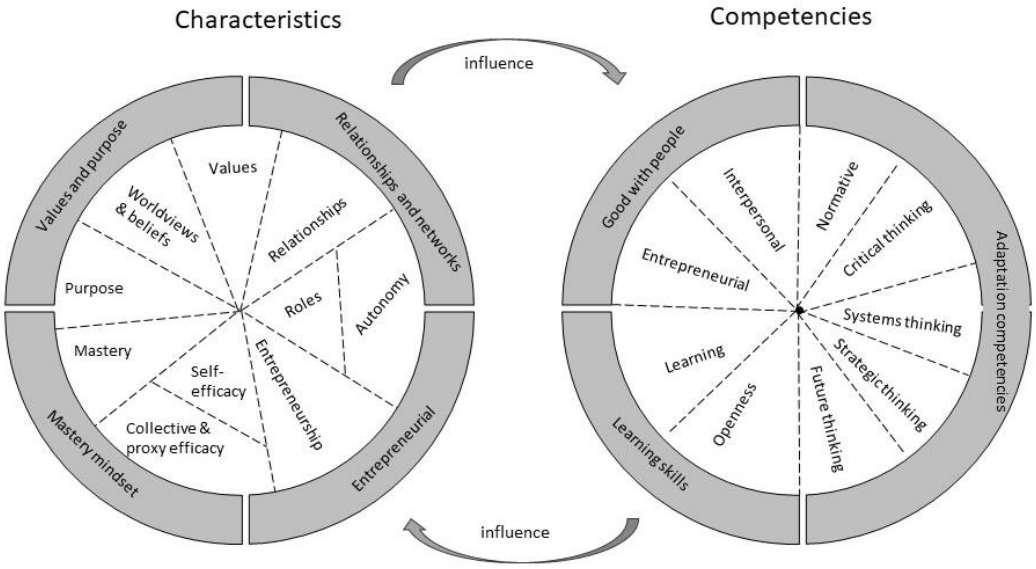


Figure 10: Change agent characteristics and competencies identified in the literature

Change agents have a set of characteristics, competencies, and networks (represented by the nested circles in Figure 11) and are situated within a broader intervention context (square dot box). As described in the above literature review R4D projects work with agents to develop new knowledge, networks and capacity, enabling pathways and opportunities for change, navigating barriers, aiming to create an anticipated change in the agents and the system of interest (dashed circles). Much like the characteristics and competencies are a virtuous feedback loop, change agents enable the success of projects, and projects grow the opportunities and capacities of change agents. More on this framework can be found in section 4.3.2.

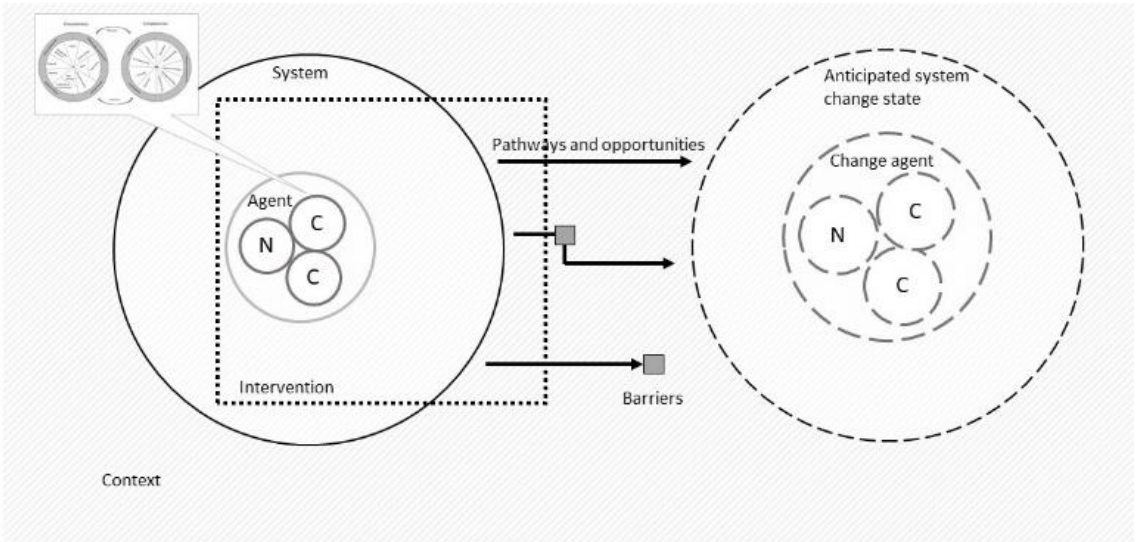


Figure 11: Exploring the influence of context and the R4D intervention on changing the agents' Networks, Characteristics and Competencies in a system of interest.

3.7 Conclusion

In research for development there continue to be many challenges in instigating systemic change. Can better co-design, capacity building and adaptive learning bridge the knowing-doing gap, thereby improving the path to impact? There is no right or single pathway, with historic case studies demonstrating that when systemic change happens, it is often because of an individual, or group of people, who have a shared purpose and work multiple pathways to achieve it. While all people have the capability to enact change, it appears that some people or groups of people are key change makers in the system: people who enable, facilitate, activate, and see windows of opportunity.

My review of the literature suggests that there are key characteristics that appear to support the actions of change agents to achieve positive systemic change, including their values, learning orientation and willingness to try something new. In addition, the literature suggests guiding principles for the necessary skills and competencies of these agents, such as good interpersonal skills and systems thinking, together with a wider set of networks that enable them to create change. A variety of capacity building activities can be used to catalyse or cultivate change agents, including formal training, mentoring and knowledge co-production. There is also a growing awareness of how R4D researchers and practitioners are part of the system and are agents themselves. Do they have similar characteristics, and is it possible to grow change agents within R4D adaptation teams, and connect them through R4D interventions with other agents of change?

My review of the literature suggests that there are many areas where different fields could learn from each other's theories, to help practitioners design better interventions, identify and facilitate agents of change, and increase serendipity to exposed windows of opportunity. More case studies are needed, exploring the effectiveness, scalability and influence of how positive change is negotiated over time involving multiple actors, identifying who the actors are and how they can be galvanised. Greater understanding is also needed as to how, and in what forms, R4D adaptation interventions and capacity building, in particular, facilitate uptake and activation of practices, principles and networks that bridge the knowing-doing gap and that activate scaling processes (Morrison, 2016).

Chapters 6 to 9 provide four case studies exploring these questions and concepts further, followed by Chapter 11 which will seek to unpack which change agent characteristics and competencies are aligned to R4D interventions focused on adapting to global change.

Next, Chapters 4 and 5 will outline the methodology and methods for case study impact evaluation in order to identify potential change agents and what enabled them to catalyse change, with Chapter 5 also outlining a brief history of the R4D Alliance and previous project evaluation undertaken.

Chapter 4: Methodology and Methods

In Chapter 2: I explored the challenges for R4D interventions within the adaptation domain to potentially instigate or contribute to systemic change. Themes explored included co-design, knowledge production, and capacity building in order to catalyse the desired path to impact. Chapter 3: followed on from this to explore what characteristics these people or groups of people have which enable them to become potential change agents in the system.

This chapter outlines the methodologies and methods used to identify potential change agents, explore their characteristics, and unpack what, if anything, the projects did to help facilitate their capacity to facilitate change. This research builds on and extends the previous evaluation work undertaken during the R4D Alliance. The R4D Alliance evaluation explored whether participant and stakeholder adaptive capacity had increased, and the impact of project activities, outputs and outcomes. The evaluation methodology and activities developed and used in the R4D Alliance are outlined in Chapter 5:. The R4D Alliance evaluations were continued as part of this PhD in order to assess ongoing impact and identify potential change agents.

Figure 12 outlines the generic Theory of Change for the R4D Alliance, highlighting when the three evaluation collection points where taken along the path to impact. The first two evaluations of the projects were undertaken in 2014 and 2015, with the third (pink) in 2017 as part of this PhD.

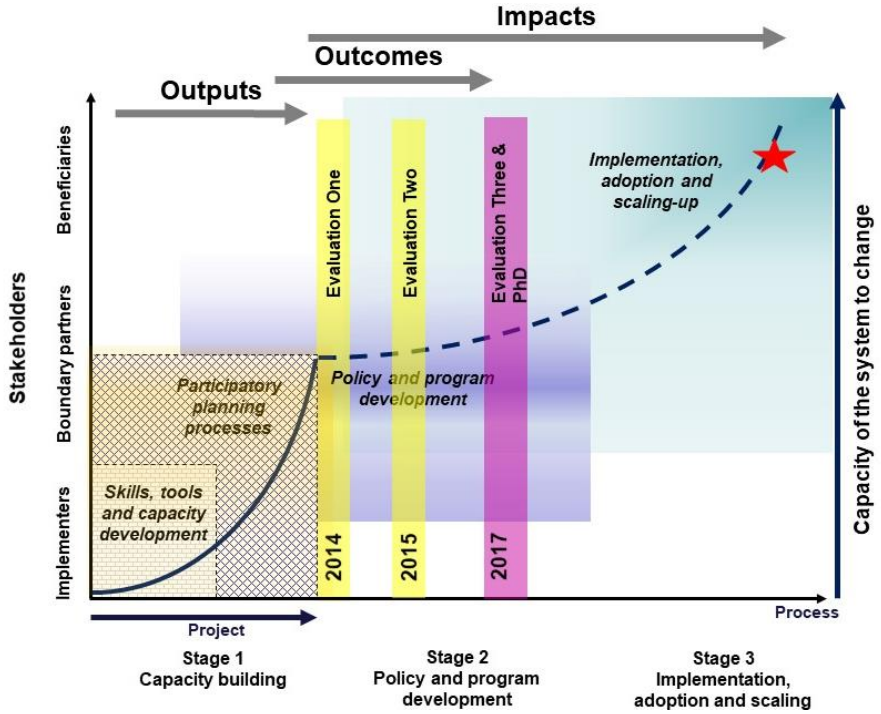


Figure 12: The three data collection points (yellow and pink bars) are represented in the R4D Alliance generic Theory of Change. The asumed pathway to impact is shown as a blue line (solid for project and dashed for post project), with a red star indicating the intervention goal. Modified from (Lazarow, 2016).

4.1 Research background

Research does not occur in a social vacuum (Hay, 2000). As individuals we are influenced by social norms and by interacting in society we are influenced and influence in equal measure.

I was a team member on the R4D Alliance projects; my two principal roles were research coordinator for the program and as a key member of the evaluation team. This meant I had a unique perspective and vested interest in what was happening. While I thought the evaluations we undertook were novel and met the objectives and requirements of our funders, there remained unanswered questions and patterns that I sought to understand.

My experience in the R4D Alliance motivated my undertaking this PhD in order to explore some of the questions that occurred through the evaluation. The PhD enabled me to stand back and re-evaluate the work we had done before, a rare opportunity in our busy, delivery focused space. There were several advantages for selecting case studies from projects that I had been involved in, including:

- I already understood most of the context and was able to fast track the engagement and data collecting process, which was especially important due to the long time scales involved in the evaluation. This approach aligns to the principles of developmental evaluation, which require evaluators to be embedded in the work and learn by 'doing' (Patton, 2011).
- I had prior, and in some cases ongoing, relationships with project participants (researchers and stakeholders) which enhanced the legitimacy of my research and therefore their willingness to participate many years after the projects had concluded.
- In addition to the published reports and outputs, I had privileged access to project background material, including evaluation data, project proposals, theory of change and internal reporting. This type of data mining of previous projects has been used by others such as Wiek et al. (2014).
- I was also able to continue the longitudinal evaluations of multiple case studies and compare the results between countries and approaches allow exploration of what the 'enduring impacts were versus the ephemeral by exploring the robustness of the original concepts and explanations' (Hay, 2000).

Through the course of my five-year PhD candidature I continued to work full time as an integration researcher for CSIRO. Working while undertaking a PhD part time enabled periods for reflection, and provided an opportunity to track change over a longer time frame. My ongoing work within CSIRO has been influenced by what I have learnt through my PhD, and my PhD has been influenced by my current projects.

4.2 Approach overview

4.2.1 Evaluations

Evaluations are undertaken for multiple purposes. At the simplest level they are a form of compliance or accounting requirement for funders, exploring whether the project did what it set out to do. Evaluations can also be used to facilitate learning, both internally and externally, as well as to inform ongoing activities and overall direction, such as in adaptive co-management or adaptive pathways approaches (Wise et al., 2014, Trimble and Plummer, 2018, Butler et al., 2016a). Evaluations can have several audiences (policy actors, donors, recipients, etc.), and depending on their purpose evaluations can be undertaken at various points during and after a project/program lifecycle.

In R4D most assessments seek to evaluate project or program impacts, such as health, nutrition, education and improved economic outcomes for affected people; and relative to costs (or avoided costs). These assessments often take place in complex policy settings and systems with multiple actors across levels and sectors, as is the case for the R4D Alliance projects. Identification of the contributory impact (i.e. attribution) when multiple actors influence the outcomes (for example, see White (2014)) is particularly a challenge in the adaptation space, especially where singular indicators or metrics are insufficient (Scoones, 2016, Hinkel and Bisaro, 2015). Evaluation in adaptation is more consistent with social learning, seeking to identify changes in cognitive variables and other pre-conditions to change, rather than a specific outcome or impact (Butler et al., 2015).

Attempting to identify the contributory impact for the R4D Alliance adaptation projects required the CSIRO team (of which I was a key member) to design a new mixed methods evaluation approach, details of which can be found in Chapter 5:. Mixed methods approaches facilitate triangulation and cross checking of ideas and concepts against different theories, while improving transparency and the robustness of the results (Hay, 2000). I decided to use this as the foundation for designing my own mixed method format, which would build off and extend the existing evaluation approach to assess ongoing impact and surface potential change agents. By eliciting evaluation data in as many ways as possible I wanted to explore if I could get at some of the underpinnings of the patterns I was seeing. I also wanted to design an approach that would help me understand specific and generalisable parts of the different contexts, cultures and research domains associated with change agents.

Longitudinal evaluations are rare in CSIRO, and R4D more generally, because it is difficult to find the funding and time to pursue this work even though the benefits are well understood. Most aid agencies and research institutes would rather fund new work than sift through the past to distil lessons (Green, 2016). Extending the existing evaluations was an effective way to determine whether and how the projects were continuing to have influence and impact at the

individual and community or policy scale, and would enable me to learn what the long-term impacts were (Hay, 2000). Before seeking if potential change agents were in the system and what influence they had, I would first need to demonstrate that systemic change was occurring. The three evaluation time slices were then used to explore additional questions to identify potential change agents. Additional interviews supplemented the time slice impact data and focused on agents of change themselves.

The evaluation of the case study follows on from the previous work in the R4D Alliance, and while there were many advantages to my long-term engagement with the case study teams there was also a risk that people would feel compelled to participate in this further research as I was a CSIRO employee. Further discussion on bias and my attempt at mitigation can be found in section 12.3.4 on p.280.Adaptive theory approach combined with longitudinal case studies

By seeking to answer my research questions using four case studies in conjunction with attributes and characteristics found in the literature (academic and grey), I was able to use iterative mixed methods to explore each case across time, as well as to look at what was common between cases. This utilised a combination of inductive and deductive approaches as described as an adaptive theory approach (Layder, 1998). This enabled exploration of my evolving ideas using both theory and practice, drawing from a wide variety of domains. As outlined in the description of the literature review below, NVivo software was used to bundle ideas gathered from the literature, observation and practice. These ideas were drawn together for sense-making purposes (Cornelissen, 2006), and for comparing theory and practice, in order to design a conceptual framework that would elicit insights about potential change agents, evaluating research for development and how to design more impactful projects (Bammer, 2012).

4.2.1.1 *Selection of case studies*

Four case studies were selected from within the portfolio of six projects that made up the R4D Alliance (Figure 13). These projects aimed to enhance adaptive decision making through improved knowledge of climate, water and energy systems, and to better understand people's vulnerabilities and options to adapt and manage their natural environment.

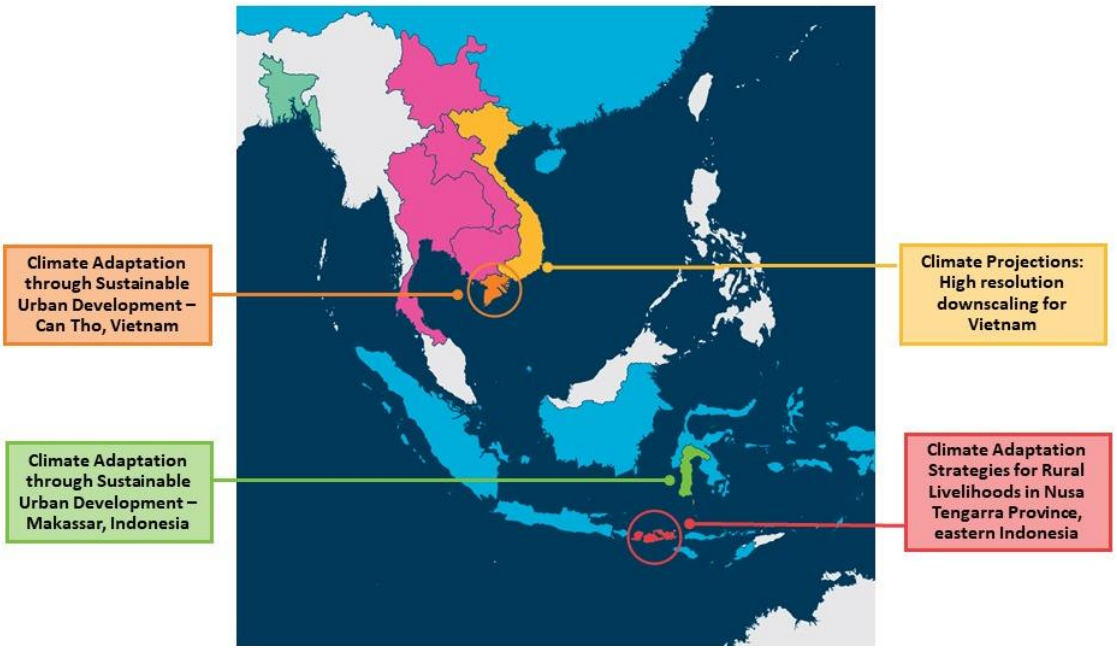


Figure 13: Case study map and project descriptions (adapted from Lazarow et al. (2015))

By selecting two case study projects from Vietnam and two from Indonesia, I could seek insights across projects (that were doing different types of science) and between cultures and contexts. Two of the projects (one in Vietnam and one in Indonesia) looked at water security challenges and were initially set up as sister projects, which supported cross-cultural comparisons. Those R4D Alliance projects not selected as a case studies, were not selected due to geography and a lack project evaluation data (data was not collected for all case studies in 2015).

1. **High resolution climate projections for Vietnam** – project was seeking to enhance Vietnam's capacity to develop regional scale climate projections, enabling more robust national and provincial climate change action plans to underpin adaptation planning and to prioritise investment.
2. **Climate adaptation through sustainable urban development, Can Tho, Vietnam** – project was seeking to facilitate an effective and sustainable urban water system for Can Tho, Vietnam, a rapidly growing city in one of the world's largest deltas, and highly vulnerable to a changing climate.
3. **Designing water security solutions in Makassar, Indonesia** – project was seeking to facilitate an effective and sustainable urban water system for Makassar, a rapidly growing Indonesian city already facing water shortages and vulnerable to a changing climate.
4. **Climate Futures – adaptive rural livelihoods in Eastern Indonesia** – project sought to enhance the adaptive capacity of rural communities in Indonesia's Nusa Tenggara Barat Province, one of the world's least-developed regions.

4.3 Research design

The resulting mixed methods design was implemented through eleven interlinked and iterative activities outlined below (Figure 14).

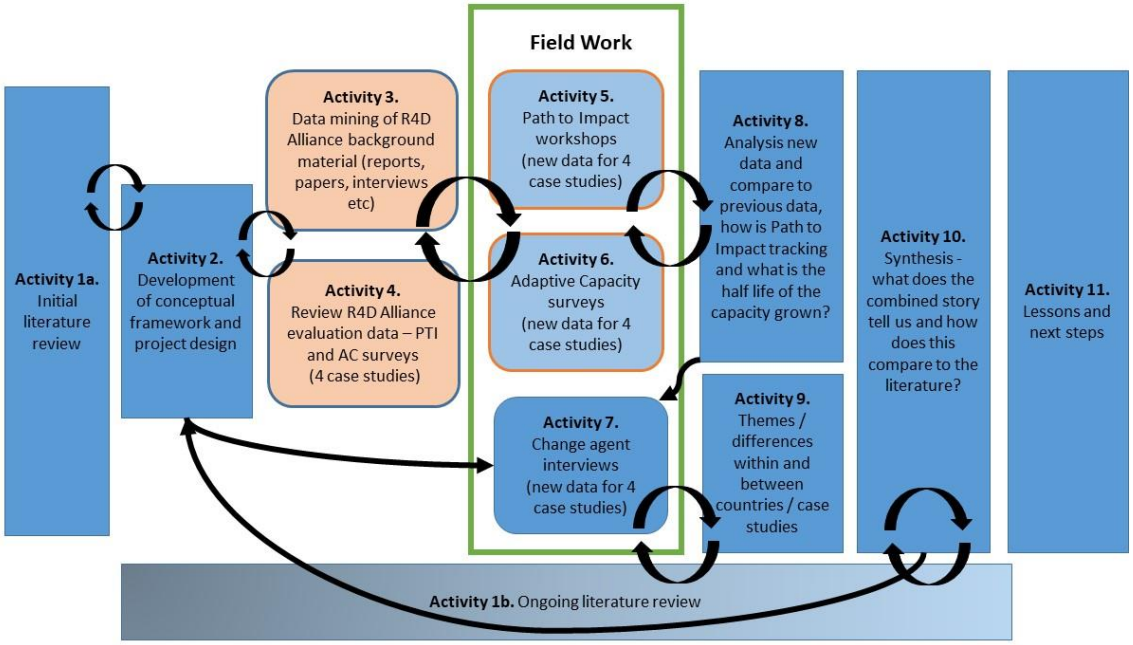


Figure 14: Sketch of the eleven activities of this PhD, highlighting how activities connect, the different data capture points, and methods used

4.3.1 Activity 1 a&b – literature review

An initial literature review demonstrated that evaluation in R4D is a diverse, complex and contested space with few evaluations of adaptation projects. The review formed the basis of a jumping off point for an ongoing exploration of the literature, both theory and practice, in order to explore lessons and concepts from other domains and draw connections between the different literatures, concepts, ideas and models. This review also explored what had already been said on the intersecting issues of societal adaptation, development and evaluation in order to refine my questions and develop a conceptual framework that might help answer them.

As previously mentioned, due to the growth in the number of journal papers in this rapidly evolving space, the literature review became an ongoing activity of my PhD. As did the realisation that it would be impossible for anyone to be on top of these burgeoning fields, and that quite possibly good lessons for systemic change were being frustratingly hidden under a mountain of material.

My initial search of the academic literature commenced in late 2014 using the ISI Web of Knowledge and Google Scholar, exploring topics on development, evaluation, adaptation pathways, change agents and enabling. Martín-Martín et al. (2018) suggest that Google Scholar has become a superset of Web of Knowledge and Scopus, including grey literature, and it was

therefore used for my ongoing reviews. I also particularly sought relevant systemic literature reviews, in order to get an overview of this 'burgeoning subject area' (Spires et al., 2014).

I used the same search terms for published reports from R4D practitioners or think tanks. Initially focusing on well-established groups such as the Overseas Development Institute (ODI), International Institute for Environment and Development (IIED), International Initiative for Impact Evaluation (3IE), Oxfam, the British Department for International Development (DFID), USAID, the World Bank, the United Nations and the Melbourne-based Better Evaluation team.

Material that was included other R4D projects, projects that sought to grow capacity (especially adaptive capacity), literature on leadership and competencies for change, and good practice in evaluation. Materials excluded beyond the research question domain comprised of non-English language papers that were not translated, materials that did not offer additional insights (positively or negatively) and articles that purported theories that have long been disproven, such as Myers Briggs personality traits. Initial materials became the foundation materials from which I sourced others, with additional searches conducted as new themes emerged, as per an adaptive theory approach (Layder, 1998). The qualitative software program NVivo was used to code journal papers and other materials into themes, researchers, practice agencies and journals. This created an organised structure for analysis and facilitated reflexivity by enabling the data to be reviewed in different ways. It also made clear that geography matters even in the international world of science, with limited fertilisation across different groups or networks of researchers. This divide was even more apparent when researchers and practitioners operated in different disciplines or domains, suggesting that while my literature review was incredibly broad, it is likely that there are lessons and insights I will have missed.

4.3.2 Activity 2 – conceptual framework

The framework evolved through many iterations as I mapped out my assumptions about change agents and what influence interventions played in their ability to enact change. I used a Theory of Change approach to articulate my evolving ideas and assumptions. A Theory of Change is a process that articulates a vision of social change and defines the activities and associated underlying assumptions required to move along an impact pathway(s) to achieve a given long-term goal (Bours et al., 2014, Van Epp and Garside, 2014, Arkesteijn et al., 2015, Ensor and Harvey, 2015, Vogel, 2012). Theory of Change has become a popular development intervention planning tool, with most donors now requiring a Theory of Change as a standard component of project and initiative planning (Valters, 2014). As such it is a lot more commonly used in practice by implementation agencies than by research agencies. The process of developing a Theory of Change is often more valuable than the pictorial diagram that often results from it (Green, 2016). I certainly found this to be true and used my evolving pictorial diagram as

a boundary object to question what I was learning from the literature and case studies about change agents' world views, motivation, networks and characteristics.

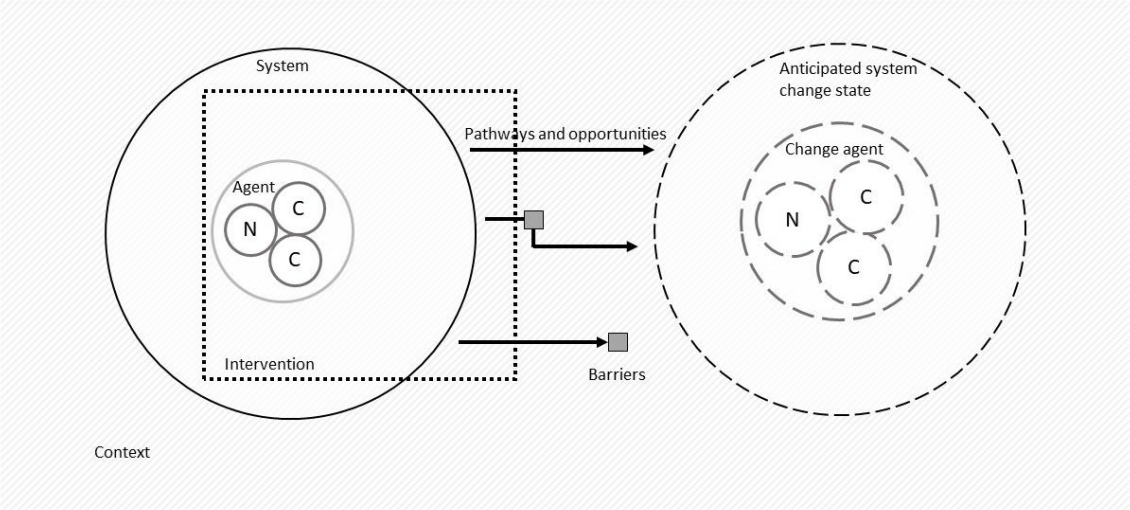


Figure 15: PhD framework exploring the influence of context and the R4D intervention on changing agents' Networks, Characteristics and Competencies in a system of interest.

The resulting framework focused on the characteristics, capabilities and capacities, and roles of change agents as outlined in Figure 15. The framework situated my thinking within the broader intervention context (square dot box) but focused on the agents themselves, represented by the nested circles (networks, character, and competencies). As outlined further in the literature review, networks expand agents' access to knowledge and resources, an enables collective and proxy efficacy. While agents' characteristics and competencies frame the types of activities and challenges an agent might attempt and their potential success at enabling change. The R4D projects developed knowledge, networks and capacity, enabling pathways and opportunities for change, navigating barriers, leading to an anticipated change in the agents and the system of interest (dashed circles).

4.3.3 Activity 3 – data mining R4D Alliance

The first data mining step was collation of all R4D Alliance material, both published and unpublished, and chronologically reviewing the materials from the establishment of the R4D Alliance in 2008. The document review was used to establish the original purpose of the R4D Alliance and how it evolved over time; from this a narrative timeline was developed (outlined in Chapter 5:).

In addition to the overarching R4D Alliance information each case study had project proposal(s), a Theory of Change, project reports, papers and other outputs. Case study material reviewed was used to gain an understanding of the project's context, activities and intended

impacts, as well as a list of stakeholders. These materials were used to inform the case study chapters of this thesis.

The document review, together with a review of the previous evaluation data, identified key people who emerged within the R4D Alliance, both from CSIRO and the in-country partner teams, boundary agents, and beneficiaries. The review also elicited constraints and challenges associated with the initial R4D Alliance approach and gaps in the results, which informed the design of additional data collection approaches.

4.3.4 Activity 4 – review R4D Alliance evaluation data

Previous R4D Alliance adaptive capacity survey data had to be re-coded into a modern version of NVivo in order to be useable. While this was time consuming it refreshed my memory and triggered comparison ideas about how individuals' responses had changed over the years. Re-coding also ensured consistency so that all time slices were easily comparable, by project and by person. A similar approach was undertaken with the adaptive capacity quantitative data (scoring) contained in Excel files, with new comparison sheets created for each project and for individuals within each project. This is something that wasn't possible during the R4D Alliance due to time constraints. Additional data from the third evaluation time slice made this approach more meaningful.

The evaluation materials were then combined with the updated project Path to Impact slides and associated narratives outlining changes from 2014 to 2015, to create PowerPoint slides for presenting information back to in-country partners. These slides became the priming material for in-country Path to Impact evaluation workshops undertaken in July and August 2017.

While the review materials developed were important for sharing with and priming partners, they were also vital for identifying potential change agents to interview.

4.4 Field Work

Activities 5, 6 and 7 were undertaken in Can Tho and Hanoi, Vietnam and Makassar and Mataram, Indonesia during 2017.

Field work commenced in June–July 2017 with two of my PhD in-country case study teams (CTU and IMHEN/HUS). During these meetings I ran the Path to Impact workshops, met with and trained those who were going to undertake the 2017 adaptive capacity surveys, and interviewed my selected potential change agents and some additional people selected by the in-country partners. In-country partner institutions were provided funds from CSIRO to facilitate the workshops, hiring of the rooms, food etc. and to provide stipends for the staff and students who were aiding the survey data collection, and any translating. These fees for management and other expenses were slightly different from what a PhD student might expect, however as a

CSIRO staff member it was impossible to unpick that relationship, and this expectation had been set by previous R4D Alliance evaluation trips.

Field work in Makassar and Mataram, Indonesia was conducted in August 2017. Costs for this trip were covered by my student research project allocation. Like the Vietnamese trip, both UNRAM and UNHAS received management fees in order to coordinate hiring of the rooms, food etc. and to provide stipends for the staff and students who were aiding the survey data collection, and any translating. Funds for UNHAS were contributed by CSIRO, while funds for UNRAM came from the students' stipend allocation.

4.4.1 Activity 5 – Path to Impact Workshops

For three of the four case studies I replicated previously run Path to Impact workshops. The in-country partnership team in Makassar felt that a Path to Impact workshop would not be appropriate for them as too many of the project team and associated stakeholders were no longer working in Makassar so it would be hard to get them together for a workshop. See Chapter 9: for further explanation.

Like the previous workshops (undertaken in 2014 and 2015), the 2017 workshops were undertaken with in-country research teams and, where possible, with key stakeholders. The workshops followed the original design that encouraged self-reflection and learning. One difference in 2017 was the absence of CSIRO staff participation in all but one case study (Can Tho). This was due to the lack of current CSIRO projects and associated funding enabling CSIRO staff to participate with their in-country counterparts.

Each workshop started with a presentation refreshing participants' memory of the project and any outputs, as well as a brief overview of the 2014 and 2015 evaluation results. The in-country project teams then spent time discussing and comparing their achievements against the project's assumed Pathway to Impact (as outlined in the project Theory of Change), telling stories of change and how that change was seen to have come about, including who was involved. Discussing the previous placement (2014) and subsquent movement (2015) of project outputs, outcomes and impacts along the pathway provided an opportunity to reflect and share progress (or the lack thereof) with colleagues. Where relevant, new impact points were added to the project path to impact.

Results were recorded live on the project Theory of Change using PowerPoint, enabling shared understanding of discussed changes. At the same time I took notes of the discussion focusing on what had changed and why. These notes were then provided to in-country research teams as a report comparing the 2017 stories with the accounts from 2014 and 2015.

4.4.2 Activity 6 – Adaptive Capacity surveys

Like the Path to Impact workshops above, adaptive capacity surveys were underaken with the partners and stakeholders in 2014 and again in 2015, using the standardised set of 18 indicators which was developed through the R4D Alliance and is described in further detail in Chapter 5:. These surveys were repeated in all four case studies between June 2017 and early January 2018, and (to the extent possible) all previous survey participants were asked to participate.

Due to time and language constraints, rather than undertake the surveys myself I trained 3 to 4 people in each case study to undertake the surveys for me. This training occurred after each of the Path to Impact workshops, and was the same approach used during the R4D Alliance. In fact, in most cases the people assisting me had previously undertaken the earlier surveys on behalf of CSIRO, and so the training was a refresher and a reiteration as to the importance of asking all the questions. The research assistants were chosen by the in-country partners (staff and students) and were paid for their time to undertake the surveys and translate them into English before sending them to me.

Researchers and change agents surveyed were reminded of their previous comments and scores (2014 and 2015) and asked to provide a new or revised assessment of how, and if at all, the project influence changed by scoring each indicator (from 'some' to 'very strong' influence) and giving evidence to support their score. Between 15 and 18 people undertook the survey for each project. Box 5 shows an example of an adaptive capacity survey question. A full list of the survey questions can be found in Appendix 1, p.267.

Box 5: Adaptive capacity survey question example

Previously we asked whether you had seen new linkages and relationships growing between participants as a result of the project, where they exchange information and ideas.

- In 2014 you scored it a very strong (2) influence and said 'Yes, participants frequently have email discussion and video call (for distant collaboration) conference'
- In 2015 you also scored it a very strong (2) influence and said 'As the result of project, groups of IMHEN and HUS can work together more closely'.

As of now, thinking of the **Researchers** and **Change Agents** directly involved in the project, have the social networks been maintained and/or grown? How would you score that influence?

4.4.3 Activity 7 – Change agent identification and interviews

Individuals were identified as people to interview through the review of R4D Alliance documents, previous stakeholder workshops, and evaluations. These individuals were project participants or partners who were regularly mentioned as having showed leadership associated with the project in case study documents and evaluation data, often with by multiple respondents

in the adaptive capacity surveys or through the Path to Impact workshops as people who facilitated change or had influence. If individuals were mentioned positively (as a leader associated with the project rather than as their role) by more than three others in the project, they were added to my list of individuals for interview as potential change agents. Names were also cross-checked against stories of change in the PTI evaluations, where individuals were mentioned as being instrumental in the change process, and with CSIRO project teams who were asked to identify change agents who helped the project to achieve influence and impact.

A set of eleven indicators was developed based on my conceptual framework and insights from the literature (Figure 11), focusing on change agents' motivations, capabilities and capacities, characteristics, and roles. From these indicators 15 semi-structured questions were developed as a starting point for the in-depth semi-structured interviews with potential change agents. See Box 6 for the list of indicators and questions.

Box 6: Semi-structured interview questions by indicators

Indicator	Opening questions
Skills	1. What do you see as your personal strengths?
Competencies	2. Do you feel you have the skills/competencies to address current and future challenges/situations? Please tell me what you think are the most important?
Resources	3. Do you have time, willingness, and resources, or an ability to access them, for what you feel you need to do? How do you feel this compares to others in your community?
Knowledge	4. What would have helped to make [insert project information] work/knowledge more integrated in your day to day life?
Mastery	5. Describe a time when the project wasn't going well for you. What happened, how did it make you feel, and how to you get through it (did you?) and how long did it take? 6. How self-reflective are you about yourself, your work/society goals? Can you give me an example?
Values and purpose	7. Do you feel you have a long-term perspective, purpose or goal in life? And would you feel comfortable in sharing that with me? 8. Do you find meaning in your work? And does it align with your personal values? How does what you do benefit others? Can you let me know a little about this?
Self-efficacy Collective efficacy	9. How do you perceive your ability to respond to, change, and/or influence things that interest you, such as water sanitation, climate change, the development of new crops? 10. How do you perceive your network's/community's ability to respond to change?
Entrepreneurship (optimism)	11. Do you think you are lucky? Do you see opportunities? Are you discouraged by institutional impediments? (give example)
Roles	12. Describe your role for me (work & community)? • Now • At the time of the project
Autonomy	13. How much freedom or control do you have to change or influence what you do at work, and in your community?
Networks	14. Do you think you can influence/persuade others? 15. What is your personal support system like – home, work, community?

Initial questions were piloted on colleagues who had no connection to the R4D Alliance. This helped establish the clarity of the questions, any cultural misunderstandings or sensitivities, and the potential length of the interview.

The potential change agent interviews were then undertaken with seven CSIRO staff associated with the R4D Alliance case study projects. In addition to the answers provided, these

interviews with CSIRO staff enabled me to gain insights into their perceptions of their partners, including who they would nominate as potential change agents for their project. Nominated individuals were then cross referenced with my list and any adjustments made before I started with the wider interviews.

Overall for each case study between 8 and 11 semi-structured interviews were undertaken with potential change agents, made up of CSIRO and in-country research partners. Most interviews were conducted face to face and in English, however a small number of interviews in Vietnam and Indonesia required a translator due to my lack of skills in either Vietnamese or Bahasa. In each case study I spent time prior to the interviews with each translator going through the questions and ensuring the meaning of the question was undertook for translation purposes.

Interviews commenced with an introduction about why I was asking further questions, given that all participants had either participated in the Path to Impact workshop or the adaptive capacity survey, some of them both. I explained that this was not an evaluation, and that I was interested in what inspired them to work and how my hope was to be able to help inform the design of future projects, not only to improve our path to impact, but also to help project participants to achieve their own goals in life.

The interviews were largely conducted in English and started with easier questions, such as what the interviewee's role at work was, and their previous role in the relevant CSIRO project. Depending on the answers and stories provided in earlier questions I skipped or re-ordered the other questions. When necessary, time was spent during interviews to ensure that the interviewee understood the intent of the question, when some of the words (e.g. reflexivity) did not have a direct translation). Interviews took between 25 and 55 minutes, with the large time difference relating to the number and length of stories told. The shortest interviews were the ones with the biggest language barriers, conducted with the assistance of an in-country partner, or where I did not previously know the participant.

4.4.4 Activity 8 – Analysing new data and comparing to previous R4D Alliance data

4.4.4.1 *Path to Impact Workshops*

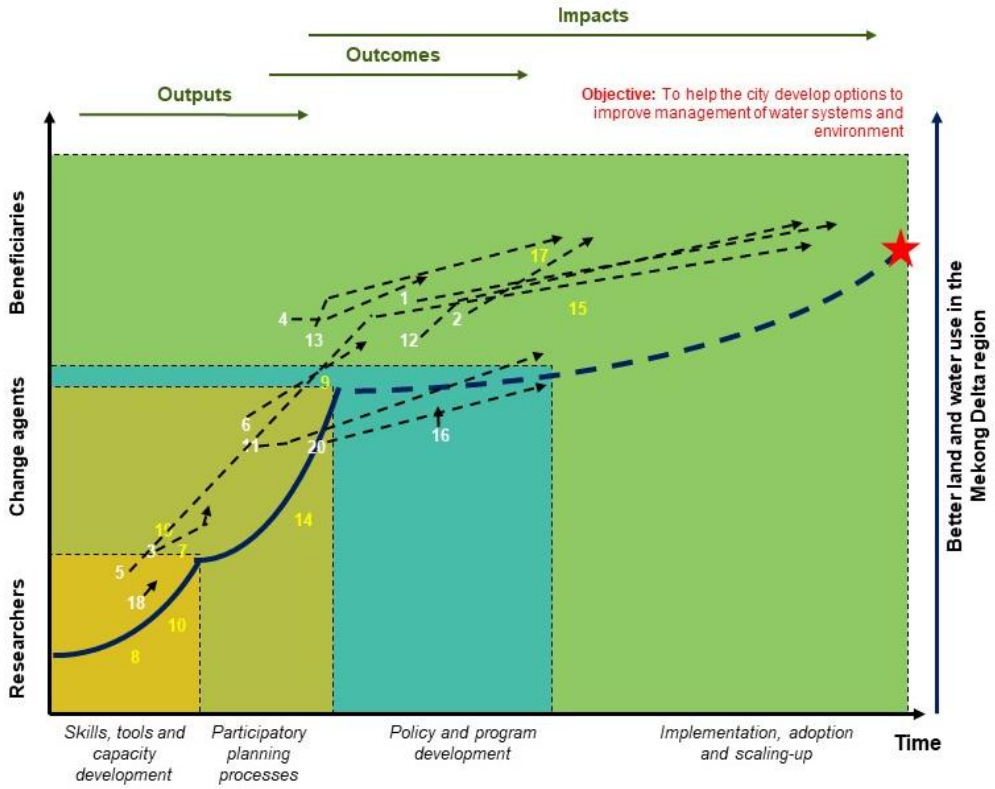
The results from the Path to Impact workshops in the three case study projects that did this activity were compared to the results in 2014 and 2015. A new report was developed for each case study, showcasing the evolving narrative for each of the items highlighted through the process. Movement was also shown in the associated Theory of Change diagram by the numbers and dotted arrows, see an example in Box 7.

This allowed me to get a better understanding of the evolving, nonlinear nature of impact, and explore emergent patterns of success or barriers to success. These stories provided a contribution to the adaptive capacity surveys and change agent interviews, as they help place the

other data in a wider context and showcase what steps people or groups took (or did not take) to mitigate the challenges they faced, or opportunities they saw.

This research has taken the Path to Impact sense-making to another level from the R4D Alliance work by taking the time to compare patterns within and across case studies, whereas in the previous evaluations it was primarily used to triangulate the adaptive capacity surveys. It is also made more robust by adding another time slice in 2017 and re-priming the potential change agents through reflection and discussion.

Box 7: Path to Impact evaluation example



For example, in 2014 impact point #5 (development of GIS and spatial analysis skills) was placed on the path to impact above the line in the skills and capacity develop part of the Theory of Change as participants felt this training had been useful beyond the project and was now being taught at Can Tho University. In 2015 the participants felt that impact point #5 should be moved significantly up and to the right as these skills were continuing to be taught at the university and now the local water company was also training their staff in these skills in order to inform strategic planning and map creation. Impact point #5 was moved further along the path to impacts in 2017 due to growing local GIS skill and the availability of informative local maps which triggered new projects with the World Bank.

The raw data was shared with in-country partners in real time, with draft reports showcasing the evolving evaluation results for each case study delivered to the in-country partners following each field trip.

4.4.4.2 *Adaptive Capacity Surveys*

Results from the adaptive capacity surveys were analysed using NVivo software and Excel to examine similarities and differences within and between projects. This is the same approach used in the R4D Alliance, which is outlined in Chapter 5:.

A new aspect to this analysis was the ability to assess the changing individual responses (scores and stories) over time. I felt this was a gap in the original analysis which I had done as part of the R4D Alliance, however, the project didn't have the time or resources to undertake further analysis at the time. Having the third time slice also provided a more robust data set for comparison over time.

This analysis was made easier by using NVivo to code the answers to each question by question, time (2014, 2015, 2017) and person. I was then able to run a report that distilled each person's answers over time to aid with analysis. An individual's changing narrative was then compared to their scored responses in Excel.

Individual changes were compared within projects, and between projects, with those individuals identified as potential change agents through observation, surveys and interviews, compared to those on the projects who were not identified as change agents.

4.4.4.3 *Potential Change Agent interviews*

Anaysis of the potential change agent interviews was undertaken by coding the interviews using NVivo software into predefined and emerging themes. The individual interview responses were then also compared to their adaptive capacity survey responses from 2014, 2015 to 2017, in order to see if any patterns emerged. Interviewees were then characteristics as prospective, emerging or strong change agents (see Table 2 for further description and Figure 48) based on their alignment to the characteristics identified in the literature.

Table 2: Change agent descriptions

Potential	Individuals identified through the case study project evaluations as leaders. Further interviews were then requested with these individuals.
Prospective	Individuals who were activity seeking to grow their knowledge, capacities and networks, and aspired to growing the characteristics identified in the literature. The case study evaluations highlighted that these individuals were at the beginning of their careers, with their colleagues and partners suggesting a bright future based on their contributions to the project.
Emerging	Individual who already have some of the characteristics identified in the literature, with strengths in some of the attributes and continuing to grow their knowledge, capacities and networks. The case study evaluations highlighted where these individuals contributed to project successes.
Strong	Individual who exhibited many of the characteristics identified in the literature, with strengths in several of the attributes, and diverse networks. The case study evaluations highlighted where these individuals had enabled project successes and continued influence in the system.

4.4.5 Activities 9 to 11 – comparing case study differences, synthesis and lessons learnt

Drawing the results of the three data evaluation approaches together, I compared the case studies' results against the literature (theory and practice), enabling triangulation and integration of ideas, concepts and insights aligned with my research questions.

Chapter 10: contains a meta narrative exploring the change agent insights and lessons from across the four case study projects. The narrative demonstrates the element of choice that exists in all of our lives, and the personal and collective decisions that lead to events and opportunities for change, and how the R4D projects help enable change.

Insights about the evaluation approach and lessons learnt from across all four case studies are included in Appendix 2 and 3, starting on p.271.

4.4.6 Human Ethics considerations

As a PhD student who is also a CSIRO employee, using CSIRO projects as case studies, I was obliged to develop and submit human ethics protocols to both CSIRO and ANU human ethics committees. The first application was to CSIRO in order to gain existing approval to use CSIRO projects as my case studies. Approval was given as I demonstrated that the case study project research teams and stakeholders would benefit from the additional impact evaluation.

However, this also required me to have conversations with CSIRO teams and their in-country partners to seek their retrospective permission. To ensure that in-country partners felt comfortable with discussing any concerns, CSIRO project leads (not me), engaged with their in-country partners seeking initial feedback on their comfort with a request for retrospective approval. This process took approximately a year.

CSIRO and ANU have a reciprocal arrangement for human ethics applications. Even so, once I had CSIRO human ethics approval, I submitted my application to the ANU human ethics committee together with the CSIRO committee assessment for final approval. The ANU Human Ethics Committee granted my application in July 2016.

All participants were provided project information sheets, and their informed consent was sought prior to each event. All information has been de-personalised, and results aggregated. Importantly, all participants were asked if they would like the results to be shared with them, and where this was requested, they will be provided with a final copy of this thesis.

4.5 Methodology and methods conclusion

This chapter focuses on how the R4D Alliance evaluation was continued to evaluate the changing nature of impact for the selected case study projects in order to identify potential agents of change. The following chapter provides the history of the R4D Alliance, the case study projects, and the mixed method evaluation approach undertaken to assess impact.

Chapter 5: Research for Development Alliance

Established in 2007, the Research for Development Alliance (R4D Alliance) was an initiative between Australia's science agency (CSIRO) and the Australian Aid agency (AusAID) designed to tackle significant development problems that limited AusAID's traction or impact and that were consistent with CSIRO science objectives (Roth, 2010). The R4D Alliance was intended to move CSIRO and AusAID from a tactical relationship to a strategic level partnership, and was undertaken in three overlapping phases, and with an extension period focused on evaluation (Box 8). By the time the R4D Alliance concluded in 2015 a total of AUD21.83 million had been spent, with Australian Aid providing $16.18 million and CSIRO contributing $5.65 million (Lazarow et al., 2015).

Box 8: R4D Alliance Phases

Phase 1 – Scoping Projects (2007–2009)

Phase 2 – Projects (2010–2014) – large scale, multidisciplinary projects that targeted complex development problems within the thematic areas of climate change, water and urbanisation

Phase 3 – Synthesis and learning (2013–2015) – wrapping up project work and synthesising lessons

Phase 4 – ODE Evaluation (2015–2016) – post project and program review

Many organisation and staff changes occurred in both agencies during the seven-year period. Perhaps the most significant was in 2014 when, due to a change in the Australian Government, AusAID was merged into the Australian Department of Foreign Affairs and Trade (DFAT). For the sake of clarity, I will refer to both AusAID and DFAT as Australian Aid rather than swap between them.

There were six main projects funded under Phase 2 the R4D Alliance; the four case studies used to examine this thesis are italicised in bold:

1. Exploring Mekong Futures in the Greater Mekong (2008–2014)
2. Bangladesh Integrated Water Resources Assessment (2011–2014)
3. ***Climate Adaptation Strategies for Rural Livelihoods in Nusa Tenggara Province, Indonesia (2011–2015)***
4. ***Climate Adaptation through Sustainable Urban Development***
    a. ***Can Tho, Vietnam (2011–2015)***
    b. ***Makassar, Indonesia (2011–2015)***
5. ***High Resolution Climate Projections for Vietnam (2012–2015)***
6. Food Security Through Food System Innovation scoping study (Africa and SE Asia).

5.1 R4D Alliance Overview

5.1.1 Phase 1 – Scoping Projects (2007–2009)

The initial focus of the R4D Alliance was a suite of small scoping projects commencing in June 2008 (Roth, 2010). Nine small projects were designed with the intention of enabling Australian Aid to get a better understanding of what CSIRO could deliver, and to develop relationships between the two organisations. These early projects were expected to inform future projects, rather than become the basis for defining future R4D Alliance projects (Spink, 2009). More on these projects can be found on the R4D Alliance website – https://wp.csiro.au/r4da/projects/scoping-projects/

5.1.2 Phase 2 – Projects (2010–2014)

By Phase 2 the R4D Alliance had three objectives (Lazarow et al., 2015):

1. To build the evidence base for responding to complex challenges relating to climate change, water management, food security and sustainable cities in the Asia-Pacific region and Africa
2. To inform development decisions and planning, leading ultimately to an improvement in the resilience and livelihoods of people living in poverty
3. To build Australia's effectiveness as a global partner in research for sustainable development.

Six large-scale multi-sectoral projects were commissioned. The projects underpinned partner government initiatives in climate change adaptation (Indonesia and Vietnam), water security (Bangladesh), sustainable cities (Indonesia and Vietnam), food security (South Asia and Africa) and multi-scale futures research and scenario planning in the Mekong region. The sixth project on food security ultimately spun out of the R4D Alliance to become its own program, with a different management structure and steering committee. More on these projects can be found on the R4D Alliance website – https://wp.csiro.au/r4da/projects/long-term-projects/

5.1.3 Phase 3 – Synthesis and learning (2013–2014)

Phase 3 commenced in July 2013, overlapping the project-based activities of Phase 2, and was anticipated to run until December 2014 focusing on integration of knowledge into practice, pathways to impact and communicating research results, as well as assessing the benefits and costs of the Research for Development partnership model.

5.1.4 Phase 4 – ODE extension for evaluation (2015–2016)

An opportunity arose in early 2015, prompted by Australia's 2014 Aid Strategy, which emphasised the need for improved evaluation of aid effectiveness to extend the post-project

evaluation of R4D Alliance projects under Australian Aid's Office of Development Effectiveness (ODE) (Commonwealth Government of Australia, 2014). The evaluation project aimed to improve understanding of:

- how aid investments deliver impact;
- the benefits of research to improve development outcomes; and
- how investment can be best targeted to support development outcomes.

Resource constraints meant that only a subset of the R4D Alliance projects could be evaluated, with four projects or case studies being selected for further evaluation. The four selected were the four that are examined in this PhD. The cases were selected in part due to my role on the project and my interest in undertaking a PhD (which commenced in November 2014) further exploring questions raised through the R4D Alliance projects. Case study evaluations were undertaken between March and May 2015, and compared with the 2014 results (Lazarow, 2016). The final report was delivered to Australian Aid in April 2016 and can be downloaded from the R4D Alliance website – https://wp.csiro.au/r4da/evaluation/.

5.2 The Research for Development Alliance Story

The seven years of the R4D Alliance were turbulent; see Figure 16. Few could have anticipated at its inception in 2007 the upheavals within both CSIRO and the Australian Aid program.

5.2.1 2007–2008

In 2007 the R4D Alliance Steering Committee Alliance Science Advisory Panel was established to inform project design; review project outputs; advise on science quality; enable pathways to impact; disseminate stories; and exchange information between CSIRO and Australian Aid to inform future Alliance development (Spink, 2009). Nine scoping projects were commissioned in June 2008.

5.2.2 2009–2010

By late 2009 the R4D Alliance commissioned the second wave of projects (Phase 2), building on the lessons from Phase 1. In August 2010 a set of key lessons was distilled from Phase 1, outlined in a short report by Roth (2010), which noted that Phase 2 projects would need additional time and resources. Phase 2 projects commenced in April 2010.

Australian Aid was concurrently developing a new Environment and Climate Change Strategy which identified urbanisation as an important future investment area. As a result, an urban project was commissioned in June 2010.

Figure 16: Timeline highlighting key points in the R4D Alliance story

5.2.3 2011

In July 2011 the CSIRO R4D Alliance teams were taken through a capacity building program designed to help them articulate their Theory of Change and develop a set of plausible narratives about how they anticipated change to happen. Following this, project teams updated their project plans and developed associated monitoring and evaluation plans which fed into an updated R4D Alliance Theory of Change and Alliance Monitoring and Evaluation Framework.

The R4D Alliance projects could broadly be described as having three sets of stakeholders, described in Table 3 as follows (some stakeholders fitted into more than one category).

Table 3: Description of stakeholders

In-country research partners	Project partners associated with the research and implementation of the work. These teams often played a role in connecting with government decision makers.
Boundary partners	Individuals and organisations that were key to facilitating change within a system. These people where often local policy makers, NGOs, or practitioners (engineers, industry groups, etc.).
Beneficiaries	Predominantly, the people whose lives the projects were attempting to improve, the most vulnerable communities in developing countries. However, research teams and boundary partners also viewed themselves as beneficiaries in terms of receiving training, tools and knowledge.

The central theory of change underpinning the R4D Alliance was that by:

> *coordinating the science skills of CSIRO with the development skills and networks of Australian Aid in a collaborative partnership will make Australia's aid program more effective in addressing critical development challenges that are constraining efforts to reduce poverty, and will contribute to sustainability of results by strengthening R4D capability in partner country institutions (CSIRO, 2013, p.1)*

Project impact pathways (the Theory of Change) were envisaged as a series of three connected and overlapping stages as shown in Figure 17:

- Stage 1: Project activities aimed to build the capacity of the research team and change agents by collating data and developing tools, and carrying out participatory planning and training which enabled in-country partners to have an increased understanding of the issues;
- Stage 2: Policy and program development and engagement was facilitated by research teams and change agents, leading to more informed decision making; and
- Stage 3: Involved implementation, adoption, scaling up and scaling out by the research team, change agents and beneficiaries.

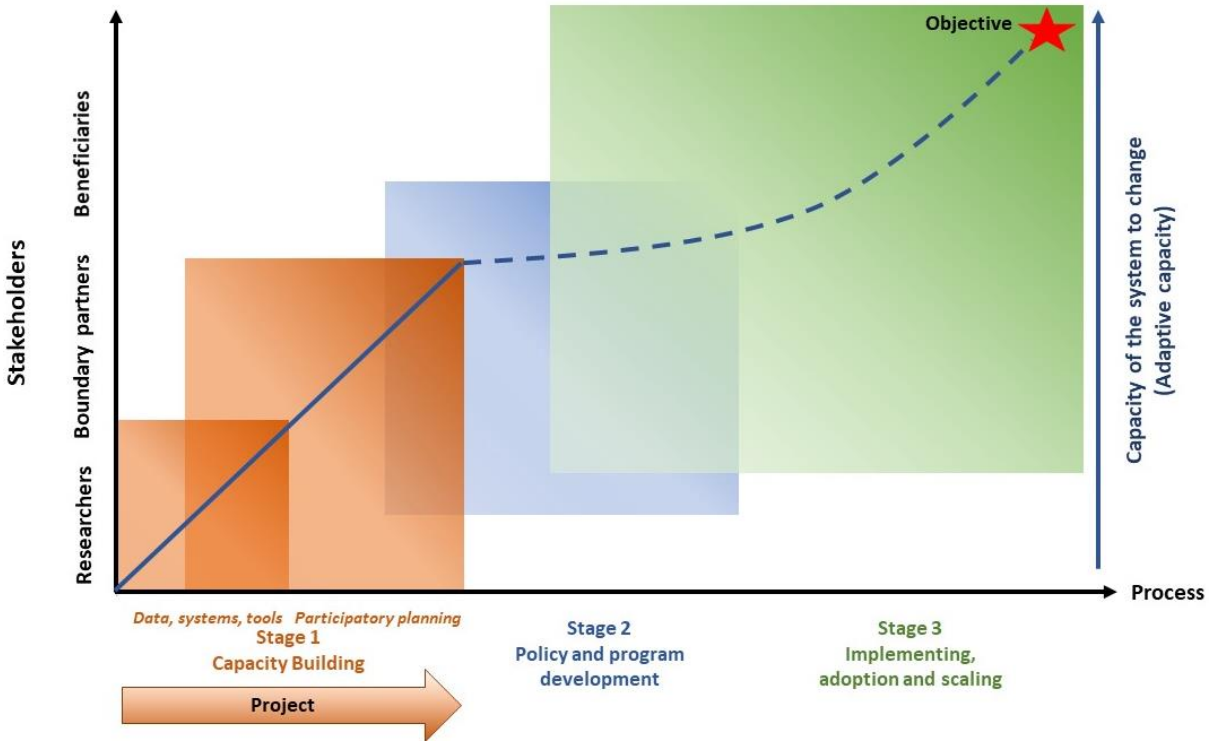


Figure 17: Project impact pathway made up of three connected stages (redrawn from (Lazarow et al., 2015))

In late 2011, Australian Aid (Vietnam) requested the development of the High Resolution Climate Downscaling for Vietnam project which commenced in early 2012.

