Knowledge Broker Support Program

Volume 1 – Foundation Modules

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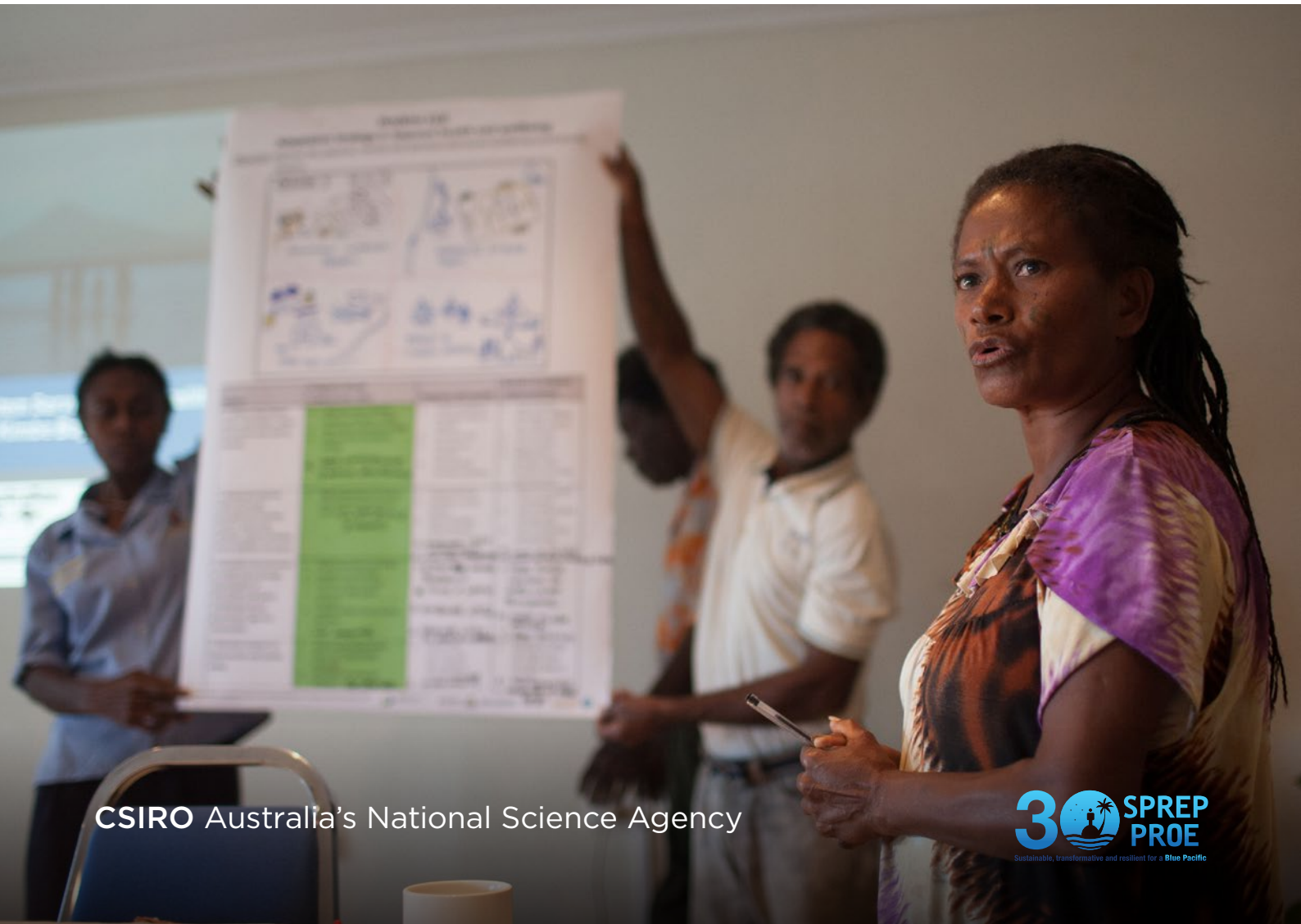

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Important disclaimer

Cover photo: Knowledge broker in action. Photo by Tom Greenwood, 2017. Photo below by Tom Greenwood.

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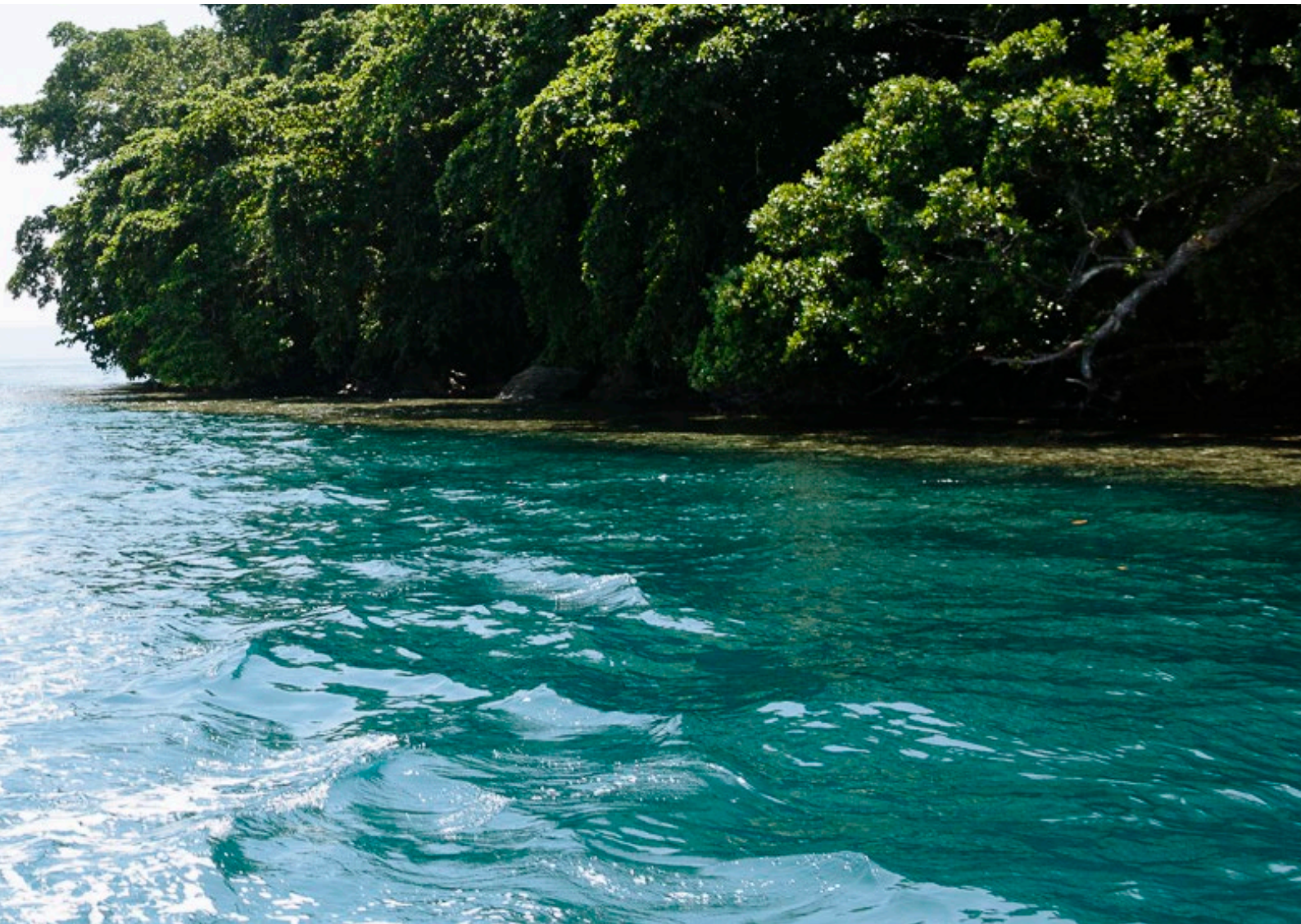
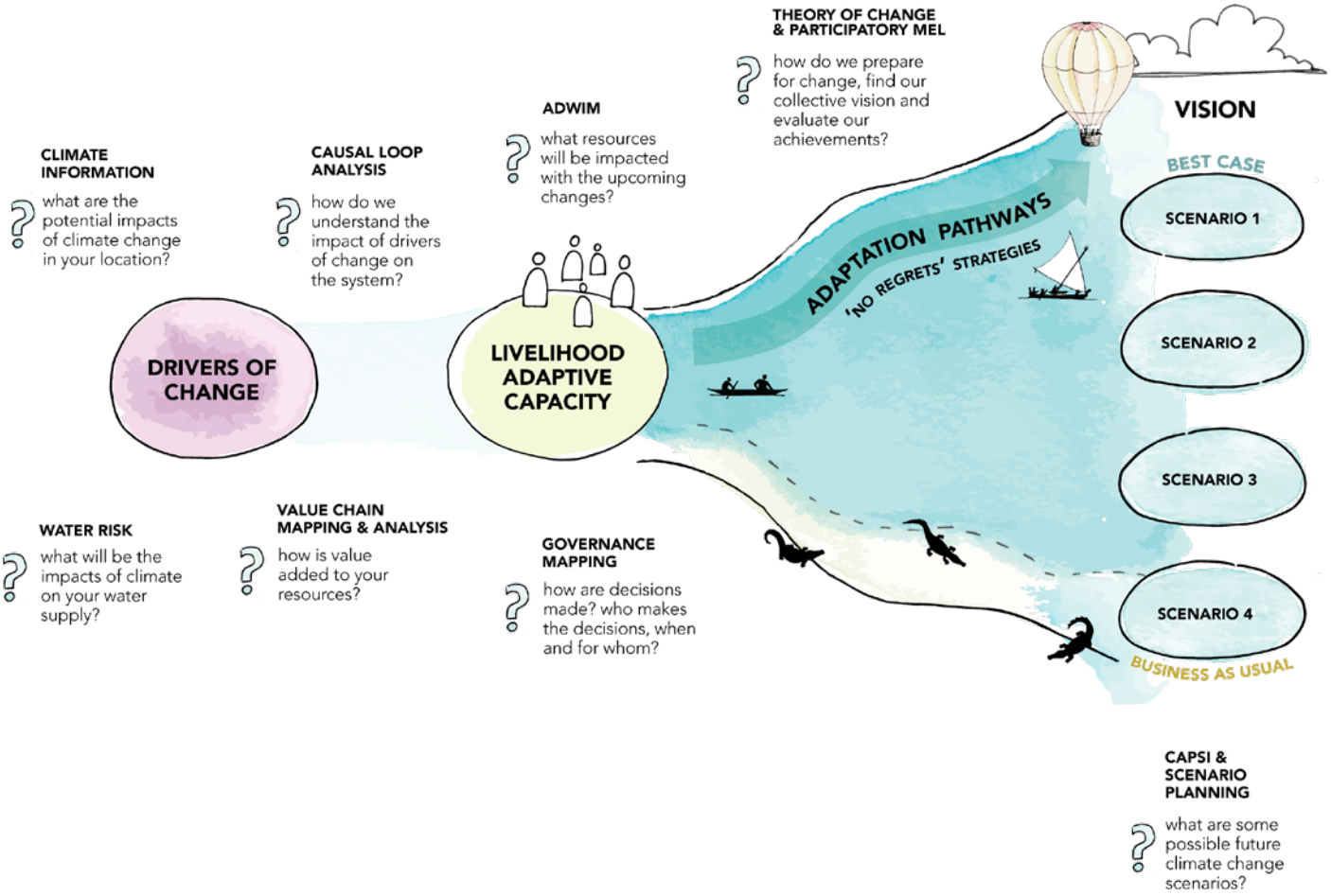




The KBSP enables you to pick and choose the tools and processes you needed to create a community adaptation pathway.
Artwork by Dr Manuela Taboada, Queensland University of Technology

Welcome to the KBSP

The Knowledge Broker Support Program (KBSP) collates tools, processes and case studies to help knowledge brokers mainstream climate change and future uncertainty into their programs. By integrating climate change and future uncertainty, knowledge brokers can increase the likelihood of the long-term success of their programs.

The KBSP toolbox is useful for NGOs, government and private sector individuals who are involved in decision-making at the community level.

Climate change is accelerating. The potential impacts of 1.5°C to 2°C increases in global average temperatures by 2050 on Pacific communities and their livelihoods are likely to be severe. Other drivers of change, such as COVID-19, population growth, and financial and political crises, will continue to emerge and potentially accelerate, interacting with climate change to generate further uncertainty. Decision-making about community development needs to account for these changes and anticipate their impacts while improving human and ecological well-being.

KBSP uses a framework that differentiates the types of decisions that need to occur when taking systems approaches ('clear', 'complicated' and 'complex' decisions) and the types of brokering that are needed for each ('infomediary' or 'knowledge translator', 'knowledge broker' and 'innovation broker'). Different skills are required for knowledge brokers to act as change agents within their system, depending on the context and complexity of decision-making.

Systems thinking is crucial to understanding the context and ensuring that decisions and appropriate interventions are co-designed. A suite of systems tools has been developed around a central 'adaptation pathways' approach, which is a process that supports decision-making when future uncertainty is great. You can follow the course structure in full or choose the modules that will help you with specific issues or stages of planning in your community.

Acknowledgements

The development of the KBSP benefitted from the following:

- Module co-design, development and artwork by Dr Manuela Taboada (Queensland University of Technology). Dr Taboada was assisted by Lydia Boyle (QUT School of Design / Symplicit, Jess Greentree (QUT School of Design), and Jason Bell (QUT School of Design),
- the support and advice from the Australian Centre for International Development (ACFID), especially Jess Smith and Shweta Tank,
- the Pacific Climate Change Centre (PCCC),
- Zelda Hilly's detailed review and ideas on how to contextualise the manual for the Pacific, and
- participants from the first two KBSP cohorts.

How to use the KBSP Manual Volume 1

This manual is a companion to the KBSP online course. For videos, links, presentations and the interactive version of this manual, go to: https://research.csiro.au/pkb/

This volume incorporates the **KBSP THEORY Modules**, which are your essential framework and very useful if you're new to the core concepts of knowledge brokering, systems thinking, participatory Monitoring, Evaluation and Learning (MEL) or climate information.