5.2.4 2012–2014

In the first half of 2012 CSIRO undertook a restructure lasting 6 months which included downsizing staff numbers. This impacted on R4D Alliance projects and CSIRO project teams in

two ways. First it was an unsettled time as people were uncertain as to whether they had a job, and secondly workloads increased as staff who left CSIRO were not replaced. In the same time frame an independent mid-term review of the R4D Alliance found that the R4D Alliance was 'well managed and that there were no major implementation problems across the portfolio of projects, and supported continuation for a third phase', although it could benefit from 'a more refined articulation of its higher order purpose' (Crawford and Swete-Kelly, 2012, p.4).

The focus of the R4D Alliance started to shift late in Phase 2 with Australian Aid budgets devolved to in-country Posts, meaning the thematic focus became less important and a more integrated approach was called for. Local partner institutions were increasingly requested to act as knowledge brokers, communicators and network builders with key players. CSIRO teams assisted in creating linkages between people and agencies and working with partners to prepare communication products.

Phase 3 commenced in July 2013 and was anticipated to run until December 2014, focusing on integration, pathways to impact and communicating results of the research findings, as well as assessing the benefits and costs of the R4D and documenting the Alliance experience. Lessons from Phase 2 indicated a need for a dedicated team, which was established, to help coordinate and deliver these outcomes, supported by the existing Alliance governance arrangements. The new structure was designed to provide greater support for in-country research teams, to consolidate and deepen the impact of the research, as well as facilitating sharing across the Alliance research teams. Resources were initially allocated to support knowledge brokering, and to translate research results into products. However, an Australian election in September 2013 led to a change in government, which had made an election promise to fold Australian Aid back into the Department of Foreign Affairs and Trade (DFAT).

By March 2014 Australian Aid advised CSIRO that funding for Phase 3 of the R4D Alliance would be reduced from AUD$4 million to AUD$2 million, and that the completion date would be brought forward from December 2014 to July 2014. This meant Phase 3 needed to be rescoped, with the lessons of Phase 2 largely ignored in the scramble to deliver projects within the remaining budget. Most of the $2 million allocated to CSIRO had already been spent or contracted to in-country research partners, leaving the research teams with limited resources to wrap up the program of work.

In addition, CSIRO was undergoing significant changes of its own with the wind down of the CSIRO Flagship program, including the dismantling of the Climate Adaptation Flagship which had been the principal contact point for the R4D Alliance. Again, CSIRO staff were being restructured and retrenched, with staff working on the R4D Alliance program particularly impacted due to the shrinking aid program. Much like the earlier round of redundancies and restructuring, this process impacted staff's ability to deliver on their project commitments. There

was also the additional stress of having to inform their in-country research partners of changes to project budgets and timelines, and the real likelihood of not being able to continue to work at all. However, as CSIRO teams prioritised cuts to their own budgets in order to allocate as much as possible of the available resources to their in-country partner teams, this led to a sense of renewed responsibility and trust being developed between the partners.

During this time the CSIRO Alliance team shrank from over 50 staff to six core individuals, with the redesigned R4D Alliance focused on delivering what project outputs were possible, and evaluating the work through benefit: cost analyses, indicators of adaptive capacity and descriptive pathways to impact at both the project and program level. In-country knowledge sharing and capacity building programs for each of the case studies were significantly reduced.

Final project evaluation trips were undertaken between April and May 2014. In addition to the evaluation activities, the trips allowed a wrap up of any outstanding project activities and provided an opportunity to mitigate any relationship damage caused by wrapping up the projects so quickly and without the contracted resources.

The Research for Development (R4D) Alliance was completed in December 2014. The final deliverables included a range of project outputs and the final evaluation report which outlined principles and lessons learned for improving aid effectiveness.

5.2.5 2015–2016

In early 2015 an opportunity arose through ongoing discussions with Australian Aid staff to undertake a post-project evaluation of four R4D Alliance projects under the Office of Development Effectiveness (ODE). This further evaluation project was prompted by Australia's 2014 Aid Strategy which emphasised the need for improved evaluation of aid effectiveness.

The ODE funded evaluation built on the earlier R4D Alliance impact evaluation and focused on:

- whether and how the project activities had persisted, grew or changed since project completion; and
- how future investment could be best targeted to support development outcomes.

The evaluations were undertaken between March and May 2015, and were compared with the 2014 results, with the final report delivered to Australian Aid in April 2016.

5.3 Methodology and Methods for the Research for Development Alliance Evaluation

The R4D Alliance goal was to contribute to the reduction of poverty, through using R4D interventions to influence partner government policies and donor development programs. The evaluation of the R4D program and projects sought to assess the impact or success that these projects had on the goal and discover what lessons might be discovered to improve future R4D programs and projects, not just for CSIRO but also to improve the quality and effectiveness of Australian aid more broadly.

To this end, CSIRO developed a novel approach to evaluate and explain the impact of projects and synthesise lessons from across the R4D Alliance. At the time it was felt that there were significant limitations amongst many impact evaluation methodologies, with a narrow set of approaches used to evaluate complex development issues, leading to impacts only being partially described due to the struggle for validation and attribution of impacts.

The CSIRO team, of which I was a core team member, developed a mixed methods approach to evaluate impact based on criteria linked to program and project Theory of Change, scalability of approach, and the desire to prompt a collaborative participatory and reflective process with in-country research partners and other key stakeholders.

The R4D Alliance evaluation team was made up of six CSIRO researchers and one consultant. I was the project coordinator, and co-designer of the evaluation approach. I was also one of the principal data collectors for both the Path to Impact and adaptive capacity surveys, as well as principal data analyst for all projects (2014, 2015), and a significant report contributor.

5.3.1 Research design

The evaluation sought to assess individual project impacts as well as the overarching theory of change that governed the R4D Alliance.

Single indicator methods are rarely able to adequately capture the societal benefits of R4D investment. Practice leaders worldwide, including but not limited to Australian Aid, 3iE, ODI, World Bank, Oxfam and USAID, continue to use ‘mixed’ or ‘multiple methods’ to evaluate the impact of research for development. ‘Mixed methods’ can refer to the data collection techniques or the design of the evaluation; in the R4D Alliance it was used it to mean both. Mixed method approaches integrate quantitative and qualitative approaches to data collection, analysis and synthesis. By integrating several approaches, evaluators attempt to capture a broad range of impacts and challenges, while minimising the limitations of using any one method or approach (Bamberger, 2012). Employing a mixed methods approach builds a more robust evidence base that could not be established otherwise (Wiek et al., 2014), and enables a triangulation of results. These approaches also generally promote greater integration of stakeholder perspectives and a more participatory approach, which in itself can generate further capacity building through

learning and which was an additional goal of the R4D Alliance evaluation (Lazarow et al., 2015, Butler et al., 2016a).

In the R4D Alliance, using the Theory of Change narrative, the evaluation team designed approaches and tools to quantify research impact and pathways to impact (i.e. the priming was underway even if the impact was yet to be realised). The evaluation design aimed to apply appropriate methods to capture different parts of the evaluation story. Using different approaches to assess project influence and impact increased evaluation confidence, validity and reliability, with the results from one approach used to inform the design of future phases of the evaluation (Lazarow et al., 2015).

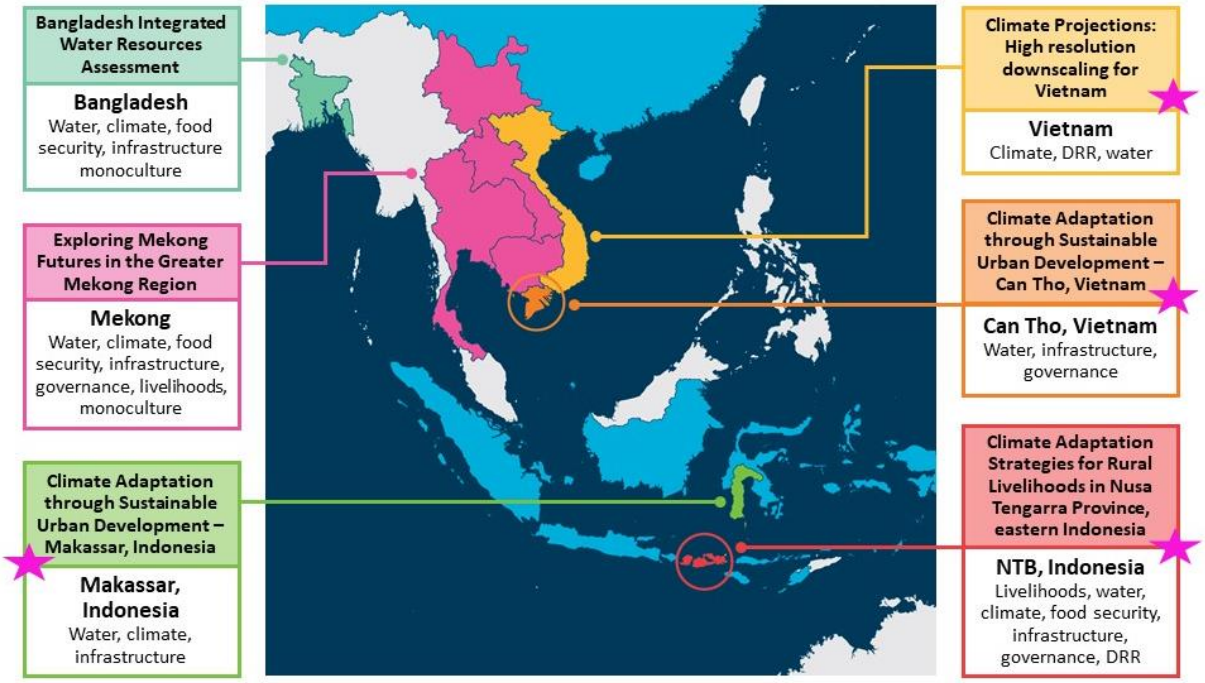


Figure 18: The R4D Alliance projects evaluated in 2014, with the four evaluated in 2015 and 2017 marked with pink stars.

The same three-step approach was undertaken across all six R4D Alliance projects in 2014 (Figure 18), with an additional step focusing on benefit cost analysis added in 2015 (Figure 19 with new step 3) where only four projects were chosen due to funding restrictions. These were the two projects in Indonesia and the two in Vietnam. The selection in 2015 was made by me, prior to becoming a PhD student, in consultation with colleagues based on potential continuation of the research activities, and qualities of the ongoing relationships. As outlined in Chapter 1: I was already thinking of undertaking a PhD and the events of 2014 had provided me with ideas that I wanted to explore in greater detail than was possible through traditional contracted evaluations.

The three-step process is outlined in further detail below.

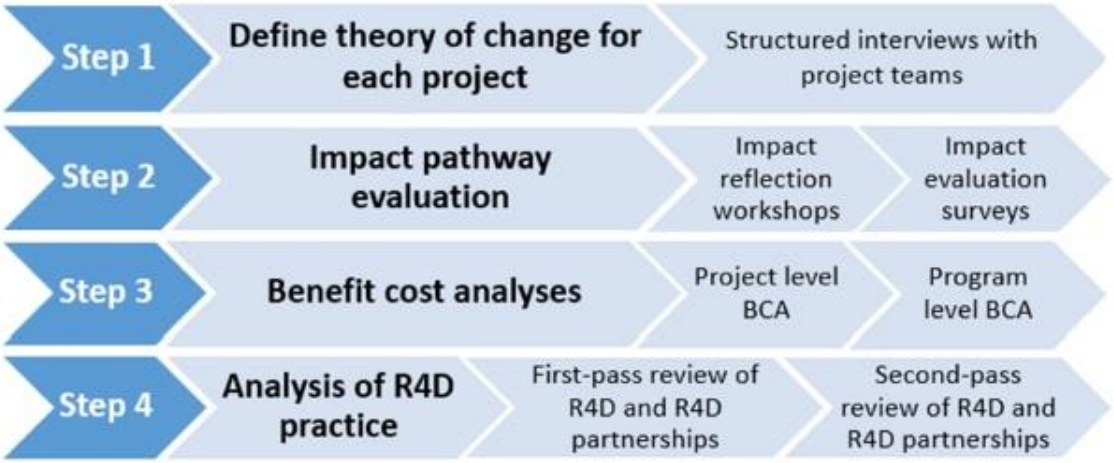


Figure 19: R4D Alliance evaluation steps, with step 3 only undertaken in 2015 (Lazarow et al., 2015)

5.3.1.1 *Step 1 – define the Theory of Change for each project*

This step had three activities. The first was a review of project material in order to develop a framework of analysis consistent with overall project objectives, stakeholder engagement opportunities and intended outcomes. This provided the background for the second activity, a structured interview process.

The structured interview was designed to compile 'stories' from inception/identification of a research idea or issue through the research process into dissemination of research findings and on towards its impact on the welfare of people and society. The objective of the structured interviews was to facilitate articulation of hypothesised (at the project design stage) and observed (after project implementation) impact and consideration of pathways from research to impact. Project teams were asked to describe the links between:

- Inputs, activities and outputs (e.g. knowledge production);
- Outcomes (generally defined as the changes in behaviour that result from the building of knowledge, skills and tools, evidenced in policy and practice that transform the way things are done), and
- Impacts (generally defined as social and economic impacts beyond the immediate project participants).

A common interview structure enabled collection of information that facilitated cross-case analyses and enabled the development of a 'narrative' about impact for each project.

Interviews were followed by a 3-day workshop, which provided an opportunity for evaluation team members to examine interview data for direct impacts as well as cross-cutting themes relating to the wider impact of the R4D Alliance. Step one was an internal CSIRO process to collect and structure information and initial results in order to inform the following steps.

5.3.1.2 *Step 2 – Impact Pathway Reflection evaluation workshops*

Step two was designed to assess the extent of progress that had been made along each project's impact pathway. The evaluation was structured using two activities: a self-reflection workshop with the wider project team; and an adaptive capacity impact evaluation survey. This process supplemented each research team's self-reflection process with a more objective survey assessment which included the views of key boundary partners.

A half-day participatory evaluation workshop was held with in-country research teams and stakeholders directly involved in the project. The applied nature of the R4D Alliance projects undertaken in contested contexts presented challenges for attribution of impacts at project completion, with project research partners and boundary partners best placed to assist with the diagnosis of impact.

The workshop took the form of a reflection exercise through facilitated discussion which enabled participants to reflect on:

- The research question/s and objectives addressed over the life of the project;
- The roles and expectations of project participants and partners – the project team, the boundary agents and potential beneficiaries; and
- The outputs, outcomes and impact achieved along the expected Impact Pathway.

The discussion provided an opportunity for teams to share their knowledge of the project and lessons learnt. Box 9 outlines the questions asked of the participants in the evaluation activity to identify the outputs, outcomes and possible future impacts achieved by the project during the three development phases (see Lazarow et al. (2015) for further detail of the approach).

Project teams were asked to map these outputs, outcomes and impacts on the project's Theory of Change and Impact Pathway (see an example in Figure 20), relative to their original expectations. These were placed on the line for 'project expectations met', above for 'exceeded' and below for 'not meeting expectations'.

The project teams mapped stage 1 activities such as training and skills building events, and outputs (such as reports and tools), and stage 2 outcomes such as new management approaches, through to new policy, plans and investment programs. They were also prompted to describe any claims of wider impact during stage 3 through scaled out implementation of new programs, and how that may be achieved in future.

Notes were taken by CSIRO staff of the results and discussions, with an interactive PowerPoint slide of the project Theory of Change projected as a boundary object to aid discussion and 'placement' of the outputs, outcomes and impacts.

Box 9: Reflection steps for evaluation workshop participants (Lazarow et al., 2015)

Research teams were asked to:

1. Rearticulate the research problem and goal for their case study, and this was used as a way to refresh the team's memory of the project, as well as a comparison against the original project proposal in order to catalogue consistency or deviation between the hypothetical Impact Pathway and the activities.
2. Identify the participants and partners over the life of the project, and their expected roles. This identified new/unexpected boundary partners or changes in project design.
3. List the new skills, tools and capacity development, and map each activity and corresponding output or outcomes on the project Impact Pathway.
4. Discuss and reflect on why certain outputs and outcomes fell below or exceeded expectations, what could be learned from this understanding, and how it could be used to inform the design of future research.
5. Identify what other changes were needed to maintain/strengthen the project's Impact Pathway and achieve its goal.
6. Reflect more broadly on the project, including on the Impact Pathway at project completion. Specifically, was it what they expected, if not why not, and what they would do differently if the project was repeated?

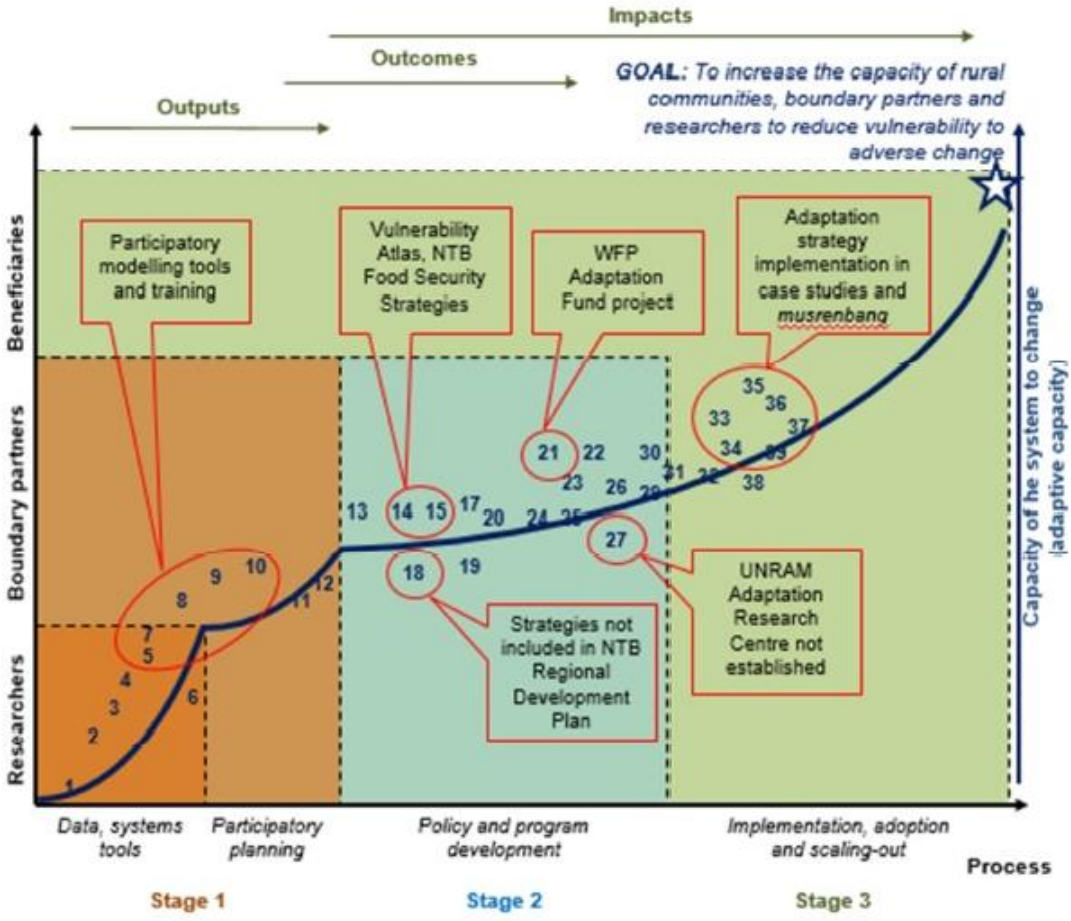


Figure 20: Mapping the hypothetical impact pathway (line) and actual project achievements (numbers) for the a R4D Alliance project. Mapping on or near the impact pathway line indicated that projects performed as expected, above the line better than expected, and below the line poorer than expected (Lazarow et al., 2015)

5.3.1.3 *Step 3 – Adaptive Capacity evaluation surveys*

A survey to measure adaptive capacity to respond effectively to change was developed by the evaluation team and administered by the evaluation team and selected in-country research partners. The question set draws on the scientific literature on social-ecological system transformation, adaptive co-management, social change and collective action processes (Plummer, 2009, Armitage et al., 2008, Armitage et al., 2009). Indicators and associated questions were aligned with the three broad stages of the Theory of Change and focused on eliciting views of change (i.e. what the project achieved) from a wider group of stakeholders.

Soon after each project's completion and again one year later, individual structured surveys were carried out by CSIRO and in-country research team members with members of the in-country research team and project boundary partners. Interviewees were prioritised according to whether they had been most directly involved in a project (i.e. Stage 1), and were therefore able to give the most comprehensive reflections about Stage 1, and possible early progress in Stages 2 and 3. Interviewees were asked to discuss whether they had observed evidence for each of the 18 indicators (Table 4) emerging amongst the stakeholders concerned. The indicators were then presented as propositions, and interviewees were asked to respond on a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. For each statement the interviewee was asked to explain their score and provide supporting evidence. If the interviewee 'disagreed' or only gave a weak 'agree', they were asked to identify barriers or impediments to a higher score having been achieved. In each of the case studies, members of the CSIRO team and the consultant trained in-country partners to undertake the adaptive capacity surveys on their behalf. This was due to language barriers, and time and resource constraints of the CSIRO project team, with each project surveying 15 to 17 people and the surveys taking up to an hour to perform. Further details on the survey design and results can be found in Butler et al. (2016a) and the R4D Alliance evaluation report Lazarow et al. (2015).

5.3.1.4 *Step 3/4 – analysis of R4D practice*

Step 3 (#4 in the 2015 evaluation) was developed in response to the independent mid-term review of the Alliance (Crawford and Swete-Kelly, 2012), which concluded that there were a number of opportunities to improve R4D practice by synthesising learning from across the individual projects, particularly to improve understanding of the role and fitness-for-purpose of research in the development context, and also of the structure and organisation of such partnerships.

The evaluation team reviewed a range of project outputs and ran a structured interview process where key CSIRO project personnel were questioned about their experience, practical learning and insights gained over the course of the project they were involved in. A first pass

assessment of material yielded key insights into these areas, which fed into a focused second review. Further details and the results can be found in Lazarow et al. (2015).

Table 4: The 18 indicators applied to evaluate progress for each stage (reproduced from Lazarow et al. (2015))

Theory of change and adaptive co-management stage	Indicator
Stage 1: Building capacity (Preparing the system for change)	1. Leadership emerging
	2. Trust created
	3. Vision and goal for an alternative development pathway
	4. New social networks established
	5. Knowledge of the problem enhanced
	6. Different knowledge types successfully integrated
	7. Questioning of values, norms and governance underlying problem, and awareness of its complexity
	8. Creative solutions and innovations developed
Stage 2: Policy and program development (Window of opportunity)	9. Management plans and agreements
	10. Enabling changes to existing or new institutions (formal and informal)
	11. Cross-scale social networks established (2nd scale)
	12. Resources made available for implementation
	13. New partnerships and cooperative initiatives
	14. New projects triggered by the project in other problem areas
Stage 3: Implementation, adoption and scaling out (Building resilience/ transforming to the desired state)	15. Implementation of innovations in arenas that can trial, monitor and learn from the experience
	16. Enabling changes to existing or new institutions (formal and informal)
	17. Cross-scale social networks established (3rd)
	18. New partnerships and cooperative initiatives
	19. Empowerment of the most vulnerable beneficiaries (communities), including women and children
	20. Enhanced self-organisation by beneficiaries (communities)
	21. Enhanced beneficiary (community) capacity to live with change and uncertainty

5.4 R4D Alliance summary

While funding for the R4D Alliance lasted 7 years, a long time by research standards, any stability can only be seen in retrospect. The reality at the time was that strategic direction and funding were far less certain. Each phase took months to negotiate, not only between CSIRO and Australian Aid, but also with in-country research partners and other stakeholders. Together with organisational change and staff churn/redundancies in both Australian agencies, funding, strategic direction and project continuity was an ongoing challenge throughout the life of the R4D Alliance.

While all of the R4D Alliance projects demonstrated impact, they were not as effective as they perhaps could have been and were having to respond to an uncertain and rapidly changing environment. Perhaps the perfect test case for adaptation after all!

Chapter 6: Climate adaptation through Sustainable Urban Development in Can Tho, Vietnam

This chapter utilises the R4D Alliance project Climate adaptation through sustainable urban development in Can Tho, Vietnam (SUD Can Tho) as a case study to explore the framework and concepts outlined in Chapter 4:.

Can Tho City is the fifth largest city in Vietnam, with a population of 1.25 million[2] located on the south bank of the Hau River in the Mekong Delta, 170 km west from Ho Chi Minh City (see map Figure 21). Located on flood plains, the regional economy is currently based on agriculture and aquaculture. Development is focused on the city becoming a regional service centre and industrial hub due to the Vietnamese Government's Master Plan (CSIRO, 2012). Can Tho city has nine districts, including five urban districts and four rural districts. Water service provision varies greatly, ranging from reticulated water supply and sanitation services in the urban areas, to no services for many rural areas (CSIRO, 2012). Climate change, rapid population growth and a changing social demographic have been identified as three of the biggest challenges for the city (CSIRO, 2012).

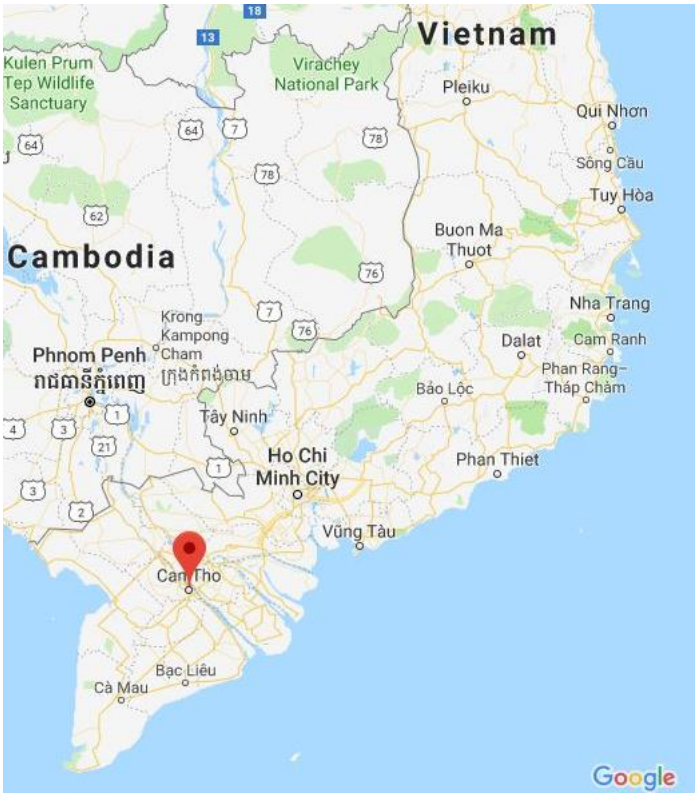


Figure 21: Map of Vietnam highlighting location of Can Tho (Google Earth, 2018)

[2] https://www.cantho.gov.vn/wps/portal/

6.1.1 The Project

6.1.1.1 *Project identification*

Vietnam was identified as a priority country for investment during the first phase of the R4D Alliance. Coordination with existing activities and capacity building with in-country research partners was of particular interest. As such, CSIRO staff visited Vietnam in 2008 and 2009 looking for opportunities to work on projects relating to climate change, urban development and coastal vulnerability. This resulted in several cities and regions being identified as potential case studies.

An initial sustainable urban development scoping project (R4D Alliance stage one, see section 5.1.1) was undertaken by CSIRO staff. This led to Can Tho being chosen as a case study site for the R4D Alliance phase two, due to increasing interest of international donors in the rapidly growing delta city and it recently having been classified as a Class 1 City by the Vietnamese government (2004). In Vietnam Class 1 cities are centrally controlled, and have been identified by the Vietnamese Government as significant in terms of politics, economy and culture (CSIRO, 2012). It was anticipated that significant infrastructure investment would be planned to support the rapidly growing population, with access to the city improved due to a new road bridge across the Hau River opened in April 2010.

CSIRO had other research links with this region including another R4D Alliance project Exploring Mekong Futures, which was working in partnership with Can Tho University (CTU). Project partners from the Institute of Sustainable Futures, University of Technology Sydney (UTS) were also connected through an Australian Aid funded project looking at sanitation options in Can Tho.

6.1.1.2 *Project objectives*

The Can Tho project was one of two sister projects exploring how water and wastewater infrastructure would be impacted by climate change and other key drivers in rapidly developing coastal cities. The research aimed to develop adaptive urban planning responses and support future decision making for infrastructure investment. The two projects aimed to grow Australian Aid's understanding of practical urban knowledge with in-country stakeholders, including researchers, national policy makers and urban managers. The projects sought to generate knowledge that would be relevant and transferable to other vulnerable cities in SE Asia for addressing health improvement, poverty alleviation and enhancing the quality of life of people. Makassar, Indonesia was the sister case study, which is also a case study in this PhD.

Three objectives for the SUD Can Tho project were identified:

1. Assess the risks of climate change on the sustainability of fresh water supplies and the functioning of the urban water system.

2. Through effective engagement establish future scenarios, planning and design alternatives for management of an integrated urban water system for the city that is adapted to climate and population change.
3. Build capacity among the country partner organisations to assess risks of climate change and develop climate adaptation strategies for sustaining clean water supply and sanitation as well as managing the unavoidable impacts of urban, coastal and delta flooding.

6.1.1.3 *Project partners and stakeholders*

The Project Team used Integrated Urban Water Management (IUWM) principles to assess the diverse range of water service options and for the development of criteria such as adaptability to anticipated climate change impacts. IUWM is designed to take into account the overall water cycle in the management of water supply, stormwater and wastewater.

A wide range of stakeholders were involved in the project planning and implementation, with a smaller subset engaged throughout the project via an Advisory Committee which met every six months. Stakeholders include national level government departments, local and provincial agencies and ministries, universities, NGOs, water authorities as well as donor agencies. The Advisory Committee was designed to provide high level oversight of the in-country research and to act as a forum for dissemination and feedback on the research activities and outputs.

The original project team was made up of staff from:

- CSIRO
- Institute of Sustainable Futures, University of Technology, Sydney
- College of Environment & Natural Resources and DRAGON Institute, Can Tho University, and
- the Can Tho Water Supply and Sewerage Company.

Australian Aid facilitated the engagement with relevant researchers, national policy makers and urban managers in Can Tho. By the end of 2012 staff from UTS had concluded their activities in the project and were no longer part of the project team, leading to CTU and the water supply company's role on the project increasing. During phase 3 it became apparent that the Can Tho city planners did not have the necessary GIS/mapping skills to house and maintain project outputs, so the Can Tho Department of Communication joined the project team to fill this gap.

6.1.1.4 *Project outputs*

By the time the project concluded in 2014, in addition to many reports and scientific publications, the most significant output was increased in-country partner capacity. This was largely as a result of the participatory planning method used and systems thinking developed by

researchers from CTU and CSIRO, which encouraged local stakeholders to depart from traditional silo management to an approach that reflected more integrated thought and collaboration.

The project also delivered a set of strategic adaptation options designed to improve water services and the environment, including an integrated assessment of both benefits and feasibility. To demonstrate one of the strategic adaptation options, the project established a rainwater harvesting pilot with two plants where rainwater is treated with a low-cost First Flush device, designed by CSIRO and CTU. The device collects the first flow of dirty water at the beginning of every rain event and siphons it off to avoid tank contamination.

One of the rainwater systems was installed at the CTU campus and is being used to study quality and treatment techniques, with rainwater used to flush toilets. This system is estimated to save about 100,000 litres of water per month for the building, currently being used by 500 students. Another system was installed in a household on the urban fringe and provides water for domestic use for approximately 20 people.

The project team also developed a Rainwater Harvesting Guidebook for the Mekong Delta, the first of its kind in Vietnam. The rainwater tank demonstration resulted in the NGO, Save the Children Vietnam, and CTU collaborating to manufacture 200 first flush devices, testing them in rural areas near Can Tho.

The project team created a City Water Atlas in the form of a map book and a WebGIS (Geographic Information Systems Resource) containing 30 GIS maps summarising current issues and challenges for urban water management. For example, maps can show the percentage of households served by water supply stations, or the level of surface water pollution, which helps the city's water utility company identify and target the most vulnerable areas for action.

The Water Atlas has been found to be an effective tool for communication and data sharing, and a practical platform for collaborative development among local government agencies. The city has initiated an adoption plan of the WebGIS, with the Department of Construction and the Department of Information and Communication leading efforts to develop a capacity building program with CTU to utilise and extend the WebGIS for management and planning of the city's infrastructure, including information on other issues such as transportation, buildings and electric power systems.

The Water Atlas is also being used to assist in planning in local departments, including the Water Supply and Sanitation Company (WSSC), the Centre for Rural Water Supply and Environmental Sanitation (CERWASS) and the Department of Natural Resources and Environment (DONRE).

More information about the project, including reports and other outputs, can be found at https://wp.csiro.au/r4da/projects/long-term-projects/climate-adaptation-through-sustainable-urban-development/case-study-can-tho-vietnam/

6.2 Post-project evaluation and change agents

This section starts with an analysis of the whole of the SUD Can Tho project evaluation using the Path to Impact workshop and adaptive capacity survey results (activities 3–6 in Figure 22), and concludes with a summary of the impact of the SUD Can Tho project by the time of the potential change agent interviews. The evaluation data was then used to identify potential change agents. Subsequent interview responses are then compared to the indicators developed from literature review (Activities 7 & 8 in Figure 22).

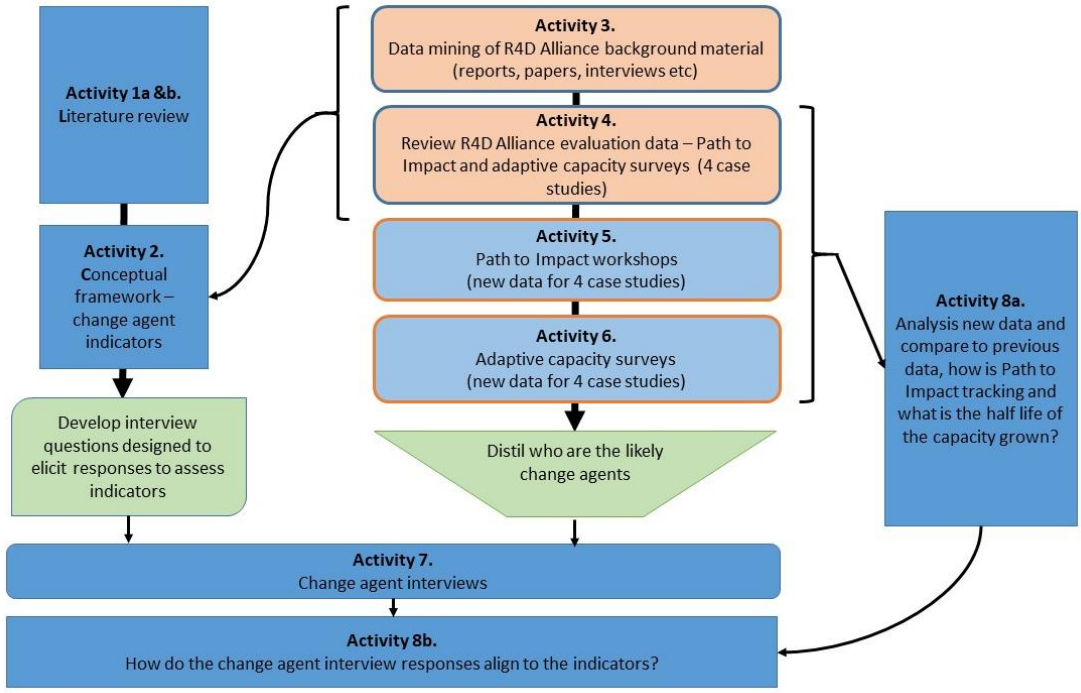


Figure 22: Thesis activity map highlighting how the review R4D Alliance activities feed into the case study evaluation, and where the theory and practice of change agents come together

6.2.1 Sustainable Urban Development Can Tho case study impact over time – Path to Impact Participatory Evaluation Stories from 2014 to 2017

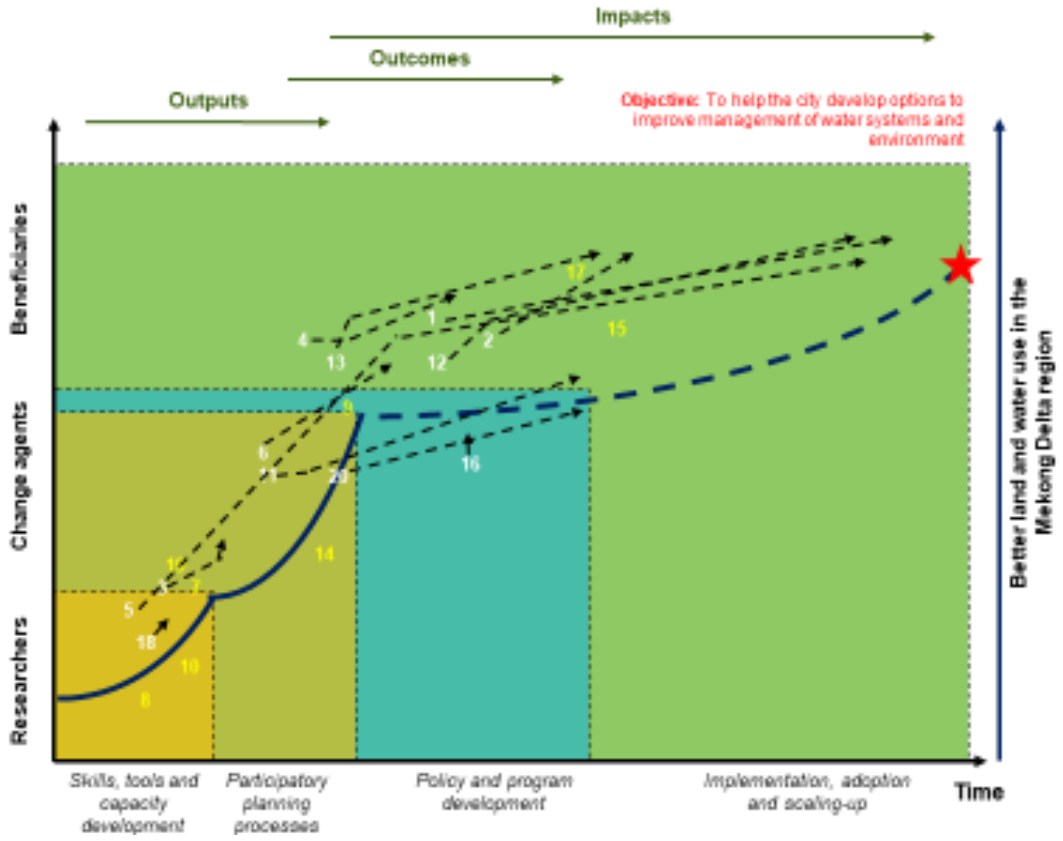


Figure 23: Project theory of change from April 2014 to June 2017. The SUD Can Tho project goal (red star) was to help the city to develop options to improve management of water systems and the environment. The white numbers with black arrows reflect the positive change in impact on the activity or outputs from 2014 to 2017. Yellow numbers reflect no change or additional impact between 2014 and 2017.

In June 2017 I undertook the third evaluation of the SUD Can Tho project with the CTU project team and the Can Tho Water Company (7 people). This started with a workshop to discuss the project's progress along the Path to Impact (Theory of Change) using the reflecting and sharing approach outlined in Chapter 5:. The afternoon session took approximately 2.5 hours and started with refreshing everyone's memory of the project aims and outputs, as well discussing the results of the 2014 and 2015 evaluations and outlining the process for the review session.

Rather than tell the story of each of the 20 impact points I will use a Most Significant Change approach (Davies and Dart, 2005) to provide a snapshot project impact across the three stages as articulated through the participatory Path to Impact process.

6.2.1.1 *Stage 1a – Skills, tools and capacity development*

The Can Tho City Water Atlas or map book **(#1)** was evaluated as having exceeded all expectations at the conclusion of the project. Through 2015 and into 2017 the map book continued to be used and updated regularly by the water supply company, with a district level map based on the project developed in 2015. The map book concept and associated GIS are also being scaled out to other water supply companies and through the Department of Information and Communication who are incorporating other types of information into the system, in addition to the original water focus. Knowledge of how to create a Water Atlas has been transferred to other provinces in Vietnam, with students helping these provinces to develop their own maps.

As of 2017 there is a provincial map for Can Tho, which allows for planning at a larger scale, and is being used for regional planning, with more government staff hired to extend and update the systems. In the past new staff would have required six months of training to use the systems, but due to the map process it is faster, saving time and resources. One respondent said, 'we just give them the map and they go with it'.

Training in GIS and spatial analysis **(#5)** had really taken hold by the end of the project, with the skills and techniques being used, modified and taught locally. By 2014 the CTU project team were getting requests for assistance from government departments and were helping other departments from within their university to access data from the government for research use.

By 2015 the water company had trained their staff to use the GIS system, as well as how to analyse the data and create maps and reports. Staff were using data and maps for strategic planning out to 2020. This activity continued into 2017, with training predominantly linked to the roll out of the map books (#1). The development of these skills and tools had triggered other work in Can Tho, such as with the World Bank and ICEM who were intending to build an open street map. CTU are now running training courses on open street map based on the SUD Can Tho project and are organising students to collect data (i.e. buildings, roads).

Another significant change was the integration of systems thinking into the project **(#6)** using future scenarios, causes and consequences in developing an implementation pathway. The Can Tho team continue to apply this thinking, as well as combining different data sets, and top-down/bottom-up approaches **(#11)** to other projects. The water company is also using the bottom-up approach to extend their service areas, and are using scenario thinking in their planning, i.e. 'if, then, what'.

Capacity building activities that were less successful included formal training courses, which were delayed **(#8)**, and the decision making tree – Bayesian belief network activity **(#10)**, which explored the social, economic and environmental needs for the area. This training was starting to 'open minds to the principles and concepts' but didn't quite achieve the project aims due to being suspended when the project funding was cut.

6.2.1.2 *Stage 1b – Participatory planning processes (outputs)*

The participatory research and planning approach developed through the project **(#4)** has enabled the multi-sectoral working group to work together and share data, knowledge and experience through presentations. This included the development of a partnership between the research team and local governmental agencies through the Can Tho Climate Change Office (CCCO). This participatory approach was ongoing in 2015 with the team still sharing data with other projects, such as with Griffith University on a health-related project, and with the CCCO about hot spots for water. This was aided by the development of a map overlaying urban and rural water supply.

Engagement was ongoing in 2017, including assisting the CCCO and newly developed Can Tho Resilient Cities office with their planning and project development. The main focus was to see how spatial data could be used for urban water management. Activity was also underway with the World Bank and Stockholm Environment Institute based on the SUD Can Tho project design and outputs.

What was less successful was the development of a set of strategies for urban water development **(#9)**; while close to the anticipated impact line this score did not change over the life of the project. In 2015 the CTU team heard that Can Tho City had incorporated the project results into its strategic plan (funded by the Rockefeller Foundation); however, the plan had yet to be released.

6.2.1.3 *Stage 2 – Policy and Program Development (outcomes)*

Stage two in the project Theory of Change was anticipated to occur towards the end of the project or shortly after project completion. The two most significant changes were the bottom-up/top-down research approach **(#11)** and the application of GIS in city water planning **(#12)**.

The bottom-up/top-down research approach centred on the sustainable design and planning of water services through a demonstration of rainwater technology to 160 households, determined through a 'hot spot' analysis of data. At the end of the project this was seen to be more successful than previously anticipated. While there was only minor improvement in 2015 with the water company applying this approach, by 2017 there had once again been a significant improvement in impact with more stakeholders engaged as people were experiencing it as an efficient form of management, incorporating the approach into policy and practice, as well as conducting further research.

The application of GIS in city water planning was also seen as more successful than anticipated at project conclusion with implementation by government departments, a water company and NGOs. Success grew over time and by the 2015 evaluation other local government departments were using the GIS approach, although with mixed results. The Department of Construction had started requesting GIS data from other agencies in order to update the GIS

reporting layers every six months, and a World Bank project was being designed with CTU to develop a GIS database for the whole city. As of 2017 GIS had become standard practice in local government, who not only understood what GIS was and its potential applications, but also how to use it.

What was less successful was operationalisation of the Integrated Urban Water Management (IUWM) application **(#14)**. This activity had been truncated due to the changes in R4D Alliance funding timelines, with no change post project as the process hadn't been internalised by the in-country teams.

Stage 3 – Implementation, adoption and scaling up (outcomes and impacts)

By project completion the project team had disseminated rainwater harvesting information **(#13)** in the provinces of Ca Mau, Soc Trang, Bac Lieu and Ben Tre. This was part of the project communication strategy and was extended through 2015 with a further three provinces and with colleagues in An Giang University. The work was presented at a Mekong workshop where 13 provinces were represented, as well as representatives from the farmers' association, women's union, youth league, NGOs and local governments.

A communication strategy was built on the success of the Rainwater Harvesting Guidebook **(#2),** as by 2017 the in-country team had developed several books on rainwater harvesting and developed internet sites to share information linked to the original guidebook. Other Vietnamese universities are now developing the water harvesting technology, expanding the work to water sensors and discussing rainwater futures for the Mekong.

Associated with this was the expansion of the rainwater harvesting demonstration by the Vietnamese arm of the international NGO, Save the Children **(#15)**, with 220 houses included in the first expansion, and a further 58 by the 2015 evaluation with plans for more in the coming years. CTU were also in negotiation with a private company to mass produce the rainwater harvesting system in order to make it more affordable. However, by 2017 the planned further expansion by Save the Children had failed to materialise, as had the private mass production, due to high production costs.

The project team intended their outputs to be adopted by provincial government agencies by the conclusion of the project **(#16**). At project conclusion this had mixed success with CCCO, WSSC and DONRE having adopted some of the project outputs, with the uptake of other outputs slower than expected (Department of Planning and Investment, Department of Construction and Department of Agriculture and Rural Development). This impact was still felt to be below the line in 2015 although with some improvement as the CCCO, the Water Company, and the Department of Construction and Department of Information and Communications continued to be interested in the project outputs and engage with CTU. The Water Company was using the

project results and products, the Department of Construction had been engaged and the Department of Agriculture and Rural Development had requested a meeting with CTU and invited others to discuss applications of the WebGIS. However, by 2017 there had been no change in spite of the project team attempting to encourage the other government departments to come on board.

6.2.2 Evolution of the Adaptive Capacity Evaluation Stories from 2014 to 2017

In addition to the Path to Impact participatory evaluation workshops, the SUD Can Tho project was evaluated using adaptive capacity surveys with project participants, including in-country research partners and boundary partners. As many of the original 2014 evaluation participants were re-interviewed in 2015 and 2017 as possible, noting that some people had retired or were studying overseas. Seventeen interviews were sought and completed.

The Path to Impact and adaptive capacity evaluation have been used to track impact over time, triangulating and cross checking the stories between the processes, as outlined in Chapter 5:. The focus of this research is to explore the importance or otherwise of potential change agents in systemic change, so the first step is to test whether systemic change happened.

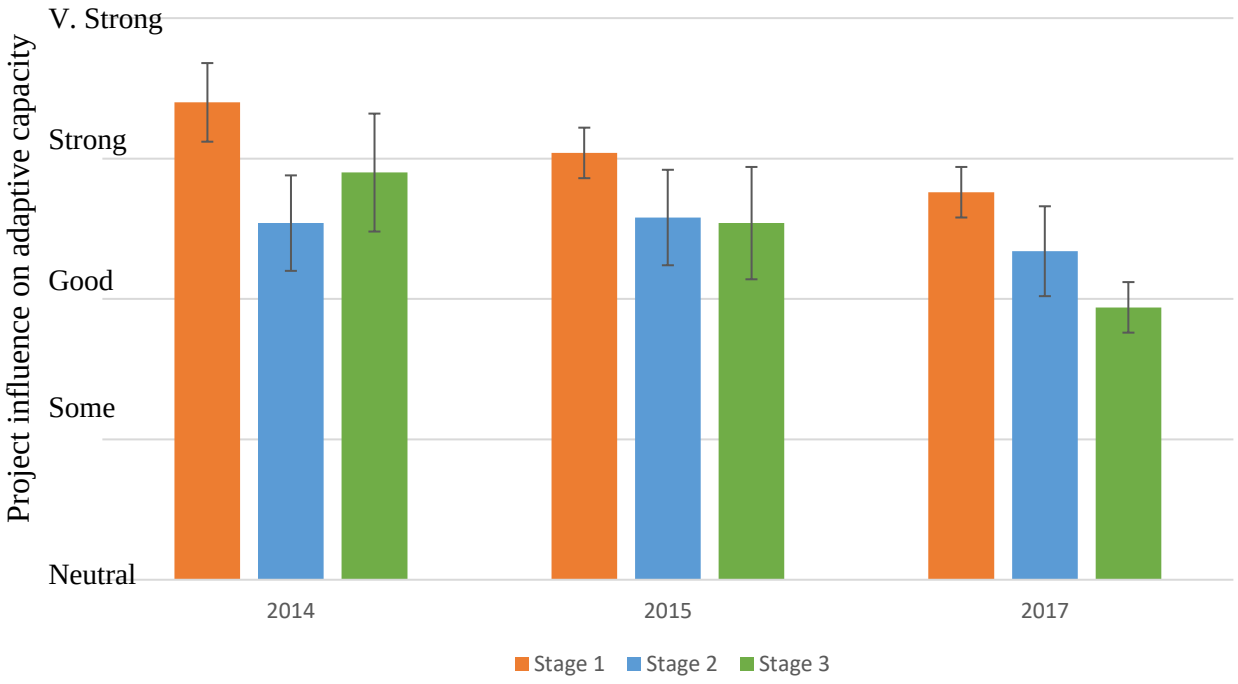


Figure 24: The influence on adaptive capacity across the SUD Can Tho project's three impact pathway stages in 2014, 2015, and 2017. Each stage is represented by an average of indicators for that stage, with error bars highlighting the range of responses to indicators.

6.2.2.1 *Adaptive Capacity Overview*

Across all time slices, the SUD Can Tho project had the greatest impact in stage 1, which focused on developing skills, tools and capacity, and the participatory planning processes (see

Figure 24). This is perhaps expected as these were the core aspects of the project and what the project team had the most control over. The perceived impact in stage one decreased slightly from the end of the project from just above 'strong' in 2014 to 'strong' in 2015, and then just below 'strong' by 2017. This is likely a result of people normalising the project tools and approaches, and no further project capacity development being undertaken.

Stage 2, program and policy development, had perceived impact between 'good' and 'strong' for the SUD Can Tho project in 2014, which was maintained in 2015 before declining very slightly in 2017, with a similar range of scores. This broad overview suggests that the hoped-for uptake of information, tools and methods into policy had partially occurred, and been maintained. However, as will be outlined below this was not as successful as was hoped by the project team, somewhat contradicting the high scores.

Stage 3, implementation, adoption and scaling out, was anticipated to take the longest to achieve and could reasonably be expected to occur only after the project had finished, giving the project team the least amount of control over the impact results. Yet due to the focus on first flush water tanks, and the WebGIS map book, the project managed to achieve 'good' to 'strong' impact in stage 3 across both 2014 and 2015 time slices, before slightly declining in 2017. As explained in the PTI evaluation, the water tanks were rolled out more widely in the Mekong delta due to other agency interventions but were too costly for local direct manufacturing and purchase. The map book continues to be used and updated, but the wider sustainable development planning has yet to be incorporated into local government planning as per the project aims. The success or otherwise of the water tanks and map book became a key indicator of potential change agent identification for subsequent interviews.

6.2.2.2 *Stage One – Building Capacity*

Stage one (building capacity) had the highest-scoring indicators across all three time slices of the project, although the Path to Impact evaluation (section 6.2.1) highlighted that not all capacity building activities were successful. As outlined in Chapter 5, the stage one adaptive capacity survey included seven indicators based on adaptive co-management principles. Six of these indicators were assessed across all three time slices, with the seventh (vision and goal) only assessed in the first time slice (see Figure 25).

Averaged across the three time slices, 'leadership emerging', and 'knowledge enhanced' consistently received the strongest stage one scores, with 'knowledge integrated' and 'creative solutions' also scoring well in 2014 before declining in 2015 and 2017, and having an increasingly wide array of scores. The lowest scoring stage one indicators were 'trust created' and 'new social networks', although 'trust created' strengthened in 2015 before declining in 2017, while 'new social networks' slightly strengthened and both indicators also had larger standard deviations, 0.53 and 0.65 respectively, than the other stage one indicators.

Figure 25: The influence on adaptive capacity across the SUD Can Tho project impact stage 1 in 2014, 2015 and 2017. The error bars show the range of scored answers. No result indicates that the question wasn't asked in that year.

6.2.2.3 *Stage Two – Policy and Program Development*

The Policy and Program Development stage had weaker indicator scores overall than stage one. The overall scores were slightly higher than 'good' across all three time slices (see Figure 26). The highest scores were 'changes to institutions', 'cross-scale networks (2nd scale)' and 'new partnerships', reflecting the new relationships with local government. 'Resources' had the weakest indicator score, declining from just over 'good' to just below 'good' by 2017. This indicator also had the largest array of scores, suggesting perceived differences in access to resources following on from the project.

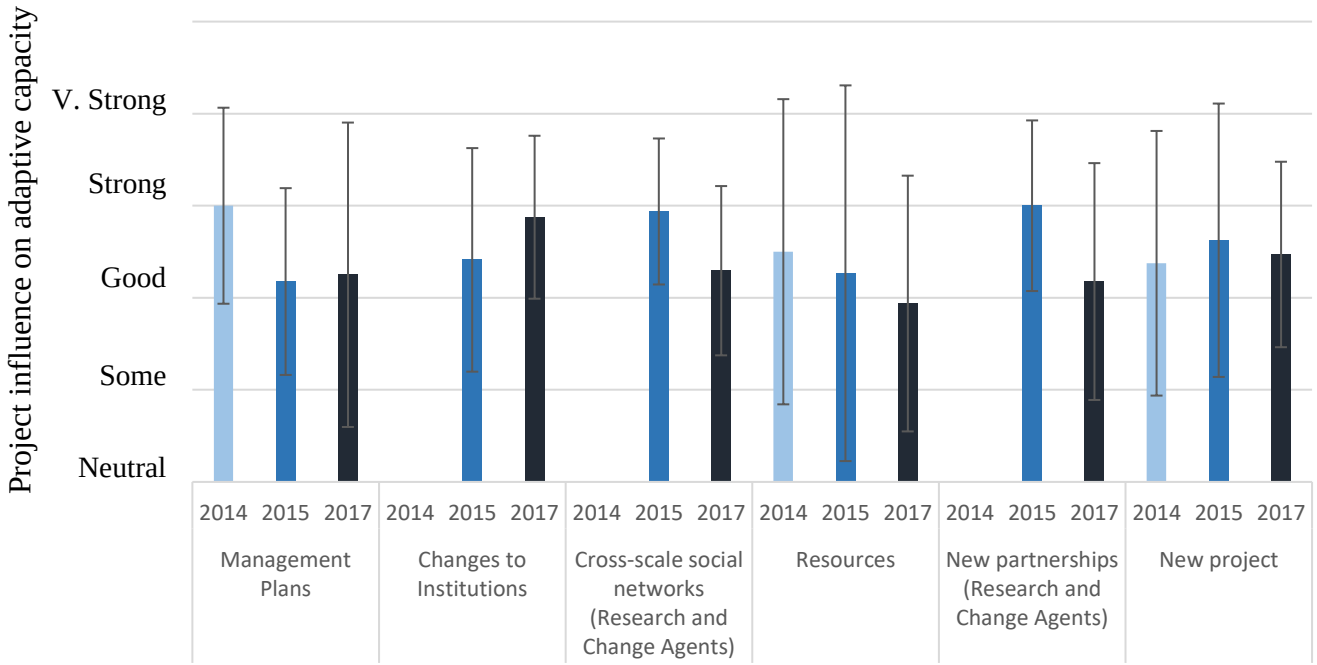


Figure 26: The influence on adaptive capacity across the SUD Can Tho project's impact stage 2 in 2014, 2015 and 2017. The error bars show the range of scored answers. No result indicates that the question wasn't asked in that year

6.2.2.4 *Stage 3: Implementation, Adoption and Scaling-Out*

Like stage 2 the implementation, adoption and scaling-out indicators had relatively high scores for 2014 and 2015, before declining in 2017, with evidence that relationships developed between stakeholders as a result of this project were starting to weaken and the relative success of first flush systems and the map book (see Figure 27). By 2017 it was more difficult to attribute impact associated with the project, and some had hoped for a wider roll out of the first flush system.

The overall highest-scoring indicators for stage three were 'helping vulnerable beneficiaries' and 'enhancing beneficiary capacity'. The lowest overall score for stage 3 was 'enhancing self-organisation', reflecting the challenges with accessing resources for creating first flush systems that were affordable for direct purchase by communities.

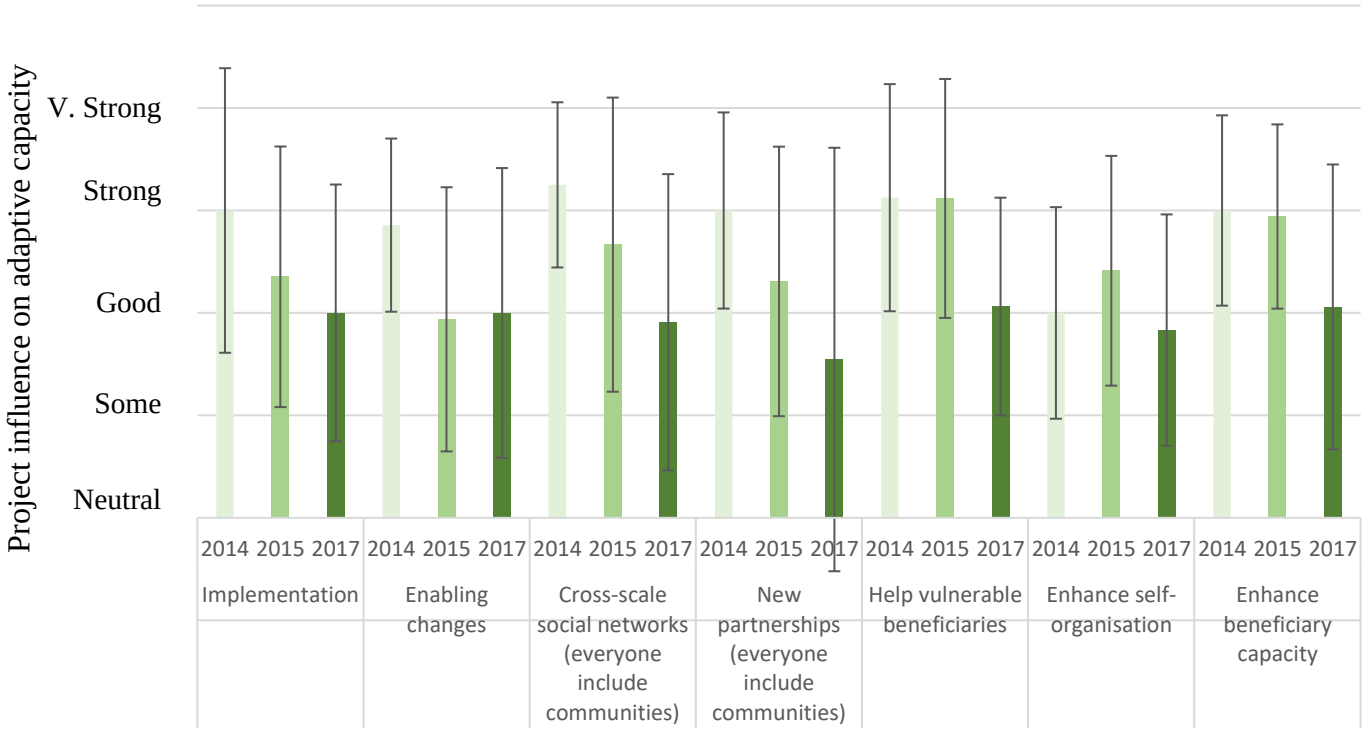


Figure 27: The influence on adaptive capacity across the SUD Can Tho project's impact stage 3 in 2014, 2015 and 2017. The error bars show the range of scored answers.

6.2.3 Synthesis of the evaluation results over time and distillation of potential change agents

Through reviewing the Path to Impact evaluations and adaptive capacity surveys I was able to distil the key individuals mentioned as growing in capacity or leadership. Over the three time slices it became apparent that by 2017 the majority of the core university team continued to work together on other projects and maintain their connections with local government.

Several names reoccurred throughout the evaluation, with four individuals most commonly mentioned and therefore identified as potential change agents. All those surveyed and interviewed in Can Tho were allocated a unique identifier for anonymity, i.e. CT #. The subsequent list was then shared with the SUD Can Tho CSIRO project leader who added a name that had been missing from the list. My interview list was provided to partners within Can Tho and interviews were arranged. However, two interviews that were requested were not able to be undertaken, one due to a change in location and difficulty in connecting with them, and the other due to significant illness of the interviewee. Overall nine interviews were undertaken, five of whom were researchers, three were local government officers, and one was a beneficiary of the project activities.

6.3 Potential agents of change

The nine interviews were used to elicit information from the interviewees to see if the set of attributes discovered through the literature review (Chapters 2 and 3) were the necessary and sufficient set to determine what makes and motivates a change agent, focusing on their capabilities and capacities, characteristics, and roles (activity 7 in Figure 22, p.101). Some of the interviews were direct with the individual, while others required the assistance of a translator. Each interview took between 25 and 45 minutes. The results below are outlined by attribute indicator and conclude with a summary of individuals identified as potential change agents.

6.3.1 Capacities and Capabilities

A review of capacities and capabilities needed to enact adaptive change in individuals and groups can be found in Section 2.2.2.3.

6.3.1.1 *Skills*

Skills can be thought of as tools for change, whether that change is specific to the individual, or their ability to undertake and engage in social change (Roberts and Lacey, 2008, Petzold and Ratter, 2015). The SUD Can Tho project specifically built the skills of project participants through formal training and collaborative participation on the project. Skills developed centred on the technical, and strengthening and widening research skills of the project team, and included facilitation, scenario planning and climate downscaling, as well as IUWM system underpinnings, like GIS and the development and testing of the first flush rainwater harvesting system included.

Most interviewees felt that they had the appropriate technical skills for their roles, but appreciated the technical training that they received from the project, which raised their awareness and understanding of the causes of the problems (CT 8, 10, and 12).

> *This project has provided the basis to improve awareness and understanding of the causes of the problem (CT 2)*

> *I have learnt this effective method from this project and applied it for other workshops in Can Tho City. (CT 5)*

The adaptive capacity surveys and PTI workshops, together with developing a better understanding of the systems perspective, were most often mentioned as a new skill for the researchers. In particular, interviewees felt that the ‘new method’ of collecting responses from stakeholders through a workshop approach was very useful and something they continued to use and apply in other workshops (CT 2, 5 and 7).

6.3.1.2 *Competencies*

If skills are tools for change, then competencies can be thought of as combining skills with abilities and behaviours to create a certain 'know-how'. See Chapter 2:, for a list of the competencies identified. Competencies are not independent of each other, with attributes and indicators potentially aligned to multiple competencies.

Several interviewees mentioned working through challenges or misunderstandings by talking with, and being open to, others. They mentioned wanting to get better at understanding, working with and helping others (CT 2, 6, 8 and 24).

> *How to work with the people. Not just work with, you have to facilitate them, to help them with some way, to introduce them to the right people. Of course you have to help them behind, and that is very very important. Like having to help prepare to facilitate the workshop, and I had to check with some other people behind the scenes arranging things and follow up. (CT 6)*

Others mentioned needing to have a level of self-confidence, self-motivation and ability to regulate what you can do, and to have a vision and the patience to get where you want to go (CT 2, 14, 10).

> *Not letting it go, but not hurry. Patience to get to where you want to go. Don't rush. (CT 2)*

Interviewees suggested that while they were keen to grow their skills it was the wider range of competencies and understanding that was more important and interesting to them. These included management, communication, thinking skills (including systems, integration and strategic) and how to evaluate projects and programs. These are a mix of what Wiek et al. (2011) refer to as regular and sustainability competencies (CT 2, 5, 7, 8, and 10).

> *Before I admired people like Einstein or Newton, but now I think people like Bill Gates is much more interesting because he is a philanthropist. Before I hated business, but now I see that business is a viable way to do things. When we talk about sustainable we usually think a lot about the environment and the social, and we are a bit against the economics – thinking those guys! It was funny 5 years ago I still thought that, but now I think differently. … I want to educate myself, and I'm more interested to that part. (CT 24)*

> *Integrated aspects to be consideration of social, engineering, economic, etc. into many research and teaching activities. In addition, the project assessment methods have been considered to be done after project ended (CT 8)*

This shows that the projects surfaced for the participants the importance of a having wide range of competencies, including how options and insights could be created from combining different competencies.

6.3.1.3 ***Resources***

As outlined in Section 2.2.2.2 it is not just a matter of having the skills and 'know-how' to make change happen; agents need to have, or be able to access, resources needed for change.

Everyone interviewed struggled with a lack of time or funding; some struggled with both. Time seemed to be the most consistent struggle with many indicating that their work came at a cost to their families and their weekends (CT 7, 14, 24). This lack of time stemmed from competing roles and expectations and increasing pressure for people to undertake a variety of activities, although some interviewees, while busy and time constrained, felt better able to manage the situation.

> *For my work I think there is not enough time, I have to steal the time from my family. … most people don't have enough time (CT 7)*

> *No – we are very fragmented. At the moment if I need anything I don't know who to talk to, or who to ask about the situation. … most of my time is spent struggling with … too much administration. … I think everyone is struggling with that, we have less time to do science and reading. It is a shame. (CT 24)*

> *That is my challenge, … because if I do everything of course it will take a lot of time from me, but also the other people will not learn anything. … But still very very busy. … I still have time to do some of my favourite research work, so I think I can manage. (CT 6)*

For others time was sufficient, it was the lack of money that presented their main challenge which they felt also limited the type of people who went into research and government roles. In Vietnam, a majority of people work multiple jobs to create a whole 'liveable' salary. For example, a university staff member might have a basic salary for teaching a set number of hours a week, undertake externally funded research projects, and have a family business on the side generating additional income.

> *Time is enough, but the money is not enough. In general the government salary is not sufficient for the staff and as a result they struggle to get high quality people (CT 5)*

Other interviewees focused on the lack of resourcing for working with stakeholders and implementation of project results. One interviewee highlighted that the allocation of resources

depended on who you were able to engage with in government, and what their role and ability to influence was (CT 6).

6.3.1.4 ***Knowledge***

Knowledge includes facts, information, and skills acquired through experience or education. Section 2.2.2.1 outlines more about the dual definition of knowledge, both as a thing and an understanding, and the implications of 'whose knowledge counts' and what enables effective knowledge exchange.

Interviewees spoke about the knowledge they gained from the project on topics such as sustainable development, water systems and the environment, integration approaches, and how to assess the current socio-economic context. This led to new interests for some interviewees who were undertaking further research based on what they were introduced to by the project (CT 5, 6, 7, 8, 10, 12, 14 and 24). CTU are now exploring offering a program and a degree on urban and regional planning as a result of the project. Others spoke about sharing the knowledge that they had gained with others (CT 2, 5, 6, and 14).

> *For example when the workshop was organised I saw how the experts shared information and I learnt how to share information and share with local stakeholders, as well as getting information from local stakeholders (CT 5)*

> *Another difficulty occurred when collecting rainwater tank knowledge for the farmer, the researcher knowledge is different from the farmer knowledge so we had a problem. At the time we had to make the technical guidelines more simple, we had to transfer the knowledge by teacher and we had to look for a more simple way to transfer the knowledge (CT 7)*

Some noted that this was also a challenge and required them to learn how to be better at communicating with stakeholders, and how to incorporate stakeholder knowledge (CT 5, 7, 8, and 12).

6.3.2 Characteristics

Characteristics of change agents have been divided into concepts of mastery, values and beliefs, self-efficacy, and entrepreneurship. More on characteristics can be found in Chapter 3:, starting on p.45.

6.3.2.1 ***Mastery***

Mastery is about the focus on lifelong learning, being reflective and reflexive, including a personal long-term vision and purpose, as outlined further in Section 3.1.2.

Interviewees revealed being both adaptable and resilient to changes and challenges in their worlds. This was often combined with a belief in themselves and what they were trying to do. While being adaptable, interviewees recognised the need to be self-motivated and persistent, suggesting that uncertainty or discomfort acted as drivers of learnings and growth.

> *Of course with the big challenge we must believe in our job, my job. Of course we must learn much to solve the problem. I think if you have to believe in yourself so that everyone will help you. … but most of the younger people want to do their job out of duty, they don't have the heart in the job. (CT 2)*

> *I was in a situation where you don't know what to do. But I realise when you feel that you learn a lot. (CT 24)*

Many interviewees highlighted the importance of learning in their lives, either seeking advice from others or mentioning that they spent time thinking and reflecting about what had worked for them (or not) in the past. This included being able to draw on multiple sources to contribute to their understanding and being open and interested in things such as how the world works, and in what others are doing. For some interviewees this included questioning the status quo, and how their system currently operated.

> *I became more confident, which I think is the most important. Because our education strategy here is to get the children to listen to the older and obey. But there you are free and very confident. The first thing is that you should be very confident, as it opened many things for me. (CT 6)*

> *Need to look back and assess critically what worked before moving forward. Of course this is the rule of life (CT 2)*

As the time series of evaluations progressed, more of the survey participants and interviewees expressed an interest in the project evaluation approach and the concepts underpinning Theory of Change, and how they were applying these ideas in their own lives and projects.

> *It is important to learn from work, some projects have no evaluation. I like the evaluation work that you are doing (CT 14)*

> *Interested in the evaluations and that you [CSIRO] keep coming back. I am learning about that too (CT 5)*

6.3.2.2 ***Values and purpose***

Personal values, beliefs and attitudes often stem from a sense of purpose and a set of core values which provide guiding principles for life and inform a personal world view. These values,

beliefs and attitudes go part way to explaining behaviour and guiding action. More about values and purpose can be seen in section 3.1.1.

Just over half of the interviewees described having a longer-term goal or focus for their careers. The three main areas of purpose were a love of the region (sense of place), helping people (especially those that were disadvantaged) and wanting to protect or conserve the environment (sustainability focus) (CT 2, 5, 7, 10, 14, 24).

> *I love the Mekong Delta so anything I can do or research I can support about the Delta to help the people in the Mekong river, this is my interesting thing to do. … My biggest aim is to help everyone, especially the people around us, around me to have a good life (CT 2)*

As mentioned earlier all interviewees revealed learning as an important and pre-existing value to them, and that this was why many had gone on to become researchers. This was reflected in several of the interviewees stating that they loved or believed in their jobs (CT 5, 24, 12), with one interviewee describing it as their 'hobby' (CT 14). Others described having a personal value that drove them to work with others, wanting to help others, or caring for others (CT 2, 10, 24), emphasising the importance of trust and relationships.

> *As long as you create trust with people you will see the thing going along quite well. But also be careful, if people trust you, you need to value that trust. Trust sometimes is interesting, and it changes over time as well. … it is like a married relationship, it is not a done deal. It is ongoing. (CT 24)*

Many of the interviewees described how the project changed them and their values, making them more community aware, changing perceptions of how to facilitate education, and how different the 'participatory action research' approach was from their previous activities, and while harder it was also more satisfying (CT 5, 6, 7, 24).

> *I've seen how it change us, including me (CT 6)*

> *The project … changed my life – a big change. Before that I was a scientist, sitting tight in one place, doing my simulations and believing too much in the accurate numbers or something. … and now I would say that it is totally wrong. … how to engage with people about the research and the results. It is way more complicated and difficult, and interesting (CT 24)*

However, not everyone's values shifted as a result of the project, with some interviewees mentioning that they didn't really care about benefiting others, that they liked doing research and finding interesting things, and wanted to focus on that (CT 8).

6.3.2.3 *Self-efficacy and collective efficacy*

Self-efficacy is one's belief in one's ability to succeed and is a precursor to agency, motivation and self-regulation. R4D interventions emphasise the role of agency and perceived self-efficacy in achieving adaptation and change, which are outlined further in section 6.3.2.3.

Over half of the interviewees mentioned a sense of self-confidence, or personal or proxy (influencing through others) efficacy with some stating this had grown as a result of the project (CT 2, 5, 6, 10, 14 and 24).

> *I have said to them first you must have a database, a good database. Second you must have organisation, a good relationship with the local chairman [politician] and other local departments. Third you must have a group of people that help, and have a big heart, and are ready to work with you. They want to work with you. Lastly you must have fun, good fun and a good plan for your work. (CT 2 describing their approach to making something work)*

> *I am proud. I really contributed something. We talk about that here, we can't change the world. But to me it depends on your perspective. (CT 24)*

Most interviewees also described elements of collective efficacy, such as when challenged they sought the knowledge, advice and support of others (CT 6, 7, 8, 10 and 14).

> *I have good environmental working, everyone together, sharing together and very pleasurable in our working together. I've got support and we work together. (CT 14)*

> *Normally we sit together, in meetings and have discussion until everything is clear. Normally we don't have big trouble, just a lack of understanding about the job. Then we agree together to work together. (CT 8)*

6.3.2.4 *Entrepreneurs*

Entrepreneurship is the ability to include a positive (although not naive) open mindedness to possibilities, and a systems perspective that enables pattern recognition, with an ability to recognise windows of opportunity or serendipity, as outlined in Section 3.1.4.

The context in Vietnam encourages a sense of entrepreneurship. As mentioned earlier, university and government salaries are quite low, so to create a liveable wage individuals often work multiple jobs or are active in creating opportunities in other aspects of their lives, such as academics who have research projects (which add to their income) and run private businesses to supplement their base wage. This was reflected, in part, by some interviewees highlighting their

ability to see something in another context and recognise it as applying to their own, and being able to propagate it.

> *I learn about the adaptation tipping point approach and when I did the paper I saw the results and the analysis for the water supply in Singapore and now I come back and use the method for the Mekong Delta (CT 7)*

> *... I saw a map of Australia about water. You had one map and many smaller maps about different aspects of Australian water, it is very good and helps you visualise clearly and helps you to understand things very quick. ... So I saw that and I came back and I asked for a copy and said we want this, because that is the best way to communicate with the Departments. I know they want this but they don't know how to describe it to you. So you look at this, we want this. And now we have it. (CT 6)*

Others talked about 'seeing problems' and coming up with ways to solve them, often persisting for a long period of time until the value of what they were attempting to do became obvious to others (CT 2).

> *I would like to help young people get new concepts for visioning, and help set up their businesses or company and (encouraging) them to create a plan for the future. ... I have applied to the Can Tho government to get permission to. (CT 5)*

6.3.2.5 ***Serendipity***

Windows of opportunity can be seen as a set of unconnected opportunities or innovations that unexpectedly lead to options that had not previously existed. Chapter 3: described how windows of opportunity are seen or opened more frequently by change agents who are prepared, open, connected, observant and reflexive.

Interviewees mentioned that they felt they were quite lucky, although they worked very hard to enable that luck. Some mentioned that 'the right people arrived at the right time' to help in a given situation, and that people were willing to help them achieve their goals (CT 2, 6, 7, 24). Others spoke about the chance to travel and see or learn new things which gave rise to ideas or innovations that could be applied in their lives and work (CT 5, 6).

> *So you look at this, we want this. And now we have it (CT 6)*

6.3.3 Roles

Roles position agents within social networks. An agent may have many formal and informal roles and functions, within both their communities and organisations. These roles will shift over time, and in different contexts, as described in Section 3.1.5.

Most of the interviewees were involved in research and/or education in one form or another. Many of the CTU interviewees identified as lecturers who also have research and administration activities, as well as interests in private enterprise as outlined in the previous entrepreneur section.

All of the interviewees mentioned having multiple roles and spoke about the challenges associated with that. In particular some mentioned the challenge of balancing their roles at work and their role in their families, and wider communities. One such example was the trade-off associated with the Vietnamese rule about career progression and the number of children you have. If you are a government employee, your career can be constrained if you have more than two children (Population Ordinance, 2009), leading to interviewees trading family desires against opportunities for progression and influence in their careers.

> *if you are in a relationship with many children you can't move to a higher level in Vietnam (CT 5)*

6.3.3.1 ***Autonomy***

While roles are important, they can also be constraining. Agents are more likely to try new things or engage in 'deviant behaviours' if they have some level of autonomy, as outlined in Section 3.1.6.

Overall, interviewees suggested they increasingly had a lot of autonomy, particularly in their research domains rather than their administrative or management roles, where they 'had to follow the system'.

> *I think normally I have some freedom to change, but firstly I follow the regulation of the ministry. The changes should be in alignment with the regulations in our country. But for the research there is a lot of freedom, but for certain activities you need to follow the rules. (CT 8)*

> *Not letting it go, but not hurry. Patience to get to where you want to go. Don't rush. (CT 2)*

Outside of the university, interviewees indicated they had less freedom in their jobs, with work assigned from higher levels. However, all interviewees in this category talked about their ability to influence decisions, although a couple noted that this often required patience and playing the long game.

> *If I compare to work in CTU to work outside, in CTU I can make a choice about work and have more freedom (CT 7)*

6.3.3.2 ***Networks***

It is important to note that people do not operate in a vacuum. Behaviour, attitudes and values are personal characteristics, but they are also shaped by social structure and the networks that people engage or are embedded within, as summarised in Section 3.1.6.

Much like the entrepreneur and role sections above, the interviewees belonged to multiple networks through the course of their lives. Their supporting family network was almost always mentioned, with family being a very important aspect of Vietnamese life. Others revealed that they stayed connected to former university peers or colleagues from previous roles. These contacts remained important for their current roles, some having got to where they are now due to their networks, while others leveraged these connections to influence situations in their working lives.

> *related to many people, so many people support. (CT 12)*

> *Family is important, even the young, my parents, brothers, the whole family. At work, he has always had the support of his boss and colleagues. It is not one way, I support them too. (CT 2)*

> *when I graduated from university I went to HCMC to get a Masters degree and one of my lab mates was the director of the water supply company and introduced me to the company. When I would like to come back to Can Tho, Dr… made an opportunity for me. (CT 7)*

All CTU interviewees cited the importance of the teams that they worked with, and how much support they received from their colleagues, including brainstorming ideas or consulting on problems, substituting for each other when research meetings clashed with lectures, and working together on research projects.

> *you must have a group of people that help, and have a big heart, and are ready to work with you. (CT 2)*

> *Colleagues at work and teachers from my former university connect with and support me. (CT 5)*

The networks built through the SUD Vietnam project were also mentioned, with connections between the university and local government strengthening over time.

> *I have good environmental working, everyone together, sharing together and very pleasurable in our working together. I've got support and we work together. (CT 14)*

> *the partnership between us has increase. (CT 10)*

Coffee and friendship was another theme that emerged from the interviews, with many interviewees outlining the support and advice they received from their network of friends, and how important it was for them to maintain this network. This was reinforced given that many of the interviews were undertaken at a coffee shop, either before work or on the weekend.

I get a lot of support from the close friends and they appear in my life at just the right time. (CT 24)

When I have problems I call friends and search/ask for solutions and advice. (CT 10)

I try every morning to go to coffee with friends. That is an advantage of living in Can Tho. Here there are many nice coffee shops and many friends (CT 6)

6.3.4 Emerging Themes

Two themes emerged through the interviews cutting across several of the other themes. The first was technology and how it was changing how people learnt, worked, and interacted. The second theme was having had the opportunity to study or work for longer periods of time overseas.

6.3.4.1 *Technology*

Since the start of the project, technology had changed how people learn, work, and interact. For the most part this was seen as positive, although some challenges of globalisation such as global commodity markets and the movement of people were mentioned. Interviewees highlighted how technology was making it easier for people in developing countries and those outside of academic or research institutes to access knowledge and skills.

Many of the interviewees mentioned how the internet had provided them with access to information that they didn't have before, and that this was improving their ability to learn as well as to connect with others for knowledge and advice. Others mentioned how the change in technology was helping them stay connected to their networks, whether that was through Facebook, Skype or Yalo, or with practical issues such as day to day planning through Google Calendar.

We use the internet as it is very popular and we have a lot of information. And later on we combine together. If I do myself, normally we have a mistake, so in order to avoid mistake we need to learn from the other. (CT 8)

6.3.4.2 *Studying or working overseas*

Three of the interviewees mentioned that they had benefited from studying overseas, and that this had opened their minds to other world views and possibilities for their own futures, and the future of their families and community (CT 6, 8, 24).

6.3.5 Project Synthesis

6.3.5.1 *Project impact*

The SUD Can Tho project ran from 2011 to 2014, and sought to help the city develop options to improve the management of water systems and the environment. This section synthesises the project impact results using the PTI reflection workshops and the adaptive capacity surveys data, specifically looking at the participatory and capacity building attributes. This will provide the jumping off point for the analysis of the project participants and the potential agents of change.

Three PTI workshops were undertaken, in 2014, 2015 and 2017. The results from these suggest that project participants gained new skills and competencies through the capacity building aspects of the project. This is demonstrated by the positive trajectory of the data points, and that following on from the project CTU created a new curriculum for students, teaching the methods from the project. However, this assessment is somewhat tempered by the stage one – building capacity – adaptive capacity survey results which declined slightly from just over 'very strong' in 2014 to just under 'very strong' in 2017 (Figure 24). The underlying indicators suggest that integrating the knowledge outside of the research domain was harder and taking longer than anticipated.

In addition to the capacity building activities, participants felt that the participatory nature of the project had been a success, particularly the partnership between the research teams and the local government. This is demonstrated by strong social network scores, and that engagement was ongoing, providing opportunities for further work and influence. These strong personal relationships and networks were particularly important for the SUD Can Tho case study, enabling the project to continue after the R4D Alliance funding was cut.

The SUD Can Tho project delivered on many of its original objectives, although the project team would have liked to have completed the full set of activities had the funding not been cut. The case study participants were able to use their new skills and knowledge to influence key local government and NGO decisions to improve the management of local water resources, with a particular focus on the first flush water system and the GIS map book. Implementation activities, networks and further research are ongoing post project completion. These are all signs that the intervention successfully achieved modest systemic change.

6.3.5.2 *Who were the potential change agents in Can Tho?*

Given that the evaluation results show that the SUD Can Tho project achieved change, who were the agents that helped make this change possible, and how did the project help them? The following section outlines who these potential change agents were, what were their characteristics and whether they individually or collectively aligned with the criteria identified in the literature.

The evaluation process identified nine potential change agents who were subsequently interviewed. Most interviewees felt that they had the appropriate technical skills and knowledge for their roles, but appreciated the technical training that they received from the project, which raised their awareness and understanding of the causes of the problems. Five of the interviewees highlighted the importance of needing 'general competencies' such as project management and communication, especially in English. These interviewees felt that further development of general competencies was needed in order to progress their careers and improve the impact of their work. Other competencies that interviewees mentioned as new to them and that they were keen to develop further were evaluation techniques, how to collect data through a workshop process, and interpersonal skills to improve their ability to work with, and help, others.

All interviewees struggled with a lack of resources, including time and funding, although some felt more able to manage their situations and influence others to resource what they need. As mentioned earlier, people work multiple jobs to create a whole 'liveable' salary, which makes them very busy and stretches their focus, but also means that they are tapped into multiple networks and are more likely to have an entrepreneurial outlook.

There was a reoccurring narrative of impact between interviewees who stressed the importance of learning and reflection in their lives, and those who responded to intrinsic rather than extrinsic motivators for their work. These potential change agents often showed empathy with the communities they were working with and saw serendipitous opportunities to help others. These interviewees described having a longer-term goal or focus for their careers and felt able to further their own activities.

Individuals felt a high degree of efficacy and autonomy, especially in a research context, with interviewees demonstrating that they go above and beyond for their work, often at a personal cost. Those outside of the research domain still felt they had autonomy, although they were more likely to have to 'follow the system'. All interviewees belonged to multiple networks: this was a very strong theme in Can Tho, with interviewees valuing and making time for their relationships with family and friends, as well as current and former colleagues. These networks, as well as the learning orientation, were enabled and facilitated by new technologies with the internet and social media often referenced.

Interviewees mentioned they felt lucky, but also worked hard to enable that luck. Others spoke about the chance to travel and see or learn new things, which gave rise to ideas or innovations that could be applied in their lives and work.

Three of the interviewees had the strongest alignment to the change agent indicators, with two others as prospective; all five expressed a sense of purpose that was bigger than themselves, whether that was about improving life for the local people and the region, or the environment. A further two had some of the characteristics, although their responses were focused much more on their own progression, rather than progressing a higher purpose. See Table 5Table 5 for a summary of agent alignment to indicators

Table 5: Number of interviewees who aligned to indicators

Prospective agents	Emerging agents	Strong agents	Total # change agents identified in project	Total # interviewed
2	0	3	5	9

Interviewees most strongly aligned to the change agent indicators expressed wanting to get better in order to help others. Two felt time poor, and had varying senses of efficacy in being able to manage that. All three spoke about the role of mastery and reflection in their lives.

Of the more weakly aligned interviewees, one mentioned wanting to improve to help others, whereas the others suggested they would like to improve their competencies and grow confidence. These people also felt more constrained by money rather than time, highlighting where they were at in terms of their careers and life stages. The three more strongly aligned change agents were older and more experienced, and had more established networks, although the two weaker potential change agents mentioned that they received a high level of support from a variety of people. Two of the more weakly aligned potential change agents also expressed an interest in using the evaluation techniques showcased in the case study as a way to learn and improve, which they had not come across before.

While some interviewees expressed more change agent indicators, no interviewee responded strongly to all indicators. This could suggest that some of the indicators are not required, or that no individual is a 'perfect' change agent and that perhaps a team or network of individuals is required to enable change.

The three stronger agents used the project to facilitate change in their contexts. Example changes included normalising the integration of science knowledge into local government decision making and changing the research culture at CTU to be more participatory and interdisciplinary. Agents used the knowledge co-created, as well as their new skills and more diverse networks together with the project outputs, such as the Can Tho City Atlas, to enable these changes.

6.3.5.3 *Project capacity building implications for change agents*

Overall the interviewees felt that the case study capacity building had provided them with new skills and knowledge and created new enduring networks that bridged research and practice. Interviewees expressed having a greater appreciation of or wanting to grow their skills in project management, communication, thinking skills (including systems, integration and strategic) and how to evaluate projects and programs to be able to demonstrate impact to their stakeholders and funders. This perhaps reflected that the potential change agent interviewees coincided with the third evaluation of the case study, although several interviewees mentioned that evaluation activities were increasingly requested of them by other partners and funders.

The capacity the 'stronger' potential change agents mentioned was centred on a new awareness of the challenge they were attempting to address (systems perspectives and including the perspectives of non-science others), which also included improving how they worked or collaborated with others. For other interviewees, the SUD Can Tho project triggered a light bulb moment; the passion was already there but the project provided a skill/competency that was missing. This suggests that it is the participatory nature of the project itself that helps activate change agents, although the formal training and workshops enable relationships to develop and networks to grow.

6.3.6 Reflecting on the project evaluation process

As outlined in earlier sections, this participatory project sought to help stakeholders in Can Tho develop new understanding and options to improve the management of their water resources. In order to do this, new knowledge was created and capacity building was undertaken to grow technical skills such as the ability to use GIS and first flush technology. General lessons from Path to Impact and adaptive capacity evaluations can be found in Appendix 2 and 3, starting on p.271. The following section synthesises case-specific lessons from the evaluation process and the individual agents' perspectives of how the project influenced and enabled them.

6.3.6.1 *Path to Impact Workshops*

The SUD Can Tho case study had three Path to Impact workshops held in 2014, 2015 and 2017. The workshops tended to take just under four hours, or half a day, which is a significant investment of time by the participants.

When asked to reflect on the evaluation process, the in-country research team and boundary partners indicated that they found it useful, and they liked the impact curve as it was a clear visual of what the project was trying to do and had achieved. This was the first time the in-country team had been asked to evaluate a project, and this participatory evaluation process helped them think through what they would have to do for future projects. The team particularly liked the concept of outputs, outcomes and impacts, noting that this made them think more about the impact of their research and how to achieve that, something they previously had not had a chance to do. They

mentioned it was also a new way of thinking about how to have more impact for 'others' (i.e. not research impact).

The in-country team mentioned challenges with the wider theory of change chart, such as having 'time' on the horizontal axis and the 'researchers, agents of change and beneficiaries' on the vertical axis. Mixing the theory of change and impact pathways was initially somewhat confusing for them, although this became clearer over the three evaluations. The CTU team also recommended adding qualitative ranking levels to evaluate impact, say, 'strong', 'medium', or 'small' impact, suggesting that this would help make it easier to assess the achievements in relation to each other.

Overall, while challenging to organise and a significant time commitment for participants, the PTI evaluation workshops enabled individual and collective reflection and evaluation of the project. This participatory evaluation exercise also had other benefits, including knowledge sharing and re-priming of participants, making it a worthwhile activity.

6.3.6.2 *Adaptive capacity surveys*

The SUD Can Tho case study undertook three adaptive capacity survey evaluations, in 2014, 2015 and then again in 2017. This evaluation was designed to track impact over time and relied on resurveying as many of the same people as possible. For the SUD Can Tho case study this resulted in 17 out of 22 people being surveyed repeatedly for all three time slices.

CTU now use the adaptive capacity and theory of change impact evaluation approaches to look back on other projects that they have been undertaking and assess their impact. The water supply company is planning on using a variation of this evaluation approach to assess whether staff are having impact in their work.

Overall the adaptive capacity surveys were able to stimulate self-reflection in the respondents and draw out stories of change and barriers to that change. While there were challenges associated with the scoring of the indicators, they did provide a boundary object for discussion in the survey and when synthesised into the case study evaluation reports, showing indicator scores change over time.

6.3.6.3 *Potential change agent interviews*

The prospective change agents were fairly easy to identify using the project evaluation data, although having been a CSIRO team member loosely connected to this project meant that I was already primed to understand the case study system and could approach the project lead to validate my suggested interview list.

The nine interviews took between 25 and 45 minutes each, with six of the interviews being undertaken directly with the interviewee, and the remaining three requiring varying degrees of assistance from a native Vietnamese speaker who was a member of the in-country project team.

Interviews were more informative when they were direct. On reflection, there are several reasons for this. The first and perhaps most limiting was the language barrier, which not only meant that questions and responses were lost in translation, but so too were concepts I was trying to ask about. Critical self-reflection and questioning what had previously worked was somewhat challenging for some interviewees, and I was told that this had not been encouraged by Vietnamese leadership.

A chance to ask these questions of them again would yield a better understanding of the contextual and temporal aspects of catalysing a change agent.

6.4 Case conclusion

The SUD Can Tho case study identified three agents who were key catalysts and connectors on the path to change; these were not isolated individuals, but rather well embedded in teams and networks. With several other weaker or self-interested agents likely to have enabled their collective success, the high level of networking across the researchers and the local decision makers through this project was particularly striking. These networks enabled the identification or creation of windows of opportunity, as well ideas as to how to mitigate barriers.

The creation of these networks, together with mentoring and the more traditional project capacity building activities, are likely to have facilitated the emergence of additional change agents in the system. This suggests that it was the participatory nature of the project itself that helped activate change agents in Can Tho, although agents indicated that formal training and workshops helped facilitate interaction which enabled relationships and networks to grow.

All of the agents identified, whether pre-existing or emerging through the project, mentioned having a core set of values or purpose, in that they wanted to help others and build a better future for their community, including a healthier environment. The three clear agents were in leadership roles, exhibited entrepreneurial tendencies (social and institutional, as well as economic) that pre-dated the project, and were keen to grow their, and their colleagues', understanding of the challenges.

The SUD Can Tho case study suggests that agents are key to enabling change and do have an identifiable set of characteristics that are shaped by their context and histories, and that the participatory nature of the project grew and, in some cases, catalysed competencies and opportunities for systemic change which have been sustained.

Chapter 7: Climate Projections: High level resolution downscaling for Vietnam

This chapter utilises the R4D Alliance project Climate Projections: High level resolution downscaling for Vietnam (Climate Projections Vietnam) as a case study to explore the framework and concepts outlined in Chapter 4:.

Vietnam is considered one of the countries most vulnerable to the impacts of climate change due to its densely populated long narrow coastline, two large deltas and the increasing frequency of extreme events (Lazarow, 2016). While Vietnam has made significant progress in poverty reduction over the past 20 years, challenges associated with climate change such as saline intrusion, sea level rise and flooding are already being felt and threaten progress (USAID, 2019).

Figure 28: Map of Vietnam's 58 Provinces (Katzfey et al., 2012)

7.1.1 The Project

7.1.1.1 *Project identification*

Vietnam was identified as a priority country for investment during the first phase of the R4D Alliance. At the request of the Vietnamese government, and facilitated by Australian Aid staff based in Hanoi, members of the R4D Alliance visited Vietnam in October 2011 to discuss how improving knowledge of climate change impacts would help identify the people and sectors at risk and, how this knowledge could support the Vietnamese government in the challenging task of prioritising its climate change response (Katzfey et al., 2012).

The Vietnamese Ministry of Natural Resources and Environment (MONRE) was seeking to build on the existing national climate change scenarios as well as undertake more detailed downscaled projections in order to better understand climate change effects at the provincial and community level. At the time, all 58 Vietnamese provinces were required to develop or update their action plans under the National Target Program to Respond to Climate Change (NTP RCC), and it was anticipated that localised projections would help provincial governments to determine their priorities for adaptation based on their particular vulnerabilities (Katzfey et al., 2012).

7.1.1.2 *Project Objectives*

The resulting collaborative partnership commenced in January 2012 and sought to produce high resolution downscaling in order to 'inform Vietnam's national and provincial climate change action plans with evidence from updated scenarios to underpin adaptation planning and prioritise investment' (Katzfey et al., 2012, p.4). Specific objectives included:

1. Improve Vietnam's understanding of the impacts of climate change.
2. Integrate past and current research for a more complete assessment of the potential effects of climate change.
3. Provide information necessary for appropriate planning and investment to adapt to climate change.
4. Develop innovative communication tools to ensure that the data generated was widely accessible.

7.1.1.3 *Project partners*

The project was a collaboration between CSIRO, the Vietnam Institute of Meteorology, Hydrology and Environment (IMHEN), and Hanoi University of Science (HUS). IMHEN is the research institute within MONRE responsible for the development of climate change scenarios. Prior to the commencement of this project, IMHEN had already been undertaking downscaled projections and sought to build on this expertise through collaborative partnership, including increasing technical skills and strengthening capacity to develop climate change scenarios. HUS also had some capacity to undertake projection modelling and held a good record of historical observed climate data which was important for validating the downscaled modelling. The R4D Alliance project was the first time that HUS and IMHEN would collaborate together.

7.1.1.4 *Project outputs*

By the time the project concluded in 2014, in addition to the reports and scientific publications, the most significant outputs were climate scenarios and increased capacity developed through formal training and a participatory planning approach.

The participatory planning approach developed strengthened the skills and capacities of local researchers, and enabled trust and leadership to emerge between the institutions which resulted in improved connections, facilitating joint development of the National Scenarios for Vietnam (CSIRO, 2015a).

Climate scenarios for seven sub-regions within Vietnam were developed, with the results communicated to key stakeholders. The provinces of Can Tho, Ho Chi Minh City and Da Nang were already utilising the scenarios in their decision making. The regional scenarios were increasingly being requested by other stakeholders such as NGOs and other donors in the region.

Figure 29: Climate change scenarios and key insights were provided for seven sub-regions of Vietnam (adapted from (Katzfey et al., 2013))

A climate futures tool was also developed, which provided an alternative model for the Vietnamese government to undertake downscaling, and an associated website which improved user access and understanding of the climate projections – http://vnclimate.vn/

More project resources and information can be found on the R4D Alliance website – https://wp.csiro.au/r4da/projects/long-term-projects/climate-projections-high-resolution-downscaling-for-vietnam/

7.2 Post-project evaluation and change agents

This section starts with an analysis of the whole of the Climate Projections Vietnam project evaluation using the Path to Impact workshop and adaptive capacity survey results (activities 3–6 in Figure 22, p.101), and concludes with a summary of what impact the Climate Projections Vietnam project had by the time of the potential change agent interviews. The evaluation data was then used to identify potential agents. Subsequent interview responses are then compared to the indicators developed from the literature review (Activities 7 & 8 in Figure 22).

7.2.1 Climate Projections case study's impact over time – Path to Impact Participatory Evaluation Stories from 2014 to 2017

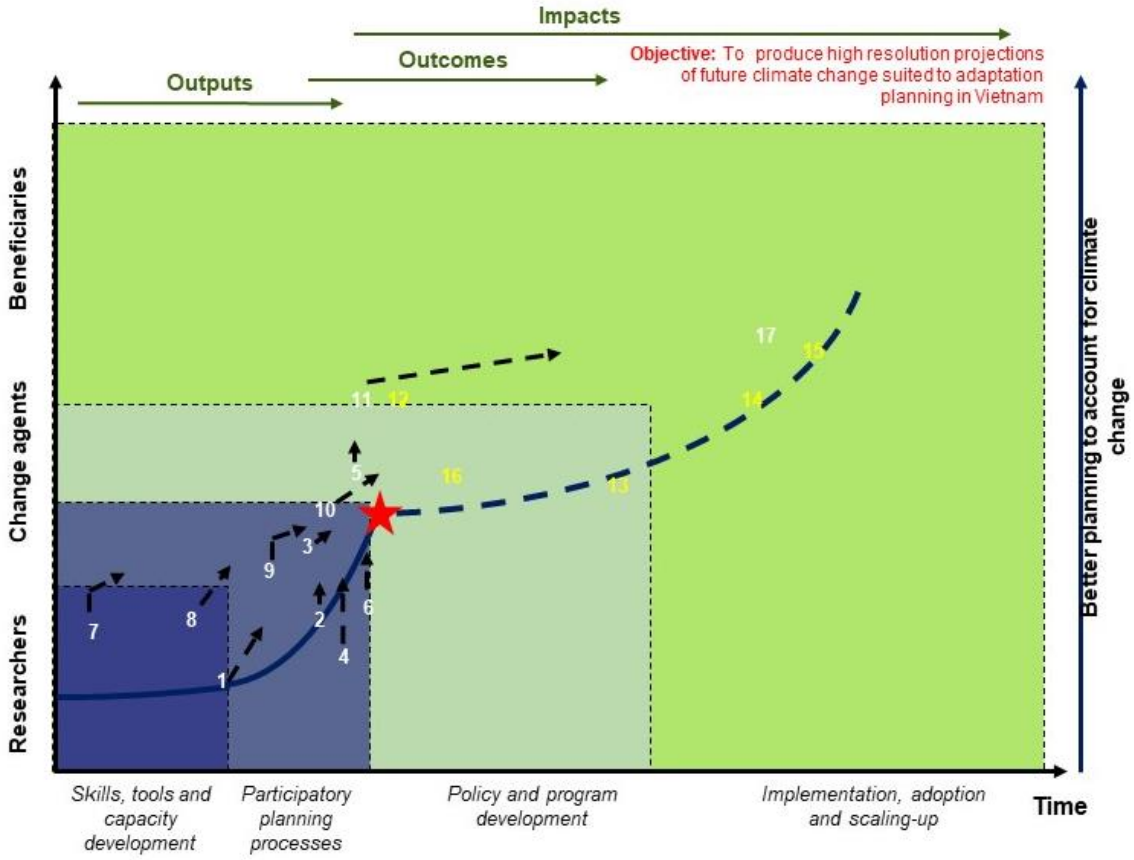


Figure 30: Theory of change April 2014 to June 2017. The Climate Projections Vietnam project's goal (red star) was to produce high resolution projections of future climate suited to adaptation planning in Vietnam. White numbers with black arrows reflect a positive change in impact on activity or outputs from 2014 to 2017. Yellow numbers reflect no change or additional impact between 2014 and 2017

In June 2017 I undertook the third evaluation of the Vietnam Climate Projections project with IMHEN staff (at the IMHEN offices) commencing with a workshop to discuss the project's progress along the Path to Impact (Theory of Change) using the reflecting and sharing approach

outlined in Chapter 5:. The morning session took approximately 2 hours and started with refreshing everyone's memory of the project aims and outputs, as well discussing the results of the 2014 and 2015 evaluations and outlining the process for the review session.

The process created a fair amount of debate between the IMHEN researchers (no HUS staff were able to attend due to other commitments) as they reflected on what they had learnt from the project and how the material produced had gone on to have impact. It became clear through the discussion that impact was ongoing, with the publication of the summary report 'Climate Change and Sea Level Rise Scenarios for Vietnam – summary for policy makers' which had been released in late 2016. The session ended with a discussion about what activities might be undertaken in the future and IMHEN's research interests.

Rather than tell the story of each of the 17 impact points I will use a Most Significant Change approach (Davies and Dart, 2005) to provide a snapshot project impact across the three stages as articulated through the participatory Path to Impact process.

7.2.1.1 *Stage 1a – Skills, tools and capacity development*

The Vietnamese Climate Projections project was predominantly a skills, tools and capacity development project with the project goal focused on successful completion of stage one of the wider Theory of Change. This was unlike other the R4D Alliance projects that sought to have impact over the other stages in the Theory of Change. Many of the skills and tools developed through the project were already understood by the participants, such as **(#1)** computing to analyse, or **(#2)** incorporating sea level data sets. The focus of this project was about refining and improving capacity.

While the Climate Futures Tool **(#3)** and the technical report series **(#5)** scored highly at project completion, they didn't improve significantly over the following years due to a lack of time and support, which participants attributed to the project finishing early. For example, IMHEN struggled to share the Climate Futures Tool as it was in English and therefore hard for Vietnamese decision makers to access. By 2017 there was a Vietnamese version.

This story was similar to two of the items below the line, **(#4)** the project website and **(#6)** publishing journal papers. The project website was published in 2015, which shifted the impact to the expected line, although it has not been updated since then. It took until 2016 for the project team's work to be published, with two papers produced, one in an international journal and the other in a Vietnamese journal.

7.2.1.2 *Stage 1b – Participatory Planning Processes (outputs)*

This project was the first time that IMHEN and HUS had worked together **(#7)** which continued after the project as they felt the new relationship had benefit to both organisations. Both organisations wanted to continue working with CSIRO after the project concluded and

mentioned that they continued to have regular Skype conversations with their CSIRO colleagues. This collaboration continued through to the 2017 evaluation, with IMHEN and HUS continuing to collaborate leading to other projects, such as a current project with UNDP. Additional collaboration was undertaken with CSIRO to develop a Vietnamese version of the Climate Futures Tool and a Vietnamese CCAM model.

Dissemination workshops **(#10)** were undertaken during the project in order to translate complex scientific knowledge into simple information for decision making. This continued in 2015 and 2017 with training of Masters students in how to use the Climate Projections Tool, and IMHEN and HUS releasing a summary report for users and a Vietnamese version of the Climate Futures Tool.

7.2.1.3 *Stage 2 – Policy and Program Development (outcomes)*

By the end of the project both the Red Cross and CARE were using the project climate projections **(#11)** in their planning. At this time the IMHEN-HUS team felt that there were significant improvements in project impact as there are now many end users of their projections.

However, the application of the projections and climate information into adaptation planning nationally and in the provinces **(#13)** was not as successful as first hoped. Initially the projections were to be released shortly after project completion and when that didn't happen it was hoped they would be released in 2015. However, the information wasn't made available until the end of 2016, and at the time of the 2017 evaluation there had been no change in planning, but province officers were now required to develop an action plan for climate change and were mandated to use the scenarios to produce this. Since the information was only published in 2016 it was felt it would take more time to show the full impact.

7.2.1.4 *Stage 3 – Implementation, adoption and scaling up (outcomes and impacts)*

As mentioned earlier this project's goal was to produce high resolution projections of future climate change suited to adaptation planning in Vietnam, so stage 3 impact wasn't anticipated during the life of the project. However, the team felt there was large potential for implementation and scale up of adaptation planning once IMHEN released the national scenarios **(#15)**. By 2017 this impact was starting to be seen, with other entities such as the UNDP **(#17)** using the project results to inform their projects.

7.2.2 Evolution of the Adaptive Capacity Evaluation Stories from 2014 to 2017

In addition to the Path to Impact participatory evaluation workshops, the Climate Projections project was evaluated using adaptive capacity surveys with project participants, including in-country research partners and boundary partners. As many of the original participants were re-

interviewed in 2015 and 2017 as possible, noting that some people had retired or were studying overseas and were therefore uncontactable. Sixteen interviews were sought, however only 14 were available.

The Path to Impact and adaptive capacity evaluation have been used to track impact over time, triangulating and cross checking the stories between the processes, as outlined in Chapter 5. This research is focused on exploring the importance or otherwise of potential change agents in systemic change, so the first step is to test whether systemic change happened.

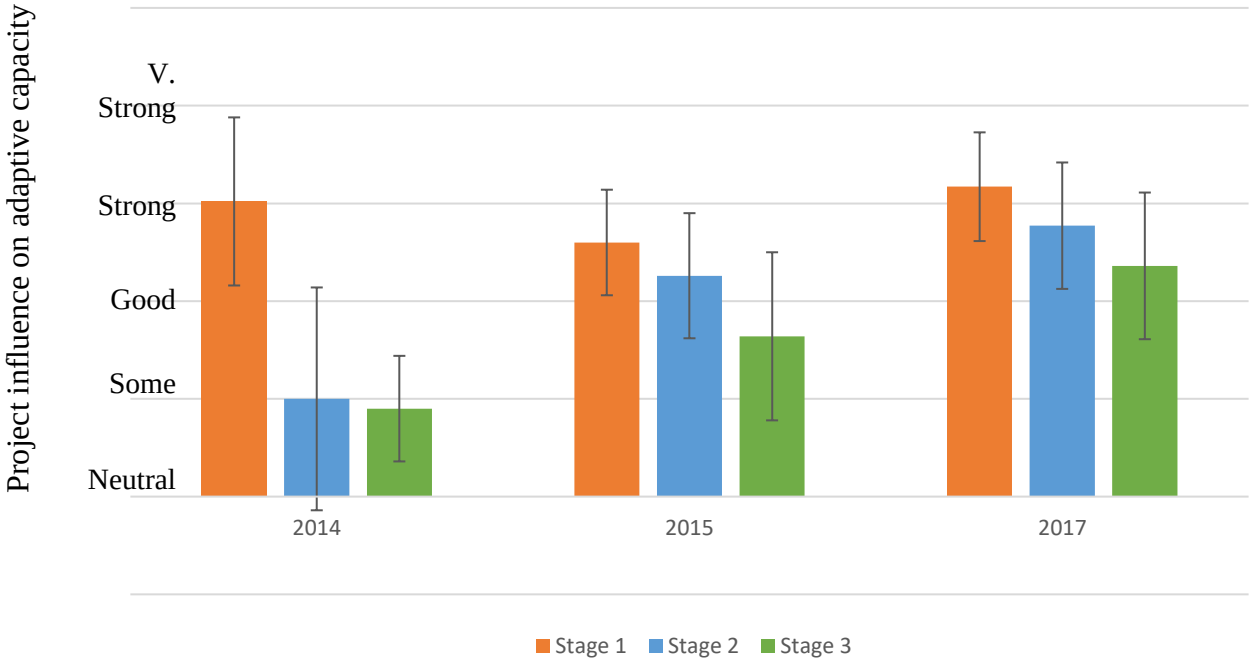


Figure 31: The influence on adaptive capacity across the Climate Projections Vietnam project's impact pathways stages in 2014, 2015 and 2017. Each stage is represented by an average of indicators for that stage, with error bars highlighting the range of responses to indicators.

7.2.2.1 *Adaptive Capacity Overview*

Across all time slices, the Climate Projections Vietnam project had the greatest impact in stage 1, which focused on developing skills, tools and capacity, and the participatory planning processes (see Figure 31). This is perhaps expected as these were the core aspects of the project and what the project team had the most control over, together with creating a stronger connection between all three research partners, as highlighted by the indicators 'trust created', 'shared vision and goal' and 'new social networks' having the highest score. The perceived impact in stage one declined slightly from 'strong' in 2014 to between 'good' and 'strong' in 2015, before increasing again in 2017 to having a perceived just over a 'strong' impact. The narrow range of scores suggests consistent belief in the project's stage one capacity impact remaining fairly stable over time, while perhaps reflecting the ongoing collaboration between the three research partners.

Stage 2, program and policy development, had ‘some’ impact at project completion, which was expected given the focus in the project on building skills and other capacities. Again, the strongest scores in stage two reflected the emphasis on collaboration, with the indicator ‘cross-scale social networks’ having the highest score followed by ‘management plans’. The lowest score was ‘resources’, which in part was a reflection of the project wrapping up early in 2014 and anticipated next steps being unable to be put into action due to a lack of funding.

Stage 3, implementation, adoption and scaling out, was anticipated to take the longest to achieve and could reasonably be expected to occur only after the project had finished, giving the project team the least amount of control over the impact results. This is reflected in the steady increase in stage three scores from ‘some’ in 2014 to ‘good’ in 2015 and close to ‘strong’ by 2017. Again, the indicator with the highest score was ‘cross-scale social networks’, followed by ‘implementation’, which grew across the three time slices. The lowest score was ‘enabling changes’, which reflects the challenges in making changes in a complex cultural and policy space.

7.2.2.2 *Stage One – Building Capacity*

As outlined in the overview, stage one (building capacity) had the highest-scoring indicators across all three time slices of the project. The Path to Impact evaluation (section 7.2.1) highlighted that not all capacity building activities were successful, and even in the successful cases not all participants perceived the same benefit, which in part explains the large range of score for some answers. As outlined in Chapter 5:, the stage one adaptive capacity survey included seven indicators based on adaptive co-management principles. Six of these indicators were assessed across all three time slices, with the seventh (vision and goal) only assessed in the first time slice (see Figure 32).

Across the three time slices, ‘trust created’ and ‘new social networks’ consistently received the strongest stage one scores as well as the smallest deviation in scores. ‘Knowledge enhanced’ also scored well in 2014 before declining in 2015, although with large differences in responses. ‘Leadership emerging’ grew steadily from 2014 to 2017, and response variation narrowed. The lowest scoring stage one indicators were ‘questioning values and governance’ and ‘knowledge integrated’; these had some of the widest standard deviations. The range of responses was in part attributable to the range of survey respondents, with those in the research team having a different perspective of success to those respondents observing as funders or wider stakeholders.

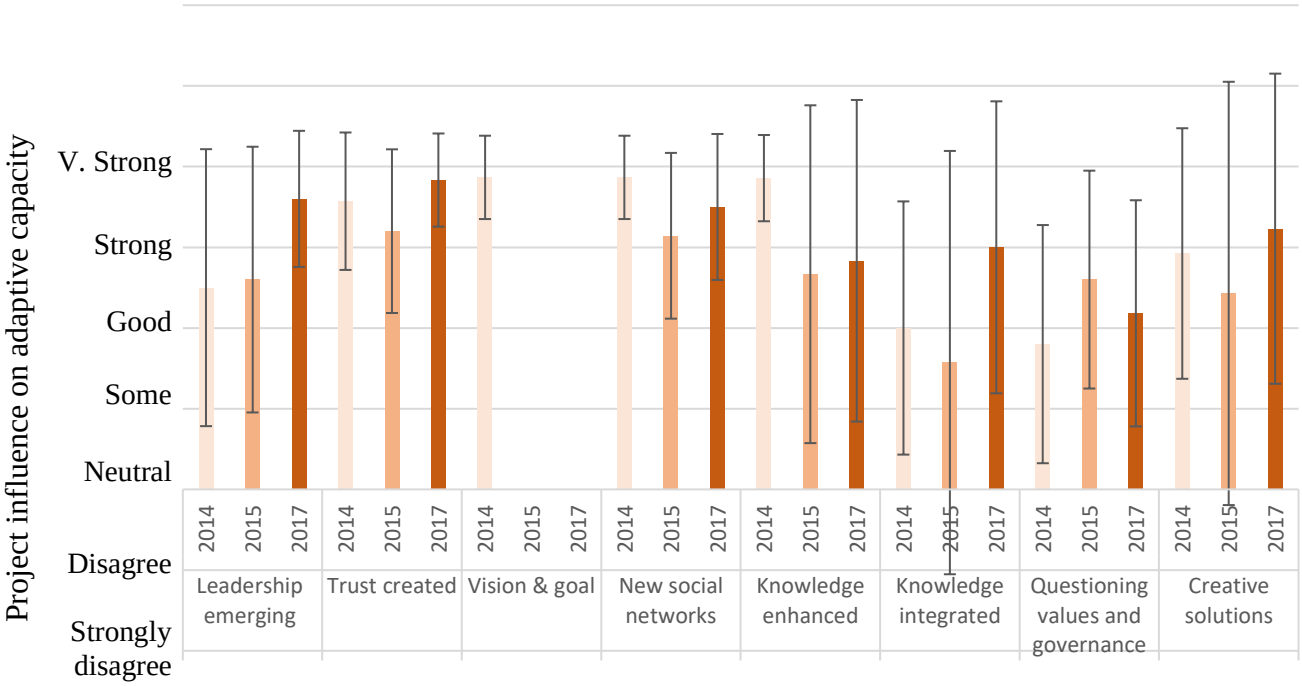


Figure 32: The influence on adaptive capacity across the Climate Projections Vietnam project's impact stage 1 in 2014, 2015 and 2017. The error bars show the range of scored answers. No result indicates that the question wasn't asked in that year.

7.2.2.3 *Stage Two – Policy and Program Development*

The Policy and Program Development stage had slightly weaker indicator scores overall than stage one. The overall scores started at 'some' in 2014, moving to 'good' in 2015 and towards 'strong' in 2017 (see Figure 33). The highest scores were the cross-scale networks (2nd scale) as discussed above, with both 'management plans' and 'new project' strengthening from 2014 to 2017. The weakest indicator was 'resources', which had grown from low at the end of the project to 'good' by 2017. Apart from cross-scale networks, the other indicators had fairly high deviations in respondents' scores, indicating that individuals had different perceptions of project impact and success.