Volume 2 comprises the **KBSP TOOLBOX**, which will help you answer key adaptation questions and co-develop solutions.

What is knowledge brokering?

This module introduces you to the definitions and theories around knowledge brokering to prepare you for the next steps in the Knowledge Broker Support Program.

When you complete this module, you should be able to:

1. **Explain the difference between information and knowledge.**
2. **Understand the role of the knowledge broker.**
3. **Identify different kinds of problems.**
4. **Have a basic understanding of the adaptation decision-making framework.**
5. **Align different types of problems with appropriate types of knowledge and decision-making processes.**

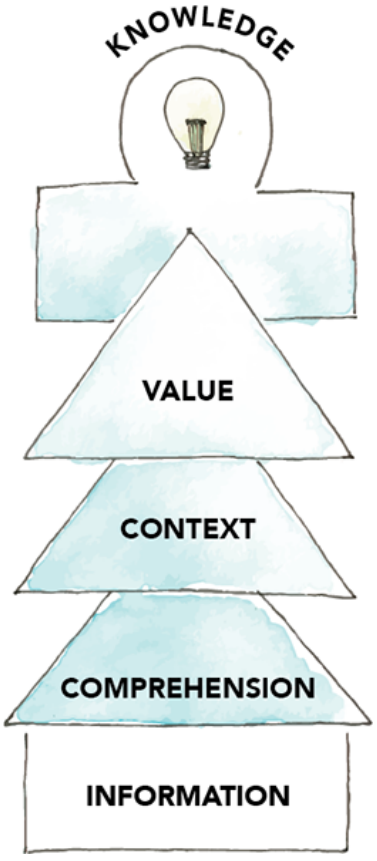


Figure 1 From Information to Knowledge. Diagram based on: Diemers, D. 1999. On the social dimension of information quality and knowledge. In Y. W. Lee and G. K. Tayi, editors. Proceedings of the 1999 MIT Conference on Information Quality. MIT Press, Cambridge, Massachusetts, USA
Artwork by Dr Manuela Taboada, Queensland University of Technology

Information and knowledge

'Knowledge' is not the same as 'information', although the two words are often used interchangeably. The Oxford English Dictionary emphasises that knowledge is acquired through experience or the practical use of facts and information. The famous English poet, John Keats, observed 200 years ago that "nothing ever becomes real until it is experienced". This highlights the process of practical experience in turning information into knowledge.

Knowledge (noun)

1. facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject. *"a thirst for knowledge"*
2. awareness or familiarity gained by experience of a fact or situation. *"the program had been developed without his knowledge"*

Source: The Oxford English Dictionary https://www.oed.com/

There may be various barriers to information becoming knowledge.

Psychologist Daniel Diemers suggested that there are **three conditions for new information to become knowledge**:

1. it must be **'comprehended'** — the individual needs to understand the new information, and it must be expressed in a known language;
2. it must be **'contextualised',** whereby it must make sense relative to their existing knowledge; and
3. it must be **'valued'**, whereby the information is useful for application.

If the information clashes with any of these steps it is rejected.

David Cash suggested that information must be 'credible', by being technically adequate; it must be 'salient' by meeting the needs of a decision-maker; and 'legitimate' by being unbiased.

Again, the information is rejected if any of these needs are unmet.

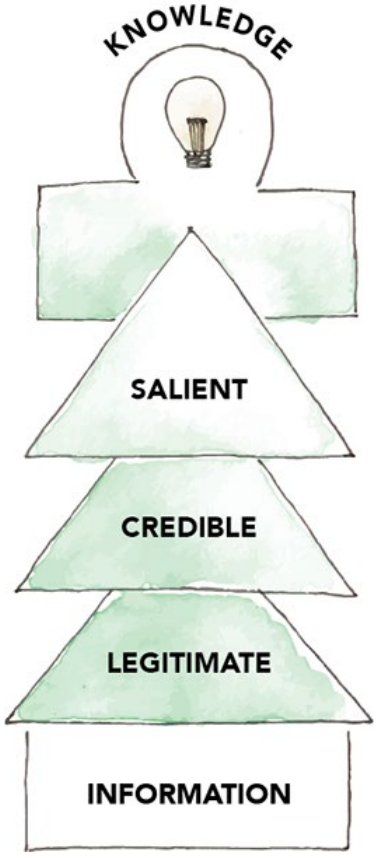


Figure 2 From Information to Knowledge. Diagram based on: Cash, D.W., Clark, W.C., Alcock, F., Dickson, N.M., Eckley, N., Guston, D.H., Jager, J., Mitchell, R.B. 2003. Knowledge systems for sustainable development. PNAS 100(14): 8086-8091. Artwork by Dr Manuela Taboada, Queensland University of Technology

Types of knowledge and power

Even when information is translated into knowledge, different types of knowledge may emerge, depending on the culture of the people involved. Everyone has their own individual knowledge, but depending on their occupations and professions, this becomes different types, including:

- Local (e.g. community knowledge)
- Specialised (e.g. scientific or professional knowledge)
- Strategic (e.g. political or planning knowledge)
- Holistic (e.g. traditional knowledge)

Brown (2008) suggests a hierarchy exists between these types of knowledge – strategic knowledge is often more powerful than all others, and local knowledge is often the weakest. Remember the saying: "knowledge is power"?

However, multiple types of knowledge are an asset. A metaphor that shows the danger of relying on a single perspective. We have adaped the Indian folktale about the blind men and the elephant, to be blind men and a whale. There were once four blind men who had heard of the animal called a 'whale' but did not know what one looked like. To satisfy their curiosity, they decided to use their sense of touch to determine the creature's appearance. Matters became confusing, however, when each man touched a different part of the whale and became convinced that he alone understood its true nature. "The whale is very like a slide!" proclaimed the man who had rode its tail. The fellow who had touched its side, however, declared the whale to be "nothing but a wall," whereas the man who touched the creature's spout claimed that the elephant was "like a fountain," and so on.

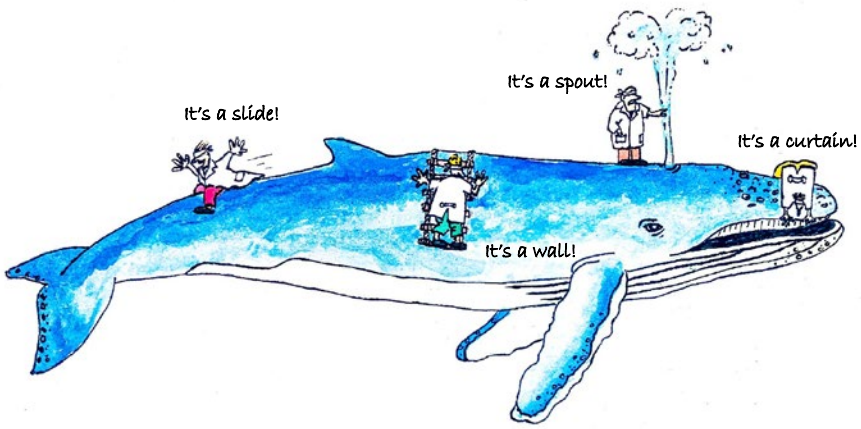


Figure 3 Whale image [Inspired by the Indian folktale about the blind men and the elephant (adapted from Himmelfarb et al 2002)] Artwork by Samara Cosijn

The moral of the story for knowledge brokering is that there are many different perspectives about a problem, and each person's perspectives can be narrow.

However, all types of knowledge must be combined to see the bigger picture and solve a complex problem.

Decisions and action

So, what is a knowledge broker?

Following Brown and Lambert (2013), we define it as someone who acts as a bridge between the information, the learner and the new knowledge. However, being a knowledge broker may also need to go further and engage with decision-making, and turning knowledge into action. As the cartoon below suggests, it's not easy!

There are numerous barriers to achieving action that will have to be recognised and overcome by brokers. If decision-makers do not accept the information, the action will be rejected. If the information is accepted, politics, power, or the differing goals of stakeholders and their 'rules of the game' may stop information being used. For action to happen, decision-makers must have the motivation and capacity to implement their decisions. The process of collating information and turning this into knowledge and action can be thought of as a journey down a river, with rapids and crocodiles that must be navigated before a boat of brokers and decision-makers can collectively reach action.

Knowledge brokers need to be able to deal with the challenges that lurk "under the bridge" during the journey from information to knowledge to decisions.

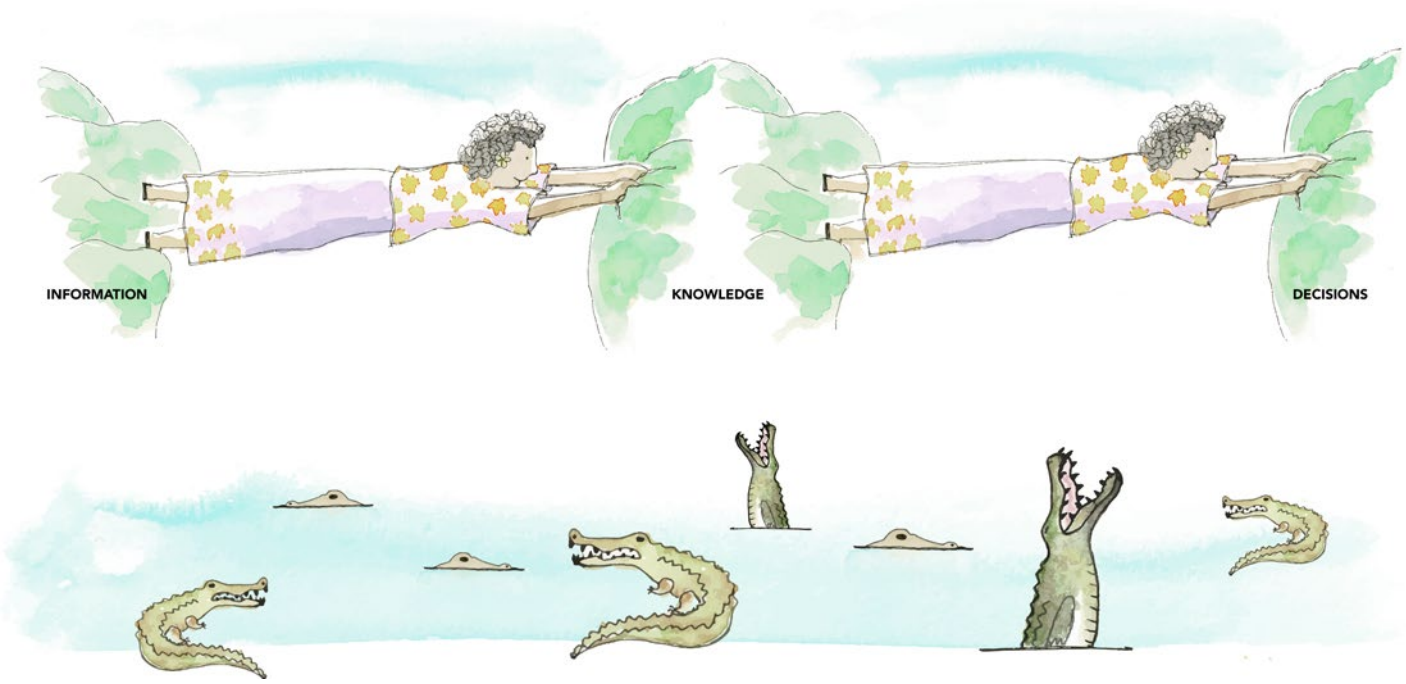


Figure 4 Knowledge broker bridging the information, knowledge and decision gap. Idea by the KBSP Team.
Artwork by Dr Manuela Taboada, Queensland University of Technology

"A knowledge broker is someone who acts as a bridge between the information, the learner and the new knowledge."

Adapted from: Brown and Lambert (2013)

The process of collating information and turning this into knowledge and action can be thought of as a journey down a river, with rapids and crocodiles that must be navigated before a boat of brokers and decision-makers can collectively reach action.

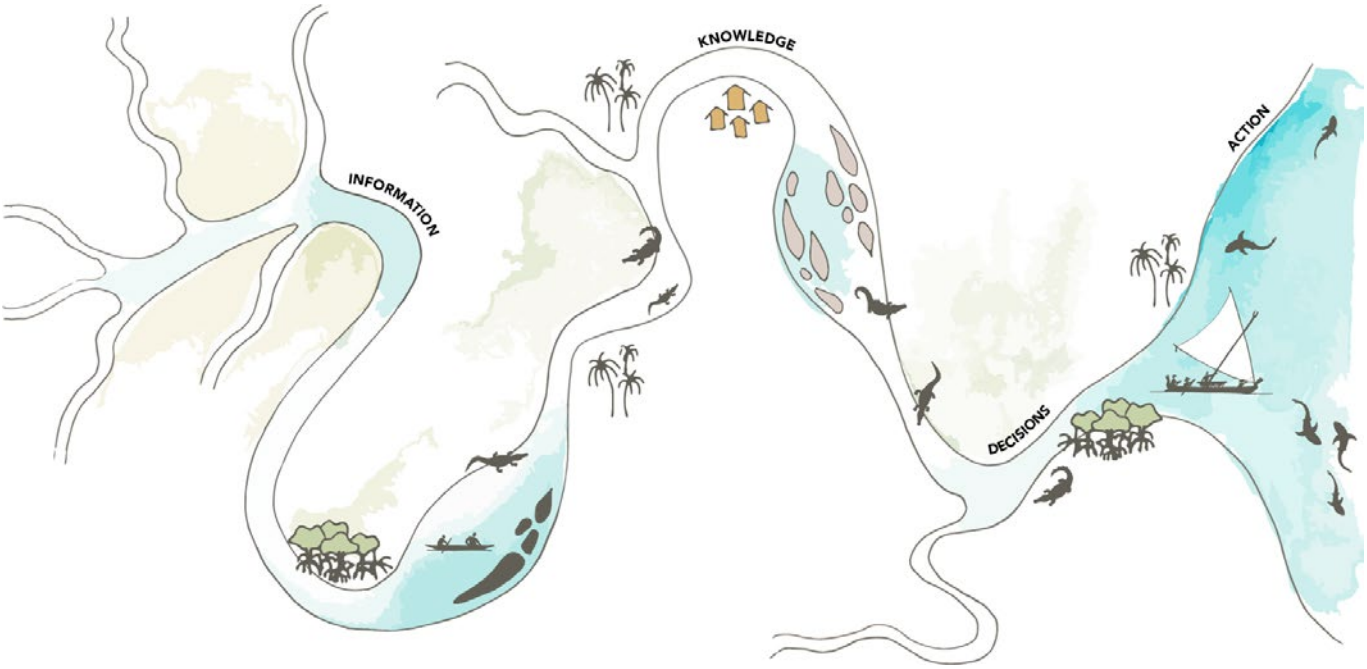


Figure 5 The journey of the knowledge broker. Idea by the KBSP Team.
Artwork by Dr Manuela Taboada, Queensland University of Technology.