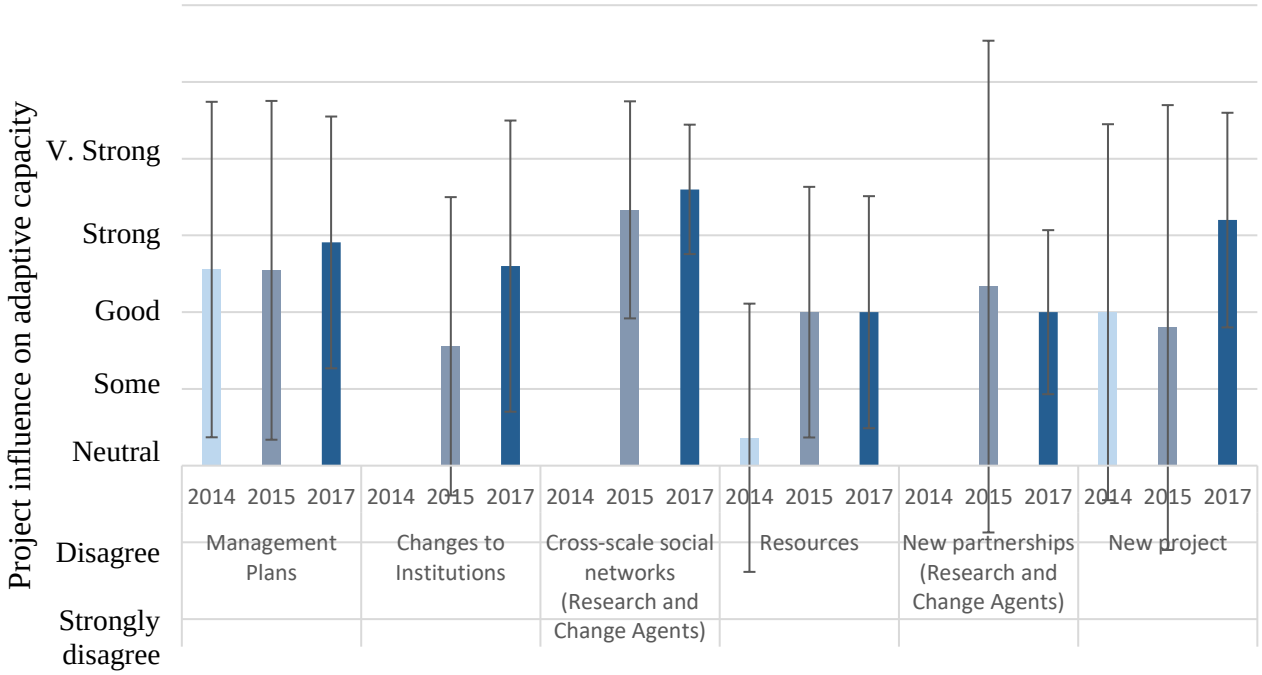


Figure 33: The influence on adaptive capacity across the Climate Projections Vietnam project's impact stage 2 in 2014, 2015 and 2017. The error bars show the range of scored answers. No result indicates that the question wasn't asked in that year.

7.2.2.4 *Stage 3: Implementation, Adoption and Scaling-Out*

Like stage 2, the implementation, adoption and scaling-out indicators grew from 2014 to 2017, moving from 'some' to 'strong', with a similar wide distribution of respondent answers (see Figure 34). Also aligning to stage 2, the strongest scoring indicator was 'cross-scale networks (3rd scale)', with evidence that relationships developed through the project had been maintained and were now being used to share knowledge and undertake work in new areas.

The second highest-scoring indicator for stage three was 'implementation', which related to the formal launch of the National Climate Projections in late 2016. The lowest overall score for stage 3 was 'enabling changes' which, although it grew from 2014, was only scoring 'some' in 2017 reflecting the challenges with changing rules and practices. Much like stages one and two, the range in scores related to personal project expectations and how much the respondents thought their work, or the project, would influence decision makers.

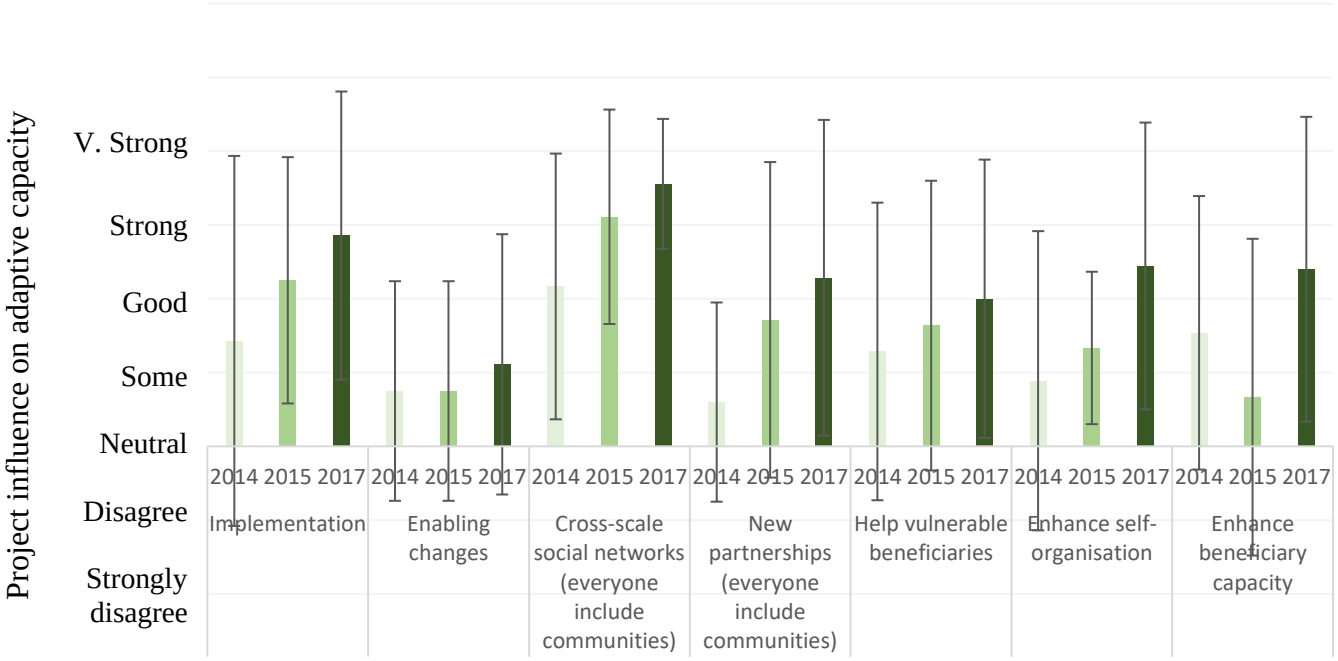


Figure 34: The influence on adaptive capacity across the Climate Projections Vietnam project's impact stage 3 in 2014, 2015 and 2017. The error bars show the range of scored answers.

7.2.3 Synthesis of the evaluation results over time and distillation of potential change agents

Through reviewing the Path to Impact evaluations and adaptive capacity surveys I was able to distil who key individuals were that were mentioned as growing in capacity or leadership. Over the three time slices the cross-scale social networks scored strongly, reflecting that connections between the three institutions were being maintained, and individuals (sometimes collaboratively) were seeking to work with their expanding network. Aligned with this, several names reoccurred throughout the evaluation, with six individuals most commonly mentioned and therefore being recognised as potential change agents. All those surveyed or interviewed were allocated a unique identifier for anonymity, i.e. CP #.

The subsequent list was then shared with the Climate Projections CSIRO project leader who added a name that had been missing from the list. My interview list was provided to partners within Hanoi and interviews were arranged. However, two interviews were not possible as the individuals had changed institutions and were not contactable. Overall, eight interviews were undertaken, seven of which were researchers, and one was a government officer.

7.3 Potential Change Agents

The eight interviews were used to elicit information from the interviewees to see if the set of attributes discovered through the literature review were the necessary and sufficient set to determine what makes and motivates a potential change agent, focusing on their capabilities and capacities, characteristics, and roles (activity 7 in Figure 22, p.101). Some of the interviews were direct with the individual, while others required the assistance of a translator. Each interview took between 25 and 103 minutes. The results below are outlined by attribute indicator and conclude with a summary of individuals identified as potential agents.

7.3.1 Capacities and capabilities

A review of capacities and capabilities needed to enact adaptive change in individuals and groups can be found in Section 2.2.2.3.

7.3.1.1 *Skills*

Skills can be thought of as tools for change, whether that change is specific to the individual, or their ability to undertake and engage in social change (Roberts and Lacey, 2008, Petzold and Ratter, 2015). Different situations and problems will require different skills, with the Climate Projections project specifically building the skills of project participants through formal training and collaborative participation on the project. Core skills developed centred on programming skills, specifically modelling (CCAM), data management and processing for forecasting and projection, as well as strengthening and widening the research skills of the project team.

> *we can use the CCAM models from CSIRO, this is also very good and highly appreciated and help me also with my publications (CP 13)*

Interviewees also mentioned they got a lot out of learning how to work with others, especially foreigners, and a better understanding of how to communicate with stakeholders.

> *There were many things we had to learn. First there was close cooperation between HUS and the CSIRO team led by Dr Jack Katzfey. In his team we worked very closely with others in the CSIRO team. (CP 10)*

> *I would say they are things around people, how to work with people, how to get people to work with you. How to form teams, and how to help those teams deliver their objectives. So there is a big one around people. (CP 27)*

However, it was also noted that the IMHEN and HUS staff would have liked to have undertaken the promised additional training, to have published more journal papers and for the Climate Futures website to have been finished by the end of the project. The reality is that due to the rapid truncation of funding and wind up of the project these were no longer possible.

Other barriers mentioned were the link between skills and resources in this particular area, with a lack of computing resources leading to delays in feedback loops for modelling and

therefore delays in learning. Others mentioned the need to continue to improve their skills, particularly around data and output quality, as well as communication with a working knowledge of English, which was seen as an increasingly important requirement with interviewees emphasising their desire to write papers for international journal publications.

> *we have to improve the focus quality and we also focus on writing international publications. (CP 9)*

> *The two most important is computer skill, using computers. ... the second is English, because most Vietnamese speak English very badly. (CP 10)*

7.3.1.2 *Competencies*

If skills are tools for change, then competencies can be thought of as combining skills with abilities and behaviours to create a certain 'know-how'. See Chapter 2: for a list of the competencies identified. Competencies are not independent of each other, with attributes and indicators potentially aligned to multiple competencies.

As in the skills section, many interviewees said the project had taught them more about how to collaborate and coordinate with others in a project, especially across disciplines. Prior to the Climate Projects project IMHEN and HUS had previously not collaborated on climate research (CP 2, 13, 26, 27).

> *is how to set up a working group because I can easily find the good collaborators who work with me and we can put together very nice, but the mechanism to organise that kind of group to maintain such a working group is not easy. … how to listen to the other … as a way to discuss with others, I learnt very much the atmosphere we got doing the CSIRO project. (CP 13)*

Others mentioned engaging more effectively with stakeholders or end users of the information that the project was producing, with many suggesting that they had a new appreciation that there was additional work required to make the project outputs useful to others (CP 2, 7, 9, 13, 26, 27).

> *If you want to work better in this field you need to learn how to change myself. (CP 7)*

> *Over the last several years the communication has become more important, … I have gained a much more appreciation from that. ... talked about this Theory of Change and how things progress through the different levels of decision making and evolve outcomes was something that was very useful for me, because when you are a scientist and working on a science problem you don't actually think about that very often … it made me adapt my approach so that I can find ways to communicate the science instead of just presenting the numbers. (CP 26)*

> *What does our stakeholders, the ones we are delivering the value to, what can they get from this? Just understanding that interaction is very important. (CP 27)*

7.3.1.3 *Resources*

As outlined in Chapter 2, section 2.2.2.2 it is not just a matter of having the skills and 'know-how' to make change happen; agents need to have, or be able to access, resources needed for change.

A majority of interviewees mentioned the challenge of low salaries for researchers, with salaries not meeting basic needs. It was also felt that this was deterring young people from entering science, and other public service jobs where this was also a problem, such as doctors, police and teachers (CP 2, 7, 14).

> *It is a government policy, it is a big problem. It is not only for scientists, it is for other sectors as well, public sectors, medical doctors or police or high school teacher. So these sectors the workers is really important but the salary is not enough, and can lead to things that are not good. (CP 14)*

A lack of adequate computing resources was mentioned by several interviewees, with the implication that they were unable to deal with large amounts of data in a timely manner. This created problems when there were mistakes in the data, as the long time between feedback loops meant that mistakes were very costly. However, some felt they had sufficient resources for projects, including computing.

> *We ran the simulations but when you compare for example the computing speed from CSIRO machine and our machine, so they can run in one week and complete everything that we run in 3 months or so. And sometimes when we do something wrong, it is very difficult to go back because it takes a lot of time. If you have a powerful system you can do a test and go back in time and no problems. (CP 7)*

> *Not in terms of money, but we provide very good conditions for working, we have the computer systems, the building and most important the close relationship. (CP 2)*

Others talked about being time poor and the challenge of short (one year) project time frames. This was specifically contributing to the challenges that interviewees faced and was exacerbated by a lack of support in some organisations (CP 10, 13, 26, 27).

> *I never felt that we got the support that we really needed. … The organisation kept on saying yes you have to do well in these projects but sometimes I felt they never really understood how to do these projects. (CT 26)*

7.3.1.4 *Knowledge*

Knowledge includes facts, information, and skills acquired through experience or education. Section 2.2.2.1 outlines more about the dual definition of knowledge and the implications of 'whose knowledge counts' and what enables effective knowledge exchange.

As mentioned earlier, technical knowledge capacity building was a key feature of the Climate Projections project. IMHEN and HUS staff appreciated the widening and deepening of their knowledge and skills through the project, which they were incorporating into the development of climate change scenarios for Vietnam. These skills and knowledge are currently being passed on to other researchers through scientific seminars and papers (CP 2, 7, 9, 13).

> *... this is also very good and highly appreciated and help me also with my publications. For example, we got experience and we have two papers in the international journal related to the work with CSIRO. (CP 13)*

Some interviewees mentioned expanding their knowledge in specific areas, such as gaining a better understanding of monsoon onset and other climate phenomena, or how to translate science knowledge into practice.

> *... the most important thing for this project besides the result that can be put in the scenario, they also helped us to develop the climate future tool. The result was not so important, but the idea of how to translate the science into practice was. (CP 2)*

7.3.2 Characteristics

Characteristics of change agents have been divided into concepts of mastery, values and beliefs, self-efficacy, and entrepreneurship. More on characteristics can be found in Chapter 3:, starting on p.45.

7.3.2.1 *Mastery*

Mastery is about the focus on lifelong learning, being reflective and reflexive, including a personal long-term vision and purpose, as outlined further in section 3.1.2.

Several of the interviewees mentioned their love of learning, and that this project pushed them to learn more, often outside of their comfort zones. This learning and reflection was not necessarily just about the project technical skills, it was also about how to work in different operating environments, collaboratively with people and across cultures (CP 10, 13, 26, 27).

Deeper learning was described as wanting to understand how things work, not just to get a result, but questioning the underlying principles. A couple of interviewees mentioned that the more they learnt, the more they realised they didn't know, and how important it is to keep an open mindset. One respondent described how the project helped facilitate this focus on deeper learning by suggesting that the 'research atmosphere increased as a result of the project' (CP 13, 14, 27).

Others mentioned the importance of reflexivity, not just about their work, but more broadly in their lives, in order to examine what is working and what is not, and how they could improve in the future (CP 7, 10, 14, 27).

> *I ask myself why, why, why. Why I do that, why we do that, why we don't do that. (CP 7)*

in the programming you can have a very tiny mistake which we call a bug which can crash all the big model programs. So the process to fix this we call de-bug the process. And also in life you sometimes you have to de-bug the life. Even like the relationship with your family, sometimes things are gradually going bad and you have to look back at what the cause and if we can find the cause we can gradually recover. (CP 14)

Many interviewees expressed a passion for their work, with some reflecting on being driven by the desire to help others and work in a field that they felt contributed positively to the world.

scientists are very passionate people and I guess passion is the product of a lot of emotional dedication to something. (CP 27)

I looked back at these experiences and what I was getting out of it and I weighed it up against the various different criteria that I applied to livelihood and how to make a career, and I projected that into the future and I said is this the future I wanted to be? I realised no, I just couldn't see myself doing this and I couldn't see myself making people feel vulnerable for money. And I thought well what if I could still use this somehow, use my skills, to use my ability to influence and convince people but in something that actually solves some of these vulnerabilities and problems. (CP 27)

7.3.2.2 *Values and purpose*

Personal values, beliefs and attitudes often stem from a sense of purpose and a set of core values which provide guiding principles for life and inform a world view. These values, beliefs and attitudes go part way to explaining behaviour and guiding action, with more details outlined in section 3.1.1.

Interviewees described an interest in science from childhood, always asking why, and becoming a scientist to feed that curiosity. Some talked about how their love of science had evolved from the technical or theoretical to incorporate the applied and thinking about what the end user needed. This love of science was emphasised, with several interviewees mentioning the need to love science to work in this space due to the low salaries (CP 7, 9, 14, 26).

Learning and curiosity was a key feature in the interviewee responses, perhaps a feature of interviewing university and research staff. Some described it as something they wanted to pass on to their students, while for others it was about trying to share that learning more broadly and influence decision makers (CP 10, 13, 14, 26, 27).

I have a mission to train the students as best as I can. (CP 10)

So my target and my long-term goal is how to change [the information gap in Vietnam]. … try to publish and encourage others to publish in climate international journals. I think when we have good enough knowledge about that it will be good for the region. (CP 13)

Several spoke of having children and this motivated them to work for a better future, both in terms of directly providing for their children and more broadly in making Vietnam better for their children's future (CP 2, 9, 14).

> *I also think we also need to transfer that to the new generation. Of course in the university we need to transfer that or inspire that to the student and also our children, especially our children I think as the students are a little bit difficult to change, but for children it is easier to change. (CP 14)*

> *I see climate change is the threat to the Nation. It have the impact to Vietnam, but I also see the opportunity of climate change. And what I try to do now is plot the opportunity for our country. (CP 2)*

> *this may help people realise the dangers of global warming and to warn the government to prepare or mitigate the future outcomes that we are likely to have. (CP 14)*

> *So of course you have family, so this is one of the main priorities. The other is the quality of life for our people. This is two main things and I think this is for all scientists. (CP 9)*

Almost all interviewees mentioned wanting to help others, with both the CSIRO and Vietnamese interviewees linking this to helping others less fortunate than themselves, especially vulnerable communities. Some described it as a purpose, something they were actively trying to achieve, whereas others described it as more like a value, and mentioned joy in helping others, suggesting that it wasn't just altruistic as they get a lot out of it too (CP 4, 7, 9, 26, 27).

> *feel a sense of responsibility to get the information right so that others can plan for the future, if we provide poor information it will affect a lot of people and plans. (CP 7)*

> *Participation across institutions would lead to better climate change projects lead to benefit for the community. (CP 9)*

One interviewee mentioned hoping the project would further their personal goal to raise the awareness and reputation of Vietnamese scientists, which would lead to further research, suggesting that international researchers often struggled to collaborate with the many good scientists in Vietnam (CP 9).

7.3.2.3 ***Self-efficacy and collective efficacy***

Self-efficacy is one's belief in one's ability to succeed and is a precursor to agency, motivation and self-regulation. R4D interventions emphasise the role of agency and perceived self-efficacy in achieving adaptation and change, which are outlined further in section 6.3.2.3.

Self-efficacy beliefs are domain specific and can be shaped by the individual's participation in activities. Some individuals mentioned a sense of self-efficacy, which existed prior to the project, but had also been strengthened through working on the project. The interviewees' existing sense of efficacy tended to be around technical skills, or teaching, while the project

strengthened their sense of ability at working and learning with others, including those from a different culture (discipline and country) (CP 14, 26, 27).

> *I learned, I gained a lot of confidence to work in the area and region. (CP 26)*

A couple of interviewees suggested a broader sense of self-efficacy, described as an ability to meet challenges head on, be adaptable and keep persisting at their goals (CP 2, 13, 14, 26, 27).

> *In terms of challenges, well this might sound a bit strange but I am sometimes excited by challenges. I think challenges presents an opportunity for growth or something to develop within you. (CP 27)*

In this case study there was a very strong belief in the collective, rather than the individual, with multiple interviewees mentioning that collectively they were able to enact change (CP 9, 14).

> *But I think we still can change together, but that doesn't mean everyone has to do it on his own, but by doing the best in his position. (CP 14)*

> *So if it is me alone I think it is very hard. But I have a very good network with Vietnamese scientists. And I also sit in many scientific communities, so I think I have some impact because I have that network and also sit on many scientific committees. Many like the committee to approve the project, I think this is the way I can have impact on the community. But of course me alone is still not enough. (CP 9)*

However, some still felt that change wasn't happening fast enough.

> *in terms that Vietnamese society doesn't reach what I hope or what I think it should be. I think it will take time to overcome that. (CP 13)*

7.3.2.4 ***Entrepreneurs***

Entrepreneurship is the ability to include a positive (although not naive) open mindedness to possibilities, and a systems perspective that enables pattern recognition, with an ability to recognise windows of opportunity or serendipity, as outlined in section 3.1.4.

One interviewee told a story about how he had worked over several years to create an opportunity to work with CSIRO, and that he kept persisting until a funding opportunity arose to make it happen (CP 2). Another interviewee described how one of the reasons they learn is to prepare, and that preparation together with an open mindset can lead to opportunities in the future.

> *But somebody have more luck because they have more preparation I think. If you learn enough, even though you don't see the benefits from now, but a few years later some of that knowledge that you studied before can apply to the current situation. (CP 14)*

7.3.2.5 *Serendipity*

Windows of opportunity can be seen as a set of unconnected opportunities or innovations that unexpectedly lead to options that had not previously existed. Chapter 3: described how windows of opportunity are seen or opened more frequently by change agents who are prepared, open, connected, observant and reflexive.

Almost all of the interviewees for the Climate Projections project aligned to the 'fortune meets preparation' view of serendipity (CP 2, 7, 9, 14, 26, 27), whereas others simply described whether they felt fortunate or not.

> *I think everybody has the same exposure to luck except some extreme … for example when you are born into a very rich family it is a different story. But for the rest of us I think we are all exposed to the same opportunity. But somebody have more luck because they have more preparation I think. If you learn enough, even though you don't see the benefits from now, but a few years later some of that knowledge that you studied before can apply to the current situation. (CP 14)*

> *I've several times gotten myself into a position where something else new comes on and I'm actually ready to do that. (CP 26)*

7.3.3 Roles

Roles position agents within social networks. An agent may have many formal and informal roles and functions, within both their communities and organisations. More on roles can be found in section 3.1.5.

All the interviewees were involved in research and education in one form or another and had jobs in a university or government research institution. Several of the project team had been promoted following the conclusion of the project, a few had retired or were about to retire, and others had changed organisation but were still working in the same broad area. The three main roles that people described for themselves were teaching, research and administration.

7.3.3.1 *Autonomy*

While roles are important, they can also be constraining. Agents are more likely to try new things or engage in 'deviant behaviours' if they have some level of autonomy, as described in section 3.1.6.

Overall most interviewees suggested they had limited autonomy, and what freedom they had was centred on the research they chose to do (CP 2, 10, 13). While some interviewees did feel a sense of autonomy, especially those retired or about to retire, others suggested that they were feeling more constrained in what they were able to do due to increasing organisational pressures (CP 2, 9, 26, 27).

I do get a lot of freedom and liberty to develop what is mine. But having said that there are still bounds. (CP 27)

Now I have a lot of freedom. Now I have a group working for me on my idea. (CP 9)

Those who spoke about the constraints to their autonomy suggested this was in part cultural, as the Vietnamese educational system placed top students in special classes and encouraged them to follow the example of 'famous elders' who had become researchers. Some of the interviewees spoke about how their education and training meant they had to learn a different way of working when working with CSIRO, and that the project had created a more autonomous and 'safe to question' environment. This was something they felt needed a collective cultural change and was something they hoped to teach the younger generations.

working with one of the old professors in Vietnam sometimes we had this idea that we needed to obey when someone says that is true you need to think that is true. But that is not the case when you work in a project such as with CSIRO, that means that we are all equal and we can discuss freely and say what we like. (CP 13)

personally I feel/think we need a lot of change in everything, in every day but sometimes that thing kind of like disperses because we see something we don't like and we want to change but we don't have the ability or we are not able to control. But I think we still can change together, but that doesn't mean everyone has to do it on his own, but by doing the best in his position. Which means as a scientist I have to do the best on my abilities and by honesty and everything else. I also think we also need to transfer that to the new generation. Of course in the university we need to transfer that or inspire that to the student and also our children, especially our children I think as the students are a little bit difficult to change, but for children it is easier to change. (CP 14)

7.3.3.2 *Networks*

Behaviour, attitudes and values are personal characteristics, but they are also shaped by social structure and the networks that people engage or are embedded, as summarised in section 3.1.6.

All interviewees mentioned having and needing the support of family to do what they do. Interviewees mostly described this as immediate family (partner, parents, children).

Without the support from family I cannot stand here. This gives the conditions needed to work. Without the support of family it is difficult to success. (CP 7)

Most interviewees also mentioned having a small network of friends who supported them. In many cases, these friendship networks had expanded to include current and past colleagues who provided support, encouragement and advice or information. In several cases this included international connections which stemmed from where people had studied or worked in the past.

We have a small little group and we work very closely together and discuss a lot of things so I think that again is, or has been, a good network to work with. (CP 26)

there definitely amazing people who work here and I get a lot of support from them. (CP 27)

I have a lot of relationship with colleagues outside of Vietnam, from CSIRO, Germany, Japan and some from America. This cooperation is very very good. (CP 10)

The Vietnamese interviewees described how the Climate Projections project had grown the relationships and networks across the three institutions, as until the project those organisations had not previously worked together. These networks had been maintained post project and were currently being used to undertake and source new research.

Throughout the project the cooperative relationships among IMHEN, HUS and CSIRO have been tighten. (CP 10)

The collaboration is maintained and further developed. Capacity of institutions are strengthened, … work together in developing new projects searching funding from the government and international agencies. (CP 2)

Several of the Vietnamese interviewees mentioned participating on committees associated with their work, which helped them have a wider understanding of the knowledge space, and also offered an opportunity for sharing their own work.

I have a very good network with Vietnamese scientists. And I also sit in many scientific communities, so I think I have some impact because I have that network and also sit on many scientific committees. (CP 9)

Only two people described themselves as a broker or connector. Other interviewees also described these people in this way, highlighting that they played an important role connecting them to others, both within and outside of Vietnam.

I like working with people and I feel like I'm quite good at getting people to work with me and together with each other to achieve some sort of common goal. (CP 27)

7.3.4 Emerging themes

Two themes emerged through the interviews, cutting across several of the other themes. The first was technology and how it was changing how people learnt, worked, and interacted. The second theme was having had the opportunity to study or work for longer periods of time overseas.

7.3.4.1 *Technology*

Since the start of the project, technology had changed how people learnt, worked, and interacted. For the most part this was seen as positive, although some challenges of globalisation such as global commodity markets and the movement of people were mentioned. Interviewees

highlighted how technology was making it easier for people in developing countries and outside of academic or research institutes to access knowledge and skills.

For this project in particular computing resources was both an opportunity and a constraint to doing the climate modelling and downscaling, as outlined earlier in the resources section. While people mentioned how the technology had improved for the better, they also noted the lack of access compared to developed country colleagues was still limiting their ability to run simulations and scenarios in a timely manner.

7.3.4.2 *Studying or working overseas*

Three interviewees mentioned that they had benefited from studying overseas, and that this had opened their minds to other world views and possibilities for their own futures, and the future of their families and community (CP 2, 9, 13).

7.3.5 Project synthesis

7.3.5.1 *Project impact*

The Climate Projections Vietnam project ran from 2012–2014 and focused on building the technical capacity and specific cross-institutional relationships to better enable the creation of climate change scenarios and projections for Vietnam. This section synthesises the project impact results using the PTI reflection workshops and the adaptive capacity surveys data, specifically looking at the participatory and capacity building attributes, which was the focus of this case study, unlike other the R4D Alliance case studies that sought to have impact on the other stages in the Theory of Change. This overview will provide the jumping off point for the analysis of the project participants and the potential agents of change.

Three PTI workshops were undertaken in 2014, 2015 and 2017. Capacity building focused predominantly on technical skills, such as computing to analyse and incorporate sea level data sets, with the results suggesting that project participants felt they gained new skills and competencies through the project. This is demonstrated by the positive trajectory of the data points, and that by the end of the project the information generated was being incorporated into national climate change and adaptation scenarios. This assessment aligns with the stage one – building capacity – adaptive capacity survey results which returned to ‘strong’ in 2017 after a small dip in the 2015 evaluation.

In addition to the capacity building activities, participants felt that the participatory nature of the project had been a success as it was the first time that IMHEN and HUS had worked together, with both indicating that the new relationship had benefited both organisations and highlighting ongoing collaborations. The adaptive capacity survey indicators reinforce this with trust, a shared vision and goal, and new social networks having the highest scores and improving over time.

The Climate Projections Vietnam project delivered on its stated objectives, and project participants were able to use their new skills and knowledge to inform the National Climate Projections which were launched in late 2016. There is ongoing collaborative research and networking post project completion; these are all signs that the intervention successfully achieved modest systemic change.

7.3.5.2 *Who were the potential change agents?*

Given that the evaluation results show that the Climate Projections Vietnam project achieved change, who were the agents that helped make this change possible, and how did the project help them? The following section outlines who these potential change agents were, what were their characteristics and whether they individually or collectively align to the criteria.

The evaluation process identified eight potential change agents who were subsequently interviewed. A core theme from the interviewees was an appreciation of the knowledge and capacity building that they had gained through the project. Five of the interviewees highlighted the importance of communicating well and being able to communicate with stakeholders or end users. English language skills were highlighted as a needed competency and something change agents would need to be developed further in order to progress their careers and improve the impact of their work. Other general competencies that interviewees felt needed strengthening included the ability to write international journal papers, project management, as well as integration and evaluation skills.

There were two main resource themes that interviewees mentioned. The first was the challenge of low salaries for researchers, which were not meeting basic needs and meant that this was placing strain on them and their families, as well as deterring young people from entering science. The second theme was focused on a lack of computing resources, which was limiting interviewees' ability to progress their research.

A majority of interviewees described themselves as having had an interest in or a love of science and learning from an early age. A subset of these mentioned that this love of science now incorporated thinking about the application of knowledge, specifically thinking about what end users needed. Others mentioned the value they got from teaching and helping future generations. Almost all mentioned wanting to help others, especially others less fortunate than themselves. Some described it as a purpose or a goal, whereas others described it more like a value that they subscribed to.

Interviewees' sense of efficacy was predominantly focused on teaching and technical skills or knowledge, being the expert. A subset expressed a broader sense of efficacy which was described as being adaptable and persistent in the pursuit of their goals. There was a strong belief in collective, rather than individual, capacity to enact change, and only two interviewees identified with an entrepreneurial mindset. This is perhaps due to the role that interviewees in this case

study play; all of them are researchers and in addition most of them are public servants. This role-mindset also played out again with interviewees suggesting their limited autonomy was centred on the research they chose to do. Working on this project had exposed interviewees to a completely different way of working, creating a more autonomous and 'safe to question' environment, and this was something interviewees hoped to teach the younger generations.

Almost all interviewees mentioned their appreciation of the cross-institution networks that had formed through the project, that these networks were enduring and provided those engaged with support, as well as opportunities to share knowledge and collaborate.

Almost all of the interviewees for the Climate Projections Vietnam project aligned to the 'fortune meets preparation' view of serendipity and expressed appreciation for the support and encouragement they received from their families and colleagues, including support from international colleagues.

Only one of the potential interviewees clearly was identified as an individual change agent, although other interviewees had many of the characteristics. This could suggest that some of the indicators are not required, or that no individual is a 'perfect' change agent and that perhaps a team or network of individuals is required to enable change.

The one identifiable agent was older, had an influential role within government, and expressed the intention of translating their knowledge into useful practice. This agent saw climate change as a significant threat to Vietnam and wanted to help mitigate the impact and help create a better future for the people. This person was one of two interviewees who expressed an entrepreneurial mindset, seeking to create opportunities for themselves and others, as well as expressing a higher degree of freedom to explore and develop ideas than other interviewees. This agent indicated they valued the support they received from their family and their colleagues and were appreciative of the opportunities they had had in studying overseas.

Most of the remaining interviewees wanted to help shape the future of Vietnam and saw themselves playing part of a collective role in doing that. For some this was expressed through teaching the next generation, while others were more ambitious. Interviewees highlighted how this project demonstrated a very different way of working, including being encouraged to reflect on how the end users would benefit from the information that they produced. See Table 5 for a summary of agent alignment to indicators.

Table 6: Number of interviewees who aligned to indicators

Prospective agents	Emerging agents	Strong agents	Total # change agents identified in project	Total # interviewed
5	2	1	8	8

Interviewees seemed quite constrained by the rules and institutions they worked within, with fewer instances of people thinking in an entrepreneurial manner or networking with a wider group of people who might have been outside of their usual sphere of interest.

Overall, only one agent of change was clearly identified through the interviews, who had used his networks and considerable influence to champion the project and the new knowledge created to ensure that project outputs were incorporated into high level government decision making. The remaining seven interviewees were identified as emerging or potential. While not hitting all of the indicators themselves, these interviewees expressed their roles as collectively enabling others. So, these people played a vital role in the project, but what did participating in the project do to enable them?

7.3.5.3 *Project capacity building implications for change agents*

Overall the interviewees felt that the technical training had provided them with new skills and knowledge, although many of the interviewees identified a need for further training and resources, including being able to better communicate with their stakeholders and end users and write for English language journals. This reflects that the interviewees were all researchers.

The capacity the 'stronger' potential change agent mentioned as useful, but still needing more work, was translating the project outputs into information that was useful for end users.

The other interviewees mentioned technical skills, which aligned with the interviewees' strong drives associated with learning or expertise in general and research in particular. The interviewees felt compelled to share what they had learnt, particularly with students and other colleagues in more traditional ways.

Interestingly the engagement with decision makers or end users of the information produced caused a light bulb moment in some of the interviewees, that in order to influence a positive future for Vietnam they would need to think and do some things, such as communication, differently. Another highlight was the change in working styles and collaborating with others, and the expansion of their networks. This suggests that the participatory nature of the project itself has primed these emerging agents, although the formal training and workshops enabled their relationships to develop and networks to grow.

7.3.6 Reflecting on the project evaluation process

As outlined in earlier sections, this participatory project sought to help stakeholders in Hanoi produce high resolution projections of future climate suited to adaptation planning in Vietnam. In order to do this, capacity building was undertaken to grow technical skills such as programming and data management, and new collaboration networks were established between HUS and IMHEM. General lessons from the path to impact and adaptive capacity evaluation processes can be found in Appendix 2 and 3, starting on p.271. The following section synthesises case-specific

lessons from the evaluation process and the individual potential change agents' perspectives of how the project influenced and enabled them.

7.3.6.1 *Path to Impact Workshops*

As mentioned, for the Climate Projections case study three Path to Impact workshops were held, in 2014, 2015 and 2017. The workshops took about two hours, which is a moderate investment of time by the participants. When asked to reflect on the evaluation process, the in-country research indicated that they found it useful, but that implementation was hard and longer time frames were going to be needed to demonstrate impact.

The team suggested that further impact would be demonstrated several years after the release of the national scenarios at the end of 2016. The team mentioned that they had undertaken many projects, however this was the first time they had been involved in a review/evaluation of a project. As this was the first evaluation that they had undertaken they had no comments as to the process but indicated that they were keen to learn more about how to undertake evaluations for other projects.

The team indicated that they had no real insights from reflecting on the project, and that their preferred focus was on seeking new funding. Most of the projects they work on are simply about applying the results of the project. Knowing the benefits is good, but implementation is something that follows after a project.

My own reflections on undertaking the PTI workshops suggest that this kind of reflection was particularly difficult for this case study, with participants struggling to critically reflect and preferring a checkbox type activity. However, this was slowly changing over the three time slices, and there was a lot more participant interest in the evaluation methods and results in 2017, with a request that I return to provide training.

7.3.6.2 *Adaptive capacity surveys*

The Climate Projections case study undertook three adaptive capacity survey evaluations in 2014, 2015 and then again in 2017. This evaluation was designed to track impact over time and relied on resurveying as many of the same people as possible. For the Climate Projections case study this resulted in 14 out of the original 19 people surveyed for all three time slices.

Overall the adaptive capacity surveys were able to stimulate reflection in the respondents and draw out stories of change and barriers to that change. While there were challenges associated with the scoring of the indicators, they did provide a boundary object for discussion in the survey and when synthesised into the case study evaluation reports, showing indicator scores changing over time.

7.3.6.3 *Potential change agent interviews*

The prospective change agents were fairly easy to identify using the project evaluation data, although having been a CSIRO team member loosely connected to this project meant that I was already primed to understand the case study and could approach the project lead to validate my suggested interview list.

The eight interviews took between 25 and 103 minutes, with all of the interviews being undertaken directly with the interviewee, although in three cases occasional help was provided by a native Vietnamese speaker. While these interviews provided a fantastic insight into potential change agents' lives, due to time and resource constraints they were only able to be undertaken once during the PhD. Interviewees were asked to reflect on their past choices and what they might like for their future, but a chance to ask these questions of them again would yield a better understanding of the contextual and temporal aspects of catalysing an agent of change.

7.4 Case conclusion

The Climate Projections Vietnam case study only identified one change agent who was already a change agent prior to the project. However, the other interviewees, while not having all the characteristics of change agents, were technical enablers on the path to change.

The Climate Projects case study demonstrates the importance of teams and networks that enable collective success. While having only one identified strong change agents, the creation of networks between research teams, together with formal and informal mentoring and more traditional project capacity building activities, are likely to have facilitated the emergence or priming of individuals who could be emerging change agents in the system. However, neither the project nor the developed networks included end users of the climate information developed, and as such there was a missed opportunity for directly influencing decision makers. How to work with end users was an identified missing capacity that the project participants self-identified as something they would like assistance to build their competencies in.

All of the interviewees mentioned a core set of values or purpose in that they wanted to help others and build a better future for Vietnam. The Climate Projections case study suggests that agents may have an identifiable set of characteristics that are shaped by their context and histories, but that sometimes it is the collective, rather than the individual, that can catalyse capacities and opportunities for systemic change.

Chapter 8: Climate Adaptation Strategies for Rural Livelihoods in Nusa Tenggara Province, Indonesia

This chapter utilises the R4D Alliance project Climate Adaptation Strategies for Rural Livelihoods in Nusa Tenggara Province, Indonesia (Adaptive Livelihoods) as a case study to explore the framework and concepts outlined in Chapter 4:.

The islands of eastern Indonesia have some of the highest levels of poverty and food insecurity in the country. Nusa Tenggara Barat (NTB) is one of the poorest of Indonesia's 33 provinces (Butler et al., 2014, Butler et al., 2016b). Of the 4.5 million people who live in the province (ACIAR, 2012), most live in rural communities and derive their livelihoods from farming, fishing and small-scale local industries. They are highly vulnerable to changes in rainfall and weather patterns that affect crop yields, livestock and fisheries, and natural disasters such as floods, drought and storms.

Prior to 2010 there was little information about the potential impacts of climate change and other changes on rural communities, and no planning processes which could proactively anticipate them. However, extremes were becoming more frequent and intense as the global climate changes, this exacerbated the underlying issues which were already impacted by population growth, fluctuating commodity prices and rising costs of living.

In response the NTB government set up a climate change task force with an explicit aim to integrate across all the different government sectors. This process mirrored what was going on at the national level through the Indonesian climate change road map. The aim was to integrate all the stakeholders and to build everyone's capacity to understand, and then coordinate and cope with, climate change actions. At both the national and provincial levels, the focus was on climate mitigation or deforestation issues rather than adaptation.

Another complication of the planning progress was the ongoing decentralisation of governance and associated funding from the national to the district level, bypassing the provincial governments. This commenced in 1998, after the Suharto regime, and initially was fairly chaotic in NTB with the newly empowered and funded district governments rapidly trying to gain the necessary skills and experience. Provincial governments were now more focused on coordination but had less authority and responsibility for implementation.

NGOs and aid agencies helped fill the decentralisation capacity gap, however, this activity was going on in parallel to the government activity, rather than integrated. The relative poverty and food security issues of NTB meant that there was a lot of donor activity with major programs underway in 2010 with WWF, GIZ, UN, WB, ADB and others. NTB Province had also been a focus of two Australian Aid programs for about 10 years.

Figure 35: Map highlighting with a grey circle around the islands of Lombok and Sumbawa in Nusa Tenggara Barat (NTB) Province, Indonesia (Butler et al., 2016b)

8.1.1 The Project

8.1.1.1 *Project identification*

Despite multiple development initiatives NTB was unlikely to achieve its own target of leap frogging the MDGs in the next 20 to 30 years. The CSIRO project team felt that one way to assist in this complex environment was to co-develop a process of adaptation planning using an adaptation pathways approach which looked at all the options and decisions and try and settle on the ones that didn't foreclose future options.

CSIRO had been working in NTB for over 10 years and had built a solid relationship with the University of Mataram (UNRAM) around livestock and livestock systems at the small holder scale. An Australian Aid consultant, who knew about the previous CSIRO work in NTB, felt that the R4D Alliance provided an opportunity to build on the existing relationship and to scale this work up to look at vulnerability of local livelihoods to climate change. This was facilitated by a small phase one R4D Alliance project that created regional climate change projections for Indonesia (McGregor et al., 2016) in order to assist regional decision making. The project provided BMKG (Agency for Meteorology, Climatology and Geophysics) staff with data sets and skills to assess possible impacts of climate change over Indonesia (Roth, 2010). These networks and information were subsequently utilised by the Adaptive Livelihoods project.

8.1.1.2 *Project objectives*

The project was managed as a partnership between CSIRO and UNRAM from 2010–2014 and aimed to demonstrate an adaptation planning approach that could be scaled out in other rural regions of Indonesia.

The CSIRO project team worked with in-country researchers, government agencies and communities on the islands of Lombok and Sumbawa (Figure 35). A cross-organisation multi-disciplinary research team was built through the project, with the aim of equipping them with analytical skills and tools to identify vulnerable communities. This was supplemented with a novel participatory planning approach which co-produced knowledge and learning by policy, community and research stakeholders alike, as well as mitigating power imbalances and creating ownership of problems and solutions. The aim of this project was to develop multi-scale adaptation strategies for the islands of Lombok and Sumbawa including:

1. Develop and test a participatory research method which can identify vulnerable rural communities, generate 'no regrets' co-benefit adaptation strategies, and 'future proof' development projects
2. Deliver a vulnerability assessment for NTB Kecamatan (sub-districts) which can prioritise development investment
3. Deliver adaptation strategies for case studies of vulnerable communities in NTB and integrate them into development planning
4. Build capacity of NTB government, university, NGOs and vulnerable rural communities to establish adaptation pathways.

8.1.1.3 *Project partners and stakeholders*

Initially the project team was made up of staff from:

- CSIRO
- University of Mataram (UNRAM)
- Indonesian Agricultural Technology Assessment Agency (BPTP)
- Indonesian Bureau of Meteorology and Geosciences (BMKG)
- NTB Government's Climate Change Task Force, NTB Planning Agency (Bappeda)
- NTB Environmental Research Board (BLHP)
- NTB Food Security Agency
- United Nations World Food Programme (WFP)
- Indonesian Ministry of the Environment
- Australian Department of Foreign Affairs and Trade (DFAT)
- EcoRegions Indonesia (ERI)

A project governance structure was established based on discussions with UNRAM and consisted of a Steering Committee, a Tim Kolaborative (collaborative team) and an advisory group.

8.1.1.4 *Project outputs*

The Adaptive Livelihoods project was one of the largest and longest running of all the R4D Alliance projects, commencing in 2010 and concluding in 2014. By the time the project

concluded in 2014, in addition to many reports and scientific publications, the most significant outputs were the increased in-country partner capacity and improved networks between key decision makers and stakeholders in the region. UNRAM emerged as a centre of adaptation excellence, and cooperation between agencies was increasing, with stronger links between BPTP, BMKG, BLHP and Bappeda.

A novel participatory planning method was developed by researchers from UNRAM and CSIRO, and the Indonesian BPTP and BMKG which integrated the data, tools and facilitation skills necessary for adaptation planning. The method was successively applied and refined by the team through five sub-district case studies.

A Vulnerability Atlas of NTB Province was produced by combining a livelihoods typology with projected impacts of climate change and population growth, and current adaptive capacity. The Vulnerability Atlas highlighted sub-districts where adaptation planning should be prioritised (see Figure 36).

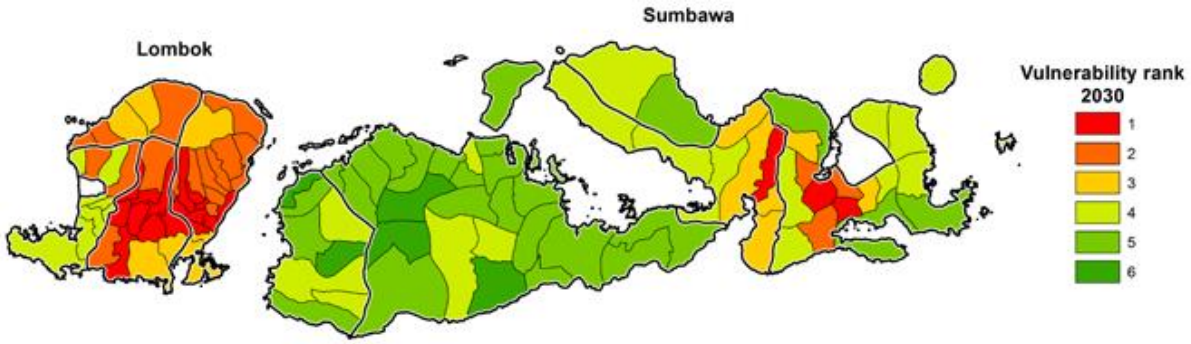


Figure 36: The adaptive livelihoods project vulnerability atlas (CSIRO, 2015b)

At project completion the World Food Programme was using the Vulnerability Atlas to guide its food security and resilience program and had secured funding for the implementation of adaptation strategies. The atlas was also incorporated into both the NTB Government's Food and Nutrition Action Plan 2012, and the Strategy and Action Plan for Food Security and Climate Change.

'No regrets' adaptation strategies were developed with vulnerable communities, based on their specific local needs. No regrets strategies are strategies designed to deliver benefits under any future conditions of change.

The research team, local farmers and fishermen tested 12 strategies in five case study sub-districts in Lombok. At project completion several of the adaptation strategies were adopted, funded and scaled out by government agencies, the private sector and communities.

All project materials can be found at http://wp.csiro.au/r4da/projects/long-term-projects/climate-adaptation-strategies-for-rural-livelihoods-in-indonesia/

8.2 Post-project evaluation and change agents

This section starts with an analysis of the whole of the Adaptive Livelihoods project evaluation using the Path to Impact workshop and adaptive capacity survey results (activities 3–6 in Figure 22, p.101), and concludes with a summary of what impact the Adaptive Livelihoods project had had by the time of the potential change agent interviews. The evaluation data was then used to identify potential agents. Subsequent interview responses are then compared to the indicators developed from literature review (Activities 7 & 8 in Figure 22, p.101).

8.2.1 Adaptive Livelihoods case study's impact over time – Path to Impact Participatory Evaluation Stories from 2014 to 2017

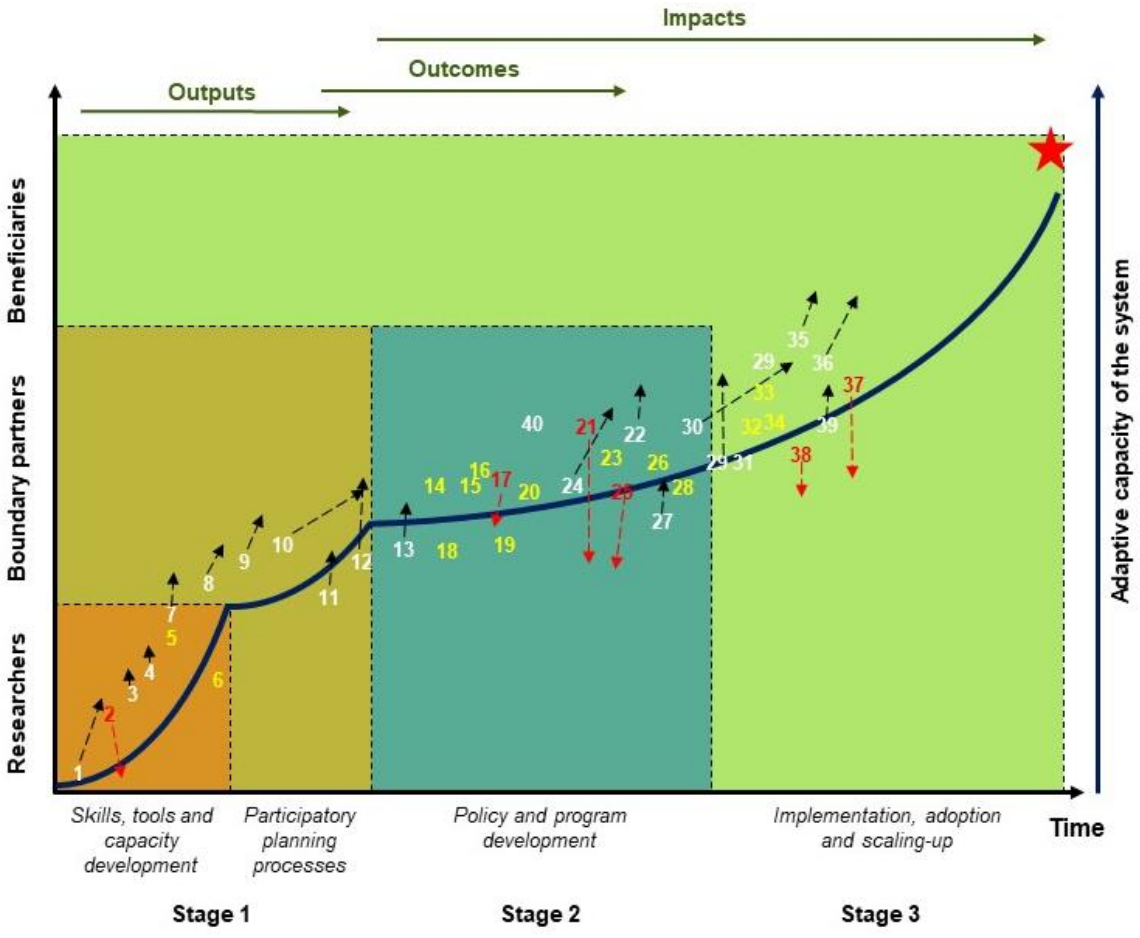


Figure 37: Theory of Change April 2014 to June 2017. The Adaptive Livelihoods project's goal (red star) was to increase the adaptive capacity of rural communities, boundary partners and researchers to enable vulnerability reduction to adverse change. White numbers with black arrows reflect the positive change in impact on the activity or outputs from 2014 to 2017. Red numbers with red arrows reflect the negative change in impact from 2014 to 2017. Yellow numbers reflect no change or additional impact between 2014 and 2017.

In August 2017 I undertook the third evaluation of the Adaptive Livelihoods project with the UNRAM project team and other key stakeholders using the reflecting and sharing approach outlined in Chapter 5.

Rather than tell the stories of each of the 40 impact points I will use a Most Significant Change approach (Davies and Dart, 2005) to provide a snapshot project impact across the three stages as articulated through the participatory Path to Impact process.

8.2.1.1 *Stage 1a – Skills, tools and capacity development*

The sustainable livelihoods approach and framework (**#1** and **4**) took a long time for the in-country partners to understand and adopt, but by 2015 and into 2017 they were using the methods and tools in other projects and adapting the concepts in order to teach staff and students.

An NTB Vulnerability Atlas **(#2**) was created through the project to identify the vulnerability of different communities and their livelihoods. Initially this work had greater impact than anticipated due to an unexpected linkage with the World Food Programme. However, by 2015, although the World Food Programme were still using the methods, they were no longer using the Adaptive Livelihoods project map. As of 2017 the World Food Programme had developed their own map with different data, and the District Government had developed a third map. It was felt by participants that the truncated Adaptive Livelihoods project resulted in a lack of integration of the project atlas and disconnection with the development of the new atlas.

The project included multiple training and capacity building activities with in-country partners with varying degrees of success. Workshop facilitation **(#8**), stakeholder analysis (**#9**), and scenario planning **(#10**) were all seen as successful and immediately useful by the partners. In part this was because they were easier to understand and didn't require advanced training, software or computing skills. While being highly technical, the CCAM training (**#7**) was also seen as useful as it was directly relevant to the BMKG staff who already had skills in climate modelling. In contrast, training in ADWIN **(#5**) and social network analysis (**#6**) was less successful due to the lack of computing and software resources within UNRAM.

8.2.1.2 *Stage 1b – Participatory planning processes (outputs)*

The Tim Kolaboratif **(#12**), a multi-stakeholder and cross-sectoral approach which encouraged collaborative work, was adopted by the partners. Some felt that the whole method, including the planning process, took too long and was therefore yet to be fully applied and adopted. By 2017 UNRAM and other partners were using the tools and methods in other research programs, especially when working with overseas partners who expected multi-agency projects.

8.2.1.3 *Stage 2 – Policy and Program development (outcomes)*

One of the goals of the project was to have the developed strategies (#17) incorporated by the local government planning process (*musrenbang*). By the end of the project there was a better

than anticipated uptake of strategies in ten village *musrenbang*. However, by 2015 local government priorities were starting to shift, which was accelerated by elections resulting in a change of local government. While some strategies were maintained, such as the bondre seaweed program, it was no longer as high a priority in *musrenbang* focused on infrastructure, health and water. In other areas the government had failed to deliver as promised, such as in Sekaroh where the NTB Agriculture Department and District levels did not provide maize seeds to farmers as promised.

In some case the strategies were continued, and implementation occurred through other projects. The situation in Sekaroh recovered through another project (ARISA) which implemented a strategy to help farmers by developing partnerships with a bank, seed and pesticide providers, and the government, and improving their farming technology through double/intercropping maize and mung beans. ARISA is now being expanded to Sumbawa.

The project was designed to influence and connect with other development activities in NTB, one of which was the World Food Programme **(#21**). By the end of the project the team had successfully influenced the World Food Programme, who were now using the focus group discussion methodology and Payments for Ecosystem Services as a new food security strategy. The World Food Programme also managed to secure a Climate Adaptation Fund (USD6 m) grant for Lombok, although by 2015 this influence had slowed due to a change in management in the World Food Programme, with Payments for Ecosystem Services no longer in operation. Discussions with UNRAM scoping opportunities were unsuccessful and by 2017 the World Food Programme had decided on a different set of activities for their program of work and had returned the $6 million for climate adaptation activities to the funder.

One of the Adaptive Livelihoods' project's in-country partners, the BMKG NTB office, increased their status or ranking with the government (#24) from Level 4 to 1, primarily due to the stakeholder linkages developed through the project. This enabled BMKG to secure more funding to expand Climate Field Schools, which now included fishermen. By 2015 BMKG had received further funding from World Neighbors (USAID) for additional field schools in East, Central, and West Lombok and Bima and Dompu districts, and with BMKG fisherman schools starting in Bali based on the NTB model.

As at 2017 the BMKG NTB office continues to be very busy, and most of the staff associated with the project have been promoted and moved to Jakarta, Bali etc. Individual staff benefited as a result of the Adaptive Livelihoods project; with the project training they improved their skills and moved on to better jobs. Fortunately for those in NTB, the new staff are also good and other government offices, especially Agriculture, are continuing to work closely with BKMG to inform decision making, such as data on climate for seasonal planting and influencing policy development.

The Adaptive Livelihoods project influenced the creation of an East Lombok District Climate Forum (#25 & #37) designed to increase farmer awareness and strategies for climate variability. However, by 2015 the Forum had stopped due to a lack of Bupati (head of local government) support and a perceived focus on short term thinking. There was no change as of 2017 due to the same Bupati being in government.

8.2.1.4 *Stage 3 – Implementation, adoption and scaling up (outcomes and impacts)*

The Adaptive Livelihoods project intended the case study trials (#29) to continue beyond the life of the project with the development of new varieties and approaches applied in local communities. Towards the end of the project some of these trials started to engage with private industry and local government to develop off-season mangoes, cassava processing and honey production.

Trials were continuing in 2015 included:

- maize–mung bean intercropping improving and expanding to other areas
- biopores and agroforestry continuing but restricted to one plot in North Lombok
- honey production progressing, promoted by the North Lombok District government
- bondre seaweed (a variety of seaweed more suitable to extreme conditions) project expanding with KPDT funding
- off-season mangoes, and connecting with private industry (Syngenta)
- livestock resilience project expansion into Dompu (pending NZ funding and ARISA)
- the scaling out of crabs to West Lombok and East Lombok
- the cassava trial was continuing, although slowly due to a crop disease in 2014–15.

As of 2017 some activities were ongoing, and new activities commencing, including:

- intercropping continuing through ARISA, and a new project with UNE on livestock resilience throughout NTB
- honey production has increased and there is now a farmer centre for developing honey bees in North Lombok, with support from the Ministry of Research and Technology
- the crab project is also increasing in scale, with a roll out in Sumbawa
- the cassava project is also going well, with more farmers growing cassava.

An unexpected outcome of the project was interest from the National Food Crop Director General Ministry of Agriculture (#30) to develop a new climate-resilient maize variety and private company. By 2015 ARISA was expanding, although the maize variety introduction failed due to the government not meeting commitments. By 2017 many people were working on maize in Lombok, with the UNRAM team seen as the experts/leaders in this space.

The bondre seaweed system (#35) was implemented and scaled up from Ekas Buana to Sekaroh with EcoRegions Indonesia (25 households) in 2013 as well as scaled up to 14 farmer groups in East and West Lombok, including four women's groups. By 2014 this had grown with another five groups in East Lombok, and the East Lombok District selected by KPDT as

demonstration sites for the bondre system for Indonesia with University of Gunung Rinjani supervised by UNRAM.