The spectrum of knowledge brokering

Knowledge broker is a broad term that covers many different activities and roles.

Blane Harvey and colleagues suggested that there is a spectrum of brokering types, starting with an **'Infomediary'** or **'Knowledge Translator'** that enables access to information and its use.

Then a **'Knowledge Broker'** improves information to use in decision-making, and therefore helps turn it into knowledge. However, a 'Knowledge Broker' must also be an 'Infomediary-Knowledge Translator'.

Finally, an **'Innovation Broker'** facilitates innovation and change, involving skills of the 'Knowledge Broker' and the 'Infomediary-Knowledge Translator'. It is important to remember that an Innovation Broker's job probably requires more time and resources and will be ongoing – by comparison, an Infomediary-Knowledge Translator's job could be more straightforward and involve less time.

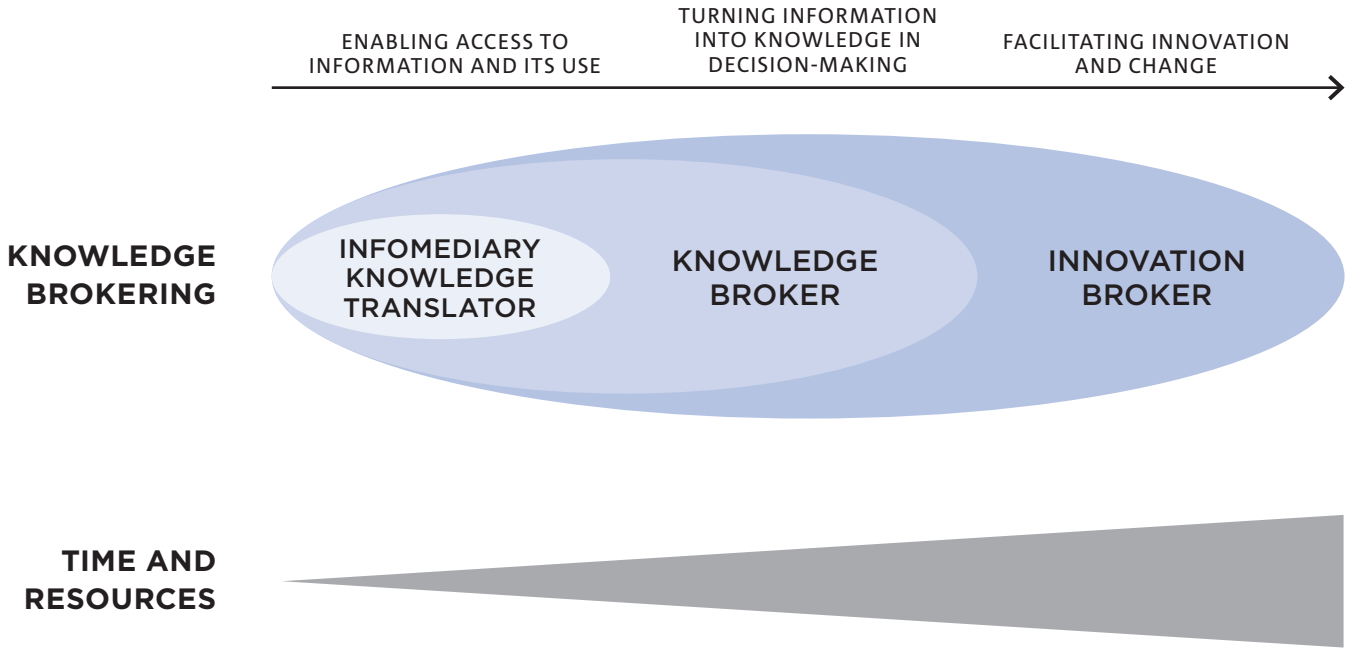


Figure 6 Knowledge broker spectrum. Based on Harvey, B., Lewin, T. and Fisher, C. 2012. Introduction: Is development research communication coming of age? IDS Bulletin 43(1):1-8.

Adaptation decision-making and knowledge brokering types

As a broker, you may be involved in different kinds of decision making processes about climate change and adaptation.

Here is a simple framework to think about the different types of decision-making, and the kinds of information or knowledge that may be needed to make those decisions.

'Clear' decisions only involve a few stakeholders with the same goals and need technical information to inform the decision – for example, an extension officer working with a farmer to decide when to plant a crop with some monthly climate forecasts.

A more **'complicated' decision** involves several stakeholders who also have the same goals, and the problem needs several sources of expert knowledge and skills – for example, managing tuna stocks in the Pacific, which are moving across many countries' international borders. Importantly, within this decision, there may still be 'clear' decisions needing only technical information to be passed between a few stakeholders, such as the sensitivity of one tuna species to temperature increases.

Finally, **'complex' decisions** involve many diverse stakeholders with varied or competing goals. In this case, multiple forms of knowledge and an inclusive process are necessary to integrate everyone's perspectives and thinking. An example might be planning a community-based tourism venture, including landowners, government, NGOs and the private sector. Note that this may also include 'complicated' and 'clear' decision-making within it.

Figure 7 Nested adaptation decisions – clear, complicated and complex. Diagram adapted by Dr Samantha Stone-Jovicich (CSIRO) from: Snowden, D. and Boone, M.E. 2007. A leader's framework for decision-making. Harvard Business Review. November 2007: 69-76.

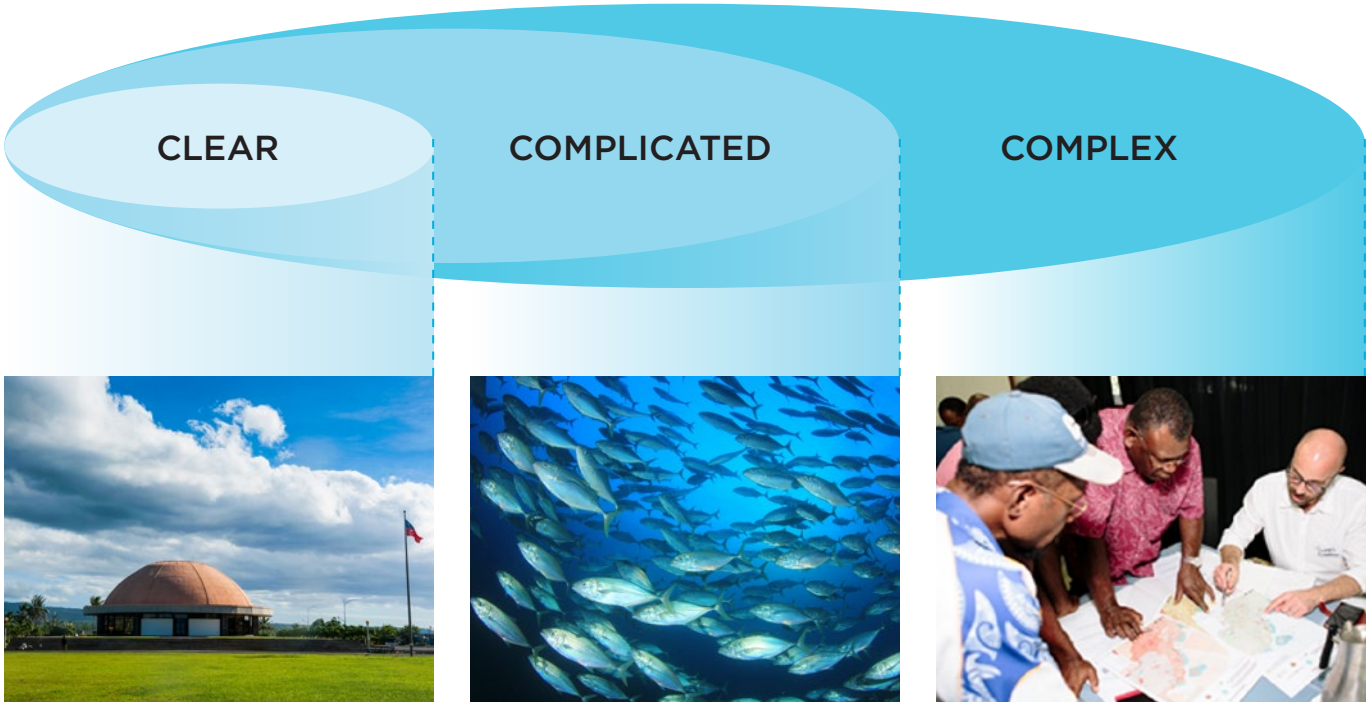


Figure 8 Clear problem – Samoa's climate-proofed parliament house

Figure 9 Complicated problem – Climate change is causing tuna to migrate

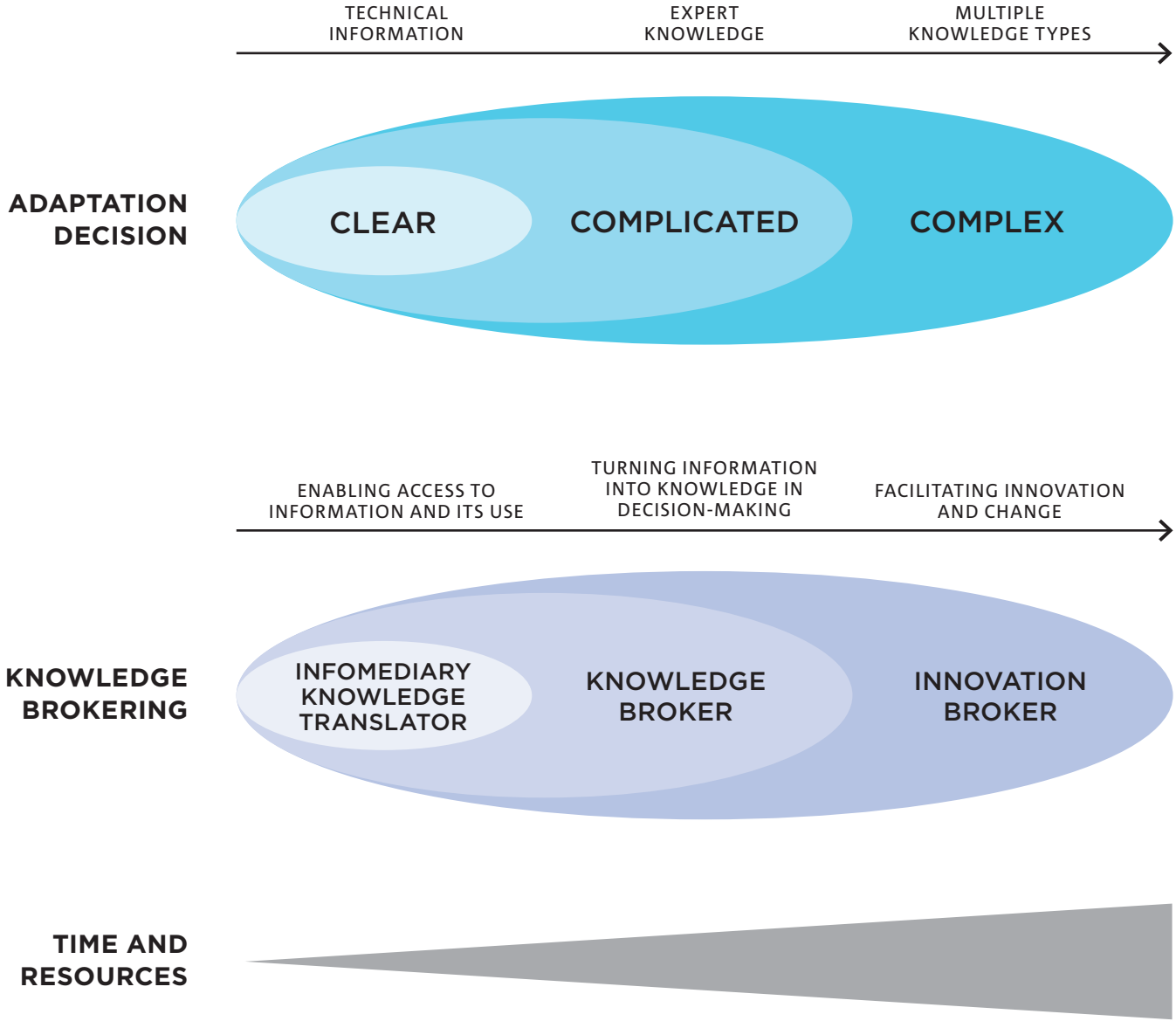
Figure 10 Complex problem – Developing adaptation pathways for climate adapted tourism in Papua New Guinea.
Image by Tom Greenwood

The knowledge brokering spectrum aligns well with these different kinds of decision-making.

For community development and climate change, much of the decision making will be complicated or complex, involving multiple stakeholders and knowledge types.

To facilitate these types of decision-making, brokers will have to be 'Innovation Brokers'. Meaning that they will need to be Knowledge Brokers and Infomediaries to deal with complicated or clear decisions that are part of complex decision-making.

The diagram below shows the relationship between adaptation decisions and the knowledge brokering spectrum.



References and additional resources

If you would like to watch a YouTube video on this module, please see https://www.youtube.com/watch?v=nFtg9hkN4gU

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Michaela Cosijn (CSIRO): an innovation broker who works in international development programmes solving complex problems and enhancing livelihoods, with her work focused on agri-food innovation systems, gender integration, and climate adaptation.