In 2015 new local farmers groups were provided funding to expand this work from Directorate General of Higher Education and the ARISA project. The bondre seaweed system continues to be scaled out, although it has slowed due to the market price of seaweed declining and therefore becoming less attractive to farmers

A program of implementing livestock for resilience using forage (#38) was established in Sekaroh, East Lombok. It was anticipated that EcoRegions Lombok would be interested in participating, although there were concerns about theft preventing development. By 2015 the livestock project had stopped in Sekaroh, only to be expanded in 2017 by the ARISA program to Dompu and Sumbawa with additional support from a new New Zealand funded project. This is mostly as a result of the ARISA project, but based on the earlier Adaptive Livelihoods project. The original activity in Sekaroh didn't prosper due to EcoRegions Lombok stopping their program of work, the limited land available and the low knowledge or understanding of the community.

In 2017 the UNRAM team wanted to add another impact point (#40) to highlight their increased status due to the Adaptive Livelihoods project. UNRAM has become well known for its climate change and adaptation work in Jakarta and with Millennium Challenge Account, a USA funded development grant institution. UNRAM is now one of the 'Big 50 Universities' in Indonesia in terms of their publications. This has been of personal benefit/impact for staff, with six UNRAM researchers listed as the most productive and most cited [in Indonesia] due to this project. They all mentioned that the CSIRO team leader had driven this publication productivity.

8.2.2 Evolution of the Adaptive Capacity Evaluation Stories from 2014 to 2017

In addition to the Path to Impact participatory evaluation workshops, the Adaptive Livelihoods project was evaluated using adaptive capacity surveys with project participants, including in-country research partners and boundary partners. As many of the original participants were re-interviewed in 2015 and 2017 as possible, noting that some people had left Lombok or were studying overseas. Seventeen interviews were sought but only 13 were undertaken due to availability of participants.

The Path to Impact and Adaptive Capacity evaluation have been used to track impact over time, triangulating and cross checking the stories between the processes, as outlined in Chapter 5:. The focus of this research is to better understand the importance or otherwise of potential change agents in systemic change, so the first step is to test whether systemic change has happened.

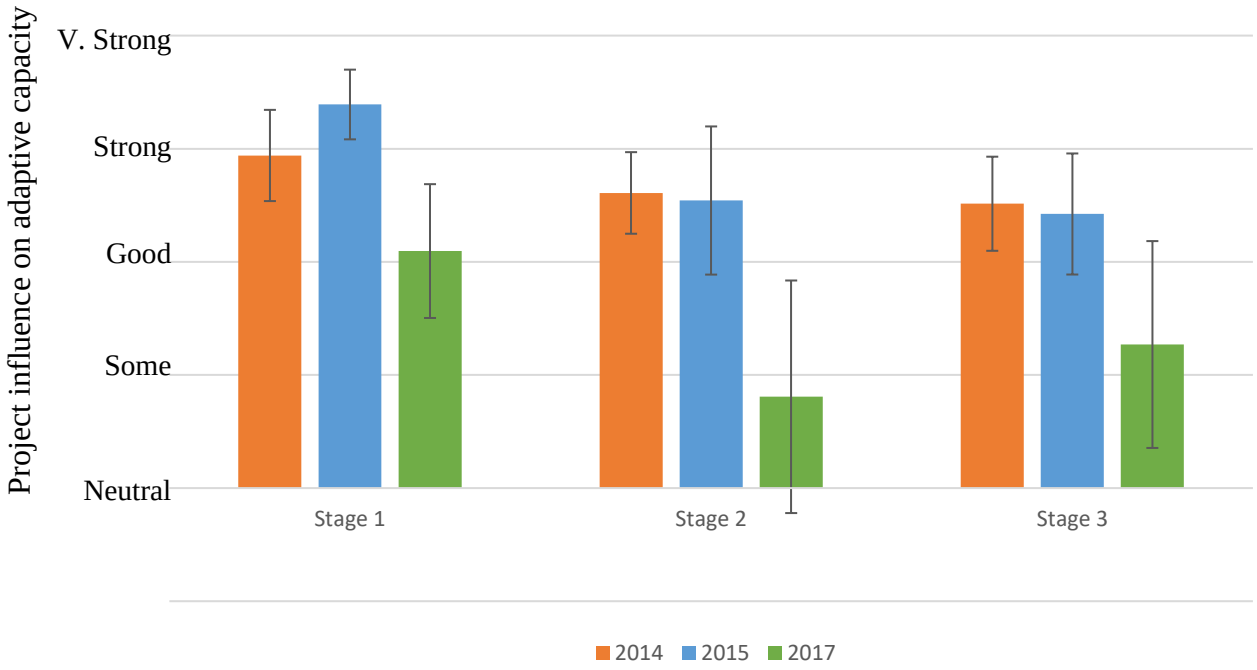


Figure 38: The influence on adaptive capacity across the Adaptive Livelihoods project's three impact pathway stages in 2014, 2015, and 2017. Each stage is represented by an average of indicators for that stage, with error bars highlighting the range of responses to indicators.

8.2.2.1 *Adaptive Capacity Overview*

Across all time slices, the Adaptive Livelihoods project had the greatest impact in Stage 1, which focused on developing skills, tools and capacity, and participatory planning processes (see Figure 38). This is perhaps expected as these were the core aspects of the project and what the project team had the most control over. While the perceived impact grew slightly in stage one from strong in 2014 towards very strong in 2015, it had declined by 2017 to having a perceived 'good' impact. This is countered by a somewhat larger range of scores, which aligns to some of the survey respondents' growing awareness and participation in ongoing work in this space, whereas the project had become less relevant for others.

Stage 2, program and policy development, had the second greatest impact for the Adaptive Livelihoods project with good to strong impact maintained from 2014 to 2015, although with a wide range of scores. This impact did not last, with the scores dropping to just below 'some' in 2017 and with a significantly wider range in scores. This broad overview suggests that the hoped for uptake of information, tools and methods into policy did not happen or was not maintained except in a very few cases.

Stage 3, implementation, adoption and scaling out, was anticipated to take the longest to achieve and could reasonably be expected to occur only after the project had finished, giving the project team the least amount of control over the impact results. Due to the focus on livelihood trials the Adaptive Livelihoods project managed to achieve good to strong impact in stage 3 across both 2014 and 2015 time slices. Much like the policy and program development stage, this impact

score then declined to slightly to better than 'some' with a significant range in scores. As will be explained in more detail below, some of the trials went on to achieve great success, while others failed to achieve their aims. The success or otherwise of these adaptive livelihoods trials became a key indicator of potential change agent identification for subsequent interviews.

8.2.2.2 *Stage One – building capacity*

As outlined in the overview, stage one (building capacity) had the highest-scoring indicators across all three time slices of the project, although the Path to Impact evaluation highlighted that not all capacity building activities were successful, and even in the successful cases not all participants perceived the same benefit. As outlined in Chapter 4:, the stage one adaptive capacity survey included seven indicators based on adaptive co-management principles. Six of these indicators were assessed across all three time slices, with the seventh (vision and goal) only assessed in the first time slice (see Figure 39).

Across the three time slices 'leadership emerging' and 'knowledge enhanced' consistently received the strongest stage one scores, with 'trust created' also scoring well in 2014 and 2015 before declining in 2017 and having a wide array of scores (standard deviation 1). The lowest scoring stage one indicators were 'questioning values and governance' and 'creative solutions', although 'questioning values' strengthened in 2017 while 'creative solutions' declined. Both had large standard deviations, 0.7 and 1.1 respectively.

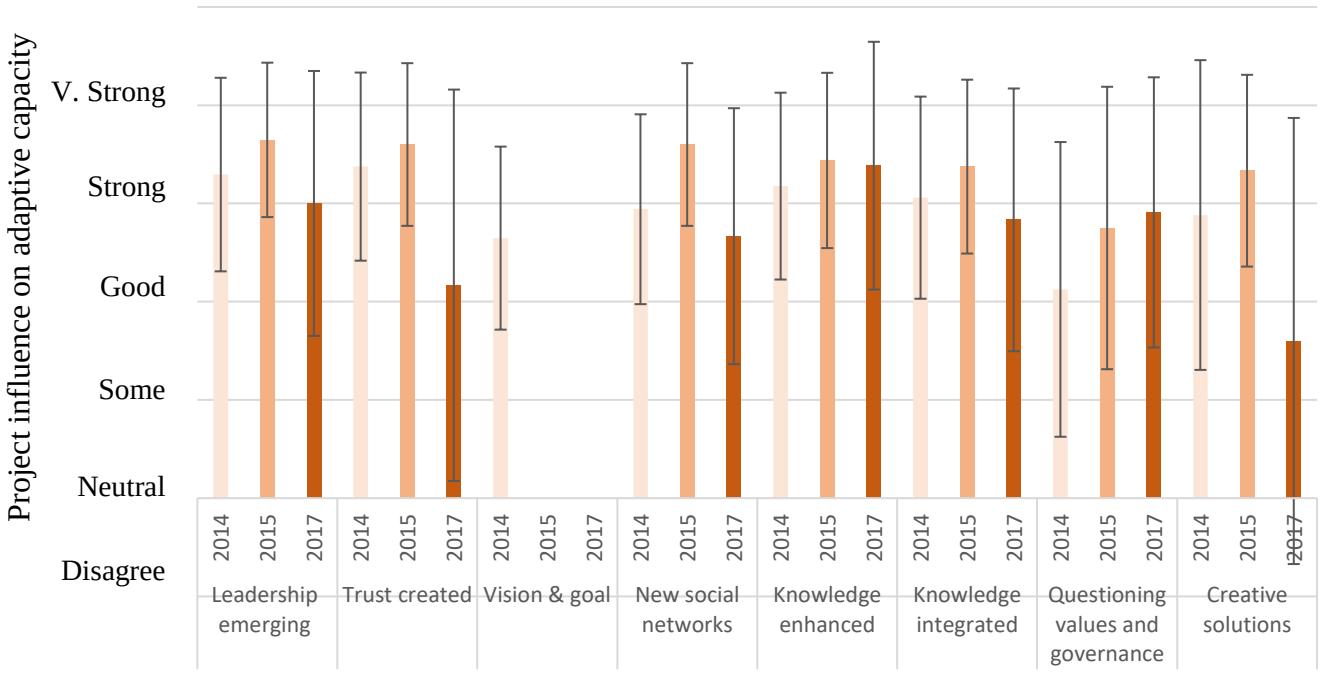


Figure 39: The influence on adaptive capacity across the Adaptive Livelihoods Project's impact stage 1 in 2014, 2015 and 2017. The error bars show the range of scored answers. No result indicates that the question wasn't asked in that year.

8.2.2.3 *Stage Two – Policy and program development*

The Policy and Program Development stage had weaker indicator scores overall than stage one. The overall scores were good in both 2014 and 2015, with a sharp dip in 2017 (see Figure 40). The highest scores were the cross-scale networks (2nd scale) as discussed above. This was 'new partnerships' and 'new project', with the weakest indicator being 'changes to institutions' which together with 'enabling changes' in stage 3 were the only indicators to score a negative result in 2017.

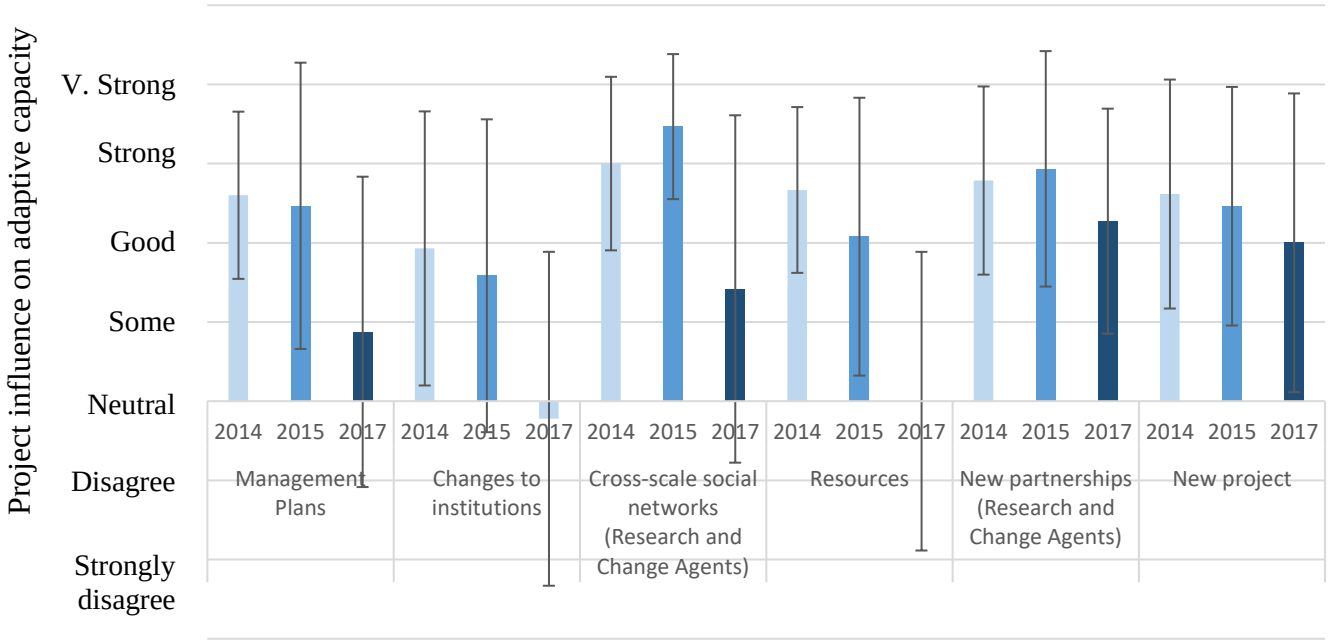


Figure 40: The influence on adaptive capacity across the Adaptive Livelihoods Project's impact stage 2 in 2014, 2015 and 2017. The error bars show the range of scored answers.

8.2.2.4 *Stage 3: Implementation, adoption and scaling-out*

Like stage 2 the implementation, adoption and scaling-out indicators had relatively high scores for 2014 and 2015, with evidence that new relationships have developed between stakeholders as a result of this project and the relative success of livelihood trials with communities (see Figure 41).

This is demonstrated by the overall highest-scoring indicators for stage three 'helping the vulnerable' and 'enhancing beneficiary capacity', with new partnerships (discussed above). The lowest overall score for stage 3 was 'enabling changes', which had a negative score in 2017, reflecting the challenges with changing organisation, rules and practices (as discussed above).

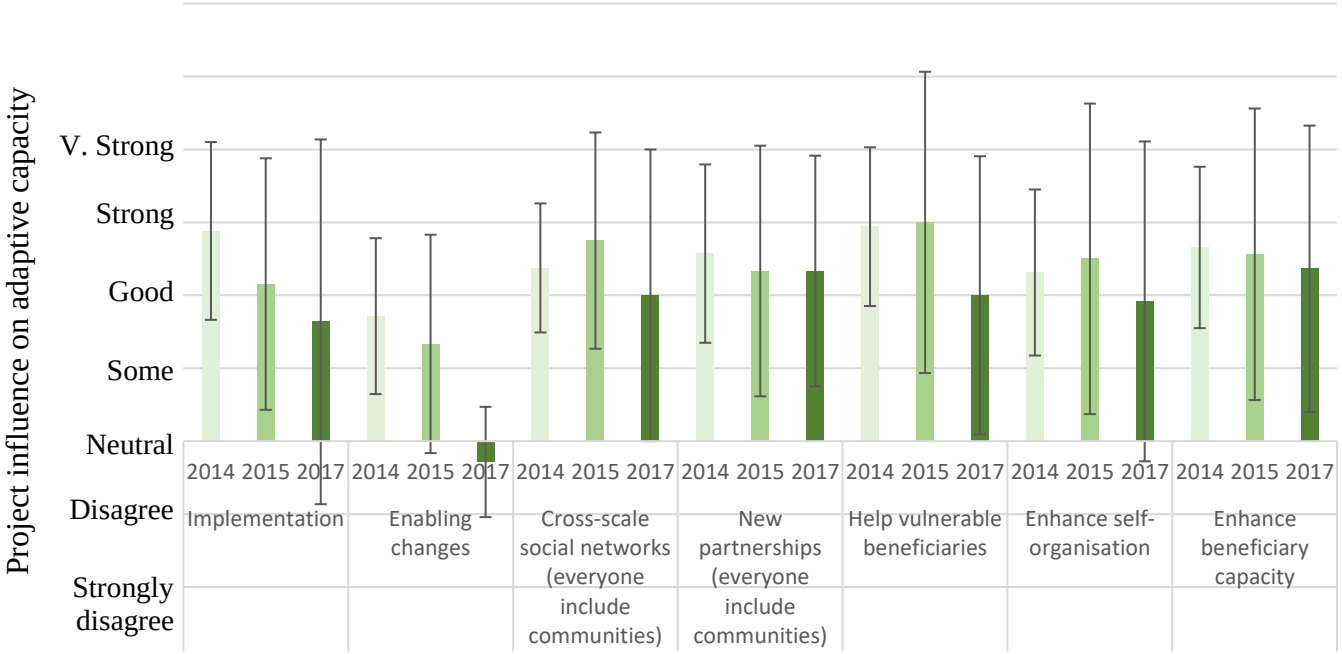


Figure 41: The influence on adaptive capacity across the Adaptive Livelihoods Project's impact stage 3 in 2014, 2015 and 2017. The error bars show the range of scored answers.

8.2.3 Synthesis of the evaluation results over time and distillation of potential change agents

Through reviewing the Path to Impact evaluations and adaptive capacity surveys I was able to distil which of the key individuals were mentioned as growing in capacity or leadership. Over the three time slices it became apparent that by 2017, some in the wider project team were struggling to maintain connections and networks, while for a small cohort their linkages were going from strength to strength. Those that maintained their networks saw value in these relationships (friendship, new work or opportunities) and had the willingness and capacity to stay connected. In some cases, these people were already well networked, although the project helped them expand into new areas or strengthen existing ones. For others this was a change in the way they operated from before and was now a new way of working.

Several names reoccurred throughout the evaluation, with three individuals most commonly mentioned and therefore potential agents of change. All those surveys and interviewed were allocated a unique identifier for anonymity, i.e. NTB #. The subsequent list was then shared with the Adaptive Livelihoods CSIRO project leader who added a name that had been missing from the list. My interview list was provided to partners within Lombok and interviews were arranged. However, more interviews were arranged than originally requested as our partners added two interviewees whom they regarded as significant. This was in part an expression of local power and politics but became useful for presenting counterfactual or alternative cases that were not indicated by the analysis as potential change agents. Of the eleven interviews undertaken, eight

were researchers, and the remaining three had formally been part of the research team but were now pursuing personal initiatives.

8.3 Potential Agents of Change

Eleven interviews were undertaken to elicit information from the interviewees to see if the set of attributes discovered through the literature review were the necessary and sufficient set to determine what makes and motivates a change agent, focusing on their capabilities and capacities, characteristics, and roles (activity 7 in Figure 22, p.101). Some of the interviews were direct with the individual, while others required the assistance of a translator. Each interview took between 25 and 45 minutes. The results below are outlined by attribute indicator and conclude with a summary of individuals identified as potential change agents.

8.3.1 Capacities and capabilities

A review of capacities and capabilities needed to enact adaptive change in individuals and groups can be found in Section 2.2.2.3.

8.3.1.1 *Skills*

Skills can be thought of as tools for change, whether that change is specific to the individual, or their ability to undertake and engage in social change (Roberts and Lacey, 2008, Petzold and Ratter, 2015). The Adaptive Livelihoods project specifically built the skills of project participants through formal training and collaborative participation on the project. These skills included facilitation, scenario planning and climate downscaling.

As would be expected in a research for development project, core skills developed centred on the technical, and strengthening and widening research skills of the project team. The project utilised a mixed methods approach for many of the research activities, including the trials and evaluation. This has been adopted by many of the project research team (NTB 1, 3, 6, 7, 9 and 13), although NTB 1 noted that some of the researchers 'found it too hard to change their paradigm and their sectoral ego'. Of particular note is the improvement in writing skills for reports and publications as well as new proposals. UNRAM has increased status due to the improved quality and number of publications (PTI impact #40) and has had enhanced success funding new proposals which integrate the new methods and approaches. However, it was also noted that the UNRAM staff would have liked to be more involved with the CSIRO reports, particularly the final reports which they feel they were left out of and some haven't seen. The reality is that due to the rapid truncation of funding and wind up of the project, no final whole of project report was prepared.

At odds with the adaptive capacity survey, interviewees mentioned appreciating the monitoring, evaluation and learning skills, particularly focused on Theory of Change and reflecting what worked and what didn't, which they felt enabled them to better plan projects in

the future (NTB 1, 4, 5). The 'too hard to change' mindset was mentioned as a reason for the lack of ongoing monitoring and evaluation of the trials.

Interviewees mentioned learning about new technical innovations for livelihoods and building on ones they were already aware of. These livelihood alternatives included the bondre seaweed system and maize intercropping (NTB 6, 7, 9, 12 and 13) and are outlined in the earlier Path to Impact and adaptive capacity survey results. Other valued 'technical' skills included a better understanding of climate change and scenario planning, with UNRAM staff now seen as experts in this space. Other skills improvements came from observing others within the team, particularly the CSIRO staff, with UNRAM staff noting that they now had better skills in knowledge management, project management, and presentation skills.

While the technical skills were valued, it was the skills in enabling the interviewees to work and collaborate with people that were seen as the most valuable.

> *I don't undervalue the technical skill but it is rather easy to get you just go for course or read a book or blah blah blah. But how to collaborate with people, how to maintain the network it's the most important. (NTB 5)*

These people skills included developing the patience to work with students and communities in this complex space (NTB 9 and 13). However, it was the gaining or strengthening of facilitation skills that was most mentioned by interviewees (NTB 1, 9 & 19, 20). Most of the UNRAM team had not worked in a participatory way with stakeholders previously. This project demonstrated how their role and impact as a scientist could be benefited by active participation in communities. Interviewees saw the skills in facilitation as a way of building trust, as well as growing implementation and adoption, thereby creating greater impact for their work.

> *develop the connection with people who have the skill, and that improves. It makes me more competent for doing this job. (NTB 1)*

8.3.1.2 ***Competencies***

If skills are tools for change, then competencies can be thought of as combining skills with abilities and behaviours to create a certain 'know-how'. See Chapter 2: for a list of the competencies identified. Competencies are not independent of each other, with attributes and indicators potentially aligned to multiple competencies.

Some individuals felt that they were already competent in strategic thinking and could help others see and create opportunities (NTB 18), whereas others felt their competency in this was developed by the project (NTB 13). The project helped develop the strategic competencies of the partners by co-designing and implementing the project together. This was undertaken again on a smaller scale with the livelihood trials, together with systems and normative competencies, where members of the project team learnt about desirable commodities, how vulnerable communities in

Lombok could grow and/or process these commodities, as well as linking the outputs with the market (NTB 9, 13).

This better understanding of the system and its complexity, together with the scenario planning skills, helped the team members cultivate their anticipatory competencies which they described as creative thinking, imagination and being able to see the future or outside of the box (NTB 1, 18 and 19).

> *The skill is creativity and seeing the future. But inside of that we have our knowledge based on the science, we have a masters [degree], we have a PhD. So it should be based on the background, but still we have to see the future. (NTB 1)*

Better understanding of the complexity of the issues was also aided by the incorporation of a mixed methods approach. UNRAM team members learnt that to address problems of climate change and food security within communities there was a need to combine the technical problems with socio-economic information.

> *This means there is a need to really understand what is happening in the communities and incorporating different types of knowledge. (NTB 4, 9, 13).*

The project team drew on their new understanding of systems and grew their interpersonal competencies in order to work with others. Lonsdale (2015) suggests these skills are fundamental for initiating, maintaining and creating a successful intervention. Multiple interviewees mentioned that this project led them to work with communities and private enterprise for the first time. In the past, project outputs had focused on delivering knowledge to stakeholders or had resulted in the researchers instructing others (often community) in what to do. This required the project team to broaden their interpersonal competencies to include those that Wiek et al. (2011) describe as regular competencies such as project management and communication skills, especially that of translating technical knowledge to those who are less educated, as well as the interpersonal and entrepreneurial competencies in how to get the best out of people in various and often unfamiliar or uncomfortable situations.

> *Helping the farmers engage with the workshops, including helping them through their discomfort at staying in a hotel with running water etc. for the first time. (NTB 13)*

All interviewees mentioned that they built their networks through this project, and that these networks led them to other opportunities. Some viewed their role as connectors, bridges and communicators in the system which was strengthened as a result of the project (NTB 4 and 18). Following on from the project some made the time to maintain and grow their networks (NTB 1, 9 and 13), whereas others let their networks associated with the project lapse (NTB 3, 5).

> *I got the scholarship from the NZ government. It is not only because of my knowledge and experience, but because of the network. (NTB 6)*

Wiek et al. (2011)'s normative competency is particularly relevant for R4D and adaptation projects as they are seeking to resolve issues of justice, equity and social-ecological integrity, as well as often challenging the status quo. Fairness proved to be an important aspect of the CSIRO responses, with all interviewees mentioning the importance of building trust and being seen as trustworthy (NTB 4, 9, 18, 19, 20).

> *how to help people to cope with this, how to prepare so that the people can cope with the problem in the future. (NTB 1)*

This normative competency is also related to getting things done and being able to resolve problems or sense-making in real-world situations. This is similar to Bandura's self-regulation competences (Bandura, 2006b) and was articulated by the interviewees as their ability to be adaptable, flexible, driven, persistent, responsible and resourceful in order to achieve their goals (NTB 5, 7, 13, 18 & 20).

The UNRAM team mentioned that they appreciated learning about and developing several 'regular competencies' while working with CSIRO. These included critical thinking, written communication, tools for reflection and learning, and coordination and management, with one interviewee mentioning he now owned a diary for planning after watching the CSIRO project leader use his.

There were competencies mentioned that arguably didn't fit within the framework of the literature review. Some of these competencies were socially relevant to Lombok, and perhaps not valued by other social groups or contexts such as western researchers (Ryan and Deci, 2000). One emergent competence was described as learning to deal with ambiguity due to the complexity, uncertainty and contested nature of adaptive decision making in development. Individuals require a comfort in not knowing, and a willingness to be open, collaborative and out of one's depth.

> *Ability to keep going even when feeling out of one's depth (NTB 20)*

> *Getting comfortable with not knowing and allowing the solutions to emerge through a collaborative process. (NTB 20)*

8.3.1.3 ***Resources***

As outlined in Chapter 2, section 2.2.2.2 it is not just a matter of having the skills and 'know-how' to make change happen, agents need to have, or be able to access, resources needed for change.

A majority of interviewees mentioned time as their most precious resource, and one that they struggled to manage. This resource is closely tied to that of the other change agent attributes, as time is needed to gain new knowledge, skills and eventually mastery, maintain relationships and initiate activities.

> *Time! This is the one that is quite difficult to manage actually. (NTB 9)*

... because ultimately the whole act of linking and communicating with people takes time and that is time which strictly speaking we don't have. (NTB 18)

Time constraints impacted their ability to do what they would like to do and was described by some as the challenge of balancing administration and project or program coordination with research. This was true for both UNRAM and CSIRO interviewees.

I have to divide my time between being the ... program and the research work, so it is really hard. (NTB 1)

So sometimes I am very busy ... we have to solve the administration stuff in our faculty, some student problems. We have to have time to solve all of these things. But it will reduce our free time to do research etc. etc. [NTB 7]

I think that the management in CSIRO takes up a lot of time ... that soaks up a lot of time beyond what [research] you are expected to do. [NTB 18]

Time was an even bigger constraint for those who were working with external stakeholders such as farmers. These activities were often added to existing roles, rather than having additional support or staff to assist. Not only was travel to the project locations or communities difficult and time consuming, but the time required to build and maintain relationships was significant, and often not able to achieve during the working week due to other commitments.

So I got very limited time to meeting with farmers, so like last week on Saturday after 2 pm I left the office and went to Sumbawa to do the work there, and was back on Sunday at 10 o'clock. (NTB 13)

What happen in this country is when the people know you, the community know you they will ask you to help, and at the moment I am in the position which it is very difficult to manage my time because I have in the last 4–5 years since I have a lot of work in the community. So my time is very tight actually (laughter). And I need to spend quite a lot of time in the field including weekends. (NTB 9)

The follow up that goes on, say post [project] is largely, not entirely, of my own volition and making. (NTB 18)

Other issues of resources related to the context, with some research or technological resources not widely available in Indonesia. Some of the interviewees had mitigated this resource issue by collaborating and sharing with others.

Some other resources we don't have here in our country in Indonesia, in our university particularly. But by collaborating with other researchers from other universities in Indonesia. And in particular I have found my collaboration other researchers is very important, particularly to get the current updates in the knowledge as well as helping each other in writing because we also need to publish our research. And also do research together sharing laboratory, sharing resources is very important. (NTB 9)

Another frequently mentioned resource was the challenge of getting money or adequate funding for projects, and in a minority of cases the lack of funding was felt more strongly felt than time.

> *you can't guarantee where the money is going to come from, when it is going to come, or if the people you get the funding from are even interested in what you are. (NTB 18)*

> *The resources is very small. … I have time, but very low resources. (NTB 4)*

These resources constraints were felt for both UNRAM and CSIRO interviews with a sense of frustration about not being able to deliver projects in a way that they would like.

> *These projects are always very resource intensive and time intensive. I don't think we necessarily always do them in the best way. … we could always use more people, more help, more money ... We operate in a world where people want to see rapid results and gadgets or gizmos, and that is not what we do. We are much more about process and relationship building. (NTB 19)*

> *In terms of accessing resources, every project that I do we seem to be able to get the people we need to do it. But we do require everyone to go above and beyond, so everyone is pushing themselves to in excess to what they would or should do I suppose. That is almost in every project that I am involved in. (NTB 20)*

8.3.1.4 ***Knowledge***

Knowledge includes facts, information, and skills acquired through experience or education. Section 2.2.2.1 outlines more about the dual nature of knowledge and the implications for 'whose knowledge counts' and what enables effective knowledge exchange.

The more traditional knowledge capacity building of research projects was a key feature of the Adaptive Livelihoods project, with UNRAM staff appreciating the widening and deepening of their knowledge and skills through the project.

> *like … using the systems approach and mixed methods whereas before he didn't. (NTB 1)*

> *Yes, it increased my capacity in collaboration with overseas donor funding body and exercises in collaboration and government facilitation. Through the experience I got knowledge and involved in reviewing project and climate change work, and dealing with farmers. (NTB 3)*

> *It helped me to grow. (NTB 6)*

> *I was previously only interested in biophysical issues, but now aware of the social issues and the impact of climate change. This has been helped by my improved understanding of complexity and I've started thinking of a strategy to help. (NTB 13)*

I really got the result of the project, and I am thankful for James and the other people who come from CSIRO to help us here. I appreciate their support and I learnt a lot from this project. (NTB 1)

Of particular interest was how to integrate knowledge across disciplines, using a mixed methods approach to solve real-world problems, and with a new appreciation for the complexity of the challenge and the drivers of vulnerability.

Some researchers integrated, others did not. It is hard to change their paradigm and some of the [boundary partners] is hard to change their sectoral ego (NTB 1)

Different types of knowledge were very much a feature of this project, with many of the interviewees mentioned working with and learning together with the communities.

for the community we share knowledge, their knowledge to us. We learn from them actually, and then develop strategies to improve their livelihood as well as to enrich my teachings and also research. (NTB 9)

Some interviewees were focused and appreciative of the technical knowledge they gained through the project '… working with foreign partners. Too many things we learn, and the principal thing is discipline' (NTB 7). Other interviewees mentioned the need to include different types of knowledge, such as learning from farmers, and the challenges in combining these knowledges for practical application.

knowledge on your field of study, and the second one is understanding the current situation in the areas and what the community needs to improve their livelihoods. But the difficult thing is then to link them. (NTB 9)

Need to combine the science and the other forms of action that is required to make change. (NTB 18)

There was also mention of how technology was changing access to knowledge for both the communities and the researchers.

Because basically for technology it is easy for the community to learn, because now the world is open. If people in the rural area can learn everything from Google, everyone use social media, so they can learn whatever technique they want to use. (NTB 9)

8.3.2 Characteristics

Characteristics of change agents have been divided into concepts of mastery, values and beliefs, self-efficacy, and entrepreneurship. More on characteristics can be found in Chapter 3:, starting on p.45.

8.3.2.1 ***Mastery***

Mastery is about the focus on lifelong learning, being reflective and reflexive, including a personal long-term vision and purpose, as outlined in section 3.1.2.

Several of the interviewees mentioned a love of learning and wanting to share their knowledge and skills with others.

> *... I have my knowledge. By knowledge I mean by what is in the literature is quite easy to learn but the one that we find in the community it is quite difficult because it is not only the problem in the technical problem, the socio-economic problem it is more complex. So I learn a lot and I think I gain some understanding to deal with the community. (NTB 9)*

> *I grow and learn from all of those people and their views and their knowledge. I feel myself growing day by day. (NTB 18)*

This sharing of knowledge and skills also had a sense of openness, with people willing to be challenged and discuss what they knew, and to see from another's perspective. This was sometimes a form of reflection or evaluation with others that supplemented or took the place of self-reflection.

> *I am also open to my students, in the first and the second lecture I always ask them how they feel about my lecture ... something they feel that is not right. (NTB 9)*

> *I recall those things from my past in my studies. I think how to bring my knowledge into the real situation and talk to farmers, who are resistant with researchers as they think we are all theory. I enjoy that very much. (NTB 6)*

> *I always ask the colleagues if I do something wrong or not. I will ask them if they see or feel that I do something wrong, please tell me. But I will of course debate first (laughter). (NTB 4)*

Several examples were given of self-reflection points such as a researcher having an assumption about what would work or benefit the community, testing or trialling it and finding that their idea didn't work. One such example was about encouraging farmers to collect seed and store it for the next season, thereby saving their resources as they wouldn't have to engage with an expensive seed company. However, this proved to be an unsuccessful trial as farmers didn't have the time to collect the seeds or the technology and space to save the seed until the next season. This resulted in a re-design of the project to include private industry suppliers, including seed collectors and an agro-chemical company.

Some of the interviewees were aware of self-reflecting, although this was not always seen as a positive or sufficient.

> *Usually doing something I am thinking, and reflecting, whether what I am doing is good or bad so I if it is something bad I am trying to fix it. I am using the action learning cycle. Because I am teaching students it, so I am using it. In the Muslim belief they have to pray in the middle of the night. I told them that this is the reflection of life. So think about what you have done, what is good, what is going bad. And then we develop the plan for the tomorrow. What we have to do. So that tomorrow is better than what we have today. (NTB 1)*

I think I spend far too much time thinking, more than most people. I envy them actually, they just seem to get on with things ... (NTB 18)

I probably think about it in vague terms sometimes. … it might be a small thing like when we ran the survey and people misinterpreted something ... I don't know if that is self-reflection, but it is reflecting on something I have done. And think we should do it differently next time or something like that. So there is some regular evaluation but it happens on an ad hoc basis when I become aware of something that could be improved. … I think we all need to self-reflect more and we don't really make enough time for it. (NTB 19)

I don't reflect enough. … I reflect a lot about the world. … personal reflection happens periodically when I carve out the time to allow it to happen. … I have time to sit and think and reflect amongst other people who are there to do the same thing. (NTB 20)

While some gained confidence through the project, others used their existing confidence and determination to see themselves through any difficulties.

The first time I was like I have so much experience, but I felt like I didn't know anything. How to apply theory in practice but gained confidence through the field work. But I learnt that there is so many things I can do. (NTB 6)

So how did I cope with that? Just by working harder, I guess. (NTB 18)

Having that experience gave me that confidence to go ok … you know like a reference point, we have done it this way, this worked well, this didn't. We can apply that here, or we can't apply that here because things are different. It definitely gave that foundation which I think is really important. In some respects, the subsequent projects were easier because there was a reference point. (NTB 19)

we do require everyone to go above and beyond, so everyone is pushing themselves to in excess to what they would or should do I suppose. (NTB 20)

Some interviewees specifically mentioned enjoying the challenge and feeling determined that they had a mandate or competencies that ideally placed them to do this work.

I like the one with big challenges. (NTB 9)

But it was a risk, and we took a risk based on our … mandate to do so. (NTB 18)

... there not many people who are willing or able to do that kind of work, so I think those are the main reasons. (NTB 20)

Sometimes I think ah! Why do I do this? I spend a lot of time and my family complain to me, students and people is hard to move on, but because of my love of crops, I love to see plants. That encourages me to keep doing this, to keep working with farmers. Because I like to see them smile, to see their crops get green and when they want to harvest. (NTB 13)

People can get bored with one thing, but not me. Maybe some say I am too stubborn, it is not stubborn it is just I am not finished yet. I have to finish this. (NTB 5)

While some interviewees struggled to reflect on their own mastery process, they could identify that others were improving, or should spend more time improving. The struggle to answer this question could have been a challenge with the questions, but since it was a small minority of responses it seems unlikely.

8.3.2.2 *Values and purpose*

Personal values, beliefs and attitudes often stem from a sense of purpose and a set of core values which provide guiding principles for life and inform a personal world view. These values, beliefs and attitudes go part way to explaining behaviour and guiding action. More on values and purpose can be found in section 3.1.1.

Learning and education was a key feature in the interviewee responses, perhaps a feature of interviewing university and research staff. Some mentioned the need to lift the standard of education and research, while others mentioned an openness to change and the need to keep changing or adapting to the world.

The most important now is to make sure that the institution that I lead, the post graduate, becomes the what we call, the pioneers, should be number one, to bring the university into efficient, to become internationally recognised research based university by 2025. … try to encourage everyone, students and the staff to do better research, and to do better publications. (NTB 13)

Actually I am quite an open minded person. I am very open to the changes as long as the changes is not related to my basic belief. I am very open to the change. I think I am changing every time (laughter). Then I think life to be continued to live in the areas in the world you need to change. (NTB 9)

This was aided by people liking their work and feeling that it was something they could do that perhaps others couldn't or didn't want to do.

I meet a lot of people from different areas, learning about their lives and giving my knowledge to the people who surround us. Making a lot of friends everywhere around the country, and overseas. Travelling a lot (laughter). So I really enjoy my job actually. (NTB 9)

The other thing is that there not many people who are willing or able to do that kind of work (NTB 20)

Interviewees attributed this sense of value or purpose as something of long standing, either something from their childhood or context, or a sense of needing to contribute as others had helped them get where they were.

yes I think that is always fascinated me from a very young age. Maybe again because I grew up in developing countries where the issues were writ large, not explicitly but you could see it. (NTB 18)

that is really my mission. I don't know because since the beginning I have felt that this [project] is really important for my people. Because I was born in a really remote area so I think it is really important. (NTB 4)

At the end of my study she don't give me anything, [but said] do what I have done with you for your students. Pass it on. So if I can help others I will do it in the first time. (NTB 1)

… when I retire I would like to go back to my home town and live in the rural community and do some community work like teaching people how to do good farming. … And give everything I have got from the community back to them without the need for them to pay me like now. (NTB 9)

Interviewees' interests predominantly centred on a public good or environmental benefit, with a sense of wanting to change the world to be a better place. This was a particular focus of the CSIRO responses, but was also mentioned by Indonesian interviewees who had travelled and observed that the underlying values of humans were the same wherever they went.

… an agent of change who can bring about fairer and more sustainable outcomes in development. … It is more of a personal goal. Science and research is one way to achieve that, but not the only one. Need to combine the science and the other forms of action that is required to make change. … How do you achieve the holy grail of improving human development while conserving limited resources in the environment ... (NTB 18)

I want to have some positive impact on something, on the world. I guess to live a rich and fulfilled life that also helps to make life on earth a little bit better. I guess that is a very broad goal. That encompasses what I do professionally and personally. (NTB 19)

... I have always wanted to make a valuable contribution to nature, to look after the world. (NTB 20)

… my children always go with me, so it will give them a perspective, a better perspective for people in the world. It is the same value in Indonesia, in Australia, in New Zealand and in other countries, the same basic value that everybody actually has. (NTB 9)

The Indonesian interviewees mentioned that helping the communities, and sometimes women and farmers in particular, had meaning for them. This view was sometimes expressed at the whole of NTB scale, helping their people become more competitive and thereby improving their lives and livelihoods. Also highlighted was the effort they made to engage with the community, often using their own time to engage with and share information with the communities.

My purpose is to improve the competitiveness of people especially here in west NTB. ... we want to improve this, we don't just want to be spectators, they have to be players. (NTB 13)

in doing research and also to behave in the community to make ourselves have a value, to serve some information related to development, to develop ourselves. Particularly I need to stress this to the community in our areas particularly for women. … not only my benefit but also community benefit which is also very important for me. (NTB 9)

It has a very deep meaning for me, I can have a very good communication and a very good link with the local community. (NTB 4)

Actually I like to meet farmers. ... doing this admin work is like being in jail. So sometimes I run away. On Sunday morning I went to see farmers we helped with the just see what happened. And my family protested – hey when is time for us? (said laughing) (NTB 13)

I am very happy to help people, and make people smile ... When the people can increase their income they become happy and they can cope with the problem that they have. ... so as a professional on community development I am really happy. That is fantastic work. It is really inside of me that one. I really enjoy the work because I can help people (NTB 1)

A sense of meaning or purpose was expressed as ambition for others, certainly not for personal gain or a sense of power. Interviewees had an awareness that researchers didn't have all the answers, and that their role was helping, facilitating or learning with, rather than instructing.

In the community it is a work together thing, it is not only myself. I am not really the one who will say that I am whatever I said is right because we have to appreciate other people ideas and then combine it to find a good solution for everyone. (NTB 9)

Like the first time I went to meet the farmers, and they said are you going to teach me farming? I've been farming for more than 20 years. ... I said no I am not going to teach you, we are going to do it together. I'll do my part, but the way I do it, and you do it your way and then we will compare what the results. By doing that then luckily what we did was much better than what they did, so they started adopting it. (laughter) And yes, we need that patience to do it and also more understand of how people are thinking. That is really helpful. (NTB 13)

To do something meaningful. I can't articulate clearly what that is. Sometimes it doesn't feel like it has anything to do with work. (NTB 19)

I want to be someone who can help them. I want my life to be of purpose for them. So I don't care about the professional career whatever that is ... (NTB 5)

My future should be a happy in the personal and to help others. Helping others, make people smile, that is my end goal. I don't want to make people unhappy. (NTB 1)

think a fair degree of humility ... A lack of selfishness, I think the more self-centred you are the harder it is to do these things. … it is about not using opportunities for personal gain it is using opportunities for other people's gain. So it is no good being driven by your own professional goals, you need to put those to one side, and be happy to be driven by broader goals where other people benefit ahead of you or your career. (NTB 18)

I like to do things for others, create environments for others to achieve, succeed, do stuff they want to do. (NTB 20)

A sense of humility or ambition for others was articulated as an innate need for fairness or justice, noting that the world as it currently is doesn't always provide this, but that the interviewees were trying to help establish that balance.

… it is just something innate. If there is something that is not fair and there is something I can do about it then I should do something about it. It is almost like this driving principle or something, which you have no power to fight against. It is just what you have to do. … Essentially that reflects my underpinning held values of justice, justice towards people and to nature ... (NTB 20)

I would like to see that no one surrounding me, my family, my neighbour cannot get the life they want. I don't know what life they want. Maybe I want to have a better school, I want to have better health, better job, whatever it is. I want them to get what they want. (NTB 5)

However, not all values were selfless, some were centred on personal gain although this wasn't always in isolation from higher values. A couple of interviewees stated personal gain values without also articulating a value or values associated with helping others.

Well at the moment I would like to pursue professorship. (NTB 9)

To be a professor. (NTB 6)

I want to do some professional things in career … and then I will do my own business. (NTB 4)

Be a good lecturer and good research, and good public services. (NTB 7)

Playing an impact role/position in university for the last 25 years – to continue to do work. Help university and help population, this is what to do and do for 25 years. (NTB 3)

Relationships were also valued and have been articulated above in relation to the communities, but also included appreciation of ongoing professional relationships. Relationships were seen as more than a project or journal paper, or a stepping stone onto something else.

My experience involved in other projects is very limited, but this project is very different. ... I think is the continuity of the researcher from the project which I have never found on other projects. When the project ended it is just ended. But this is somehow … how can I say this … they keep trying to stay in touch. Relationships to maintain the network relationship. And to us, for

me for myself, this is something in that is very important, because we don't feel that you've done your research and then you go. (NTB 5)

8.3.2.3 ***Self-efficacy and collective efficacy***

Self-efficacy is one's belief in one's ability to succeed and is a precursor to agency, motivation and self-regulation. R4D interventions emphasise the role of agency and perceived self-efficacy in achieving adaptation and change, which are outlined further in section 6.3.2.3.

Self-efficacy beliefs are domain specific and can be shaped by the individual's participation in activities. They are also impacted on by how some interviewees were raised to seek opportunities, while others spoke about how lucky they had been to have the support of others or how they had grown by overcoming challenges on their own.

I had a supportive family growing up and was able to go to university and get advanced degrees. (NTB 19)

I think I am lucky because of the support of my family [for education], without that I might not be lucky. (NTB 9)

I have had a very stable family life. They were sufficiently well off to provide me with every opportunity that I wanted. (NTB 20)

Considering where I came from … I didn't get enough support from family. … each semester I had to work to support my life which is unusual in Indonesia. (NTB 13)

Some of the interviewees expressed a strong sense of personal efficacy, stating that they were able to achieve what they set out to achieve and either were open and welcoming of change or felt resilient. Some of the interviewees told stories of times when they had undergone significant personal upheaval or challenges and how they had managed to get themselves through this with their own sense of efficacy as well as being able to draw on others for support.

… probably wouldn't have happened without my support. (NTB 18)

Actually I am quite an open minded person. … I am very open to the change. I think I am changing every time. (NTB 9)

No one push me to change. The change comes from me. (NTB 7)

... basically what I try and do is draw on my ability to get people together to work out the solution. (NTB 20)

Although most of the interviewees either sought or were comfortable with change, several acknowledged that this sometimes changed depending on where they were at in their families or life stages.

Historically I've sought change and thrived under change. This phase of my life has been the most stable phase of my life that I have ever had. … well you get into a comfort zone and you are less inclined to respond as positively to change as historically I used to. So I think I am in a transition

phase. Big disruptions or changes are less welcome. But I like change and I respond well to change generally. But that is not now, but maybe that is just because I am getting older (laughter). (NTB 20)

This after my children become independent it changed my focus for my future. (NTB 9)

My PhD has trained me to be tougher, because at the beginning it was lots of pressure because I left my family and was away from home (NTB 6)

I won't be able to work on projects that have a high demand for travel in the next few years. (NTB 19)

Ongoing change did not exclude people gaining experience and skills from the project and collaboration with others, with multiple interviewees mentioning that they gained experience and confidence from the project.

I really got the result of the project, and I am thankful for James and the other people who come from CSIRO to help us here. I appreciate their support and I learnt a lot from this project (NTB 1)

Having that experience gave me that confidence to go ok … you know like a reference point, we have done it this way, this worked well, this didn't. We can apply that here, or we can't apply that here because things are different. It definitely gave that foundation which I think is really important. In some respects the subsequent projects were easier because there was a reference point. (NTB 19)

[the project] built my confidence to do this (NTB 6)

A core aspect of the collective efficacy associated with the project and subsequent activities beyond the project was the good relationships between the participants who shared similar values or goals.

And to work with such nice people. (NTB 19)

I had a good relationship with James and with this project, of course with you and the other team (NTB 4)

Work with a good team. (NTB 3)

I'm very lucky to be working with people who have similar values and goals. Not necessarily the same, but certainly similar. … I grow and learn from all of those people and their views and their knowledge. (NTB 18)

Interviewees mentioned that they could not be an expert in everything, but they now knew they could partner with others to come up with an effective team. As outlined in the adaptive capacity survey results some of these relationships have strengthened and expanded over time.

… we are expected to collaborate closely with our colleagues … we have quite a lot of responsibility to bridge across our internal silos. (NTB 18)

... no I am not going to teach you, we are going to do it together. (NTB 13)

without having to go through that process of bringing different people together with different perspectives on a problem because it is only once they are out and everyone has a different light shining on the thing that they start to see different possible solutions. (NTB 20)

We also develop the connection with people who have the skill, and that improves. It makes me more competent for doing this job. (NTB 1)

8.3.2.4 ***Entrepreneurs***

Entrepreneurship is the ability to include a positive (although not naive) open mindedness to possibilities, and a systems perspective that enables pattern recognition, with an ability to recognise windows of opportunity or serendipity, as outlined in section 3.1.4.

Interviewees mentioned seeing opportunities and making them happen and reflected on what they done before and how they could alter what they did next to improve their success.

And things have just fallen into place, always. (NTB 20)

my vision of the future, my creative thinking, not being negative thinking. I am always positive thinking. … I am trying to go for adaptation, the economic, to help the people. It is not just the physical things, but we have to move beyond that to social, to economic. So I think we have to do more analysis and creativity in using the problem to become an opportunity, so it is not just a problem. Climate change is not the problem let's see it as an opportunity to create something else that we can do. (NTB 1)

Having cooperation other people from different worlds and experiencing different places it opens your mind and you can see the life in better perspective. (NTB 9)

my role … in a broader sense which is to be a rain maker, a connector, an agent of change who can bring about fairer and more sustainable outcomes in development. (NTB 18)

There were examples of how interviewees had made the best of what was happening around them, how they could to see a silver lining in a challenge and use what they knew to continue their work.

Regarding the project, unfortunately the project was cut. Actually, there are many things that still need to be done but that cut also bring me another project. … then I got my idea with … and I tried to approach … and we got the … project which is a really good exercise from the first project. (NTB 13)

Opportunities were also linked to interviewees' networks, both the ones developed through the Adaptive Livelihoods project and more widely.

I have worked with different institutions and background, and that is why the opportunity is open for me. And it depends on me and my colleagues now, how can I use that opportunity to develop my skills and competition. (NTB 4)

Through this project I develop my connection, I develop my network. People recognise me and give me a job. (NTB 1)

While more often positive, some interviewees mentioned that there were personal challenges and negatives with holding this mindset, highlighting the personal toll either through the impact on their families or fatigue.

you very often have to go beyond the call of duty to achieve those things which is why it becomes exhausting. (NTB 18)

8.3.2.5 *Serendipity*

Windows of opportunity can be seen as a set of unconnected opportunities or innovations that unexpectedly lead to options that had not previously existed. Chapter 3: describes how windows of opportunity are seen or opened more frequently by change agents who are prepared, open, connected, observant and reflexive (see more in section 3.1.2).

This cross-cutting theme emerged partially in the Adaptive Livelihoods project with some interviewees suggesting that their luck was the gift of God, whereas others suggested that it was a case of hard work and timing.

I think I was probably a bit lucky to get my job … and to still have it. But it isn't like winning a lottery, there was some work I had to do to get to where I am. (NTB 19)

And because of the trust I think I have opportunity. Not only the trust I have the network, I have the skills. I have worked with different institutions and background, and that is why the opportunity is open for me. And it depends on me and my colleagues now, how can I used that opportunity to develop my skills and competition. (NTB 4)

That teach me how to appreciate money because it is hard to get money unlike my kids now (laughter). That experience teach me ... (NTB 13)

I don't like the term of lucky. Because there is not such a thing of lucky. It is just about if you do it good, if you do it better enough, if you do it often enough then good things come to you. … so there is no lucky or unlucky thing. If you don't do anything then nothing comes your way. (NTB 5)

I say to my friends, I got this … because I am lucky but I don't know is it because I am lucky or if it because … I did it and my desire to work with you and showing my willingness to work. (NTB 6)

I believe in God, very very much. Because what I wanted to do when I wanted to do it, through people doing it and praying, it has become easier to me. God will help me when I need to help. (NTB 1)

8.3.3 Roles

Roles position agents within social networks. A change agent may have many formal and informal roles and functions, within both their communities and organisations. These roles will shift over time, and in different contexts, as outlined in section 3.1.5.

All the interviewees were involved in research and education in one form or another; while the CSIRO staff are researchers, many of the UNRAM interviewees self-identify as lecturers who also have roles in public services and research. This triple role for staff is part of the requirements set up under the wider Indonesian university structure. Some of the interviewees had been promoted or gained additional roles or jobs since the project concluded. Several talked about their broader or multiple roles which helped them grow and maintain connections outside of their primary role (NTB 4, NTB 18).

8.3.3.1 *Autonomy*

While roles are important, they can also be constraining. Agents are more likely to try new things or engage in 'deviant behaviours' if they have some level of autonomy, as described in section 3.1.6.

Overall, interviewees suggested they had a lot of autonomy, particularly in their research domains rather than their administrative or management roles.

> *Yes a fair amount. This is the whole structure versus agency sort of thing. The structure always seems to be limiting us, and our agency is how we work through or around problems to achieve what we want to achieve. I think at the moment the structure is getting the upper hand ... (NTB 18)*

> *On a personal level when I started at xxx I had more flexibility. I didn't have family, I was more able to travel. But even then, the way these projects were designed was not really allow for that. And the way that we all work in xxx is that it is rare more than 30–40% allocations for something. … you are never devoted entirely to one project which you can throw yourself at. This is just the way the organisation works. (NTB 19)*

> *The work I am currently doing, I am doing because I choose to. Every project I am currently on is really interesting, challenging project, and I work with great people. (NTB 20)*

> *right now I am free. I'm free because I don't have institutions which will order me to do something. Like for instance the foundation, is still a foundation and I control them. I am not a lecturer in the university because I am temporary, so it is not really tight relationship with the university. I can do many things outside that. So, I have lots of chance to control something (NTB 4)*

Some were able to create their own autonomy by being able to say no.

> *I am free. That is why when they want to have a meeting I am not here. Sorry! If you want me to stop being xxx, then I will say thank you and*

continue to be a researcher. Because as a researcher I am really free, and also I can develop my knowledge, develop my ability to teach students because I can bring the real time, real life into the class. That is more important than just meeting. (NTB 1)

Whereas others were somewhat constrained by considerations of security such as balancing an interesting role versus a more boring but secure role. There was also mention of gender and family considerations. This predominantly was mentioned by female interviewees, but not exclusively so.

I have to consider family as well. ... I have more influence in my family for what I would like to do, particularly in the research because what I would like to do is completely by myself. (NTB 9)

Contextual constraints were also mentioned, such as who individuals could select to be on their projects, with institution and power aspects impacting selection and availability. Also, how innovative people were able be due to the overall low level of education of the population.

Not much. Because the well educated people here, it is still really hard [for them] to accept the change that now happens. Like we can't avoid the technology, we can't avoid the mass open information at the moment. Also we can't avoid the free market. That is already the agreement among countries. The consequence of those openness now will have on those who haven't got experience or exposure to different conditions, different cultures. And for me to tell them directly or to affect them is a bit hard, even in my family it is a bit hard. (NTB 13)

8.3.3.2 ***Networks***

Behaviour, attitudes and values are personal characteristics, but they are also shaped by social structure and the networks that people engage or are embedded within, as outlined in section 3.1.6.

Some of the interviewees saw network building as a habit or a requirement of the job. This was especially true when seeking to influence social change or in order to share limited resources.

I tried to maintain and grow connections and continue the process of linking people together and creating windows of opportunity or taking windows of opportunity. I still do that to this day by connecting people. (NTB 18)

... some other resources we don't have here in our country in Indonesia, in our university particularly. But by collaborating with other researchers from other universities in Indonesia ... is very important, particularly to get the current updates in the knowledge as well as helping each other in writing because we also need to publish our research. ... do research together sharing laboratory, sharing resources is very important. (NTB 9)

As explored through the adaptive capacity evaluations, networks were built through the project, with some of these networks leading to further projects and roles for the interviewees.

… at the time I don't have too much experience to work with community. … so my first difficulty at the time was to communicate with them. Not in language but to understand what they want, what they would like to do … In the beginning it was quite difficult. But once they know us, that we are really serious and keen to help community. I say to help because they have problem in the cultivation in this area, and they open to us and we become friends up to now. (NTB 9)

Through this project, I develop my connection, I develop my network. People recognise me and give me a job. (NTB 1)

However, in spite of almost all interviewees noting how important maintaining and building these networks are it didn't always happen. There were many barriers and constraints to building and maintaining networks, not only in time and resources as discussed earlier, but also due to proximity. This was especially true for the non-Indonesian interviewees, but also was a challenge for the Indonesian interviewees where travel and time constraints also played a role in maintaining relationships.

to collaborate with people, how to maintain the network it's the most important. (NTB 5)

the whole act of linking and communicating with people takes time and that is time which strictly speaking we don't have. (NTB 18)

Having some sort of local champion or coordinator is extremely important. Of course, that is what we tried to do … (NTB 18)

In addition to research or other collaboration networks interviewees mentioned their support networks which included a mix of colleagues, friends and family. It was particularly important for female interviewees that their family supported their career, whereas several male interviewees mentioned their wives and office staff.

In my family we treat each other as a partner, with my children, with my husband also. So we have responsibility together. (NTB 9)

In terms of family, they support me a lot. It may be hard for man to support his wife, but my husband supports me as you give a good example for the kids. My parents also really support me (NTB 6)

Friends and family obviously … friends, they know what I need and they know what I am like and they are part of that calibration of what you are doing and why you are doing it (NTB 18)

It is a mix, home and work. At home it is my family … At work I think it is the teams that I am part of. My team as far as how we are organised, our capacity, but also project teams. … there is a supportive vibe and we all look out for each other in a way (NTB 19)

For the first actually my family. … and the second of course I will choose my colleagues and if they support me then I can have more power to do it.