Seona Meharg (CSIRO): an integration scientist focused on the capacities and competencies needed for systemic change, and with experience in research evaluation and project management for transdisciplinary projects.

Nicky Grigg (CSIRO): a research scientist who works in interdisciplinary teams on a diverse range of projects concerned with global change and social-ecological systems.

Emily Barbour (CSIRO): a research scientist in hydrology. Emily works on a diverse range of water issues focusing on collaboratively generating knowledge and tools to support decision making for complex environmental challenges.

Tim Skewes (Tim Skewes Consulting): an ecologist with a background in coastal fisheries and ecosystems, valuing ecosystem goods and services, and assessing the impacts of climate change.

Sara Busilacchi (Independent research scientist): research scientist with a background in fisheries science with a focus on social-ecological systems thinking for the sustainability of small-scale fisheries in a changing world using collaborative and participatory approaches.

Anthony Nadelko (CSIRO): a research technician who investigates the environmental interactions, resource use efficiency and sustainability of natural and human-made ecosystems.

Samantha Stone-Jovicich (CSIRO): an anthropologist with an interest in strengthening science's contribution to on-the-ground impacts and a focus on complexity-aware monitoring, evaluation and learning (MEL) frameworks and tools to critically assess current research approaches and practices and to foster experimentation with new ways of thinking and practice to better bridge science and meaningful, lasting social change.

Reflective practices and knowledge brokers as change agents

In this module, you will learn about the characteristics and competencies of change agents in adaptation interventions. The focus is on reflecting on ourselves and learning to be better knowledge brokers who can cultivate change in your projects and communities.

What you learn in this module will be used in other modules and will also be useful for engaging with others and influencing them to change.

At the end of this module, you will be able to:

1. **Reflect on how change happens and your role in it.**
2. **Identify and reflect upon the competencies and characteristics that knowledge brokers need.**
3. **Understand the different competencies needed to facilitate adaptation decision-making.**
4. **Reflect on your role as a change agent by being a knowledge broker.**

Why are we doing this?

Self-reflection is the key to self-awareness.

Self-reflection is an important and sometimes difficult aspect of learning and growth, whether change is planned, or unplanned and unexpected.

In its simplest form self-reflection allows a person to examine what is working and what is not, and how they could improve in the future.

> "Between stimulus and response there is a space.
> In that space is our power to choose our response.
> In our response lies our growth and our freedom."
>
> — Quote attributed to Viktor Frankl by Stephen R. Covey.

The 'space' in the above quote is an opportunity to critically self-reflect and make a choice in how to respond, rather than to react.

Pausing is hard and requires constant practice especially when you are under pressure or are emotionally triggered.

What sets stronger change agents apart are their self-reflection practices, re-thinking their goals and approaches, as well as their interest in further developing their competencies including interpersonal skills, strategic planning, and their systems perspectives. This closely aligns to the multiple types of learning needed for adaptation.

What does a knowledge broker look like?

Figure 11 Vision of a knowledge broker. Design by Zelda Hilly, Michaela Cosijn and Samara Cosijn. Artwork by Samara Cosijn

Characteristics and competencies

Characteristics are the qualities or attributes of a person, such as their values and purpose, relationships and networks, and interest in learning or mastery and creativity.

Competencies are how a person combines their skills and resources into their 'know how' or expertise.

Together, characteristics and competencies are like two wheels of a bicycle that help propel you further and faster on your journey.

Characteristics and competencies are changeable and can be strengthened, and like bicycle riding the more you **practice the more proficient** you get.

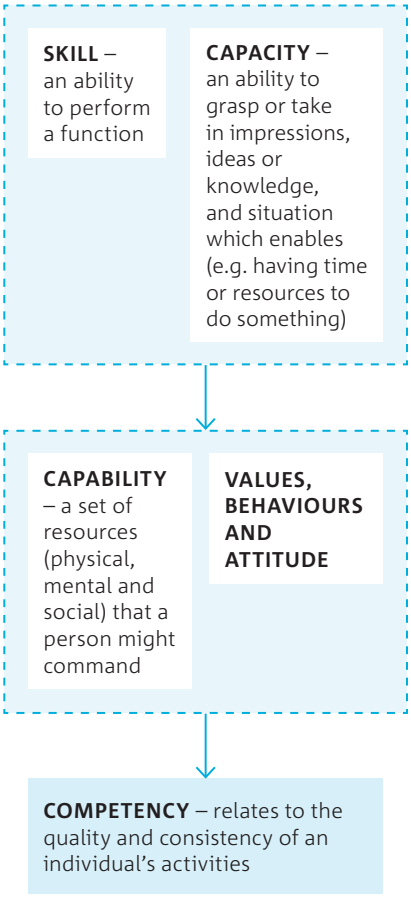


Figure 12 Capacities, capabilities and competencies

How to grow your competencies and influence your characteristics?

If an individual or group wants to do something, they need the skills to do it. Like baking a cake, they need to know the mechanics of how to mix butter and sugar.

A person making a cake also needs to have the capacity to cook, which might involve the ability to read a recipe and be able to understand and implement the steps.

In addition to the skills and capacity, a person needs the capability to bake a cake. This capability includes having access to ingredients, appropriate tools, such as an oven, and the time to make the cake.

If a person wants to get good at baking, they will need to value learning the skills and develop the appropriate behaviours and attitudes in order to practice. This practice is also true for everything else we do.

The combination of a person's capability and values, behaviour and attitude all contribute to the level of a person's competence — in this case, the quality and consistency of their cakes!

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.

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' or practice.

It is important to note that an individual's capacity and associated capability is tied to:

- their individual and social context,
- their history and culture,
- often 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. Through your activities and projects as a **knowledge broker you can help people grow their capacity, capabilities and competencies**.

> No one is born fully-formed: it is through self-experience in the world that we become what we are.
>
> — Paulo Freire

What characteristics and competencies are useful for a knowledge broker?

Rapidly changing global and local contexts will require thinking differently about designing and implementing adaptation activities and projects. Different situations and problems will require different skills and competencies in knowledge brokers seeking to be change agents.

While skills are important for activities and projects, they can be highly specific to the task at hand. By focusing on developing your competencies for adaptation and sustainability interventions, you and your stakeholders will be better able to deal with different contexts and situations, and develop the specific skills you need.

Over time you and your stakeholders will grow stronger knowledge broker characteristics, which in turn will help further strengthen your competencies.

Four characteristics and three competency themes are important for knowledge brokers seeking to enable change (Meharg, 2020).