Of course, for people who have religion like me, I always pray to God for help (NTB 4)

8.3.4 Emerging themes

Two themes emerged through the interviews cutting across several of the other themes. The first was technology and how it was changing how people learnt, worked, and interacted. The second theme was working or studying overseas.

8.3.4.1 *Technology*

Since the start of the project, technology had changed how people learnt, worked, and interacted. For the most part this was seen as positive, although some challenges of globalisation such as global commodity markets and the movement of people were mentioned. Interviewees highlighted how technology was making it easier for people in developing countries and outside of academic/research institutes to access knowledge and skills.

for technology it is easy for the community to learn, because now the world is open. If people in the rural area can learn everything from Google, everyone use social media, so they can learn whatever technique they want to use. (NTB 9)

Technology is also being used by the interviewees to maintain their relationships and networks, as well as to share information.

Using social media to share latest information with members. (NTB 1)

With the communication system now that we have I can ask someone on behalf of me to attend the meeting. (NTB 1)

However, not everyone was being carried along by the technology wave, and it was suggested that this could create a divide between those who couldn't or didn't choose to access it and those who did.

Because the well educated people here, it is still really hard [for them] to accept the change that now happens. Like we can't avoid the technology, we can't avoid the mass open information at the moment. Also we can't avoid the free market. That is already the agreement among countries. The consequence of those openness now will have on those who haven't got experience or exposure to different conditions, different cultures. (NTB 13)

8.3.4.2 *Studying or working overseas*

Several of the interviewees mentioned that they had benefited from studying overseas, and that this had opened their minds to other world views and possibilities for their own futures, and the future of their families and community (NTB 9, 18, 19, 20).

8.3.5 Project Synthesis

8.3.5.1 *Project impact*

The Adaptive Livelihoods project ran from 2011 to 2014 and sought to increase the adaptive capacity of rural communities, boundary partners and researchers to enable vulnerability reduction to adverse change. This section synthesises the project impact results using the PTI reflection workshops and the adaptive capacity surveys data, specifically looking at the participatory and capacity building attributes. This will provide the jumping off point for the analysis of the project participants and the potential agents of change.

The results from the three PTI workshops (2014, 2015 and 2017) suggest that project participants, particularly the Tim Kolaboratif, gained new skills and competencies through the capacity building aspects of the project. This is demonstrated by the positive trajectory of the data points, and that by the end of the project UNRAM was emerging as a centre of excellence and one of the Big 50 universities in Indonesia for their work addressing climate change and adaptation issues, although this assessment is somewhat tempered by the slight decline in stage one – building capacity – adaptive capacity survey results which dropped from 'strong' in 2014 to between 'strong' and 'good' in 2017 (see Figure 38).

In addition to the capacity building activities, participants felt that the participatory nature of the project had been a success, that they now saw their challenges and how to address them differently and that this had helped them to work more effectively with others and increased their reputation and status. The adaptive capacity survey indicators reinforce this with knowledge enhanced and questioning values and governance strengthening over time.

While the Adaptive Livelihoods project was not able to deliver on all its objectives due to funding being cut, the project participants were able to use their new skills and knowledge to influence key local government and business decisions to improve beneficiaries' access to information and adapt their livelihoods. Implementation activities, networks and further research are ongoing post project completion; these are all signs that the intervention successfully achieved modest systemic change.

8.3.5.2 *Who were the potential change agents in Lombok?*

Given that the evaluation results show that the Adaptive Livelihoods project achieved change, who were the potential change agents that helped make this change possible, and how did the project help them? The following section outlines who were the potential change agents for the Adaptive Livelihoods project, what were their characteristics and did any of them individually or collectively hit the criteria?

The evaluation process identified eleven potential change agents who were subsequently interviewed. A core theme from the interviewees was an appreciation of the knowledge and capacity building that they had gained through the project, particularly workshop facilitation,

stakeholder analysis and scenario planning. Six of the interviewees highlighted how much they valued how the project had improved the quality and number of publications, project management and enhanced funding success of new proposals, and that these skills would improve their careers and future impact of their work. However, interviewees also mentioned that they would have liked to have been more involved with the write up of project reports.

Three interviewees mentioned wanting to learn more about the monitoring, evaluation and learning skills, particularly Theory of Change and the PTI reflection approach, as they felt this had enabled them to better plan future projects. While the technical skills training, particularly systems thinking, was valued, it was how the project enabled interviewees to work and collaborate with others that was seen as the most valuable skill.

Learning and education was a key feature in interviewee responses, with a majority of interviewees describing a higher purpose in wanting to make a positive contribution to society, especially in more vulnerable communities, and in the case of the CSIRO interviewees to nature or the environment. Interviewees' sense of ambition and efficacy was relatively strong, thinking that with effort, support from their networks (and often faith), they would be able to achieve what they set out to do and make the most of opportunities when they see them. Some acknowledged that this sometimes changed depending on where they were at in their families or life stages.

A collective sense of efficacy played out in interviewees' responses where people mentioned that they could not be an expert in everything, but they now knew they could partner with others to come up with an effective team. Almost all interviewees mentioned their appreciation of the networks that had formed through the project, however these networks were only enduring for some of the interviewees. For those that endured, the interviewees mentioned needing to work to maintain them, but it was worth it as they provided those engaged with support and opportunities.

A vast majority of interviewees expressed gratitude for the opportunities they had had, not only through the project but more broadly in their lives. Some attributed their good fortune to support from their family and hard work, while for others it was more about luck or assistance from God.

Four of the potential interviewees clearly were identified as change agents. One of them, given their responses, was likely to have been a change agent prior to the project, while the other three mentioned how the project had enabled them to learn from others, collaborate differently and see the challenges in a new way. Critically, they expressed a strong sense of purpose and motivation that drove then to helping others and expressed reflexive and entrepreneurial attributes. All three personally felt they had thrived through the project and had built wider networks that were enabling them to see and action new opportunities. This was demonstrated by their influence on enabling change in their contexts including, using the tools, processes and networks developed through the project to support farmers in the development and cultivation of new climate adapted crops, widening their traditional research projects to become more inter and

transdisciplinary, including partners who they have never before worked with such as private industry, and becoming trusted advisors to government.

One interviewee was a slightly less defined or prospective agent, with a further two interviewees described as emerging change agents. While these three had fewer characteristics, they were very strong on others, and had driving values and a personal sense of purpose, and were actively seeking to improve their immediate environment through their new knowledge, roles and networks. Age is likely to have impacted these scores, with these three interviewees the youngest.

Three of the remaining interviewees expressed the desire to enable change and were part of a network where they shared knowledge, resources and helped to enable others. While one of these three was focusing on being the best person they could be in the role that they had, the other two expressed being constrained by their current contexts.

Overall, four change agents were clearly identified through the interviewees, with a further three to five emerging. No interviewee responded strongly to all indicators, suggesting that no individual is a perfect agent of change and that perhaps a team or network of individuals is required to enable change; this insight was reinforced by a small cohort of interviewees who were successfully continuing to interact, support and work together to enact change. See Table 7 for a summary of agent alignment to indicators.

Table 7: Number of interviewees who aligned to indicators

Prospective agents	Emerging agents	Strong agents	Total # change agents identified in project	Total # interviewed
1	2	4	7	11

There was a reoccurring narrative of impact between interviewees who stressed the importance of learning and reflection in their lives, and those who responded to intrinsic rather than extrinsic motivators for their work. These interviewees often showed empathy with the communities that they were working with and saw serendipitous opportunities to help others. They also felt able to further their own activities.

These people demonstrated that they go above and beyond for their work, often at a personal cost. In a few cases the Adaptive Livelihoods project triggered a light bulb moment, in others the passion was already there but the project provided a skill/competency that was missing. And in a few the project had little to no lasting impact. In these cases, the characteristics of the person suggest other values or drivers, such as a disinclination to leadership or being at a stage in their career or life where other matters are more important.

8.3.5.3 *Project capacity building implications for change agents*

Overall, the interviewees felt that the technical training and collaboration approaches had provided them with new skills and knowledge. Interviewees expressed greater appreciation of,

and a desire to be trained in, the evaluation processes, to enable better learning and reflection and to be able to demonstrate impact to their stakeholders and funders. This perhaps reflected that the potential change agent interviewees coincided with the third evaluation of the case study, although several interviewees mentioned that evaluation activities were increasingly requested of them from funders.

The capacity of the more strongly aligned change agents was centred on the systems perspectives (livelihoods approach) and working or collaborating with others, particularly farmers, as well as the expansion of their networks. This suggests that it is the participatory nature of the project itself that helps activate change agents, although the formal training and workshops enable relationships to develop and networks to grow.

8.3.6 Reflecting on the project evaluation process

As outlined in earlier sections, this participatory project sought to help stakeholders in Lombok increase the adaptive capacity of rural communities, boundary partners and researchers to enable vulnerability reduction to adverse change. In order to do this, new knowledge was created and capacity building was undertaken to grow technical skills such as testing new livelihoods and scenario planning. The evaluation of the capacity building activities is outlined at the beginning of this chapter, followed by the personal impact of these trainings. General lessons from the path to impact and adaptive capacity evaluation process can be found in Appendix 2 and 3, starting on p.271. The following section synthesises the case-specific lessons and the individual change agents' perspectives of how the project influenced and enabled them.

8.3.6.1 *Path to Impact Workshops*

The Adaptive Livelihoods case study undertook three Path to Impact workshops, held in 2014, 2015 and 2017. The workshops tended to take just under three hours, or half a day, which is a significant investment of time by the participants. When asked to reflect on the evaluation process, the in-country team indicated that they found the opportunity to reflect useful, and that the process increased their understanding of climate change and adaptation issues, and potential solutions. It also provided an opportunity for them to learn what fellow participants had been doing and opened up more possibilities of maintaining and/or extending collaboration. In particular, they felt that the process facilitated learning about other disciplines, the sharing of new ideas, and forced them to think outside of the box.

Overall, while challenging to organise and a significant time commitment for participants, the PTI evaluation workshops enabled individual and collective reflection and evaluation of the workshop. This participatory evaluation exercise also had other benefits, including knowledge sharing and re-priming of participants, making it a worthwhile activity.

8.3.6.2 *Adaptive capacity surveys*

The Adaptive Livelihoods case study undertook three adaptive capacity survey evaluations, in 2014, 2015 and then again in 2017. This evaluation was designed to track impact over time and relied on resurveying as many of the same people as possible. For the Adaptive Livelihoods case study this resulted in 13 out of the original 17 people being surveyed for all three time slices.

General feedback on the evaluations from the in-country team indicated that they would prefer more frequent PTI workshops and survey evaluations, as a year was a long time and they felt they were forgetting things over time and would like faster feedback from CSIRO on the results of the evaluations.

Overall, the adaptive capacity surveys were able to stimulate reflection in the respondents and draw out stories of change and barriers to that change. While there were challenges associated with the scoring of the indicators, they did provide a boundary object for discussion in the survey and when synthesised into the case study evaluation reports, showing indicator scores changing over time.

8.3.6.3 *Potential change agent interviews*

The prospective agents of change were fairly easy to identify using the project evaluation data, although having been a CSIRO team member loosely connected to this project meant that I was already primed to understand the case study system and could approach the case study lead to validate my suggested interview list.

The eleven interviews took between 25 and 45 minutes each, with all interviews being undertaken directly with the interviewee, and the occasional bit of language assistance from the UNRAM student who was assisting me. Several of the interviewees were challenged by the question asking how self-reflective they felt they were. Having just come from Makassar I was able to use the insights from undertaking interviews there to adjust the question. Interestingly some interviewees (the stronger change agents) were not challenged by this concept and articulated that they reflect a lot in their lives.

A chance to ask these questions of change agents again would yield a better understanding of the contextual and temporal aspects of catalysing an agent of change.

8.4 Case conclusion

The Adaptive Livelihoods case study identified four strong change agents who were catalysts and connectors on the path to change. However, these were not isolated individuals, but connected to each other and well embedded in teams and networks, with several other emerging and prospective agents likely to have enabled their collective success. This project demonstrated a high level of networking across and between research institutes and agencies, with beneficiaries enabling the identification or creation of windows of opportunity.

Networking, together with formal and informal mentoring and the more traditional project capacity building activities, is likely to have facilitated the emergence of additional change agents in the system. Identified change agents suggested that it was the participatory nature of the project itself that helped them achieve success, although they appreciated the formal training and workshops as they enabled the development of skills and networks.

All of the change agents identified, whether strong, emerging or prospective, mentioned a core set of values or purpose, in that they wanted to help others and build a better future whether for their communities or for people less fortunate than themselves. The four strong change agents were in more senior roles, exhibited entrepreneurial tendencies, and were keen to grow their and their colleagues' understanding of the challenges.

The Adaptive Livelihoods case study suggests that change agents do have an identifiable set of characteristics that are shaped by their context and histories, and that networks can be crucial. Project participants suggested that the participatory nature of the project, not just between the research teams, but with stakeholders and beneficiaries, was key to expanding their capacities and opportunities for systemic change.

Chapter 9: Climate Adaptation through Sustainable Urban Development in Makassar, Indonesia

This chapter utilises the R4D Alliance project Climate adaptation through sustainable urban development in Makassar, Indonesia (SUD Makassar) as a case study to explore the framework and concepts outlined in Chapter 4:.

Indonesia is an archipelago country in south east Asia that is highly vulnerable to climate change. Sulawesi was one of the seven regions identified in the Indonesian Climate Change Sectoral Roadmap developed by the BAPPENAS (the Indonesian National Planning Agency), with Makassar the capital city of South Sulawesi Province, Kalimantan. In 2006 the population of Makassar was 1.27 million and was already facing increased pressure from urbanisation, population growth (growing to just under 1.4 million by 2019[3]) and limited resources including water resources (Kirono et al., 2014). The Indonesian government was keen to develop the city as an exemplar of urban development and a gateway to eastern Indonesia (Kirono et al., 2014). The expected growth of the region was anticipated to put increasing pressure on already scarce fresh water resources, and the potential increase in sea level due to climate change was also likely to impact the coastal city which is located 1 to 25 m above mean sea level (Inman and Meharg, 2010).

Figure 42: Map of Indonesia highlighting location of Makassar (Google Earth, 2018)

[3] https://makassar.consulate.gov.au/mksr/Blog_26.html

9.1.1 The Project

9.1.1.1 *Project identification*

Indonesia was identified as a priority country for investment during the first phase of the R4D Alliance, with an initial scoping study exploring urbanisation and sustainability transitions in Asia. A scoping mission to Indonesia in 2010 identified Makassar as a key city of interest for both CSIRO and in-country stakeholders due the city's vulnerability to coastal inundation. Water and waste water infrastructure planning, policy and investment did not yet include climate risk and this was identified as an opportunity for collaboration (Inman and Meharg, 2010). CSIRO had previously undertaken research in Makassar and had established good links with key agencies and researchers from Hasanuddin University (UNHAS).

9.1.1.2 *Project objectives*

The SUD Makassar project was one of two sister projects exploring how water and wastewater infrastructure would be impacted by climate change and other key drivers in rapidly developing coastal cities. The research aimed to develop adaptive urban planning responses and support future decision-making infrastructure investment. The two projects aimed to grow Australian Aid's understanding of practical urban knowledge with in-country stakeholders, including researchers, national policy makers and urban managers. The projects sought to generate knowledge relevant and transferable to other vulnerable cities in SE Asia for addressing health improvement, poverty alleviation and enhancing the quality of life of people. The other sister city was Can Tho, Vietnam which is also a case study in this PhD.

In the scoping phase two challenges for Makassar were identified through a meeting with stakeholders, these were:

1. Establishing knowledge about climate change impacts and risk at the local/regional scale
2. Integrating climate change knowledge into existing and/or future development and spatial planning so that any development can be climate adapted.

The project proposal (Inman and Meharg, 2010) focused on three main objectives:

- Assess the risks of climate change to affect the sustainability of fresh water supplies.
- Establish future scenarios and planning and design alternatives for management of an integrated urban water system for the city that is adapted to climate and population change.
- Build capacity among the country partner organisations to assess risks of climate change and develop climate adaptation strategies for sustaining fresh water supply.

9.1.1.3 *Project partners and stakeholders*

In addition to CSIRO the project team included:

- the Research Center for Climate Change Impacts in Eastern Indonesia, Hasanuddin University (UNHAS)
- the Regional Environmental Management Center for Sulawesi, Maluku and Papua, Ministry of the Environment (Pusreg)
- Makassar Municipal Water Company (PDAM)
- The Bureau of Meteorology, Geophysics and Climatology (BMKG – National Office and Makassar Regional Office).

9.1.1.4 *Project outputs*

By the time the project concluded in 2014, it had contributed fine resolution climate projections, adaptation options, reports and scientific publications, and training that increased in-country partner capacity.

The fine resolution climate simulations and projections were used to inform local scale climate change impact and adaptation assessments. Additional outputs included projections for stream flow and soil erosion for the wider region. These outputs helped build awareness of the issues and the information was integrated into planning decisions by the public works agency, the World Bank and UN Habitat.

In addition to the simulations and projections a set of adaptation options and implementation strategies was developed to improve sustainable water provision for Makassar. This required that the project team develop an understanding of Makassar's existing and future water security challenges, as well as assessing the suitability of the Infrastructure Master Plan to meet demand. The project team's assessment concluded that infrastructure and population are both major drivers that needed to be addressed in order to improve sustainable water provision.

Like the other R4D Alliance projects, SUD Makassar had a focus on formal and informal capacity building, specifically building skills in modelling for climate change and sustainable water service, and planning and implementation using integrated water management.

All project outputs can be found at https://wp.csiro.au/r4da/projects/long-term-projects/climate-adaptation-through-sustainable-urban-development/case-study-makassar-indonesia/

9.2 Post-project evaluation and change agents

This section starts with an analysis of the whole of the SUD Makassar project evaluation using the Path to Impact workshop and adaptive capacity survey results (activities 3–6 in Figure 22, p.101), and concludes with a summary of what impact the SUD Makassar project had had by the time of the potential change agent interviews. The evaluation data was then used to identify potential change agents. Subsequent interview responses are then compared to the indicators developed from literature review (Activities 7 & 8, Figure 22).

9.2.1 Sustainable Urban Development Makassar case study impact over time – Path to Impact Participatory Evaluation Stories from 2014 to 2015

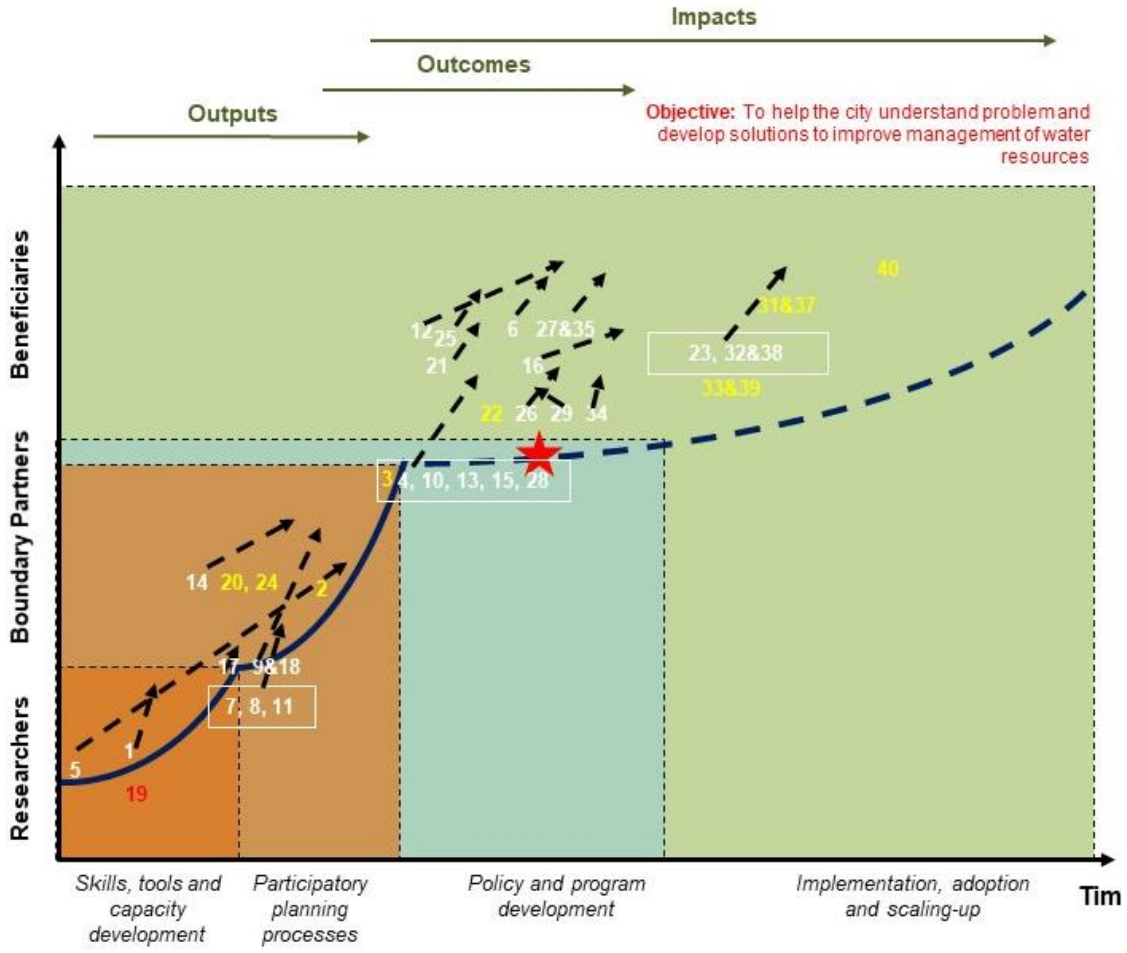


Figure 43: **Theory of Change April 2014 to May 2015. The SUD Makassar project's goal (red star) was to help the city understand the problem and develop solutions to improve management of water resources. White numbers with black arrows reflect the positive change in impact on the activity or outputs from 2014 to 2015. Red numbers with red arrows reflect the negative change in impact from 2014 to 2015. Yellow numbers reflect no change or additional impact between 2014 and 2015.**

The SUD Makassar project only had two Path to Impact workshops with the project team and other key stakeholders, in 2014 and again in 2015. The third PTI workshop was not undertaken in 2017 as many of the project participants had moved organisations, and sometimes cities, so there was no opportunity to get them together in the same room to reflect on project impacts.

Rather than tell the stories of each of the 40 impact points I will use a Most Significant Change approach (Davies and Dart, 2005) to provide a snapshot project impact across the three stages as articulated through the participatory Path to Impact process.

9.2.1.1 *Stage 1a – Skills, tools and capacity development*

One of the core aspects of the SUD Makassar project was a better understanding of the climate impacts for Makassar; in order to inform climate change impact and adaptation assessment at local scale the team undertook fine resolution climate change simulation and projection **(#1)**. By 2015 the developed simulation data was being used in many studies in other regions, including Tangka watershed, Bantaeng and Barru Regencies, and Selayar Island. UNHAS staff were growing their ability to use climate simulation data and develop projections **(#7)**, and by 2015 this capacity had increased substantially with three UNHAS postgraduate students utilising the data for their research.

Other capacity building activities with UNHAS included the ability to use Resource Allocation Model (REALM) to assess long-term supply-demand and water resource scenarios for security **(#9)**. By 2015 REALM had been used in teaching at UNHAS (Faculty of Engineering) and in West Sulawesi University.

Additional skills and competencies were included in project training, leading to UNHAS staff and students improving their capacity to identify solutions to problems **(#10).** By 2015 competencies had increased with the Public Works Agency using social media to advocate for and discuss the need to identify solutions related to drinking water and sanitation.

By the end of the project UNHAS was emerging as a centre of excellence **(#6)** in helping local government address climate change adaptation and mitigation issues, and this reputation was starting to be known nationally and internationally. By 2015 the UNHAS team had become a local and regional trusted adviser, as evidenced by an increasing number of new consultancy and advisory projects, as well as many requests for keynote speeches at seminars and conferences. A good demonstration of this was that UNHAS was asked to co-lead the establishment of a cooperation program in higher education and research for agriculture between Indonesia and France with a focus on 'Climate Change, Food Security and Management of Natural Resources in Indonesian Small Islands and Coastal Areas' (December 2014).

The SUD Makassar project also created a Water Needs Index (WNI) mapping for the city and water catchments **(#19)**.

9.2.1.2 *Stage 1b – Participatory planning processes (outputs)*

By the end of the project the project team had produced information and methodologies for understanding the social-cultural dynamics **(#5)**. In addition, a set of adaptation options and implementation strategies **(#4)** to improve water provision sustainability for the city had been developed with stakeholders. It was felt that this output's impact had increased slightly over the evaluation years as the boundary partners had been involved in informal discussion about this issue via social media.

Participants felt the project had created a successful participatory and integrated approach for impact and adaptation assessment for water security **(#16).** By 2015 a manuscript describing the SUD Makassar project had been accepted for inclusion as a case study in the Urban Climate Change Research Network (UCCRN) Second Assessment Report on Climate Change and Cities (ARC3-2) which was published in late 2015. The UCCRN-ARC is an equivalent of the Intergovernmental Panel on Climate Change (IPCC) report but for cities.

9.2.1.3 *Stage 2 – Policy and Program development (outcomes)*

By the end of the project new linkages and networks had been established between UNHAS, government agencies and other stakeholders (national, regional and local) **(#13)**. These networks grew post project and resulted in new relationships between UNHAS and the South Sulawesi Province's Regional Disaster Management Agency, between UNHAS and Pare-Pare Regency, and between UNHAS and the Millennium Challenge Account Indonesia (MCA-Indonesia).

The networks developed through the project led to UNHAS being commissioned by the Government of Makassar City to conduct a Strategic Environmental Assessment for Makassar City. By the end of the project the UNHAS team were advising other government projects **(#34),** and this continued into 2015 with UNHAS assisting government in conducting many strategic environmental assessments.

Key stakeholders indicated that they now saw problems differently and more holistically as a result of the project **(#35)**. This perception continued into 2015 with one of the project team members short-listed as a candidate for the new Director of the Makassar PDAM (Water supply company). One of the reasons he was short-listed is because he demonstrated 'holistic' and 'outside of the box' thinking.

9.2.1.4 *Stage 3 – Implementation, adoption and scaling up (outcomes and impacts)*

By 2014 UNHAS was asked to design a recycled water pilot at PPE's headquarters **(#23, 32, 38)**. The subsequently developed pilot demonstration for rainwater harvesting system and the waste water recycling system at the PPE office were selected as 'benchmarking sites'. PPE built another replication of this pilot demonstration in Maros Regency and introduced an Eco-Family Program.

The desire to 'change the thinking' continued with LAN (State Administrative Agency) utilising the project pilot and demonstration activities at the PPE office to train more than 1500 government officers each year.

Project information about climate change and other outputs were used by a number of donor-funded activities **(#29)**; these outputs were still being used in 2015, such as in a collaborative project between UNHAS and Japan exploring regional flooding.

9.2.2 Evolution of the Adaptive Capacity Evaluation Stories from 2014 to 2017

In addition to the Path to Impact participatory evaluation workshops, the SUD Makassar project was evaluated using adaptive capacity surveys with project participants, including in-country research partners and boundary partners. As many of the original participants were re-surveyed in 2015 and 2017 as possible, noting that some people had left Makassar for other parts of Indonesia or had left CSIRO and were working overseas. Seventeen surveys were sought, with only 15 surveys completed.

The Path to Impact and adaptive capacity evaluation have been used to track impact over time, triangulating and cross checking the stories between the processes, as outlined in Chapter 5:. The focus of this research is to explore the importance or otherwise of agents of change in systemic change, so the first step is to test whether systemic change has happened.

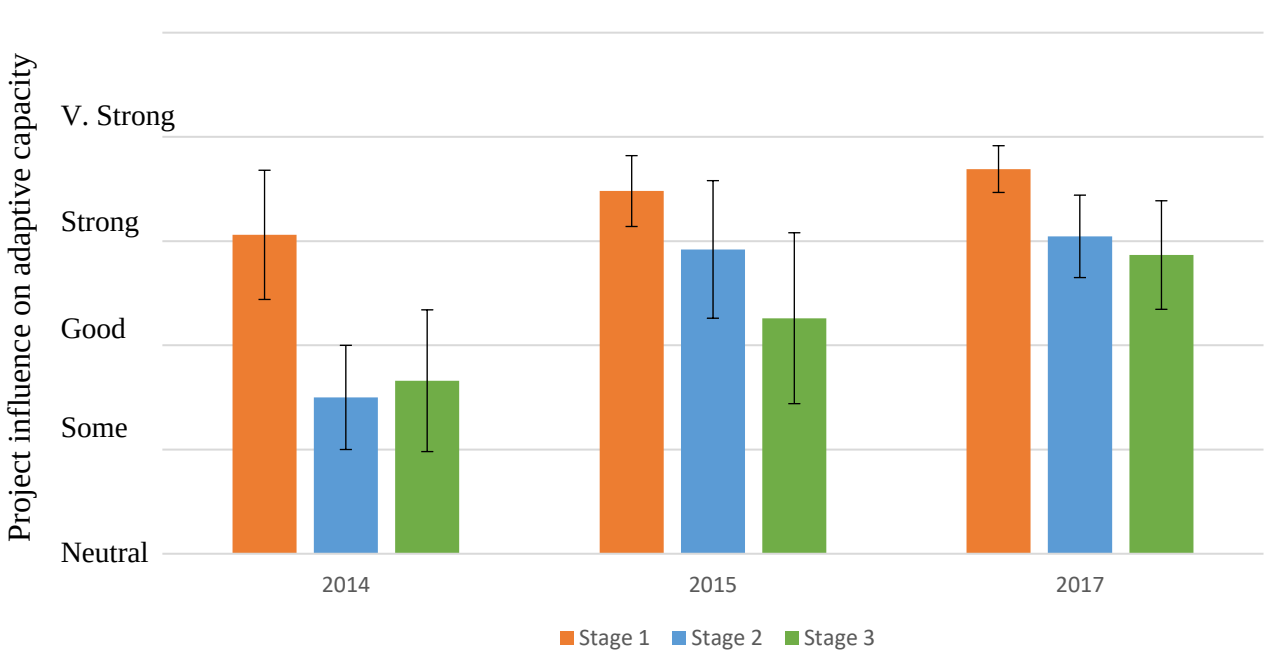


Figure 44: The influence on adaptive capacity across the SUD Makassar Project's impact pathways stages in 2014, 2015 and 2017. Each stage is represented by an average of indicators for that stage, with error bars highlighting the range of responses to indicators.

9.2.2.1 *Adaptive Capacity Overview*

Across all time slices, the SUD Makassar project had the greatest impact in stage 1, which focused on developing skills, tools and capacity, and the participatory planning processes (see Figure 44). This is perhaps expected as these were the core aspects of the project and what the project team had the most control over. The perceived stage one impact grew from 'strong' in 2014 towards 'very strong' by 2017. The range of scores also narrowed, highlighting increasing shared perception among participants.

Overall stage 2, program and policy development, had the next greatest impact for the SUD Makassar project with just over 'some' impact in 2014 to 'strong' in 2015 and 2017, and like stage one the range of scores narrowed by 2017. This is the progression that the project Theory of Change anticipated as it was understood that the uptake of information, tools and methods into policy in policy and programs would take time.

Stage 3, implementation, adoption and scaling out, was anticipated to take the longest to achieve and could reasonably be expected to occur only after the project had finished, giving the project team the least amount of control over the impact results. The SUD Makassar project stage three scored between 'some' and 'good' impact in 2014 to 'good' in 2015 and 'strong' 2017, and like stages one and two by 2017 the range of scores had narrowed from 2015.

9.2.2.2 *Stage One – building capacity*

Stage one (building capacity) had the highest-scoring indicators across all three time slices of the project, although the Path to Impact evaluation highlighted that not all capacity building activities were successful. As outlined in Chapter 5, the stage one adaptive capacity survey included seven indicators based on adaptive co-management principles. Six of these indicators were assessed across all three time slices, with the seventh (vision and goal) only assessed in the first time slice (see Figure 45).

Across the three time slices 'trust created' and 'knowledge enhanced' consistently received the strongest stage one scores, with 'new social networks' and 'questioning values and governance' also scoring well. The lowest scoring stage one indicators were 'creative solutions' and 'knowledge integrated', but with indicator scores strengthening in 2017.

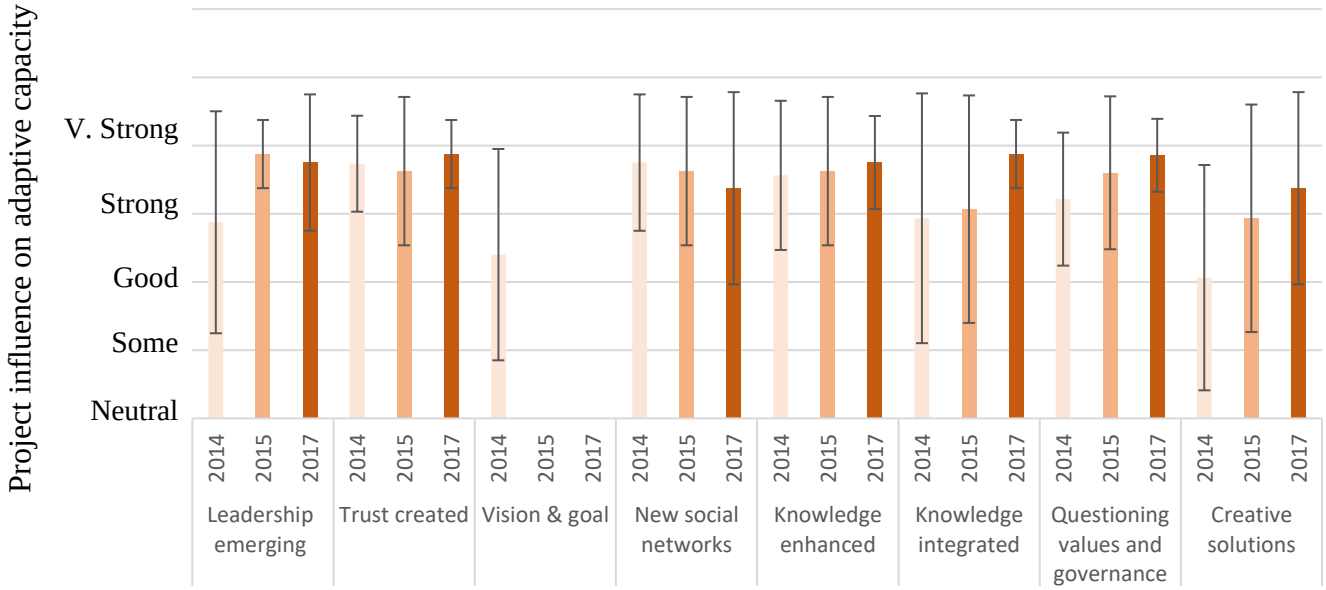


Figure 45: The influence on adaptive capacity across the SUD Makassar Project's impact stage 1 in 2014, 2015 and 2017. The error bars show the range of scored answers. No result indicates that the question wasn't asked in that year.

9.2.2.3 *Stage Two – Policy and program development*

The Policy and Program Development stage had weaker indicator scores overall than stage one. The overall scores were 'some' in 2014 moving towards 'strong' in 2015 and 2017. The highest scores were the cross-scale networks (2nd scale) as discussed above, and 'new partnerships'. The weakest indicator was 'resources'; this also had the largest range of scores, even as it moved from 'some' in 2014 towards 'strong' in 2017, highlighting that resources were not evenly distributed, or that not everyone was aware of the resources available.

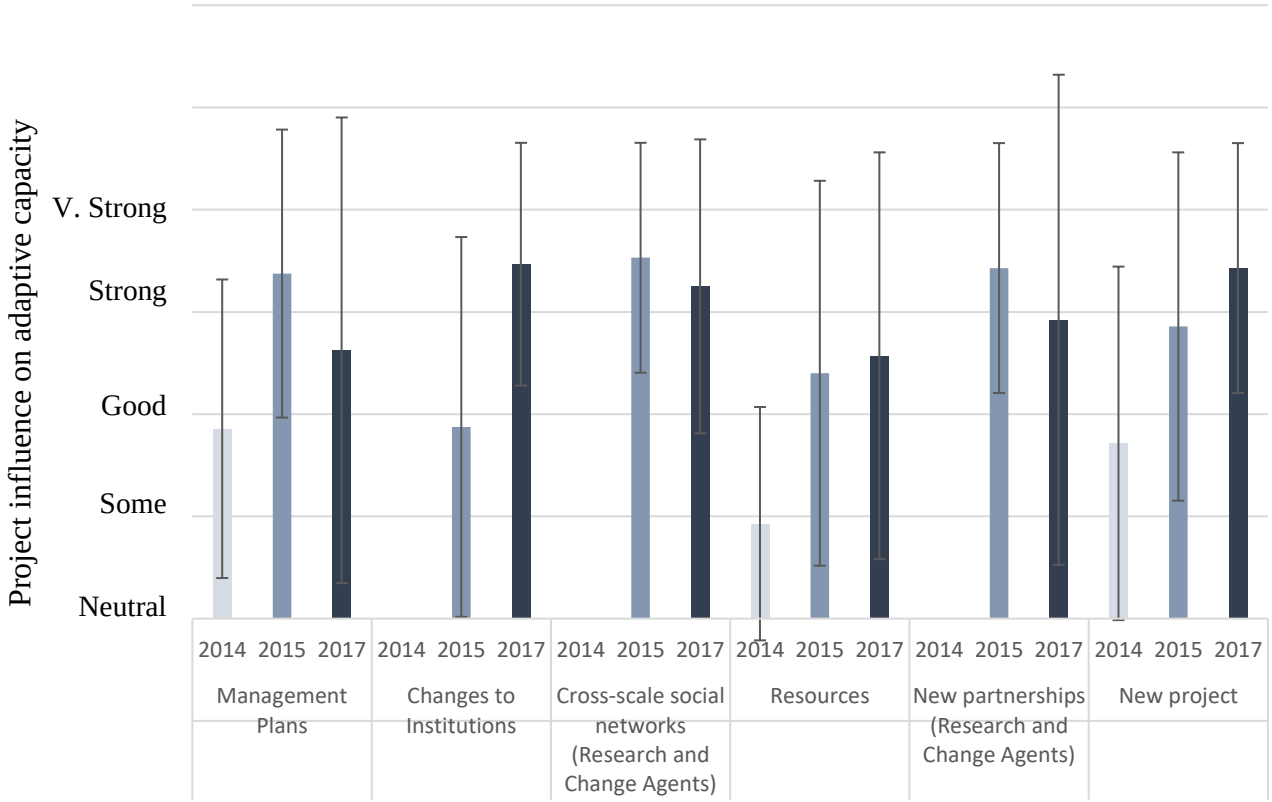


Figure 46: The influence on adaptive capacity across the SUD Makassar Project's impact stage 2 in 2014, 2015 and 2017. The error bars show the range of scored answers. No result indicates that the question wasn't asked in that year.

9.2.2.4 *Stage 3: Implementation, adoption and scaling-out*

The implementation, adoption and scaling-out indicators grew from between 'some' and 'good' in 2014 to 'good' in 2015, and then towards 'strong' in 2017. This was anticipated post project due to implementation of project ideas.

The overall highest-scoring indicator for stage three was 'cross-scale networks (3rd scale)' and 'new partnerships', both discussed above. The lowest overall score for stage 3 was 'enhancing self-organisation' and helping vulnerable beneficiaries', although both of these indicator scores increased in 2017, reflecting the time delay from project delivery to on-ground

impact. Indicators in stage 3 had the widest range of scores, reflecting that survey respondents had differing perspectives or awareness of the project's impact.

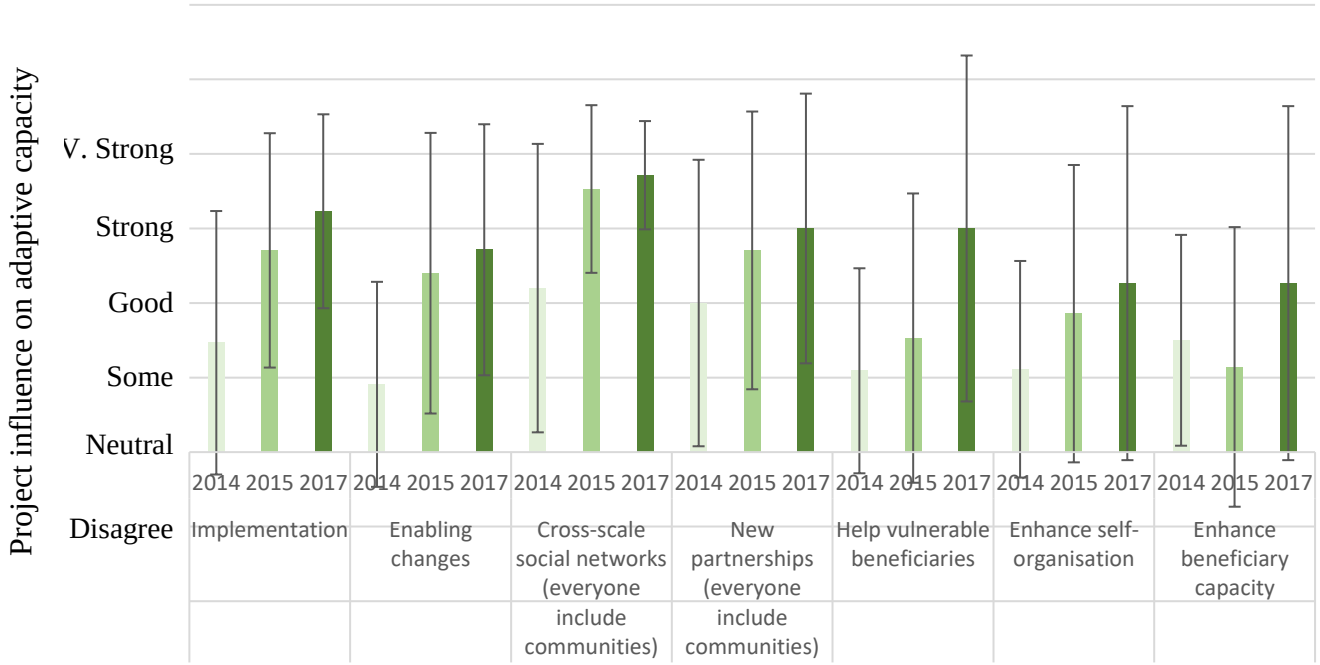


Figure 47: The influence on adaptive capacity across the SUD Makassar Project's impact stage 3 in 2014, 2015 and 2017. The error bars show the range of scored answers.

9.2.3 Synthesis of the evaluation results over time and distillation of potential change agents

Through reviewing the Path to Impact evaluations and adaptive capacity surveys I was able to distil the key individuals mentioned as growing in capacity or leadership. Leadership emerging is strongly linked to growth in personal capacity and potentially the catalysing of agents of change. Several people were named as leaders across the three evaluation time slices, with seven people most commonly mentioned as leaders. All those surveyed and interviewed were allocated a unique identifier for anonymity, i.e. M #. Most were UNHAS staff or associates, with the others identified as local boundary partners who worked in government agencies.

The list was then shared with the SUD Makassar project leader who added a name that had been missing from the list. This interview list was provided to partners within Makassar and interviews were arranged. However, two interviews requested were not possible due to these people having left their former agencies and living in locations that made it significantly harder to connect with them. Overall, nine interviews were undertaken, six of whom were researchers and three were local government officers.

9.3 Potential agents of change

Nine interviews were undertaken to elicit information from the interviewees to see if the set of attributes discovered through the literature review were the necessary and sufficient set to determine what makes and motivates a potential change agent, focusing on their capabilities and capacities, characteristics, and roles (activity 7 in Figure 22, p.101). Some of the interviews were direct with the individual, while others required the assistance of a local who was hired by UNHAS to help me organise the interviews. Each interview took between 25 and 55 minutes. The results below are outlined by attribute indicator and conclude with a summary of individuals identified as potential agents.

9.3.1 Capacities and capabilities

A review of capacities and capabilities needed to enact adaptive change in individuals and groups can be found in Section 2.2.2.3.

9.3.1.1 *Skills*

Skills can be thought of as tools for change, whether that change is specific to the individual, or their ability to undertake and engage in social change (Roberts and Lacey, 2008, Petzold and Ratter, 2015). The SUD Makassar project specifically built the skills of project participants through formal training and collaborative participation on the project. These skills included the creation of options, scenario planning, remote sensing and climate simulations and projections.

As would be expected in a research for development project, core skills developed centred on the technical, and strengthening and widening research skills of the project team. Interviewees mentioned that they really appreciated the opportunity to learn more about remote sensing and spatial analysis, and the importance of mastering multiple types of GIS software. Some mentioned that it had become easier to develop these skills due to open source software (M 9, 16). Others mentioned database management and the development of scenarios.

> *Because in software sometimes it is very expensive, but now we have open source software and I have found several software for my students , for example that do not need a licence but they can use it to perform their analysis very well. So I try always to develop it. (M 9)*

Some interviewees said that students get a lot of training, as did public servants, but that more training in English and management (varying types, but the essence was about how to manage) would be important for their futures.

9.3.1.2 *Competencies*

If skills are tools for change, then competencies can be thought of as combining skills with abilities and behaviours to create a certain ‘know-how’. See Chapter 2:, for a list of the

competencies identified. Competencies are not independent of each other, with attributes and indicators potentially aligned to multiple competencies.

Several interviewees mentioned the importance of communicating well, including spoken and written English, as well as communicating to different audiences. Many interviewees indicated that this was a competency they were still developing and was often tied to an ability to learn from others (M 2, 9, 12, 15, 19).

The ability to communicate. We can do everything with patience. Everything will be easy with patience. (M 15)

Several interviewees stated that they needed or wanted to have better awareness of problems and keep an open mindset about how to address them, including society (M 5, 13, 19).

you need to have a high level of curiosity and bravery, … to take the risk and challenging established concepts. (M 19)

Change is still about change of mindset. (M 5)

Several interviewees suggested that as knowledge increases, it was just as important that the 'human resource' or competencies be improved to take advantage of that new knowledge (M 3, 13, 19). These competencies were referred to as skills and included management skills, people skills, risk management skills, and business development skills. This was thought to be especially important for working across disciplines or organisations, and became even more challenging when working across cultures with people living in different countries. It was also felt there was a lack of systems thinking which was still needed to help people think 'outside the box'.

9.3.1.3 ***Resources***

As outlined in Chapter 2, section 2.2.2.2 it is not just a matter of having the skills and 'know-how' to make change happen, agents need to have, or be able to access, resources needed for change.

About half of the interviewees indicated that they had sufficient time and resources to do what they wanted to do. 'Wanted' was seen to be an important distinction as each organisation was responsible for allocating its own resources, and individuals were able to make their own choices (M 9, 12, 13, 15, 16).

It is a choice. Life is a choice. (M 9)

Some suggested that this was more of a balancing act, which meant that sometimes they did have sufficient time and resources, while at other times they didn't. This related to their sense of control about what they were doing and what their other roles and responsibilities were.

Others felt that there was a lack of time and resources for the Mayor of Makassar City, which constrained improvements to the city. A few interviewees mentioned that when projects had short

or tight time frames, this could be a challenge, especially when collaborating with others, or dealing with issues that take a long time to show results (M 3, 5, 19). Other project and city management constraints included a lack of data, or data that was of a sufficient quality for decision making.

9.3.1.4 *Knowledge*

Knowledge includes facts, information, and skills acquired through experience or education. Section 2.2.2.1 outlines more about the dual definition of knowledge both as a thing and an understanding, and the implications of 'whose knowledge counts' and what enables effective knowledge exchange.

Interviewees spoke about the knowledge they gained from the project, and how the project had been designed for learning, in particular about climate change, environment and water issues, (M 3, 5, 9, 12). As interviewees' understanding and knowledge grew, the reputation of UNHAS improved, both at an individual and an institutional level.

> *work with CSIRO introduced me with the new things and conferred me to what I reach right now. Because I begin to focus, because before it was forest management, I became focused on the environment, how the environment influenced the production, the water resources. Working with CSIRO was the beginning. They guide me to a new area. (M 9)*

Public servants also felt their knowledge had increased, which helped them undertake their work, however several felt that this new knowledge was not always communicated and shared as well as it could be to have influence with others in government and the communities (M 2, 3, 12, 13). One example of this was the challenge of keeping government staff up to date due to the rate of churn in government positions. One proposed solution was to have more communication outputs, especially videos, as 'Indonesian people like to see and hear and listen' (M 15).

9.3.2 Characteristics

Characteristics of change agents have been divided into concepts of mastery, values and beliefs, self-efficacy, and entrepreneurship. More on characteristics can be found in Chapter 3:, starting on p.45.

9.3.2.1 *Mastery*

Mastery is about the focus on lifelong learning, being reflective and reflexive, including a personal long-term vision and purpose, as outlined further in section 3.1.2.

Interviewees revealed a focus on learning and improving through discussion and the internet, as well as formal training. This was described as two-way learning, as sharing what you knew with others was seen as just as important (M 2, 5, 9, 13, 15, 16, 19). These responses were styled

as a form of humility, that there was always someone better than you that you can learn from, and that with patience and commitment you can solve the problem (M 12, 13, 15, 16, 19).

> *every day I bring new things to discuss with them and try and develop it. (M 9)*

Many of the interviewees described a form of self-reflection about their work and their life more generally, with one interviewee reflecting that they would like to know how to reflect better so as to have more self-motivation and be better able to motivate others (M 5, 9, 12, 16, 19).

> *I am inward looking … the outside is determined by what is inside. So I don't see change as a challenge just that it is something that you need to do. (M 19)*

> *Likes to go out of the city each weekend. He uses the time to think about the problem, for example in his home town and how to solve the problems. (M 16)*

9.3.2.2 ***Values and purpose***

Personal values, beliefs and attitudes often stem from a sense of purpose and a set of core values which provide guiding principles for life and your world view. These values, beliefs and attitudes go part way to explaining behaviour and guiding action. More about the details on values and purpose can be seen in section 3.1.1.

A majority of interviewees described wanting to make a positive contribution to society (M 3, 5, 9, 12, 15, 19), with over half also indicating they wanted to be a good teacher or mentor (M 5, 9, 12, 13, 19). Some mentioned the importance of the environment and trying to improve or protect it (M 3, 5, 12, 15). Others spoke of the importance of relationships, especially family and community (M 2, 5), being a responsible civil servant (M 15, 16), being faithful to country (M 12) and getting closer to God (M 16).

> *The goal at the end is that they can have a better life, the government can have a better management. The ultimate goal is how the government can use their resources to fulfil the needs of the people. (M 9)*

Overall most interviewees stated that they had a longer-term purpose which centred on improvements to the environment and society; this was described in two ways. The first was directly helping people and the environment, in order to build a better future (M 3, 15), while others focused on helping the government to help the environment and society (M 9, 12, 13, 16).

Two interviewees mentioned wanting to help women and girls in particular (M 5, 13).

> *What I learn in Indonesia is that women not usually educated right. Like my grandfather said it is better you stay at home. But how is it if we can do it as women then it is ok for us to do that … so work hard! (M 13)*

9.3.2.3 *Self-efficacy and collective efficacy*

Self-efficacy is one's belief in one's ability to succeed and is a precursor to agency, motivation and self-regulation. R4D interventions emphasise the role of agency and perceived self-efficacy in achieving adaptation and change, which are outlined further in section 6.3.2.3.

The most commonly revealed form of efficacy interviewees mentioned was proxy efficacy or an ability to influence others (M 2, 3, 5, 9, 12, 15, 16). Some interviewees described how through their personal relationships they were able to educate and influence others, while others suggested it was their role or position that allowed them to have more influence than others.

> *the choice is yours but if you choose this one your fate can be like this (bad), but if you choose this one your fate will be much better. They can't force the government but they can use another hand, such as NGOs and journalists. There are other ways. If the local government says maybe we can use NGO or journalist and the newspapers. Or reference the Koran. (M 15)*

> *for the highest position it is difficult to contact directly, but they will contact the lecturers who have a similar position with them, so it is easier for them to meet with the higher position in government [work through a network] (M 16)*

Some described a sense of personal efficacy as general resilience or a commitment to problem solving. Others described it as being a recognised expert in their field (M 3, 9, 12, 16, 19).

> *Able to adjust as move through life's journey (M 3)*

> *I think my strength is thinking we can contribute to anything regardless of whether it is small or big, it doesn't matter. Contribute to making the project successful and things like that. (M 19)*

Other interviewees focused on collective efficacy through networks, either describing the need for critical mass or that collectively they all had a piece of the knowledge which they could bring together (M 3, 13, 15, 16).

> *The people will see and they will force the government. (M 15)*

9.3.2.4 *Entrepreneurs*

Entrepreneurship is the ability to include a positive (although not naive) open mindedness to possibilities, and a systems perspective that enables pattern recognition, with an ability to recognise windows of opportunity or serendipity, as outlined in section 3.1.4.

Only a couple of interviewees described elements of entrepreneurship. This could be case study specific and related to the type of roles that project participants held, it could be cultural, or could be due to a lack of clear questions from the interviewer. The two interviewees who did self-identify as entrepreneurs expressed their entrepreneurship through their roles, such as being in a position to act and influence, and build on existing work or identify opportunities. Both also

articulated a sense of not having to work too hard to 'see' opportunities or have opportunities brought to them (M 9, 15).

9.3.2.5 ***Serendipity***

Windows of opportunity can be seen as a set of unconnected opportunities or innovations that unexpectedly lead to options that had not previously existed. Chapter 3: described how windows of opportunity are seen or opened more frequently by change agents who are prepared, open, connected, observant and reflexive (see more in section 3.1.2).

Interviewees mentioned that they felt lucky because of the opportunities they had had, who they were connected to and the people they got to work with (M 2, 3, 5, 9, 12, 13, 15, 19). Several of the opportunities mentioned were the chance to study or work in another country (linking to the third theme). In many cases this luck was attributed to God.

9.3.3 Roles

Roles position agents within social networks. An agent may have many formal and informal roles and functions, within both their communities and organisations. More on roles can be found in section 3.1.5.

A third of the interviewees worked in government and were boundary partners associated with the project; the remaining interviewees were involved in research and education in one form or another. In Indonesia university staff have three core features of their roles, the first is to teach, the second to undertake research, and the third is to work with society to improve it. Some of the researchers worked as consultants in addition to their three university roles. Several interviewees talked about their additional roles, such as mentoring, providing strategic advice, volunteering and helping others, which was often at a time cost to their own career or personal lives (M 2, 9, 15, 19).

All of the researchers enjoyed their jobs and saw value in what they did, but not all of the boundary partners felt the same way about their jobs. Most commonly, researchers mentioned appreciating the opportunity to educate and mentor junior staff and students (M 9, 12, 13, 19).

> *Three roles – teacher, researcher, and working with society. Have to do all three, balance all three. (M 12)*

A couple of the interviewees had been promoted since the project concluded, with the project contributing to their promotion.

9.3.3.1 ***Autonomy***

While roles are important, they can also be constraining. Agents are more likely to try new things or engage in 'deviant behaviours' if they have some level of autonomy, as described in section 3.1.6.

University staff indicated that they had to teach but were free to choose what research they did, with some interviewees indicating that they had a lot of scope to shift direction and explore new things (M 9, 12, 13, 16). However, some interviewees stated that they had not been able to choose their original major, as this was chosen for them by others such as their family or school, and this choice had shaped the nature of their current career.

Public servants felt they had less autonomy as they are allocated their jobs by government leaders, and so could not choose where they worked. Their job allocation depended on their education and background, and their relationship with the leaders (M 2, 3). Only two interviewees felt completely free to choose what they wanted out of work and life (M 5, 19); neither were public servants and both described freedom as a mindset.

I think I have 100% freedom ... (M 19)

9.3.3.2 ***Networks***

Behaviour, attitudes and values are personal characteristics, but they are also shaped by social structure and the networks that people engage or are embedded within, as summarised in section 3.1.6.

Much like the role section above, interviewees belonged to networks where they provided advice or expert opinion, often to government and sometimes to communities (M 5, 12, 15, 16). Multiple interviewees mentioned the networks that had formed from the project, and how these networks had been used to influence decision making or to generate/facilitate new projects (M 2, 3, 9, 16, 19).

the MCA project have their own/different management. No linkage to earlier project. The Alliance project helped him to get into the network. (M 16)

Interviewees spoke of the personal value they found in their wider networks, as a source of support, advice, data, potential jobs and as a venue to share what they had learnt (M 2, 12, 15, 16). Many interviewees mentioned their family and friends as an important source of support for their work (M 2, 3, 5, 9, 13).

9.3.4 Emerging themes

Two themes emerged through the interviews cutting across several of the other themes. The first was technology and how it was changing how people learnt, worked, and interacted. The second theme was having had the opportunity to study or work for longer periods of time overseas.

9.3.4.1 ***Technology***

Since the start of the project, technology had changed how people learn, work, and interact. For the most part this was seen as positive, although some challenges of globalisation such as global commodity markets and the movement of people were mentioned. Interviewees

highlighted how technology was making it easier for people in developing countries and outside of academic/research institutes to access knowledge and skills.

Many of the interviewees mentioned how the internet had provided them with access to information that they didn't have before, and that this was improving their ability to learn as well as connecting through social media (Facebook etc.) and creating WhatsApp and email groups to share knowledge and advice.

> *I am getting old. I like to give what I have [knowledge] to students, to share with others so they can move up. Our time is a little bit different from the new students (new generation), what they have now is not the same as us, especially in IT. (M 13)*

9.3.4.2 *Studying or working overseas*

Several of the interviewees mentioned that they had benefited from studying overseas, and that this had opened their minds to other world views and possibilities for their own futures, and the future of their families and community (M 2, 13, 19).

9.3.5 Project Synthesis

9.3.5.1 *Project impact*

The SUD Makassar project ran from 2011 to 2014 and sought to help the city develop solutions to improve the management of its water resources. This section synthesises the project impact results using the PTI reflection workshops and the adaptive capacity surveys data, specifically looking at the participatory and capacity building attributes. This will provide the jumping off point for the analysis of the project participants and the potential agents of change.

While a PTI workshop wasn't undertaken in 2017, the results from the previous two workshops (2014 and 2015) suggest that project participants gained new skills and competencies through the capacity building aspects of the project. This is demonstrated by the positive trajectory of the data points, and that by the end of the project UNHAS was emerging as a centre of excellence in helping local government address climate change and adaptation issues. This assessment is further strengthened by the stage one – building capacity – adaptive capacity survey results which improved from 'strong' in 2014 to 'very strong' in 2017.

In addition to the capacity building activities, participants felt that the participatory nature of the project had been a success, that they now saw their challenges differently and that this had helped them create an integrated approach for water security impact and adaptation assessment. The adaptive capacity survey indicators reinforce this with trust and knowledge strengthening over time.

The SUD Makassar project delivered on its stated objectives, and project participants were able to use their new skills and knowledge to influence key local government and business decisions to improve the management of local water resources. Implementation activities,

networks and further research are ongoing post project completion; these are all signs that the intervention successfully achieved modest systemic change.

9.3.5.2 *Who were the potential change agents in Makassar?*

Given that the evaluation results show that the SUD Makassar project achieved change, who were the agents that helped make this change possible, and how did the project help them? The following section outlines who these potential change agents were, what were their characteristics and whether they individually or collectively hit the criteria.

The evaluation process identified nine potential change agents who were subsequently interviewed. A core theme from the interviewees was an appreciation of the knowledge and capacity building that they had gained through the project. Five of the interviewees highlighted the importance of general competencies, particularly English language skills and communication, and this was something the emerging change agents suggested they would need to develop further in order to progress their careers and improve the impact of their work. Other general competencies that interviewees felt were important included management skills, risk management and business skills. Three interviewees mentioned the need for a mindset that was open to new things. There was also a strong feeling from interviewees that systems thinking still needed to be strengthened in themselves, their colleagues and their agencies.

A majority of interviewees described wanting to make a positive contribution to society, with most highlighting the importance of improving the environment for all. Interviewees' sense of efficacy was mixed, with more interviewees stating that they influenced others rather than enacted changes themselves. This sense of efficacy played out in interviewees' responses associated with how much autonomy they had, with those who expressed having more personal efficacy also expressing a greater level of freedom or autonomy to make decisions. Interestingly, these interviewees also described having a variety of roles such as mentoring, providing strategic advice, and helping others.

Almost all interviewees mentioned their appreciation of the networks that had formed through the project, that these networks were enduring and provided those engaged with support, advice and opportunities. Again, a vast majority of interviewees expressed gratitude for the opportunities they had had, not only through the project but more broadly in their lives, with many attributing their good fortune to God.

Three of the potential interviewees clearly were identified individually as change agents. One of them, given their responses, was likely to have been a change agent prior to the project, while the other two mentioned how the project had enabled them to learn from others and see the challenges in a new way. Critically, they expressed a sense of purpose and motivation which they brought to their multiple roles; they described their values and world view, and how they had an

ability to tap into multiple networks, and expressed entrepreneurial attributes, particularly the ability to see opportunities.

Two interviewees were slightly less defined or emerging change agents, with fewer of the characteristics, but they stated their environmental values and a personal sense of purpose, and that they were actively seeking to improve their immediate environment through their new knowledge, roles and networks.

A further two interviewees were prospective change agents but were part of a network where they shared knowledge, resources and tended to influence through others. This was also expressed in both cases as enabling others, and women and girls in particular. While not hitting all of the indicators themselves, two of the interviewees expressed their roles as enabling others, which may have been a gendered response, but doesn't mitigate the importance of their contributions to the success of the project. These people played a vital role in the project through their support of the stronger agents.

The remaining two of the nine interviewed felt that they had learnt from the project, and the new networks that they connected with, however they didn't express the drive, purpose or entrepreneurship of an agent of change. They were happy to do what they do well and leave it at that. See Table 8 for a summary of agent alignment to indicators.

Table 8: Number of interviewees who aligned to indicators

Prospective agents	Emerging agents	Strong agents	Total # change agents identified in project	Total # interviewed
2	2	3	7	9

The three stronger agents, as well as the emerging agents, used the new tools, knowledge and networks developed through the project to change their context, including the standing of UNRAM and associated staff who is now seen trusted advisers to government and industry. Through the project and other subsequent activities, the agents have been able to positively influence local government plans (as well as the associated allocation of resources) and the plans of international banks such as the ADB and WHO.

9.3.5.3 *Project capacity building implications for change agents*

Overall, the interviewees felt that the technical training had provided them with new skills and knowledge, although a few mentioned that they would like refreshers or further training in some areas. Interviewees have a greater appreciation of, and would now like to develop more capacity in, understanding the system (systems perspectives) and evaluation process, both to enable better learning and reflection and to be able to demonstrate impact to their stakeholders and funders. This perhaps reflected that the potential change agent interviews coincided with the

third evaluation of the case study, although several interviewees mentioned that evaluation activities were increasingly requested of them by their university and funders.

Those more strongly aligned to the change agent characteristics mentioned seeing the challenge they were attempting to address differently using systems perspectives, and foresighting, working or collaborating with others, and the expansion of their networks. This suggests that it is the participatory nature of the project itself that helps activate change agents, although the formal training and workshops enabled relationships to develop and networks to grow.

9.3.6 Reflecting on the project evaluation process

As outlined in earlier sections, this participatory project sought to help stakeholders in Makassar develop solutions to improve the management of their water resources. In order to do this, new knowledge was created and capacity building was undertaken to grow technical skills such as the ability to use climate simulation data. The evaluation of the capacity building activities is included at the beginning of this chapter, followed by the personal impact of this training. General lessons from the path to impact and adaptive capacity evaluations can be found in Appendix 2 and 3, starting on p.271. The following section synthesises case-specific lessons from the evaluation process and the potential individual change agents' perspectives of how the project influenced and enabled them.

9.3.6.1 *Path to Impact Workshops*

As mentioned for the SUD Makassar case study, only two Path to Impact workshops were held, in 2014 and 2015. The third PTI workshop was not undertaken in 2017 as there was no opportunity to bring the original participants together to reflect on project impacts.

The workshops tended to take just under four hours, or half a day, which is a significant investment of time by the participants. However, in both instances the evaluation workshop was followed by a stakeholder meeting which enabled the team to share the results and impacts of the project that they had discussed. When asked to reflect on the evaluation process, the in-country research team and boundary partners indicated that they found it useful, and that the process increased their understanding of sustainable development issues and potential solutions. It also provided an opportunity for them to learn what each other have been doing and opened up more possibilities of maintaining and/or extending collaboration. In particular, they felt that the process facilitated learning about other disciplines, the sharing of new ideas, and forced them to think outside of the box. Importantly, the process motivated them to follow up on project recommendations and keep the SUD Makassar project 'spirit alive'. Participants appreciated that the process enhanced their thinking around what kind of study topics and practical solutions were needed and could be done to help their region.

The in-country team suggested an additional step for the PTI process, which involved clearly identifying indicators, a timeline, and who's doing what associated with each of the identified changes needed for implementation.

Overall, while challenging to organise and a significant time commitment for participants, the PTI evaluation workshops enabled individual and collective reflection and evaluation of the workshop. This participatory evaluation exercise also had other benefits, including knowledge sharing and re-priming of participants, making it a worthwhile activity.

9.3.6.2 *Adaptive capacity surveys*

The SUD Makassar case study undertook three adaptive capacity survey evaluations, in 2014, 2015 and then again in 2017. This evaluation was designed to track impact over time and relied on resurveying as many of the same people as possible. For the SUD Makassar case study this resulted in 15 out of the original 17 being surveyed for all three time slices.

General feedback on the evaluations from the in-country team indicated that they would prefer more frequent PTI workshops and survey evaluations, as a year was a long time and they felt they were forgetting things over time. They suggested that the absence of the CSIRO team in Makassar should not be a barrier to conducting more frequent evaluations and suggested setting up a social media (e.g. WhatsApp) group for the project.

Overall the adaptive capacity surveys were able to stimulate reflection in the respondents and draw out stories of change and barriers to that change. While there were challenges associated with the scoring of the indicators, they did provide a boundary object for discussion in the survey and when synthesised into the case study evaluation reports, showing indicator scores changing over time.

9.3.6.3 *Potential change agent interviews*

The prospective agents of change were fairly easy to identify using the project evaluation data, although having been a CSIRO team member loosely connected to this project meant that I was already primed to understand the case study system and could approach the case study lead to validate my suggested interview list.

The nine interviews took between 25 and 55 minutes each, with four of the interviews being undertaken directly with the interviewee, and the remaining five requiring varying degrees of assistance from an individual hired to assist me. Interviews were more informative when they were direct; on reflection there are several reasons for this. The first and perhaps most limiting was the language barrier, which not only meant that questions and responses were lost in translation, but so too were concepts I was trying to ask about. One example of this was the question asking interviewees how self-reflective they felt they were. For those with the strongest English skills this question and concept were not a challenge, however over several interviews it

became apparent that some people really struggled with this concept and question, not understanding what I was asking about. The lightbulb moment for me occurred when one of the other interviewees intervened in an interview to explain the concept to their colleague and the translator in Bahasa. This created an ah-ha moment, and then a fantastic description of how the call to prayer in the middle of the night is meant to be a time of reflection. This example was then used to explain the concept to other interviewees.

A chance to ask these questions of change agents again would yield a better understanding of the contextual and temporal aspects of catalysing a change agent.

9.4 Case conclusion

The SUD Makassar case study identified three strong change agents who were key catalysts and connectors on the path to change; these were not isolated individuals, but well embedded within teams and networks. Several other emerging and prospective change agents were likely to have enabled their collective success. In particular the high level of networking across the water management researchers and government decision makers through this project was impressive, and led to the creation of windows of opportunity, particularly through policy and management plan development.

The creation of these research–policy networks together with the more traditional project capacity building activities facilitated the emergence of additional change agents in the system. The collaboration across sectors helped activate the change agents, with the formal training and workshops enabling the interaction which facilitated the development of relationships and networks.

All of the agents identified, whether strong, emerging or prospective, mentioned a core set of values or purpose, in that they wanted to help others and build a better future for Makassar. A shared value for creating a healthier environment grew through the project together with a better understanding of the system. The three strong change agents were in leadership roles and were keen to grow their own as well as their colleagues' understanding of the challenges.

The SUD Makassar case study suggests that change agents do have an identifiable set of characteristics that are shaped by their context and histories, and can be influenced by an R4D project. The cross-sector network developed by the project, together with new and existing participant competencies, enabled opportunities for change to be actioned and sustained.

Chapter 10: Comparative analysis of potential change agents

In the preceding four case study chapters I have outlined what impact each R4D project had over time, distilled a list of potential change agents, analysed their alignment to suggested competencies and characteristics in the literature, and explored what the project did (if anything) to catalyse them.

This chapter explores how change agents are important to the 'success' of the R4D adaptation interventions by enabling change to occur. The identifiable set of characteristics of change agents is discussed, followed by how it is possible for R4D adaptation interventions to catalyse, cultivate and empower potential, emerging and established change agents to achieve intervention goals through the development of new networks, knowledge and competencies.

Personal characteristics influence which competencies are developed and how they are developed. In turn, competencies developed influence the characteristics of people who are, or become, change agents. While it is unlikely that one individual can have all characteristics and competencies to enact change on their own, it is possible for people to partner with others to offset/complement gaps in characteristics and competencies which can help create or identify windows of opportunity, which lead to change.

Further comparison and discussion of the evaluation approach and findings from across the four case studies, including similarities and differences between countries and across research domains, can be found in Appendix 2 and 3 (starting on p.271) together with reflections on what the potential implications are for undertaking R4D adaptation interventions.

10.1 Emerging change agents

The central premise of this thesis is that when R4D adaptation interventions are successful at creating systemic change, it is often because of an individual or group of people who work at multiple pathways to achieve their goal. The case study chapters demonstrate that change agents associated and enabled by the R4D Alliance projects managed to enact change in their systems, although to varying degrees. Within each project, potential change agents were identified as prospective, emerging or strong (Figure 48). System change was enabled by the R4D projects influencing and cultivating change agent knowledge, networks and competencies in order to bridge the knowing-doing gap (Figure 49).

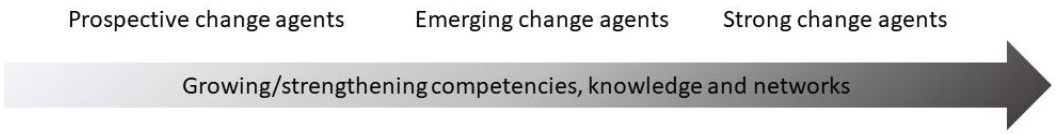


Figure 48: Change agents evolved from potential, to emerging and strong as they developed and strengthened their competencies, knowledge and networks.

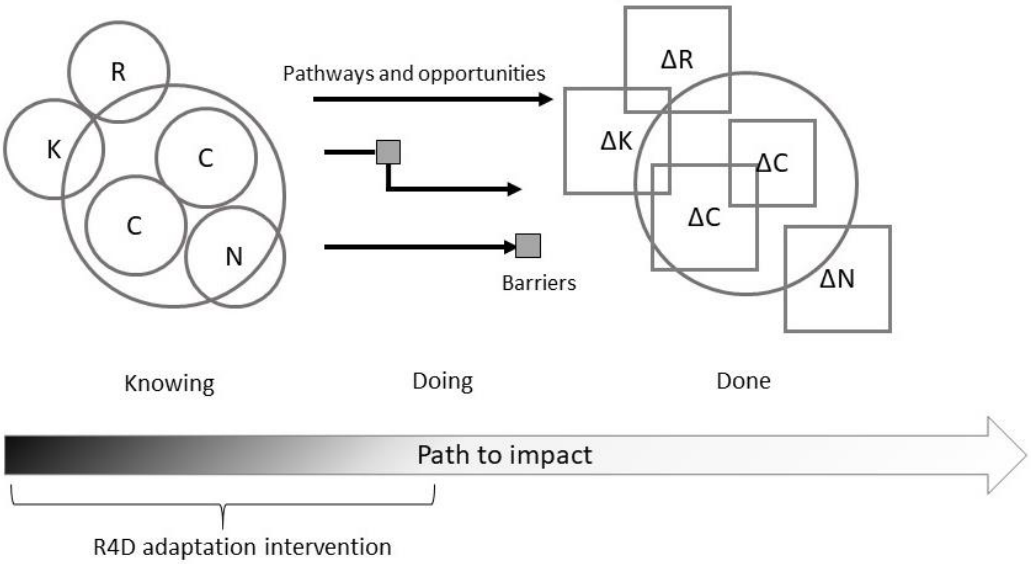


Figure 49: R4D adaptation intervention projects influencing and cultivating change agent knowledge, networks and competencies in order to bridge the knowing-doing gap. K – knowledge, R – resources, C – characteristics, C – competencies, and N – networks.

Across the four case studies, 37 potential change agents were interviewed, with eleven showing strong alignment to the identified change agent characteristics distilled through the literature review (section 3.1). Sixteen prospective and emerging change agents, or collectives of agents, were identified as having weaker alignment to identified characteristics. See Table 9 for a summary of numbers of identified change agents by case study. Results suggest that it is much harder for one person to act as an independent change agent, with even the stronger change agents relying on their networks to enact change. This research suggests, as have other studies, that rather than make a hero of individuals, it is more likely that people and their networks or collectives can be catalysed to help maximise opportunities (Westley et al., 2009, Heffernan, 2015). This reinforces Albert Bandura's argument that to create success requires a blend of individual, collective and proxy agency (Bandura, 2018).

For R4D adaptation interventions this suggests it is important to build networks, and associated competencies, with a diversity of people and ways of thinking to enable opportunities for change to be identified and actioned.

Table 9: Summary of identified change agents by case study

Case study project	Total #	Strong	Emerging	Prospective
Adaptive Livelihoods	7	4	2	1
SUD Can Tho	5	3	0	2
SUD Makassar	7	3	2	2
Climate Projections	8	1	2	5

10.1.1 Knowledge

Across all case study projects those interviewed felt they had the knowledge they needed, or that the projects helped them develop the knowledge they needed, to address their challenges. Three of the four projects were designed to co-produce knowledge with a wider group of stakeholders, working with potential end users of the information. These project teams were able to co-produce knowledge, tools and processes that enabled information to be shared that was relevant for different types of end users or stakeholders.

Those interviewed as part of the Climate Projections Vietnam case study project, which did not involve an end user or stakeholder group, demonstrated fewer and less developed interpersonal competencies. Interviewees reflected at the end of the project, and through subsequent evaluations, that they would like to learn more about how to engage effectively with end users and a wider set of stakeholders in order to see the information and knowledge they produce taken up and used.

Case study project teams that did work with end users indicated that this was a new and much appreciated approach for them, although it required that they learn a new set of skills and competencies to better engage and work with stakeholders. Many of the identified change agents (strong, emerging and prospective) indicated they were actively continuing to cultivate their own interpersonal competencies. Learning to facilitate workshops and discussions was often identified as a key skill required for enabling change, and reinforces the insights of Ensor and Harvey (2015, p.10) that facilitation 'builds trust, addresses power imbalances, and bridges diverging aims and interests' and that to help initiate social learning for adaptation necessitates a shift or expansion in research skills from technical specialists to facilitators. Stronger change agents demonstrated more developed interpersonal competencies, including facilitation skills.

Participatory evaluation was another new type of activity and source of knowledge for all the projects, with the shared social learning activity enabling individual and collective reflection and consolidation of knowledge between the project team and wider stakeholders, catalysing new collaborative partnerships, which is similar to the insights found by Wyborn et al. (2019). Multiple interviewees commented that this was the first time that they had been asked to undertake an evaluation of their own work, and how much they appreciated the opportunity to do so.

Through the evaluations and change agent interviews it emerged that the rise of new technology, such as open source software, wiki, and social media such as Facebook, Yelo, and WhatsApp, were making information and technical resources far more accessible. This led to another advantage mentioned, which was knowledge sharing between people becoming easier, not just between researchers, but also connecting with stakeholders more frequently (such as with farmers via text). However, as highlighted by Paasche and Österblom (2019), the rise of technology was also contributing to interviewees' sense of time constraints due to being available anytime and anywhere.

For R4D adaptation projects this confirms the knowing-doing insights identified in the literature (section 3.4.2) that while the traditional science knowledge generated is important, it is not sufficient in itself. The development of general knowledge, as well as other knowledge associated with competencies (discussed later), is often as important when planning an intervention.

10.1.2 Resources

Almost all interviewed indicated that they were time poor, with some identifying other resource gaps, such as computing and money for research. However, in spite of their contexts, the stronger change agents felt they were able to achieve impact by:

- having good support networks or social capital from which they could seek assistance or information
- making good choices, which connected to their pre-existing values and competencies
- having self-belief that it would all work out in the end, which was tied to hard work and the agent's personal sense of purpose, and most strongly aligned to the idea of serendipity being 'change favours the prepared'.

Interviewees connected being able to better manage their lack of resources to feelings of control and higher levels of autonomy. Interestingly this was not always individual, such as in the Adaptive Livelihoods project where both strong and emerging change agents mentioned using collaboration to mitigate resource constraints. For example, while they might lack certain knowledge or tools at their university, they were able to share and collaborate with other universities, enabling access to resources.

Interviewees who expressed feeling less support, or a lack of support, were likely to be identified either as prospective change agents or were not identified as a change agent. Feelings of disempowerment due to a lack of resources have been suggested by others (Spires et al., 2014). Challenges associated with a lack of resources were particularly difficult in Vietnam where the salary for researchers is 'not sufficient for life' and created a challenge for many, although in the SUD Can Tho project this tended to produce more entrepreneurial skills, especially in the stronger change agents. As Scoones (2016) suggests, opportunities and resource scarcity can look and be very different for groups of people, with the two Vietnamese case study groups behaving very

differently, although both northern and southern Vietnamese interviewees worried about future generations coming through, and how they were less likely to attract high quality people into science.

Across all four case studies interviewees mentioned that time for their work or passion can come at a cost to their families. Many attributed the extra busy-ness to the increasing amount of administration or non-core work they had to do, which aligns to the global issue of how unsustainable science is becoming (Paasche and Österblom, 2019). Both CSIRO and in-country interviewees noticed it was becoming increasingly challenging to collaborate or work with others (i.e. other researchers, government, farmers etc.) due to the amount of time it takes to build and maintain relationships, including the time required for travel.

Stronger change agents had well developed networks, most of which were developed prior to the case study projects and then expanded upon. Needing to allocate more time for relationships is a particular and growing challenge for prospective and emerging change agents as it is through the development of their social networks that they can bridge resource constraints and share knowledge, enabling adaptation (Butler et al., 2017, Butler et al., 2016a).

10.2 Change agent characteristics and competencies

Change agent characteristics influence the types of knowledge, resources and competencies they have, or have access to. Knowledge and competencies directly and indirectly influence characteristics, suggesting that individuals and collectives involved in an intervention both shape that intervention and are shaped by it.

The literature review in Chapters 2 and 3 outlined a core set of change agent characteristics and competencies needed by agents to enact change. These identified characteristics and competencies were then used to assess potential change agents in the four case studies. Across the projects, it became clear that the nine competencies identified through the literature review were insufficient, with three additional competencies emerging through the evaluations and interviews; these were general, integration and ambiguity competencies (Figure 50). A renewed exploration of the literature suggested that these competencies had also been identified by others as useful for catalysing adaptation (Ahvenharju et al., 2018).

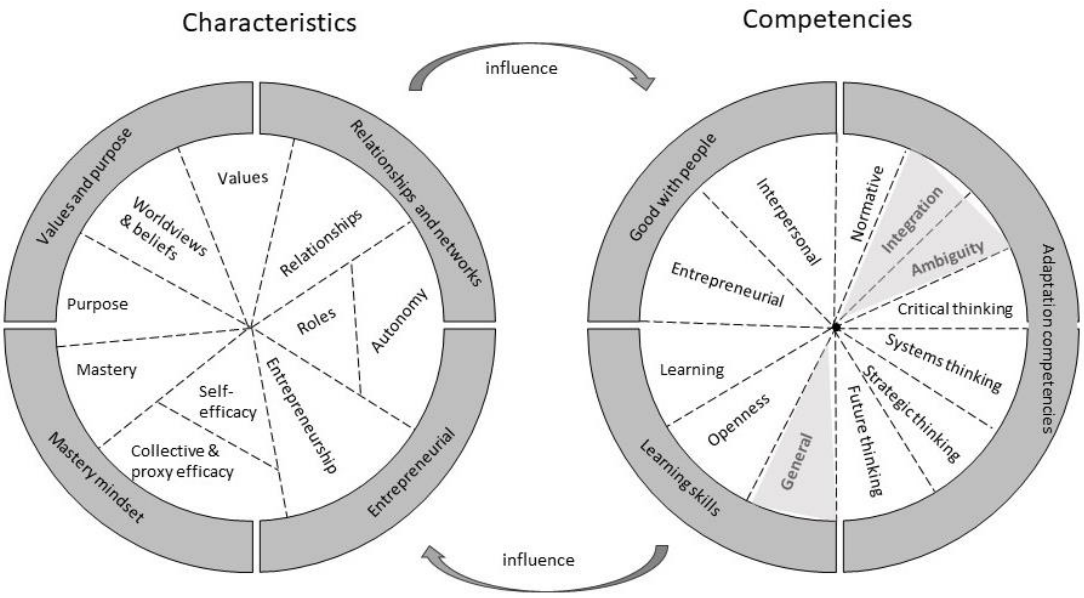


Figure 50: Change agent characteristics and competencies, with addition competencies identified through the case studies highlight in grey.

10.2.1 Change agent characteristics

The initial set of characteristics identified in the literature were found to varying degrees in potential change agents across all four case studies, with no additional characteristics identified. These characteristics can be lumped into four overlapping and interconnected themes: values and purpose; mastery mindset; relationships and networks and entrepreneurial (Figure 50).

10.2.1.1 *Values and purpose*

Overall the case study projects did enable participants to reflect on their beliefs and values, and in some cases adjust or add to them as new insights were realised. Stronger change agents spoke about having a core set of values or a higher purpose that drove them to improve and keep going when times were tough. Emerging and prospective change agents also expressed having a purpose aligned to their values; however, responses varied significantly between individuals and were often tempered by competing values, such as needing or wanting to progress their career.

There was a climate change focus across all projects, so it is perhaps not surprising that expressing value for the environment was common across most case study participants. Other expressed values and beliefs, such as positive social change, justice and thinking about the future also aligned to the objectives of the projects (as well as the normative competencies) and provided all change agents with a shared goal and motivation to pursue it (Frankl, 1985, Baumeister et al., 2016).

Many of the project participants were tasked with or undertook 'personal projects' within each of the case studies, which led to the further development of environment and social values, as well as a desire to work with others (Little, 2017). For example, in the SUD Makassar project some of the interviewees already had well developed feelings about the environment while others

developed an environmental perspective with a new appreciation for the link between the environment and human wellbeing.

Across all four projects, interviewees expressed concern for others, especially those more vulnerable, with interviewees wanting to help people to have a good life, and in the SUD Makassar project two interviewees highlighted wanting to help women in particular. The Can Tho and Makassar SUD projects' interviewees expressed a strong sense of place, which was conveyed as a desire or responsibility to improve their patch on earth and was used by them as a leverage point (Abson et al., 2017) to encourage others to share their values through the projects.

Teaching and developing the next generation also came through strongly, for both strong and emerging change agents and aligned to interviewees' roles, many of whom were university staff. For some interviewees who were public servants, values were expressed as being a good public servant and described as being conscientious, helping others and being somewhat conservative (Schwartz, 2012). Helping others was often expressed as being motivational due to being trusted by others and the responsibility associated with that; this was true for both in-country and CSIRO interviewees.

Personal values and beliefs were the main reason why many of those interviewed participated in R4D Alliance projects and this was equally true for strong and emerging change agents. Common beliefs and values associated with learning and research, the environment and social good helped create a bond and shared goal for the projects. There were also some beliefs and values in tension, both within project teams and within individuals, leading to behaviours not always aligning to expressed activities or goals of the intervention (Gifford et al., 2011). For example, developing research outputs which helped individual careers could be in tension with developing products or processes that were designed to have a more tangible benefit for end users or community stakeholders.

Alignment with people who already share a similar value system would enable R4D project teams to more quickly develop a shared goal and a desire to work together. The case study projects also demonstrated that it is possible to cultivate new or alternative beliefs in project participants through capacity building, two-way mentoring and social interactions, potentially shifting a participant to become a change agent. This will require R4D intervention teams to consider the potential power and ethical considerations of undertaking deliberate value shifts.

10.2.1.2 *Mastery mindset*

Almost without exception, interviewees mentioned valuing learning and having already developed associated mastery competencies. A majority of interviewees' comments focused on how to do what they were doing better or being curiosity driven. All change agents, as well as those interviewees not identified as change agents, indicated that they learnt through formal training or seeking feedback and guidance from others. The more formal R4D project capacity

building activities, designed to build participant confidence or efficacy in certain skills, were seen by interviewees as a typical continuation of their education.

However, the project and self-reflection activities, particularly the evaluation, were not seen as typical learning approaches. Only the stronger agents mentioned self-reflection, often in the context of wanting to improve themselves in order to help others, rather than just learning new things out of a sense of curiosity. Reflexivity (reflecting on self, not just what one has done), was an even rarer attribute and mostly limited to the stronger potential change agents who were more sure of themselves and worked hard at what they wanted to do, which correlates with Bandura (1997)'s idea that mastery practices stem from a sense of self-efficacy.

Stronger change agents mentioned the importance of mastery and reflexivity, not just about their work, but also more broadly in their lives, in order to examine what is working and what is not, and how they could improve in the future. These mastery characteristics mostly pre-dated the case study projects, although there were a few examples where prospective and emerging change agents were inspired by the project to grow their awareness of issues and reflect on their choices and actions.

Again, stronger change agents had a higher level of self-efficacy in their work, while those emerging or working as part of a collective spoke more about proxy or collective efficacy. However, as Bandura (2000) outlines, collective efficacy requires that individuals have a level of self-efficacy to start with.

While all case studies had a mix of responses for self, proxy and collective efficacy, the strongest sense of self-efficacy was found in SUD Makassar, SUD Can Tho and Adaptive Livelihoods. In SUD Makassar it was described more as a form of resilience or persistence, while in the Adaptive Livelihoods and SUD Can Tho projects it was expressed as a very strong sense of self-efficacy brought about from training away from home, often overseas, for long periods.

The concept of perseverance, the ability to keep going even when things got hard, was a general theme across the four case studies. Perseverance was motivated by change agent purpose, as well as self-described as a personal characteristic (Credé et al., 2016). Interviewees expressed this as stubbornness, needing passion or heart for their work, or connection to personal values, and that they wanted to help others to be more self-motivated.

Proxy efficacy was most commonly mentioned in the Climate Projections Vietnam and SUD Makassar case studies; the need for patience and playing the long game. Collective efficacy was mentioned multiple times in the SUD Can Tho and Adaptive Livelihoods projects, with many interviewees mentioning how important it was to have a great team, and highlighting that it is impossible to know everything, so there is a need to partner with others. In SUD Can Tho interviewees articulated needing to have all three forms of efficacy to make change happen. This aligns with Bandura's (2000) proposition that while collective efficacy enables individuals to

achieve more than the sum of their parts, individuals also gain motivation and efficacy from watching others do similar things.

Collective efficacy was an important feature in three of the case study projects and was fundamental to catalysing change, as demonstrated by emergent change agents gaining confidence and empowerment along with additional skills through the projects, though stronger potential change agents were better able to utilise these new skills, knowledge and networks within their existing resources and roles.

Stronger potential change agents, and some of the emerging ones, mentioned being more open to new or different concepts, and described lightbulb moments when exposed to new ideas (such as systems thinking or integration of other knowledges) or experience (seeing how others live or do something) (Sterman, 2002, Brown et al., 2014). This type of characteristic was mostly aligned and cultivated by project activities and training.

Another connected theme was an expressed sense of humility, which included sharing lessons with others, and was particularly true for the stronger change agents who were not only attempting to improve themselves but to lift others as well (Sterman, 2002).

In all case study projects, it was a few key existing change agents with strong mastery characteristics that enabled the project to commence or keep progressing, highlighting how important this characteristic is for actioning R4D interventions. In addition, R4D adaptation interventions have traditionally focused on cultivating agency without exploring some of the underpinning activation concepts such as efficacy (Brown and Westaway, 2011). This research suggests that if R4D adaptation interventions want to cultivate systemic agency they explicitly need to explore developing project participants' self, collective and proxy efficacy through capacity and competency building, and developing and strengthening networks for change.

10.2.1.3 *Relationships and networks*

Networks proved to be a key attribute of change agents and a clear opportunity for capacity building in R4D adaptation interventions, both from the perspective of utilising and growing stronger change agent networks for the project and developing new networks and showcasing to others how these could be used to improve research results, provide support and identify and create windows of opportunity.

Interviewees in all four case studies spoke about the importance of trust and the support of their colleagues; this is a key aspect of social capital (McCrea et al., 2014) and attribute of perceived knowledge experts (Checkland and Poulter, 2010). In addition, many interviewees mentioned family and friends as an important source of support for their work.

Networks were a particularly important theme in Vietnam, with interviewees speaking about staying in long-term contact with the people they went to university with. There was also more mention of the importance of friendship and coffee, and needing to connect with people on a

regular basis. In both projects in Vietnam, interviewees mentioned the importance of their overseas networks, telling stories of people who kept coming back to work with them, and how much they appreciated this. By contrast, the Adaptive Livelihoods project interviewees mentioned that they maintained their networks as it was part of their job.

Across all case studies, the interviewee's role and sense of autonomy appeared to be linked to life or career stage, with collaboration and expanding horizons easier when young without children or older when family pressures had eased. However, stronger change agents tended to be older with well-developed networks, and in positions that enabled them a degree of power and autonomy. However, not all interviewees holding senior roles felt they had power or expressed interest in working outside of their narrow role; these people were not tagged as potential change agents (Lonsdale, 2015, Weick and Quinn, 1999).

Prospective and emerging change agents tended to be younger, and were focused on developing their professional skills and meeting family commitments, so had smaller and less complex networks. There was more autonomy to make choices within universities, with those not in universities having fewer degrees of freedom due to work being allocated by those in more senior roles. This was identified as a particular challenge in the SUD Makassar project due to 'role churn' in the public service.

A common attribute both Vietnamese and Indonesian interviewees mentioned was having increasing freedom to choose what research they do, with some interviewees reflecting that they had a lot of scope to shift direction and explore new things. However, some interviewees in both countries stated that they had not been able to choose their original major (assigned in school or chosen by parents) and this training is what their current career was based on. Life and career stage implications were not an explicit focus of this research but would be an interesting area for future research.

In spite of almost all interviewees noting how important to was to maintain and build networks, they also noted that this did not always happen. They mentioned many barriers and constraints to building and maintaining their networks, with insufficient time and resources to do this properly, and additional constraints when there was a lack of proximity in the relationships. This challenge was consistently mentioned by all of the CSIRO interviewees and has been noted by others as an ongoing challenge that needs to be addressed to create successful collaborative research projects (Cundill et al., 2019, Cundill et al., 2018).

This research confirms what others have suggested, that R4D adaptation interventions need to cultivate a wide range of participants from across knowledge cultures and life stages as this produces a diversity of thinking, networks and opportunity to enact change (Dutra et al., 2015, Westley et al., 2013, Butler et al., 2017). When designing adaptation projects, R4D teams might look for strong agents with well-developed networks to partner with, while at the same time

providing additional time and resources to enable prospective and emerging agents to strengthen and grow their networks.

10.2.1.4 *Entrepreneurship*

Very few of those interviewed expressed entrepreneurial skills, and those that did were exclusively the stronger change agents. This trait also appeared to have a contextual difference, with the Vietnamese showing stronger tendencies in this area (noting that this was mostly economic entrepreneurship). A small number of people who were not identified as change agents also expressed entrepreneurial traits, mentioned in connection with self or family promotion, and without the normative social attributes.

In the broad picture, those that had the most entrepreneurial tendencies were more likely to be systems thinkers, had a sense of openness and optimism about the future, and mentioned being prepared or working hard in anticipation of an opportunity coming their way. These people mentioned having the courage to take risks, often associated with travelling overseas or to other places, and when in these other places learning new things that could be applied, and perhaps adapting these ideas or approaches to bring back to their own context.

While less common in Indonesia, entrepreneurship featured with both SUD Makassar and Adaptive Livelihoods interviewees, where entrepreneurial attributes were more often described as things falling into place or an openness to others and opportunities. All change agents who expressed entrepreneurial traits mentioned the toll (associated with additional work to take advantage of an opportunity) that this takes on them and their families.

Like entrepreneurship, serendipity was viewed culturally very differently between Vietnam and Indonesia. Predominantly, the Vietnamese described working very hard and making opportunities for themselves, whereas interviewees in Indonesia (with a few notable exceptions) put their faith in God. Stronger change agents were more likely to frame serendipity as an action, describing that they generated their own luck through hard work and being open to new things (Lawley and Tompkins, 2008). This trait was strongest in those who had studied away from their families, particularly those who went overseas to work or study. While not everyone who has ever worked or studies overseas becomes a change agent, it was interesting to see the correlation of this opportunity with strong change agents. For the CSIRO interviewees, the idea of serendipity was connected to their sense of privilege, and actively seeking opportunities to help others.

Seeing opportunities and then actioning them was a characteristic of stronger change agents, with serendipity perspectives being more common than entrepreneurialism. Prospective and emerging change agents had significantly fewer of these characteristics, however, as a result of participating in the projects' networks and mentoring they were starting to behave more like the stronger change agents.

Overall, the literature review did identify the attributes of the stronger change agents, with prospective and emerging agents having fewer of the characteristics. However, strong change agents did not all express characteristics in exactly the same way. This was particularly true for entrepreneurialism, with some focusing on hard work and waiting for opportunities, while others took a more proactive approach. This suggests that there are a variety of ways that these characteristics can combine both individually and collectively to enact change, and reinforces the importance of R4D adaptation interventions to develop a wide and diverse network.

10.2.2 Change agent competencies

R4D adaptation interventions are deliberately designed to create knowledge, networks, and competencies. During the R4D Alliance knowledge, resources and technical capacity building were seen as important and enabling; however, through the evaluations and subsequent interviews it became apparent that developing key competencies was vital for creating adaptive capacity in strong and emerging change agents. In part, twelve competencies (Table 10) were highlighted as being particularly important, because they were unanticipated (learning was thought to be technical) and because these competencies are more broadly useful for change agents in other projects as well as more broadly in their lives, shaping who they are.

Table 10: Description of the twelve change agent competencies

Competency	Description
General	Includes but is not limited to the ability to speak and write in English, planning and management skills, risk management skills, and business development skills
Interpersonal	The social skills that enables connection to others, helps build trust, networks and social learning.
Learning	Wants to learn and has the skills to do so, these include the processes of social learning, critical reflection and reflexivity.
Integration	Thinking differently, with the capacity to cope with nonlinearities, have a decent understanding or several disciplines and accommodating the belief and knowledge of others
Openness	Has an open mind, open to new or different world views, values, ideas and processes.
Ambiguity	Able to sit with the discomfort of not knowing, and encourage others to do the same
Systems thinking	Understanding of connections, feedback loops, drivers and scenarios of change.

Strategic	Planning and self-regulation skills. Identifying and then actioning steps to implement, including addressing any barriers.
Future thinking	Anticipatory skills which help people think about the future and make practical judgements.
Critical thinking	Critical thinking skills include reasoning skills, flexible thinking and the capacity to shift from one perspective to another.
Normative	The values, principles and goals of individuals and groups, such as having concern for others and thinking socially.
Entrepreneurial	Communication and influencing skills, engage with politics and understand the institutions that support innovation.

10.2.2.1 *Learning skills*

Almost across the board potential change agents interviewed expressed their love of learning, suggesting this was a lifelong process of mastery linking it to change agent characteristics. Learning was often described more formally as education and training, with ongoing learning focused on receiving feedback from others which aligns to first loop learning (Figure 8). What set the stronger change agents apart was a focus on self-reflection, re-thinking their goals and approaches, as well as their interest in further developing their other competencies including interpersonal skills, strategic planning, and an improved understanding of systems perspectives which more closely aligns to the multiple types of learning the literature review identified were needed for adaptation (Tschakert and Dietrich, 2010, Bandura, 2018, Armitage et al., 2008).

Like characteristics, this learning orientation also gave them an openness to new or other things, although this was the second to least mentioned competence in interviews, with critical thinking the least. When mentioned, interviewees related openness to an experience that had occurred while travelling or undertaking education in another country. Only the stronger change agents mentioned having this competency, which suggests that this is a skill that could be more strongly cultivated within R4D adaptation interventions, perhaps through providing capacity building opportunities in other countries to the participant's original location or through training in opening the mind to possibilities (Scharmer, 2018, Ahvenharju et al., 2018).

While general or regular competencies are mentioned in the literature, the absence of these competencies was self-identified by project participants, highlighting that their education and culture was different to those assumed in a western context, suggesting that in a R4D intervention context these competencies cannot be assumed, as suggested by Wiek et al. (2011), and do require special attention. While general competencies grew through the projects, in all cases, this was

seen as insufficient by interviewees, with all mentioning the need to get better at writing and communicating in English, particularly in order to publish in international journals and to write proposals. Others have noted that the English language domination of global science is major barrier to the transfer of information, especially whether local knowledge is important, such as adaptation (Amano et al., 2016). Other interviewees mentioned that they receive a lot of technical training, but that improving 'human resource' competencies including English, management skills, people skills, risk management skills, and business development skills was needed to take advantage of new knowledge and technologies, and for developing their futures.

Overall the stronger change agents had more well-developed regular competencies, and almost all had studied overseas. Prospective and emerging change agents indicated that they were working hard on developing these general competencies to progress their careers and to improve their ability to have impact.

This research suggests that if R4D adaptation interventions explicitly set out to develop or strengthen learning skills, including 'regular' competencies in addition to the technical capacities and adaptation competencies, then a greater number of change agents might emerge. This insight adds to the call by others such as Riddell and Niño-Zarazúa (2016) for donors to prioritise and strengthen long-term support for education programs.

10.2.2.2 *Good with people*

Interpersonal competencies are arguably the most important competency required for enabling change. Almost every capacity paper read for my thesis literature review mentioned an aspect of interpersonal competence as being vital, whether it was the capacity to collaborate or co-produce (Van Kerkhoff and Lebel, 2015), smoothing conflicts (Vignola et al., 2017), or creating trust and motivating others (Brown and Lambert, 2015, Stajkovic et al., 2018, Edwards and Jones, 2008).

Interviewees in all four projects indicated that learning to collaborate with others was a highlight of the projects. Collaboration included others from within their own organisation, those from other research organisations, or with other stakeholders in the system. Some mentioned learning to work with end users and beneficiaries, noting that this was new for many, even those more strongly aligned to the characteristics of change agents.

The Climate Projections Vietnam project raised project partners' awareness of the need to provide information accessible to end users, but this was not further developed through the project, and was an identified gap for future work. For SUD Can Tho and Adaptive Livelihoods, interpersonal competencies included learning skills in facilitation and engagement at workshops, including how to share and elicit information and work with communities.

In addition, three of the projects' (once again not Climate Projections Vietnam) interviewees said that they needed to become better at communicating with and to end users in a way that was

useful and that they could understand. In the SUD Makassar project, an emerging change agent was actively pursuing learning to communicate with different audiences via different media such as video.

Strong change agents already had well developed interpersonal skills, with some of the emerging and prospective change agents further developing their interpersonal skills through the projects. Activities that facilitated this included having to work with others that you had not worked with before, including stakeholders and end users of the research, watching how the CSIRO teams worked together and attempting to emulate the same approach, and in a few cases, training in how to facilitate workshops.

Entrepreneurial skills were strongly associated with interpersonal skills, as well as other competencies such as strategic planning. Networks, communication and influencing skills enable entrepreneurism (Wiek et al., 2011) and were designed features of the R4D Alliance projects. However, all interviewees described the trait as pre-existing within themselves, noting that the case study project had provided new ideas or networks which they added into their entrepreneurial mix, supporting Frances Westley's (2013) idea that people with this competency are adept at leveraging resources, networks and institutions to enable their changes.

My research found an entrepreneurial difference within countries and between case studies. Within Vietnam, those in Can Tho articulated far more entrepreneurial traits than those in Hanoi, with both strong and emerging change agents expressing these tendencies, suggesting that their context supports and encourages entrepreneurism. Fewer interviewees in Indonesia expressed entrepreneurial traits, with only the stronger change agents mentioning them.

For R4D adaptation interventions it would be beneficial for R4D teams to have a decent understanding of how contextually normal entrepreneurial traits are in the region, or system of interest, in which they are working before co-designing interventions with local entrepreneurs to help cultivate entrepreneurial thinking in others. This capacity building could be undertaken as part of a broader set of interpersonal skills and competencies, including facilitation and learning to work with those who come from a different domain, culture or world view.

However, while people skills are a much recognised and needed set of competencies to create lasting positive change, they are often not specifically cultivated or rewarded by research organisations despite multiple calls for this to change (Cundill et al., 2018, Cundill et al., 2019). Therefore, for R4D adaptation intervention teams, perhaps their first action should be to influence their own organisations before attempting to cultivate others.

10.2.2.3 *Adaptation competencies*

Adaptation competencies are arguably the core priority for R4D adaptation intervention; however, without people skills and learning skills they are hard to develop. Adaptation competencies often build off the characteristics of players in the system (normative and ambiguity

competencies) and require a base level of competency in general skills, such as understanding relationships and interactions between things (systems and integration competencies).

Normative competence is about the values and principles that individuals and groups bring to their actions and activities (Wiek et al., 2011). Across all projects, participants valued learning, education and research. Other values expressed included those that related to a sense of place, the environment and helping those less fortunate or more vulnerable in society. These normative competencies created a shared sense of purpose across the project teams and helped created the initial bond enabling them to work together, and is an insight shared with others such as Abson et al. (2017).

In some individual cases, projects expanded the normative competencies of the project participants, such as in SUD Makassar where emerging agents mentioned that they previously focused on helping people, but their new systems understanding had led them to have a greater appreciation of the importance of the environment.

Stronger change agents and a few of the prospective change agents spoke about how they gained energy and motivation from their values and principles, including how a love of the environment or a desire to help others kept them going when things got tough. Having a value that was about helping others or the environment helped project participants to think about the future (future competencies), aided by the projects' stated climate change adaptation goals for the future of their communities or country.

With the exception of the Climate Projections Vietnam project, interviewees mentioned that the project had helped them to think about the future and better anticipate what might be needed to ensure uptake of their work and that this thinking had been furthered through participating in the evaluations. For the Adaptive Livelihoods project, scenario and planning skills were mentioned as growing participants' future thinking competency, which was appreciated by strong, emerging and prospective change agents.

Interviewees from all four case studies mentioned how the case study projects introduced systems thinking concepts to them, and how novel and informative this was, growing their awareness and understanding of the causes of the problems and the potential solutions. In all projects interviewees, including those stronger change agents, mentioned wanting to grow their systems thinking competency further.

Systems thinking competence and learning to work with others were the two competencies most mentioned and appreciated by all case study participants, featuring in both the evaluation and interview data. However, unlike interpersonal competence, systems thinking was seen as a new and beneficial capability by the majority of potential agents including those existing strong in-country change agents, suggesting that this was a vital aspect of the R4D Alliance's ability to prime agents for change. As Westley et al. (2013, p.2) suggest, this is a capacity to 'see the systems and its dynamics, and it identifies emerging windows of opportunity'.

Critical thinking competency includes reasoning skills, flexibility in thinking and the capacity to shift from one perspective to another. Critical thinking skills were the least mentioned competency throughout the evaluations and subsequent potential change agent interviews. Interviewees may have assumed that it was not necessary to mention these 'obvious' research skills, or possibly the way the questions were designed meant that these skills and competencies were not drawn out effectively. However, as others have previously noted, critical thinking competencies are vital for decision making, particularly in the fast and increasingly complex world we live in (Brown and Westaway, 2011, Hinkel and Bisaro, 2015, Fazey, 2010). An improved understanding of this competency's prevalence and how it is cultivated through interventions would be of benefit.

Interviewees from both the SUD Can Tho and Adaptive Livelihoods projects said they had benefited from learning how to integrate different types of science (especially socio-economic with the biophysical or technical) and to incorporate other knowledges, such as from government and farmers. Integration is a competence that can be described as making whole various pieces of information that may not be comparable (Brown, 2018). Integration requires people to think differently and develop a capacity to cope with nonlinearities, have a decent understanding of several disciplines, and accommodate the beliefs and knowledge of others (Tschakert and Dietrich, 2010, Fazey, 2010, Buchanan, 2004, Marope et al., 2017).

In the case study projects, integration competency was linked to other competencies such as openness and interpersonal skills. Some interviewees felt that not all of their colleagues had appreciated these attributes of the project, suggesting that this challenged those who viewed themselves as knowledge experts, wounding their 'sense of ego'.

Another emergent competence found through the interviews was the ability to handle uncertainty or ambiguity. This ambiguity competency relates to the ability to sit with the discomfort of not knowing and encourage others to do the same, and was found most predominantly in the CSIRO interviewees and a couple of interviewees in SUD Can Tho project. This competency is important to cultivate due to the complexity, uncertainty and contested nature of adaptive decision making in development, with individuals needing to develop a comfort in not knowing, a willingness to be open, collaborative and out of one's depth.

Developing the need to cope with ambivalence or developing the capacity to manage ambiguity and to inspire others to stay with you in uncertainty has been identified by others (Voß et al., 2007, Riddell and Moore, 2015, Brown and Westaway, 2011), with Meadows (1999) suggesting a need to be aware of paradigms and to let go of not knowing. Clarke (2016) goes further, advocating tolerance and acceptance of the unknown and a 'strong stomach'.

While it would seem obvious that an R4D adaptation intervention would seek to cultivate adaptation competencies in project participants, with a few exceptions these competencies were not explicitly included in project design or capacity building. Rather, technical knowledge and

capacities were specified and prioritised, making the change agent insights about how much they valued gaining competencies all the more important. In order to improve the stickiness of an R4D adaptation intervention, it would be worth explicitly incorporating cultivation of and training in the full suite of adaptation competencies.

The twelve competencies identified through this research may not yet be a complete set as with the fast pace and increasing complexity of the current era new competencies may need to be added to this list, suggesting that having a character orientated towards learning and mastery will be vital (Friedman, 2017, Harari, 2018). Marope et al. (2017) have already suggested that general competencies, which they call multi-literate, will need to move beyond reading, writing and arithmetic to digital, cultural, financial, health and media literacies.

10.2.3 Bringing characteristics and competencies together

The case study projects demonstrated that not all members of a team or community need to have all competencies, but that not having access to all competencies can be limiting for an intervention to succeed. Learning and interpersonal competencies appeared to be the most important for all participants to have or to cultivate, with strong or emerging change agents personally having a wider number and deeper set of competencies than the prospective. In contrast the adaptation competencies were new to most, with interviewees particularly appreciating systems thinking, seeing it as vital for adaptive decision making leading to systemic change (Ahvenharju et al., 2018, Wiek et al., 2011).

Interviewees across the projects suggested that the ability to look ahead and imagine, combined with strategic thinking and planning, was what they most valued. Interviewees suggested that this combination of competencies was helping them bridge the knowing-doing gap (Kappes and Oettingen, 2014, Edwards and Jones, 2008) and that participating in the evaluations was providing an opportunity for reflection, which in turn was informing planning for future projects.

The combination of characteristics and competencies was significant for all interviewed, although prospective and emerging change agents were seen to receive greater benefit from learning about future and strategic competencies as these strengthened their existing skills and activities while shaping how they thought about themselves and their futures. For example, a SUD Can Tho emerging change agent mentioned that they now realised how important thinking about the future was and that they were now trying to help young people (they were not very old themselves) to envision a future for themselves and how to get there.

This research demonstrates that while characteristics influence competencies, as people develop competencies this can influence characteristics, suggesting that those funding and planning R4D interventions may need to consider assessing what competencies they need in an R4D intervention team, as well as designing projects that develop the ongoing adaptive capacity

of participants that focus on growing a mix of competencies, rather than (or in addition to) focusing training on technical skills, knowledge and resources. How the different case study projects achieved this is outlined in section 10.4.

10.3 How change agents influenced case study impact

Across all four case studies success was achieved through change agents associated with the projects using a mix of new knowledge, tools and networks to enact positive change in their systems. These changes clustered into three main themes, 1) positively changing local plans and associated resources, 2) changing norms around how decisions are made, and 3) transforming research practice.

Across three of the four case studies agents associated with the projects were able to positive influence the development of local plans and resources. This included improving plans and growing the resources to support associate activities to be more climate adapted and sustainable for both people and the environment. In SUD Can Tho and SUD Makassar examples include changes in urban planning and water management, and in the Adaptive Livelihoods projects, changes in financial resources for farmers.

Decision norms were influenced both within the research partner organisations and the wider network of stakeholders associated with the project, leading to more participatory and inclusionary activities being undertaken that enabled communities, farmers, local government and researchers to engage with decision making processes. This included normalising the integration of science into decision processes, such as the urban map book and associated GIS practices in Can Tho.

In all four case studies research practice was seen to have changed, with change agents driving ongoing collaboration across organisations and disciplines, in some cases this had been established prior to the project, but was more common after the projects. In three of the case studies, strong and emerging change agents were inspired to internalise the new knowledge and approaches developed through the projects and share them with others. One example of this was the development of a new course for students at CTU. This also led to the two Indonesian universities raising their national ranking.

Similarly to how characteristics influence the development of competencies, which in turn influence agent characteristic, change agents not only influence the success of project, but are influenced by them in turn. The success of the R4D Alliance projects was influenced by the change agents involved, the following section explores how the projects influenced the change agents.

10.4 Influence of case study projects on change agents

Chapter 5: outlines how all of the R4D case study projects explored themes associated with climate change and adaptation and were explicitly designed to grow the capacity of in-country partners. Two of the case studies, SUD Can Tho and SUD Makassar, were initially set up as sister projects exploring sustainable urban development water challenges. The second Vietnamese case study sought to increase in-county research capacity for climate projections, while the second Indonesian case study explored how to improve sustainable livelihoods under a changing climate.

10.4.1 Country differences

While Vietnam and Indonesia are very different, the two countries have been on similar development trajectories, making them ideal countries to compare and contrast when considering the success of R4D interventions and associated change agents. Both the similarities and the differences played out in the project evaluations, and subsequent potential change agent interviews. A number of main themes emerged, including an observed difference between interviewees' narratives of change and attribution of opportunities, with Vietnamese interviewees more generally attributing 'luck' or opportunity to hard work, maintaining connections, and being in the right place at the right time. By comparison a majority of Indonesian interviewees saw opportunity as a gift from God or voiced the idea that they trusted in God to provide. Indonesian exceptions expressed that they either had an alternative faith to Islam or were atheist in their beliefs.

Within country differences were noted, although many of these differences were related to the types of project being undertaken and the personalities of the individuals involved. However, there was an observed change narrative difference between the two Vietnamese teams working on these projects. The SUD Can Tho (southern Vietnam) team exhibited more entrepreneurial traits and willingness to network than the Climate Projections team from Hanoi (northern Vietnam and the capital city). These differences extended to what people felt their roles were and how much opportunity they saw, perhaps giving those in southern Vietnam more opportunity to act as change agents. While it is not possible through this research to determine why these differing narratives of change occur in Vietnam, it is likely that the differing north-south history of research and policy development may play a role.

10.4.2 Science domains and project design

As outlined earlier, the two SUD projects were originally designed as sister projects, and while they diverged over time, they commenced exploring similar science domains and approaches to sustainable urban water challenges under a changing climate. The Climate Projections Vietnam project was designed as more of a traditional science capacity building and knowledge production project, focusing on improving highly technical skills, while the Adaptive

Livelihoods project used adaptive management and livelihoods approaches in order to influence both the capacity of in-country researchers as well as on-ground decision making and practice.

In addition, the two SUD and Adaptive Livelihoods projects took a systems perspective to unpack challenges and design possible interventions with end users, using participatory approaches that incorporated other types of knowledge (local government, farmers, etc.) in their projects. All three case study projects' in-country research partners mentioned that this was an innovative approach for them, which while challenging produced enhanced understanding between researchers and end users of the information, and was felt to help bridge the implementation-adoption gap by strong and emerging change agents. Working with end users was a gap identified in the Climate Projections Vietnam project and perhaps accounted for why there was less uptake of the information than for the other three case studies.

One of the lessons that started to emerge following the 2015 evaluation was that the process of undertaking a post-project evaluation was an intervention in itself. Across all four case studies, although less for the Climate Projections Vietnam project, the opportunity for participants, including prospective, emerging and existing change agents, to come together to discuss what they had learnt, what worked and what did not, and to share what they were currently doing was greatly appreciated.

While the adaptive capacity surveys facilitated personal reflection and provided data for discussion at the following evaluation points, it was the participatory nature of the PTI workshops that generated social learning and discussion about what could be done collectively in the future. Participants stated that the evaluation provided them with an opportunity (including the time and resources) to reconnect with the case study networks, which for some was not otherwise possible.

By the 2017 evaluation, it was clear that the 2014 and 2015 evaluations had triggered further activity in at least two projects. For example, in SUD Can Tho, where strong and emerging change agents decided to broaden their engagement with other local government agencies to facilitate implementation of the outputs into decision making and to develop their own version of the evaluation approach to reflect and learn from other projects.

While incorporating evaluation into a project enables success or impact to be monitored and evaluated for funding bodies, it can also trigger learning for a project team in order to adjust their activities as they go. Adding participatory post-project evaluation has the potential to keep intervention momentum going long after an actual project concludes, and should therefore be an important consideration for inclusion in project design by funders, researchers and practitioners who are interested in achieving systemic change.

10.4.3 Project stakeholders and networks

Three of the projects had a similar set of project stakeholders, with a mix of in-country researchers, government staff and business or NGOs, while the fourth (Climate Projections

Vietnam) focused predominantly on in-country researchers. The first three projects' in-country research partners found that including a wider variety of stakeholders through a participatory approach was novel and initially a challenging concept to work through and coordinate. However, as the projects progressed, and as evidenced in the evaluations, they found that they were able to establish new networks, as well as broaden existing ones. In addition to helping change agents bridge the implementation-adaptation gap, the wider networks have created further opportunities for collaboration and individual promotions for some of the interviewees.

The Climate Projections Vietnam project participants also widened their networks, but these were restricted to research networks. It was the first time that HUS and IMHEN had worked together, and the first time either had worked with CSIRO. The Climate Projections Vietnam project was also different from the other three, commissioned at the request of the Vietnamese government, starting a little later (in 2012 rather than 2011) and designed using a traditional research approach. The project goal was articulated to be completed at the end of stage one (capacity building and outputs) whereas the other three case studies expressed goals beyond the life of their project, reflecting anticipated impacts in stages two and stage three. While traditional approaches and a near-term focus worked for the Climate Projections Vietnam case study participants, it limited their ability and desire to engage more effectively with users of the information; this was identified through the evaluations as an omission or next step for this project.

Comparing the stakeholders and networks across the four case studies suggests that there is benefit in designing R4D projects to include a wide mix of end users, even if the intervention objective is a very specific research output. Had there been funding for further work at the conclusion of the Climate Projections Vietnam case study, the next project would have included end users.

10.4.4 Examples of how projects influenced change agent competencies and characteristics

Following are three selected examples of how the R4D adaptation interventions influenced strong, emerging and prospective change agents. Dark grey represents existing characteristics or competencies, with light grey being additional capacity developed through the case study project.

A *strong agent* from SUD Can Tho (Figure 51) already had well developed characteristics prior to the project, although through the project the agent widened their networks and learnt to work more effectively with other groups including government officers and farmers. Several of the adaptation competencies were completely novel, as were the evaluation tools and approaches, which became the principal change and opportunity for growth.

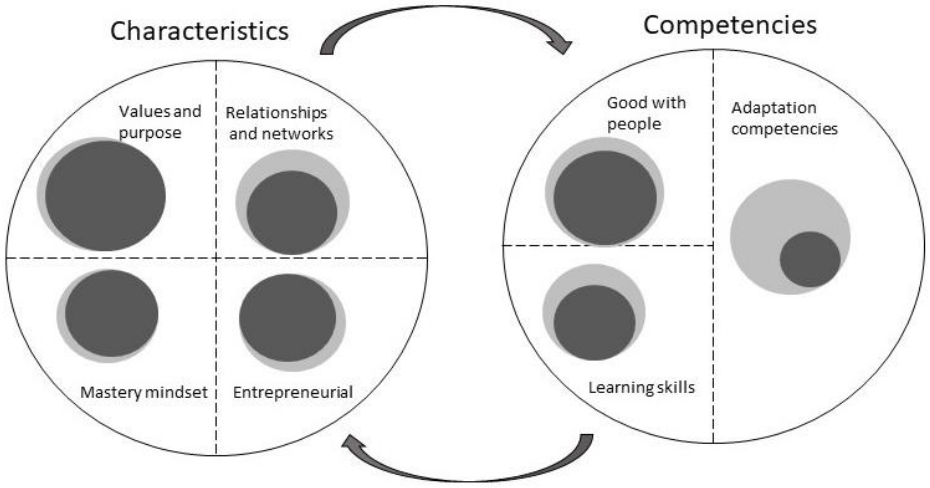


Figure 51: Example of a strong change agent in the SUD Can Tho case study

An *emerging change agent* from SUD Makassar (Figure 52) widened their networks and learning how to work with others. Many of the adaptation competencies were completely novel, as were the evaluation and concepts of social learning. A key personal insight was the connection between the social and ecological, creating a shift in values towards the environment and subsequent entrepreneurial tendencies on how to communicate this connection to others. Like the strong change agent from Can Tho, the most substantial change was the development of adaptation competencies, which was assisted by the expansion of their networks.

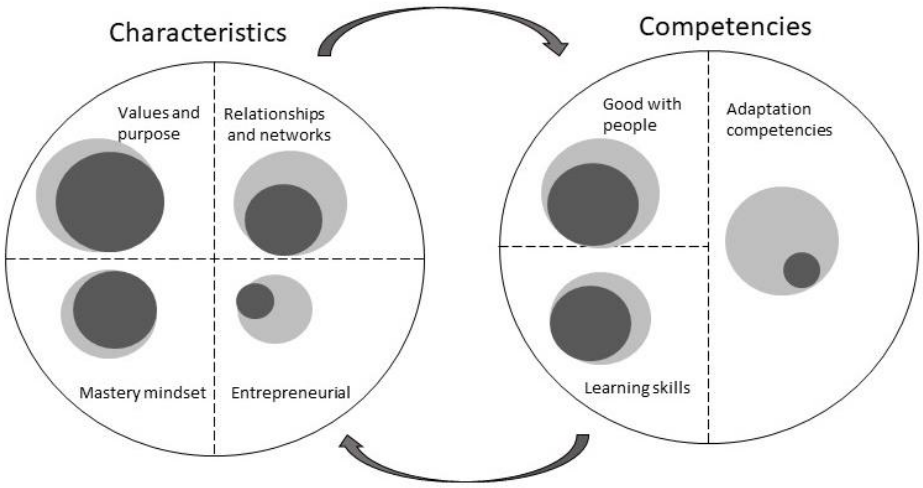


Figure 52: Example of an emerging change agent in the SUD Makassar case study

A *prospective change agent* from Adaptive Livelihoods Indonesia (Figure 53) had a strong passion for their work. As they were an early career researcher at project commencement, they had small, mostly academic networks. The case study project expanded their networks both within their own institution as well as with farmers and international researchers. They grew

many of the previously non-existing adaptation competencies and learnt who and how to partner with to address their competency gaps. Unlike the previous strong and emerging change agents, this agent went through significant change in multiple competencies, leading to a shift in mindset and a desire to further develop themselves.

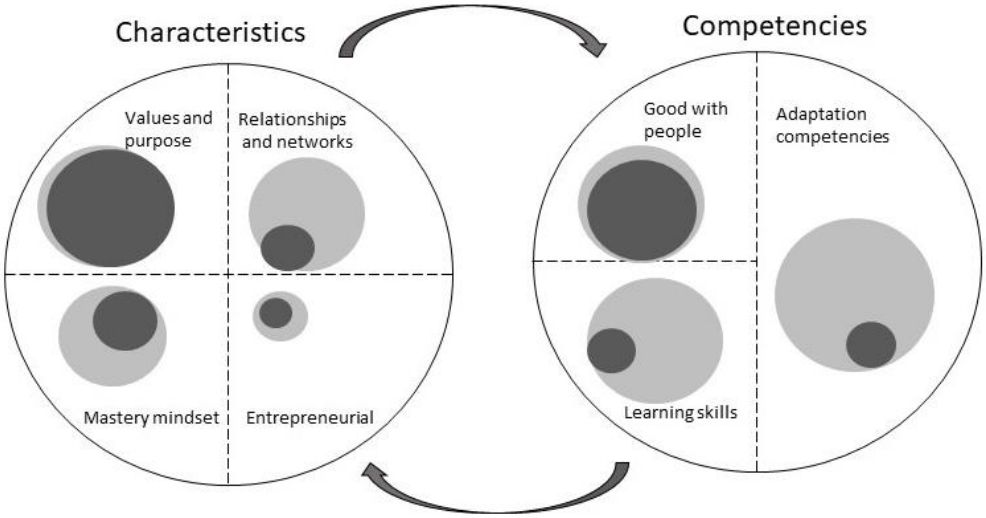


Figure 53: Example of a prospective change agent in the Adaptive Livelihoods case study

Many of the project participants grew their competencies as a result of the case study projects, however, it was the strong, emerging and prospective agents like the examples given above who used these competencies to help strengthen and grow their own characteristics. In part this was due to their strong values and purpose which also aligned to the goals of the project. Another unifying feature was the importance or growing importance of mastery and learning in their lives, which was reinforced through the formal training provided by the projects, but also more subtly and perhaps impactfully through the informal mentoring and relationships built through the project.

10.4.5 Role of CSIRO teams

In all four case studies, the CSIRO teams were seen as enablers of networks, sources and connectors of information, empowering organisations and individuals to collaborate who had never done so before. This type of enabling was driven in part by project funding; however, CSIRO was also seen as a neutral entity that could bridge divides or enable previously unseen opportunities for connection. This 'enabling' attribute was highly valued by in-country participants, and the evaluation results demonstrate that collaboration has continued even after CSIRO stopped working with stakeholders, indicating that the new relationships and networks are enduring through the strong, emerging and prospective change agents. Similar insights have been found on other collaborative CSIRO projects (Lazarow et al., 2015, Williams, 2018, Butler, 2017), and have been seen more broadly in other collaborative ventures (Cundill et al., 2018),

suggesting that R4D interventions potentially have a unique role to play in bridging worlds to enable change.

10.4.6 Emerging insights

While undertaking this research I came across two main themes that were not in my original framework, but due to the frequency with which they were mentioned across all case studies I felt it was important to capture and comment on them. The first was how the change in technology has become increasingly more enabling for capacity building and networking over and beyond the life of projects. The second insight was the power of education or significant periods of working time spent overseas on individuals' world views and openness to change.

Between the commencement of the projects in 2010 and the last of the evaluations in 2017, the world has seen a rapid change in technology. The change has enabled people to be more connected and access a greater range of information and tools than ever before. Interviewees across all four case studies mentioned how the rise of new technology had improved their access to resources and knowledge, using such things as open source software, wiki, and social media such as Facebook, Yelo and WhatsApp. Strong, emerging and prospective change agents mentioned that technology has enabled them to create and maintain networks and personal relationships, and while these were not sufficient in and of themselves, the connections were making sharing information easier and bridging the gaps between more personal face to face contact.

The second insight connects to the first, in that some interviewees expressed an appreciation for things outside of their contexts and being able to maintain relationships and learn from others outside of their city and country. This was expressed across all case studies, as experiencing other cultures, ideas and ways of doing and knowing. Interviewees who had had the opportunity to live and learn or work somewhere other than their own culture spoke about gaining insights which would not have been possible at 'home'. For most of the in-country people this meant being educated overseas and having to adapt to a new way of learning, as well as the everyday culture that was different. For the CSIRO teams it is the exposure to working in developing countries, and how this is changing them and their purpose at work.

> *Having cooperation with other people from different worlds and experiencing different places it opens your mind and you can see the life in better perspective* (Indonesian participant)

Overall those who had had an opportunity to work or learn overseas had significantly stronger change agent attributes. These change agents used technology to maintain and grow their relationships from that time, enabling them to continue to be exposed to different ideas and opportunities. A majority of these strong and emerging change agents also expressed a desire to continue to travel to broaden their minds.

The rise of technology was supporting prospective and emerging change agents, who had not yet had the opportunity to travel, to gain access to insights through social media and other internet resources, such as the online learning platforms and Wikipedia. Prior to the change in technology many indicated that they previously would not have had access to information needed for their work.

Technology did not appear to be as transformational an experience as travel and living in another country, but by combining technology with engagement through projects (not just the case studies) in particular prospective and emerging change agents were growing their capacity to enact change. Enabling people to experience new things and learn from others is transformational, and shouldn't be underestimated for those designing future R4D interventions.

10.5 Insights for R4D adaptation intervention teams

Research for Development, especially in the field of adaptation to global change, often focuses on building the capacities of in-country partner(s) to further enable or activate a sought-after change. This section provides insights as to whether R4D adaptation interventions are addressing the 'right things' to activate agents in these systems. Also, are similar attributes required for the 'developed' researchers to become agents of change? And what are the barriers and enablers to researchers working in this space?

The results from this research suggest the R4D interventions are managing to catalyse change through capacity building, new knowledge and networks, but that this could be improved as the focus is often still on the technical rather than interpersonal skills needed for success. One way to improve the design and implementation of R4D projects would be to map what competencies are likely to be needed against the project team and wider participants, much like a research organisation would assess what technical skills were needed to undertake a particular piece of science. A competencies audit would then allow R4D project teams to fill any gaps with additional people or specific training to grow those competencies.

In particular, an early focus on understanding and growing general competencies, rather than taking them as assumed (Wiek et al., 2011), would be beneficial to both project delivery and in-country partners, priming both for success. In addition to the general competencies, it would be worthwhile for R4D teams to enable the exchange of people between country teams for blocks of time, in order to allow those insights that come from experiencing the 'other' and to enable relationships to grow. This does not just have to be between developed and developing countries, it can also be between developing countries.

Capacity and relationship building aspects have implications for both project resourcing and time frames, both of which can be very constrained. In order to jumpstart projects, as most intervention experts already know, it is easier to build on former projects or with people you already know and draw further participants in as time goes by. Given that relationships are

important for the success of interventions, the characteristics of the people involved are vital. Key characteristics include good people skills combined with a mastery mindset, leading people to want to collaborate, learn and share with others, not necessarily wanting to be the expert airdropping in. Partners in more senior roles can help, as they tend to have broader networks and a greater sense of agency, although this is not to discount those who are more junior who can be both enablers of others and the leaders of the future.

For developed country researchers, it is also important for them to better understand the context they are intervening in, such as whether it is entrepreneurial and can they help activate those attributes in individuals, or would a more collective approach be more effective in order to create a network of potential change agents working together through more traditional channels.

The participatory evaluation process, particularly post project, can help maintain relationships and networks and was useful across all contexts. As demonstrated in the case study and discussion chapters, these evaluations also have the ability to re-activate capacity and generate new ideas to keep the change momentum rolling.

However, there are resourcing implications for undertaking a collaborative and participatory approach, and as demonstrated through the case studies additional resources often come at a personal cost to the individuals involved. This personal cost is not a new idea, with others suggesting vital collaboration insights and calling for more institutional support for these relationships and networks to be sustainable (Cundill et al., 2019, Butler et al., 2017, Paasche and Österblom, 2019).

10.6 Summary of insights

This research set out to inform how to bridge the gap between the theory and practice of enabling systemic change through research for development adaptation interventions, by focusing on whether change agents influenced the success of these interventions, and if os, how to identify and catalyse them. Specifically, what makes some people change makers, what are their characteristics and how do they influence the systems they are in? Also, how to identify these people, or groups of people, in order for R4D interventions to partner with them, as well as to gain a better understanding of how R4D teams can identify or grow potential change agents within their own teams/organisations.

My research has demonstrated that change agents are important to the success of an R4D adaptation intervention; they are a key part of why systemic change happens. These change agents have a set of identifiable characteristics which enable R4D adaptation interventions to identify them. It is also possible for an R4D adaptation intervention to catalyse strong, cultivate prospective and empower emerging change agents by growing knowledge, networks and agent competencies, enabling them to create and utilise windows of opportunity. Much like the causal relationships between characteristics and competencies, there is a positive feedback loop between

change agents enabling R4D projects to achieve positive change and projects facilitating the emergence and strengthening of change agents. By growing competencies, in particular, R4D adaptation interventions can influence individual characteristics, enabling further change agents to emerge.

Chapter 11: Conclusion

This research contributes to a growing body of R4D literature which argues that some people or groups are key change agents in the system, acting as catalysts, connectors and enablers. Change agents are an important aspect of success in R4D adaptation intervention, and potentially in other types of R4D interventions, and therefore funders and researchers should spend more time and resources considering how best to partner with and enable these people when establishing their activities.

Change agents are uniquely created by their personal and social histories, their opportunities and contexts. This uniqueness leads to differences in how change agents perceive the future and their role in shaping it, although this research suggests that some characteristics are shared regardless of the project or context. Across all case study projects, people and groups identified as strong change agents had a sense of personal responsibility and purpose, they went above and beyond their day job, and spoke about the importance of learning in their lives.

There were noticeable differences between those who felt empowered to influence the future and those who did not. For example, in-country researchers who had more freedom to operate were likely to take on additional roles that aided their purposes outside of their careers, whereas others relied on working hard and waiting for a higher entity, such as God, to intervene.

11.1 Identifying change agents

My research demonstrates that it is possible to identify potential agents of change within interventions, with strong, emerging and prospective change agents named more often than their colleagues through the evaluation process, particularly when asked who was leading and networking, and whether trust had grown.

Within each case study, and when comparing across cases, some change agents were better able to create opportunities for and from the project than others. Some of these people were already acting as change agents and saw the project as a way to learn something new and use that knowledge to further their mission. Others emerged or became strong change agents through the life of the projects. These change agents already had good people skills; they were more open to new ideas and able to quickly adopt new knowledge and competencies, as demonstrated by the growing research hubs in Can Tho, Vietnam and Mataram and Makassar, Indonesia.

Partnering with people who have a similar set of goals to the intervention, and who are already engaged within local networks, makes it easier for R4D adaptation interventions to develop appropriate knowledge and competencies that are likely to last long after the project. In addition, by working with change agents who have aligned goals, together with identified characteristics and competencies, R4D teams will design adaptation projects that have better potential for sustained change.

11.1.1 Facilitating change agents to emerge

All case study projects had either strong, emerging or prospective change agents develop through the project activities, suggesting that it is possible to catalyse change agents to emerge in a variety of ways. Feedback through the evaluation processes suggested that if participatory approaches are new to in-country teams then this can initially be an uncomfortable approach for them to be a part of. However, the projects demonstrated that capacity building activities scheduled early in a project can help in-country teams to become comfortable with a participatory approach, by developing a shared understanding and setting expectations.

Change agents were also catalysed by informal mentoring within the projects, and demonstrations from the CSIRO teams of how to work differently. Working differently included engaging with stakeholders and beneficiaries to help shape and undertake activities, working in more balanced team arrangements where all members were encouraged to contribute ideas and challenge approaches, and approaching challenges from systems and learning perspectives.

Specifically, 12 competencies were identified as being important for growing agents' adaptive capacity, which enabled individual and collective agency. This increased agency together with networks developed by the case study projects, saw in-country researchers continuing to work together and with stakeholders to enact change. This has endured beyond the projects with prospective, emerging and strong change agents continuing to use knowledge, approaches (evaluation, facilitation etc.) and competencies developed (systems thinking, future thinking) to further their individual careers and create windows of opportunity for themselves and others.

The participatory post-project evaluation exercises provided an opportunity for those on the case study projects, including the change agents, who had not remained connected to reconnect, share what they had learnt and continue to learn. These evaluations re-invigorated the project networks and created new ideas and activities, enabling changes to continue.

For funders and agencies, the idea of participatory post-project evaluations is particularly important to consider in the funding and design of new projects. Planning a set of post intervention evaluations from the beginning to re-prime participants and potential change agents would ensure ongoing activity and relationships associated with the intervention. This would be a relatively small investment, when thinking of the intervention as a whole, and would increase the likelihood of systemic change over the longer term.

Across the projects change agents had built and maintained strong personal relationships with other members of the wider project teams, including researchers from CSIRO. These enduring relationships enabled collaboration to be maintained through significantly difficult times, such as the withdrawal of project funding due to a change in leadership of the Australian Government. In many cases these relationships and collaborations have been maintained post project conclusion, with strong and emerging change agents prioritising these networks.

In all four projects the CSIRO team leads continue to engage with their former project partners. The nature of the engagement is different in each case, with some actively pursuing further work together, while others have passed on information and guidance at various times, enabling other projects and collaborations outside of the initial project to create additional resources and networks.

The formal training and ongoing participatory evaluation helped catalyse action for change. However, emerging and strong change agents suggested it was the two-way mentoring and the development of real relationships/friendships that had made the biggest difference. Both in-country and CSIRO team members noted that caring mattered, it was not 'just' a job or a project for them.

This raises some interesting challenges for R4D agencies, where researchers and practitioners are often rewarded for project outputs and outcomes, and not for the quality of their relationships. Yet if these relationships are the catalyst for impact then overly focusing on outputs and outcomes is short sighted, as pointed out by others (Paasche and Österblom, 2019, Cundill et al., 2019, Cundill et al., 2018, Ahvenharju et al., 2018).

11.2 Reflections

There is a growing body of literature highlighting agents as being critical to creating change, although few previous studies unpack what this actually means for R4D interventions or what makes these agents who they are. This work contributes to this literature by unpacking the characteristics of these agents across cultures and research domains, exploring what enables them to be or become change agents, and provides guidance on how R4D adaptation interventions can help catalyse or grow them.

11.2.1 Summary of limitations

This PhD was undertaken part time due to my full time work commitments with CSIRO, which constrained the time I was able to work on all aspects of this research, including limiting the number and scope of the case studies and reducing opportunities to spend significant periods of time getting to know the identified potential agents of change.

However, this time constraint also enabled a set of engagement opportunities over a longer time series than would be normally open to a PhD student. As a CSIRO scientist I had been working on these case study projects prior to commencing my PhD, and in most cases had built a tentative relationship with the research partners prior to undertaking this research. This made the third case study evaluation possible and streamlined the potential change agent interview process. I was also able to observe and chat with many of the project participants over several years and therefore gained a better understanding of how they, and their contexts, were changing.

The path to impact reflection workshops relied very much on who attended, and while participants said they gained much benefit from participating in the evaluation (and wanted to learn how they could do it themselves), it was difficult to get people to attend and became increasingly difficult the longer it was after project completion. Perhaps with more regular workshops, stakeholders would have had more motivation to participate.

The adaptive capacity survey instruments were difficult for partners to understand and implement. As mentioned in the case study reports, not all survey questions were asked in the first evaluation, due to a lack of understanding. This created challenges in future years when comparing the data. Time and language constraints of in-country partners who helped collect the data as well as those interviewed limited the quality of data collected, with more stories and insights recorded when surveys were undertaken by CSIRO staff. While undertaking the survey provided a valuable capacity building and engagement opportunity, it sometimes resulted in confusion for the surveyed or a lack of response, making analysis difficult; some answers had to be discounted from the results.

In the future I would anticipate spending longer on building evaluation capacity and competencies with in-country partners, explaining the underlying theory of why we are asking the questions that we are, how to conduct the surveys, and how to analyse the results. By working through the whole process, I anticipate that better data would be collected and capacity for evaluation improved.

While beyond the scope of a PhD, ideally this work would explore more than four case studies in two countries. Additional case studies would enable more robust demonstration of whether characteristics are universal, and how types of projects and contexts create unique differences.

11.3 Recommendations and opportunities

This research provides key insights for informing funders of R4D adaptation interventions, as well as R4D adaptation researchers, practitioners and their agencies.

11.3.1 For funders of R4D adaptation interventions

For funders, it repeats the call of Cundill et al. (2019) and others that funding projects and initiatives over longer time frames has more scope to build relationships with change agents and other stakeholders, build stakeholder capacity and help agents take the work from outputs to impact (Williams, 2018, Butler et al., 2017). This research suggests that more time upfront for project scoping would include an opportunity for building relationships and identifying potential change agents in order to collectively understand the context and what the actual challenges are, and then co-design the intervention including a chance to start developing any missing

competencies early, in order to build a coalition of the willing before implementing project activities.

Extending the funding time frame to include a participatory evaluation phase beyond the life of the project would enable further impact by:

- Facilitating ongoing connection/networking with partners and stakeholders
- Re-priming change agents and other participants through shared reflection, which enables the possibility to identify windows of opportunity that have opened since project completion
- Developing an improved understanding of what worked and what did not in the R4D intervention for all players involved including the funders, and how 'sticky' any change is following on from the project.

Some funders have already come to this conclusion themselves, and seek to change the way they operate, building longer relationships with their key research and implementing partners (Abercrombie, 2018).

11.3.2 For R4D adaptation researchers and agencies

For R4D adaptation researchers, practitioners and their agencies this research suggests that their own characteristics and competencies are as important as those of their partners.

R4D project teams would need to be aware of their individual and collective skills, competencies and personalities to be able to identify and address any gaps. Interpersonal competencies will be vital for demonstrating to others another way of working, as well as being open to building enduring relationships with stakeholders in other countries. Other important skills for teams working in adaptation include systems, integration and evaluation skills and processes.

For research agencies this means encouraging a wider diversity of skills and competencies, especially interpersonal competencies in addition to any scientific or technical capacities. This would need to include a change in reward structures to encourage researchers to spend time on building relationships, providing training and opportunities for staff to learn additional competencies in order to work in transdisciplinary styles, and improving evaluation of social impact, moving beyond journal papers and patents.

When designing R4D projects, in addition to being aware of their own characteristics and competencies, and the resources, knowledge and networks that might be required for change (see Figure 49 for a visual representation), research teams need to develop a good understanding of their partner's characteristics, competencies and networks. Using the characteristic and competencies wheels (Figure 50), and the change agent interview questions researchers can map their partners and work with them to address any gaps through training or additional people. This process can be repeated to assess process and adjust capacity building programs as needed.

For R4D adaptation interventions in particular, special focus should be given to explicitly designing the development and strengthening of adaptation competencies into projects. This research demonstrated that adaptation competencies are new to many people, including strong change agents, and that the development of these competencies, rather than technical knowledge, was what empowered change agents to take advantage of windows of opportunity.

Further research is needed to establish whether the identified change agent characteristics and competencies really are the necessary and sufficient set, and whether they are applicable across countries outside of Australia, Vietnam and Indonesia. Future studies should take into account cultural and domain specific issues, the changing role of technology in capacity building, information sharing and the maintaining of networks. It would also be worthwhile to explore how undertaking long-term (greater than a year) education, work or research in another country shapes potential change agents' views of the world and how they engage with others.

11.4 Personal reflection

This PhD has taken me on a long and winding journey since commencing on 10 November 2014. At times like most students I wondered if I would ever finish, or worse worried that someone else would publish the insights that I was finding, which seemed so obvious someone else must have already written about them. However, I have learnt that just because something seems obvious does not mean that it is, or that insights have been shared effectively.

I have learnt that:

- Change agent leadership can manifest in different forms depending on personality, context and timing.
- Positive leadership characteristics can be cultivated, along with environmental and social values, everywhere.
- Systems thinking, integration, facilitation and networking skills help build support for activities and actions, and while these are not 'general competencies' they can be taught.
- Catalysing others' capacity, decision making and networks across disciplines and cultures provides meaning and purpose to my life.

This research has reinforced my love of learning, and pursuit of mastery, which for me is exploring how I can continue to become a better enabler of others. I am a time-poor introvert; however, learning more about the importance of the characteristics and competencies of change agents has encouraged me to strengthen my existing relationships and networks, and connect to new networks and communities of practice. I have also sought to grow my competencies in enabling others such as through the power of facilitating people to get to know others, so that new understandings are developed and potential pathways forward are enacted.

11.5 Summary

This research demonstrates that participatory research for development has the potential to grow capacity for systemic change which can be sustained, although care and attention is required in the design and set up of these projects. Catalytic change requires a set of competencies and characteristics including a shared normative purpose, reflexivity, cross-scale networks, and windows of opportunity.

My research has demonstrated that change agents are important to the success of an R4D adaptation intervention, and that they are a key part of why systemic change happens. Change agents have a set of identifiable characteristics which enables R4D adaptation interventions to identify them, including their values and purpose, prioritising relationships, having a mastery mindset, and occasionally being entrepreneurial. It is possible for an R4D adaptation intervention to catalyse strong, cultivate prospective and empower emerging change agents to help achieve the sought-after intervention goals.

R4D adaptation interventions can help change agents achieve change by growing knowledge, networks and competencies, enabling them to create and utilise windows of opportunities. By growing competencies, R4D adaptation interventions can influence individual characteristics, strengthening existing and enabling further change agents to emerge. While it is not possible for every individual to have a full set of competencies, partnering with others can complement gaps.

There are project and cultural differences about how prospective, emerging and strong change agents perceive the future and their role in shaping it, yet some characteristics were shared across the change agents regardless of project or context. These included:

- the importance of learning in their lives
- a sense of personal responsibility and purpose
- being driven by their sense of purpose or responsibility to go above, beyond and sometimes around their day job.

Strong change agents, as well as some of the emerging and prospective change agents, had built and maintained robust personal relationships with members of the CSIRO research teams and other partners. The two-way mentoring and social interactions, together with formal training and ongoing participatory evaluation. helped catalyse action for change, suggesting:

- people matter, with more genuine relationships needed between researchers, partners and practitioners which need to be enabled and supported by their institutions
- capacity building is more than developing new technical knowledge and skills, it should also focus effort on developing the necessary competencies for enabling change.

Cultivating potential change agents' sense of personal responsibility and purpose, as well as providing them with skills and networks, increases the likelihood of enduring success and

participating in these types of interventions enables R4D researchers and practitioners to become better agents of change themselves.

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Chapter 12: Appendices

12.1 Appendix 1 – Evaluation Questions

12.1.1 Path to Impact workshop questions

Research Problem

1. What was the research problem that this project set out to address?
2. What were the project objectives?

Who's who?

1. Who is your research team? What roles did you expect them to play?
2. Who are your change agents? What roles did you expect them to play?
3. Who are your beneficiaries? What roles did you expect them to play?

Skills, tools and capacity development (stage 1)

1. What top three things did the team learn about the problem? How is this documented? Informal products? Peer reviewed products?
2. Did the project establish multi-sectoral/participatory teams to research the problem? Is there evidence that this approach has been adopted by partners? Other agencies?
3. What specific skills were built in the team (partners and CSIRO)? How was this achieved? What evidence is there that the team members are using these skills? Can team members teach them?
4. Were specific methods developed by the team? How are they documented? Informal reports? Peer reviewed reports? Who is continuing to use these methods? Have they evolved post project?

Policy, planning and enabling (stage2)

1. Is there any evidence that the research raised knowledge and awareness beyond the research team? What awareness products were produced? Local? National? International?
2. What evidence is there that the research influenced policy, plans and programs? At what level? Informal agreements? Official sanction? Integration in existing operational plans and programs?
3. What else are people doing differently because of the research?

Implementation, adoption and scale up (stage 3)

1. Are the policies, plans and programs influenced by the research being implemented? Who by? At what scale?
2. From one off or core budgets?
3. What other changes (awareness, policy, programs, investment etc.) are needed to scale up implementation? Are these changes occurring or likely to occur in the next five years?
4. How will they impact on people's lives/livelihoods?

Reflective learning

1. What other changes are needed to scale up implementation?
2. Was the pathway to impact the one/s you expected at the beginning? What was unexpected?
3. What would you do differently next time to achieve a better impact pathway?

12.1.2 Adaptive capacity survey indicators and questions

Adaptive Co-management phase (ToC)	**Indicator**	**Questions**
Stage 1: Building capacity (Preparing the system for change)	1. Leadership emerging	Has leadership been maintained and/or have any new leaders emerged?
	2. Trust created	Has trust been maintained or continued to grow?
	3. Vision and goal for an alternative development pathway	Are you maintaining the vision/goal that the project was trying to achieve?
	4. New social networks established	Thinking of the **Researchers** and **Agents of Change** directly involved in the project have the social networks been maintained and/or grown?
	5. Knowledge of the problem enhanced	Has knowledge continued to increase as a result of the project?
	6. Different knowledge types successfully integrated	Have the tools and knowledge continued to be integrated?
	7. Questioning of values, norms and governance underlying problem, and awareness of its complexity	Have you continued to develop your awareness and understanding causes of the problem, its complexity, and the way it is currently being thought about and managed by government and society?
	8. Creative solutions and innovations developed	Did the innovation continue beyond the life of the project?
Stage 2: Policy and program Development (Window of opportunity)	1. Management plans and agreements	What happened to the existing plans, and if not why not?
	2. Enabling changes to existing or new institutions (formal and informal)	What is the status now, and what has happened is new?
	3. Cross-scale social networks established	Thinking of the **Researchers** and **Agents of Change** directly involved in the project and those outside the project have you seen linkages maintained and/or growing?

	4. Resources made available for implementation	Have they made resources (e.g. funding, staff) available to implement the new management plans and tackle the problem?
	5. New partnerships and cooperative initiatives	Have any new partnerships or collaborations emerged between them as a result of the project?
	6. New projects triggered by the project in other problem areas	Have any new projects been designed or implemented to deal with different issues (e.g. give examples) as a result of this project?
Stage 3: Implementation, adoption and scaling out (Building resilience/transforming to the desired state)	1. Implementation of innovations in arenas that can trial, monitor and learn from the experience	Have any of the ideas and solutions developed by the project been implemented? Have they been set up as trials with a monitoring and learning design?
	2. Enabling changes to existing or new institutions (formal and informal)	Have any changes been made to organisations, rules or the usual practices the problem?
	3. Cross-scale social networks established	Thinking of the **Researchers** and **Agents of Change** directly involved in the project and those outside the project, and **Beneficiaries** have you seen new linkages and relationships growing between them and other stakeholders from different levels (e.g. national government, communities) as a result of the project, where they exchange information and ideas?
	4. New partnerships and cooperative initiatives	Have they formed any new partnerships between them to implement the new ideas and tackle the problem?
	5. Empowerment of the most vulnerable Beneficiaries (communities), including women and children	Has the project empowered vulnerable communities? What about women and children?
	6. Enhanced self-organisation by Beneficiaries (communities)	Has the project helped vulnerable communities to organise themselves better and tackle their own problems?
	7. Enhanced Beneficiary (community) capacity to live with change and uncertainty	Has the project helped vulnerable communities to anticipate unexpected changes and to adapt to them?

12.1.3 Change agent interview questions

Order of questions changed depending on who is being interviewed and how they answer the questions.

1. Describe your role for me (work, community)?
    - Now
    - How has this changed since the time of the project? (if at all)
2. Does your work align with your personal values?
    - How is it meaningful for you? How?
    - How does what you do benefit others? Can you tell me know a little about this?
3. Do you feel you have a long-term perspective, purpose or goal in life? And would you feel comfortable in sharing that with me?
4. Do you have time and resources for what you need to do?
    - Or an ability to access them?
    - What makes this difficult?
    - How do you feel this compares to others in your community?
5. Do you feel you have the skills/competencies to address current and future challenges/situations?
    - Please tell me what you think are the most important?
    - If you had the opportunity, what skills or competencies would you most want to develop further?
6. Describe a time when the project wasn't going well for you.
    - What happened?
    - How did it make you feel?
    - How to you get through it (did you?)?
    - How long did it take?
7. Have you found it easy to incorporate the project information in your day to day life? (if yes, give example)
    - What would have helped to make work/knowledge more integrated?
8. How do you perceive ***your ability*** to respond to, change, and/or influence things that interest you?
    - How do you perceive your networks/community's ability to respond to change?
9. How much ***freedom or control*** do you have to change what you do:
    - at work?
    - in your community?
10. How self-reflective are you about yourself, your work/society goals?
    - Can you give me an example?
11. What do you see as your personal strengths?
12. What is your personal support system like – home, work, community?
13. Do you think you are lucky? Do you see opportunities? (why/example)
    - Are you discouraged by institutional impediments? (give example)
    - Did you overcome them? How?

CSIRO only

14. Who did you identify as your project AoCs?
    - Who is influencing v, r and k?
    - Is anyone a connector, broker?

12.2 Appendix 2 – Comparative analysis of the four case study evaluations

In the four case study chapters (Chapters 6–9) I outlined what impact each R4D project had over time, distilled a list of potential change agents, analysed their alignment to suggested competencies and characteristics in the literature, and explored what the project did (if anything) to catalyse them. This appendix provides more detail on the case study materials and participants, as well as a comparative analysis of the four case studies evaluations, including similarities and differences between countries and across research domains.

Reflecting across the four projects, it is clear that participatory research for development can grow capacity for systemic change which can be sustained. It is also clear that context, project design and implementation produced different evaluation results and associated impact. The section concludes with insights as to whether participatory evaluation approaches can be used as both capacity building and priming for further change.

12.2.1 Population sample – people and documents

Across the four case studies 102 people were engaged through the PTI, adaptative capacity surveys, and change agent interviews. Further details by project are included in Table 11 below.

Table 11: Numbers by project who engaged in project evaluations and change agent interviews (individuals are only counted once, but may have been involved in multiple activities multiple times)

Case study	Total # engaged	# of who were researchers/ academics	# change agents identified
Adaptive Livelihoods	26	17	4 strong change agents, with 1 prospective and two emerging
SUD Can Tho	30	19	3 strong change agents, with 2 prospective
SUD Makassar	19	13	3 strong change agents, with 2 prospective and 2 emerging
Climate Projections	27	24	1 change agent with 7 emerging or potential

In addition to the people engaged through the case studies, and the evaluation database (Excel and NVivo) over 90 R4D Alliance documents and data sources were used in the analysis, including:

- 20+ internal reports, working papers, and team reflection files (not published)
- 56 published reports and journal papers
- 14 communication materials – project pamphlets and other materials
- The R4D Alliance website - https://wp.csiro.au/r4da/research-for-development-rfd/

12.2.2 Measuring R4D impact

Each case study project was subject to three post-project evaluations, starting in 2014 at project conclusion, one year later in 2015 and the final (to date) in 2017. Each evaluation included PTI workshops (noting that SUD Makassar did not undertake the PTI workshop in 2017) and adaptive capacity surveys. Interviews with potential project change agents followed the evaluations.

Using the same multi-pronged evaluation approaches across all four projects and repeating them for several years after the projects concluded enabled an understanding of how project outputs, outcomes and hoped-for impacts shifted across time (see Figure 54). Using the same monitoring and evaluation approach allowed for comparisons between projects, noting that each case study had a different goal or objective, was undertaken in a different context and had a different set of individuals involved.

By the end of 2014, all four projects had delivered on most of their activities and outputs despite the rapid wind up of the R4D Alliance due to a funding withdrawal from Australian Aid. Project evaluation suggests that all four case studies had strongly influenced in-country capacity by project completion, with all four case studies receiving a ‘strong’ rating on the completed adaptive capacity surveys, and with a majority of identified impact points ‘above the line’ through the PTI workshops.

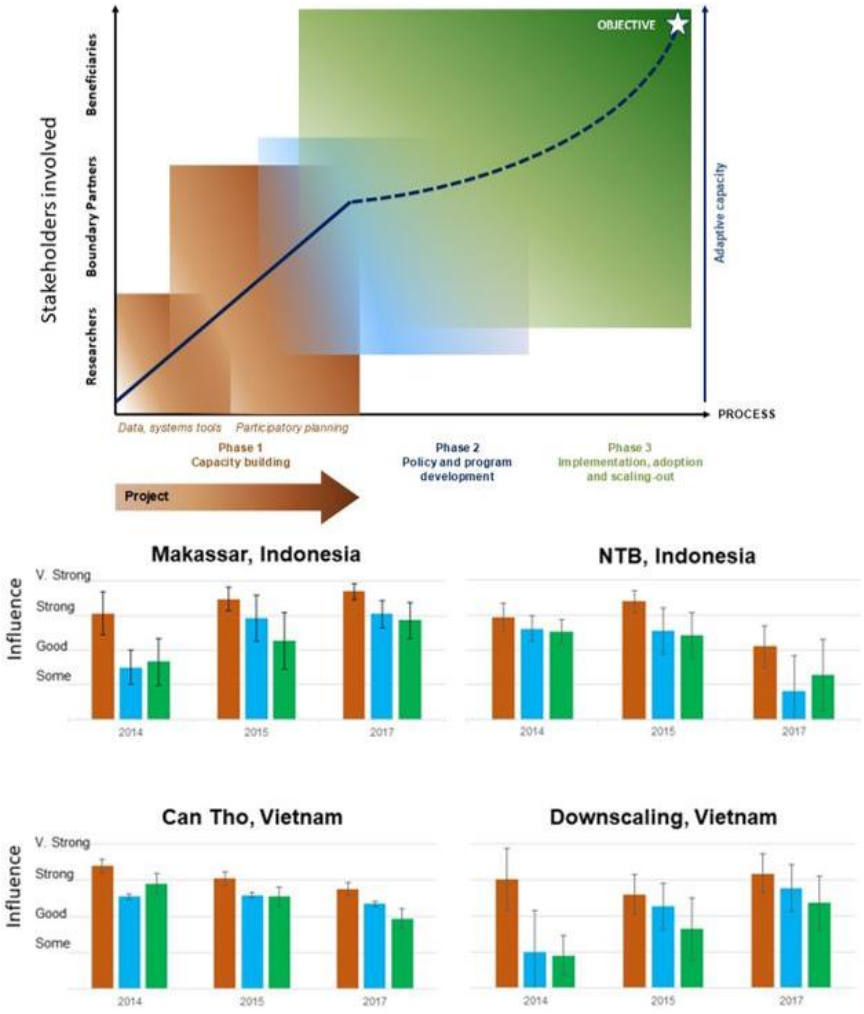

Figure 54: Overview of the adaptive capacity survey results for the four case study projects. Evaluation results are mapped to the three stages of the overarching Theory of Change

12.2.3 Evaluating capacity building and end user engagement

The main capacity building challenges identified across the four projects included computing resourcing and in-country base capacity or general competencies, which limited the more technical training aspects. Three of the four case studies' (not Climate Projections Vietnam) in-country partners mentioned valuing learning about systems approaches, end-user needs, participatory and facilitation techniques, and indicated that they would appreciate further training in these. All four project in-country partners stated an appreciation for the chance to collaborate with those that they had not worked with before, including CSIRO.

Again, the Climate Projections Vietnam case study was an outlier, as the project did not attempt to engage with policy and program development, leading to a 'some' score at project completion and identified in subsequent evaluations as an omission that needed to be addressed. The other three projects struggled, with mixed success, to engage with local decision makers. All

three had included local decision makers, including government, business and NGOs in their wider project team, including engagement in workshops, planning and training activities. SUD Can Tho and the Adaptive Livelihoods case studies both achieved 'good' to 'strong' adaptive capacity survey scores, with SUD Makassar achieving between 'some' and 'good'.

These differences followed through to the third implementation stage of the overarching Theory of Change, with the Climate Projections Vietnam case study tentative at 'some', SUD Makassar between 'some' and 'good', and with SUD Can Tho and Adaptive Livelihoods coming in between 'good' and 'strong'. This reflected the nature of the case studies, with both the SUD Can Tho and Adaptive Livelihoods projects engaging with beneficiaries throughout their projects, including conducting trials.

12.2.4 Changing nature of impact over time

One year later, the second evaluation showed very little change in assessment for SUD Can Tho across all three stages. This was similar for Adaptive Livelihoods, although capacity had grown slightly, approaching 'very good', reflecting the increasing status of the in-country partners. Both the SUD Makassar and Climate Projections Vietnam case studies improved their results across stages two and three, with SUD Makassar also improving in capacity reflecting the increasing status of the in-country partners. Climate Projections Vietnam lowered slightly in capacity over time, due to a lack of computing resources and no follow up training, however, the case study participants had started to work with other government agencies and were hopeful of using the project outputs to influence the National Climate Projections of Vietnam.

The last evaluation in 2017 was undertaken after the late 2016 release of the National Climate Projections for Vietnam, which improved the evaluation results across all three stages of the Climate Projections Vietnam project with increased influence and traction through other projects building off the original project, including new projects with CSIRO. There was a similar story for the SUD Makassar project, with in-country partners gaining a national and international reputation in climate adaptation and water management, increasingly being able to influence local decision makers and development banks (ADB and WB), and successfully gaining funding for new projects.

Conversely, the adaptive capacity survey results for the SUD Can Tho and Adaptive Livelihoods case studies showed a decline in the 2017 assessment, although SUD Can Tho only slightly. These results are tempered by the PTI reflection exercise that identified some impact points still increasing, with specific project outputs and partners going from strength to strength. A potential explanation for this discrepancy is that as time passes attribution gets harder, also people's memory about what has happened gets poorer, with some survey participants no longer connected to the case study network and therefore not aware of what has happened or is still happening.

This last point is likely to explain the Adaptive Livelihoods project survey results, given the very large standard deviation of scores in the 2017 evaluation, and comments from several of the in-country project team who mentioned that they were struggling to maintain connections and networks developed through the project, whereas for a small cohort their linkages were going from strength to strength. Those that maintained their networks saw value in these relationships (friendship, new work or opportunities) and had the willingness and capacity to stay connected. In several cases, these people were already well networked, although the project helped them expand into new areas or strengthen existing ones. For others this was a change in the way they had previously operated and was now their preferred way of working.

Overall all four projects successfully generated new knowledge, built the capacity of in-country partners, and managed (to varying degrees and over different time scales) to influence policy and practice.

12.2.5 Participatory evaluation as an R4D intervention

One of the lessons that started to emerge following the 2015 evaluation was that the process of undertaking a post-project evaluation was an intervention itself. Across all four case studies, although less for the Climate Projections Vietnam project, the opportunity for participants to come together to discuss what they had learnt, what worked and what did not, and to share what they were currently doing was greatly appreciated.

While the adaptive capacity surveys facilitated personal reflection and provided data for discussion at following evaluation points, it was the participatory nature of the PTI workshops that generated social learning and discussion about what could collectively be done in the future. Participants stated that the evaluation provided them with an opportunity (including the time and resources) to reconnect with the case study networks, which for some was not otherwise possible.

By the 2017 evaluation, it was clear that the 2014 and 2015 evaluations had triggered further activity in at least two projects, such as in SUD Can Tho, where participants decided to broaden their engagement with other local government agencies to facilitate implementation of the outputs into decision making more broadly and were developing their own version of the evaluation approach to reflect and learn from other projects.

Incorporating evaluation into a project enables success or impact to be monitored and evaluated for funding bodies, it can trigger learning for a project team in order to adjust their activities as they go, and participatory post-project evaluation has the potential to keep the momentum going long after the actual intervention concluded. This is an important consideration for funders, researchers and practitioners who are interested in achieving systemic change.

12.3 Appendix 3 – Reflections on approach

This appendix reflects on how the evaluation approaches worked across the four projects and concludes with lessons for future evaluations.

12.3.1 Discussion of the Path to Impact reflection evaluation method

The PTI participatory evaluation approach was designed as one part of a mixed methods approach to interrogate impact against the project Theory of Change. The generic R4D Alliance Theory of Change consists of three overlapping stages: capacity building; policy and program development; and implementation, adoption and scaling out self-reflection process (Figure 54).

Evaluation questions, together with the diagram were designed to elicit the views of research teams and key boundary partners. Participatory evaluation workshops provided an opportunity for teams to meet and share their knowledge of the project, lessons learnt, what they were doing currently and discuss potential opportunities. Results were recorded live on the project Theory of Change using PowerPoint, with the discussion transcribed where possible, enabling a transparent process.

Subsequent evaluations enabled reflection on the previous impact and associated 'scoring' of impact points, as well as any ensuing movement of project outputs, outcomes and impacts along the pathway. The collaborative and participatory provided an opportunity to reflect and share progress (or the lack thereof) with colleagues. New items were also added to the project path to impact. The PTI approach produced a mix of qualitative findings and catalysed reflection with in-country research teams and boundary partners on what worked and what did not for a project.

Across all four case studies the opportunity to reflect was appreciated, with more than one participant commenting that this was novel for them, both in terms of the approach and the reflection itself. Research team participants suggested that workshops 'forced' them to think more clearly about the pathway to impact for their projects, including designs of future projects. In addition, having time to discuss barriers to success enabled individuals to reflect and consider actions to individually or collectively address them.

Reviewing this process in 2015 and 2017 not only allowed for tracking the changing nature of impact over time (both positive and negative), it also generated considerable discussion among the project teams which consisted of both updating each other and clarifying progress as this was often the only time the team had collectively gathered to talk about the project. Sometimes there was debate as to how successful something (impact point) had been with different people articulating their points of view.

Combining the PTI reflection activity with other evaluation approaches allowed for impact assessment triangulation, enabling an evaluator to identify the most salient achievements from

the projects and revealed a range of outcomes and impacts which the research teams were not aware of, and which had not been captured through other mechanisms.

However, these workshops were relatively resource and time intensive, running from 2 to 4 hours each time and requiring much coordination by the in-country teams to set up. It was challenging to get the original PTI participants and members of the project teams together again and proved to be infeasible for the 2017 SUD Makassar evaluation.

Workshop participants appreciated the chance to participate in the project evaluation (none of the teams had been invited to do this on other projects), collectively share their news, and learn from the wider project network. Participants liked the concepts of projects or interventions being made up of outputs, outcomes and impacts, noting that this made them think more clearly about how to achieve the goals associated with their research. Participants were keen to provide suggestions on how to improve the process, such as undertaking evaluations more frequently, and creating a qualitative ranking guidance to evaluate impact, i.e. define or provide guidance on makes for 'strong', 'medium', or 'small' impact?

However, enthusiasm for participatory evaluation was not shared by all projects. The Climate Projections Vietnam project participants indicated that they had no real insights from reflecting on the project and that they would prefer to focus on seeking new funding in order to collaborate with CSIRO.

Despite the resource and coordination challenges, undertaking PTI workshops was a worthwhile effort for several reasons including, but not limited to, the evaluation results and collective learning. Additional benefits included re-priming (knowledge and networks) of the project participants, who in some cases had not had an opportunity to get together as a group since the previous evaluation. In addition to catching up and learning from each other, the workshop provided a chance to think about what might improve their individual and collective success along the path to impact, with several proposals and subsequent projects being catalysed from these discussions.

I observed a big change in understanding of the Theory of Change idea with in-country partners over time, with a shift from resistance or agreeing as compliance, to wanting to learn how to do it. The Climate Projections Vietnam project participants also experienced this shift, and this aligns to my own experience within CSIRO, where Theory of Change has moved from a funding requirement to a sought-after project activity with associated demand for those skills.

I had multiple conversations following the PTI workshops with all four in-country partners about Theory of Change and evaluating impact, with requests for training in our approach and other monitoring, evaluation and learning practices. This was true even for the Climate Projections Vietnam project, whose participants found this kind of reflection particularly difficult but were increasingly being asked by their funding body to articulate their impact. I learnt that the SUD Can Tho case study team was already replicating our adaptive capacity and Theory of

Change approach on other Australian Aid funded projects which were unrelated to the R4D Alliance.

My own reflections on undertaking the PTI workshops are that while the evaluation is not precise, with the data qualitative rather than quantitative despite the graphs, it is worthwhile. The data can become visually messy and hard to communicate to those who did not participate, but served as a boundary object which enabled collective discussion and shared insights. The process requires good facilitation and has the capacity to generate much discussion and sharing of stories and insights, capturing more detailed evaluation data in story form that can triangulate the adaptive capacity survey results.

12.3.2 Discussion of the adaptive capacity surveys evaluation method

The adaptive capacity surveys were designed to provide a mix of quantitative and qualitative findings associated with 21 indicators along the three overlapping stages of the Theory of Change impact pathway. As outlined in Chapter 4:, the evaluation questions were repeated (where possible) with the same project stakeholders over three time slices, enabling impact to be tracked over time. Despite many people having moved on in their work, resurveying people was possible with all case studies managing to survey at least 74% of the original set, and one case study getting as high as 88%.

The structured surveys were carried out by in-country research team members who had been trained to undertake the evaluation. Surveys had the advantage of being both time effective and culturally enabling (due to the surveys being undertaken in Bahasa or Vietnamese), and provided another capacity building opportunity for in-country research partners. However, training for this activity was relatively limited, an oversight which became apparent through the evaluation process across all of the case studies in 2014, with both those surveyed and those who were surveying them struggling to understand the survey question language and concepts. This was especially apparent in the three different network scale questions, with three of the case studies removing several of the questions in the 2014 survey as they felt they were needlessly repeated queries.

More broadly these conceptual misunderstandings, and possible language nuances, meant that both those conducting the survey and then unsurprisingly those answering the questions had several responses that suggested ‘don’t know’ or ‘see earlier answer’, without referencing which answer they were referring to.

Another challenge is that the adaptive capacity surveys were quite long to undertake, between 40 and 60 minutes. The people surveyed were challenged by the length of time it took to undertake the survey, which may have contributed to the ‘see earlier answer’ result. With

improved training, and perhaps coaching or mentoring through the first few interviews, better and more detailed answers are likely to have been elicited from survey responses.

Respondents were asked to provide a statement and a 5-point Likert scale score from –2 ('strongly disagree') to +2 ('strongly agree') for each question. Raw results were then sent to the CSIRO team, before being processed and analysed by myself (although not in my PhD capacity for the 2014 and 2015 evaluations). The limited 5-point Likert scale proved to be too coarse for participants, with many giving half scores.

Across all case studies there was also a perception that respondents did not want to give negative scores to an answer, which resulted in a mismatch between the statement and the score. For example, the statement might indicate room for improvement for a particular indicator with a high score indicating success. Bias responses have been observed by others (Dolnicar and Grün, 2007). I noticed this myself in the 2014 evaluation results, and an attempt to address this in subsequent surveys was proposed to the in-country interviewers, who were requested not to provide the scoring system to the survey respondents. Rather, respondents were asked to respond in words i.e. agree or disagree. However, since all respondents had been surveyed before, and were given their previous results to reflect upon, this change did not address the issue.

Overall the adaptive capacity surveys proved to be a useful and transferable evaluation tool in spite of the many challenges with repeating the survey, the survey length and the language and conceptual misunderstandings. The surveys were able to stimulate reflection in the respondents and draw out stories of change and barriers to that change. While there were challenges associated with the scoring of the indicators, the indicators provided a boundary object for discussion in the survey and when synthesised into the case study evaluation reports showing change over time. The indicators enabled suggested trends in path to impact between projects across the three Theory of Change stages, and over time, enabling higher-order insights into how projects can be designed to achieve success.

General feedback on evaluations from the in-country teams indicated that they would prefer more frequent PTI workshops and survey evaluations, as a year between assessments was a long time, and they felt they were forgetting things. Several project teams requested faster feedback on the results of the evaluations.

With improved evaluation training of in-country teams, and perhaps coaching or mentoring through the first few interviews, better and more detailed answers are likely to have been elicited from survey responses. This additional training would be appreciated by in-country partners who mentioned that they would like to use these evaluation approaches to look back on other projects that they have been undertaking and assess their impact.

My own reflections on the survey design and repeated evaluations is that we should have kept the vision question in subsequent adaptive capacity evaluations to see if the shared vision had been maintained post-project or whether the vision had adapted or fragmented post-project

(that the 'shared' was actually project driven). This question was removed in an attempt to shorten the time it took to undertake the survey, and the CSIRO project team perhaps mistakenly assumed that the vision set by the project was the 'Vision'.

12.3.3 Discussion of the change agent interview method

The potential change agent interviews only occurred once for each case study, with insights into the approach recorded for each of the 37 interviews. Each interview took between 25 and 103 minutes, with the vast majority taking less than 40 minutes.

Overall just under half of the interviews required additional assistance from a native speaker to facilitate the questions. There were facilitation challenges as the available assistants struggled to understand the intent behind the questions, or even the meaning of the words and concepts, such as reflection. While this was also true for some of the interviewees when I was able to talk directly, I was able to ask additional questions or nuance the original question to elicit the information I was seeking. When conducting the interviews with an assistant the conversation was facilitated in both directions, meaning that questions and responses were occasionally lost in translation. Interviews were, therefore, more informative when they were direct. In the future, I would spend more time outlining the reasoning behind each question to the assistant first, or perhaps employ someone with specific translation skills rather than accept the kindly offered assistance of my in-country colleagues, none of whom were professional translators or had domain knowledge.

The set of interview questions was also a very different experience for many of the interviewees. Inevitably during an interview, the interviewee would comment that this was a very unusual interview for them, that they had rarely been asked to reflect on their life and how they had got to where they are. Several interviewees mentioned how much they enjoyed the process. However, it was also clear that critical self-reflection and questioning project processes were somewhat challenging for some interviewees. In both Vietnamese projects, I was told that this kind of reflection had not been encouraged by Vietnamese leadership.

The interviews provided a fantastic insight into potential change agents' lives and were highly transferable across case studies. While the interviews were only undertaken once, interviewees were asked to reflect on their past choices and what they might like for their future. Being able to re-ask these questions of interviewees has the potential to yield a better understanding of the contextual and temporal aspects of catalysing an agent of change.

12.3.4 Research bias and mitigation activities

I was very aware throughout this research that the case study participants regarded me both as a PhD student and as a CSIRO colleague, which as Berger (2015p. 224) suggest 'may colour the

power relationship between researcher and participant'. This dual role created many positive opportunities for me, as well as some challenges including the following:

- I was continuing previous evaluation work, limiting the selection of some of my methods and techniques, particularly in the project evaluations.
- Survey and interview responders may have been reluctant to share criticism of the project and the CSIRO teams involved in the projects due to my previous involvement and ongoing connection to CSIRO. As per Dolnicar and Grün (2007) this potential bias for positive response may also have reflected responders' concern about alienating research partners and funders or a desire to gain further funding. While CSIRO is not a funder, but this nuance isn't always clear to in-country partners who perceive that CSIRO teams are the source of budget allocations, which is understandable given many of the contracts are directly with CSIRO rather than the funding agency.
- My inability to speak Vietnamese or Bahasa meant that occasionally I had to have a translator assist me in the interviews. These translators were students or junior staff members associated with the in-country case study partners and may have felt uncomfortable in translating both the questions and responses that sought critical reflections and assessments.
- In addition, I did feel a tension between my roles as a PhD student who wanted to be open to all possibilities and ongoing CSIRO staff member, who had also been involved in the R4D Alliance and therefore invested in wanting to make the projects as success.

As per principles of good research, as outlined in human ethics protocols, participation in both the evaluation and subsequent change agent interviews was voluntary. Participants were aware that all responses would be confidential, and they would not be individually identified in the final products. While some of the quantitative responses seemed to indicate a positive response preference, the narrative associated with those responses told a much more nuanced picture of the projects and their impact. This highlights the benefits of taking a mixed methods approach to triangulate evaluation results.

With regard to my dual role as a student and CSIRO employee I was very aware of the consequences of sharing criticism of my own organisation processes and practices, and the interpretations of the research findings. I kept a private diary throughout my PhD which enabled me to be honest with myself about the approaches I was using, any conversations that triggered insights, how I felt I was being perceived or related to both with my CSIRO colleagues and in-country partners, and any concerns that occurred to me. One of several mitigation actions that these reflections inspired me to undertake was to change from a PhD by compilation to a thesis format in order to be more open in my critical reflections. It has not been easy to balance the

tensions of being a PhD student and an employed scientist, but I think the benefits and insights gained through this research outweigh the costs.

12.3.5 Evaluation review summary

Overall the mixed methods evaluation approach designed through the R4D Alliance proved an effective way to assess the changing nature of impact associated with a project. By having multiple tools and approaches, it was possible to triangulate impact and importantly develop a narrative of what led to that impact aiding attribution. Using the same approach for several projects, and across time, enabled a meta understanding of how R4D interventions can catalyse change in different countries and research domains.

The R4D Alliance evaluation results allowed me to identify the most likely potential change agents for each project and provided an understanding of their contribution to the project and the subsequent impact prior to undertaking the change agent interviews. Interviews enabled me to gain an improved understanding of potential change agent background, characteristics, competencies, and resources and better understand what, if anything, the project has done to help catalyse them. The interviews would be more useful if undertaken over several time slices like the other evaluations in order to better understand how the changing nature of character, networks and windows of opportunities influence systemic change.