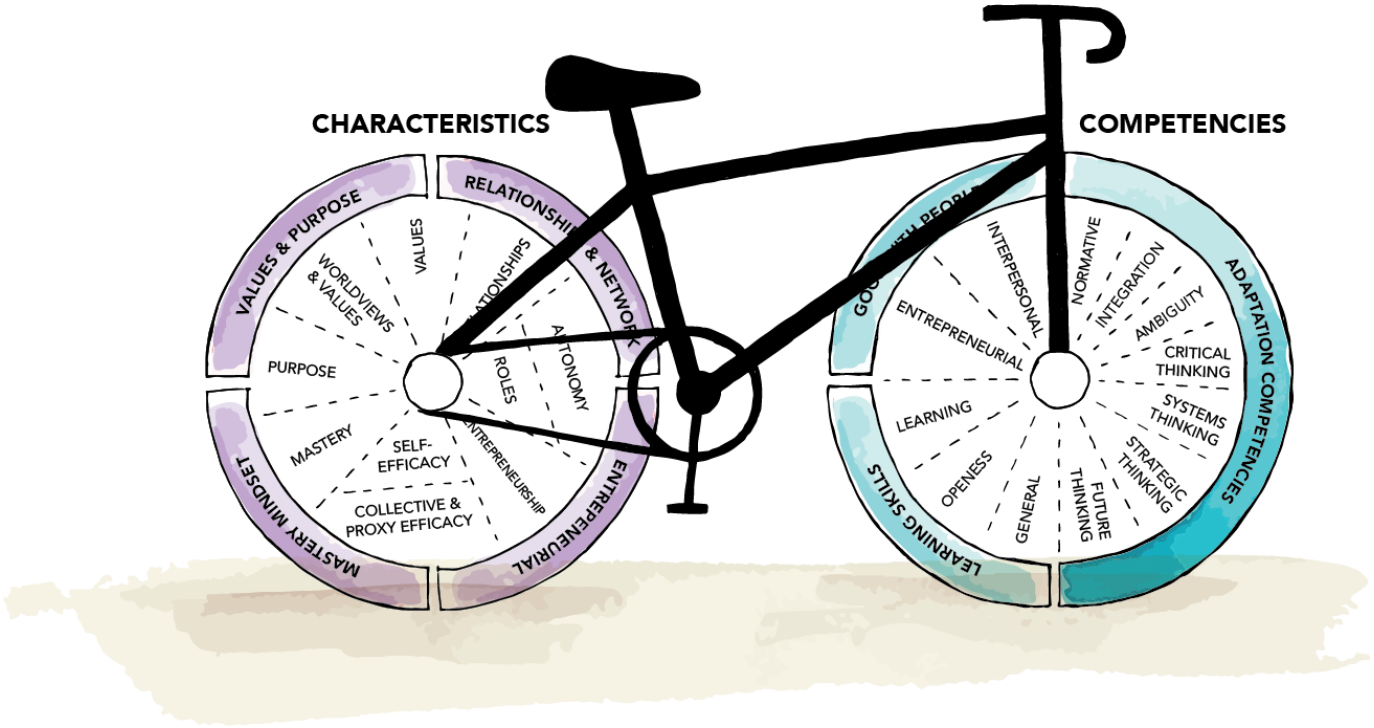


Figure 13 The connection between characteristics and competencies. Source: Meharg,S. 2020.
Artwork by Dr Manuela Taboada, Queensland University of Technology

REFLECTION OPPORTUNITY
– what are your core values?

Capabilities and competencies are intertwined

These characteristics and competencies are useful in all contexts. The adaptation competencies become more important when undertaking climate change and climate adaptation activities and projects.

This module focuses on values and purpose, being good with people, learning and mastery, entrepreneurial spirit, and adaptability, which are core for knowledge brokers mainstreaming climate change to develop.

Values and Purpose

VALUES

Values, beliefs and attitudes go part way to explaining an individual's behaviour and guiding their actions.

You are influenced by your context and in turn, you help shape this context often through social comparison and norms.

Schwartz (2012) suggests that there are ten basic personal values that are clustered into four higher-order values:

1. Openness to change (self-direction and stimulation)
2. Self-enhancement (power and achievement)
3. Conservation (security, conformity and tradition)
4. Self-transcendence (overcoming of individual limits to have concern for the welfare of others)

Importantly, some values are better predictors of success for adaptation and development interventions, such as openness to change and self-transcendence.

Research has shown that a high degree of threat or risk does not change behaviour (Thaker et al. 2016). Therefore, cultivating desired values and traits in others is an important aspect for adaptation intervention teams to consider.

> "Those who have a 'why' to live can bear with almost any 'how'."
>
> — Victor Franklin
> Man's Search for Meaning (1946)

PURPOSE

Purpose is the reason why something is done, an intention or objective.

Purpose is someone's "why".

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, have a shared purpose and worked through multiple pathways to achieve their goal.

Purpose provides motivation to act and to keep going when someone faces difficulties or barriers.

Values and purpose connect closely to the 'normative' adaptation competency (values, principles and goals of individuals and groups).

Relationships and networks

Developing strong relationships and networks is important as a knowledge broker to understand others, learn from them, influence them and support change.

Building strong relationships where people trust you is crucial to developing a network of people who can enact change. It is also important to develop a diversity of relationships with a wide variety of people as a knowledge broker, so that you can action multiple pathways towards your goals and bring your community with you.

Being good with people

Knowledge brokers need to be good with people. The Pacific way also honours people and places, and embodies relationships and values.

Knowledge brokers require social skills that enable connection to others, team work, trust building, network creation and maintenance, two-way communication, emotional intelligence, empathy, social learning, motivation, etc.

It encapsulates the African concept of

> "Ubuntu": I am only because you are.

Ubuntu is similar to the Pacific Way, which is about how we all live together, listen deeply and treat ourselves and other people and the environment and how we work together for the common good in a chaotic, rapidly changing world.

Be empathetic and put yourself in the shoes of others, and acknowledge the reality of the situation no matter how painful.

Communicate effectively, as poor communication often damages or destroys relationships. Be open and communicate clearly at the level of the people you are engaging with and in a way that is relevant to them. Try to be clear about your own assumptions and biases, and clarify what people say. Knowledge brokers can often communicate in multiple languages to bridge the communication gap between people.

Be open about how you feel and show you care about people.

Be inclusive in who you engage with and how you talk to people (everyone should have a valid voice). Consider including those who often struggle to have a voice, such as women, people with a disability and youth.

Good relationships and networks require care and connection, much like weaving

"What if we assumed that learning is as much a part of our human nature as is eating and sleeping, that it is both life-sustaining and inevitable? And what if, in addition, we assumed that learning is a fundamentally social phenomenon, reflecting our own deeply social nature as human beings capable of knowing?"

— ETIENNE WENGER

Mastery mindset, efficacy and learning skills

Learning and having a learning mindset is critical for adaptation as it is an entry point for change and innovation, creating a sense of possibility, motivation and resilience. Everyone needs to learn actively.

Educational theorist and practitioner Etienne Wenger strongly believes that learning is not only essential for humans, but it is also more effective when done socially and in a situated, contextualised manner.

Reflection and Reflexivity

Reflective practice is the capacity to actively reflect on what you have done/ what others are doing and to develop insights and lessons. Reflective practice is part of continuous learning and draws heavily on the **first two learning loops.**

Reflexivity draws on the **third learning loop**, developing strategies to query our values, assumptions, thought processes and attitudes to question what is right and what is possible, noting that we are all shaped by our culture, environment and situations.

There are three loops of learning or questions you need to ask yourself and your team when designing projects and undertaking activities.

FIRST LOOP

Are we doing things right? Learning is normally easy to do, requires redoing what has been done before and has low risk of failure. Only incremental change is required. This type of learning is appropriate for clear problems —such as baking a cake or learning to recycle your waste.

SECOND LOOP

Are we doing the right things? It is about understanding causality and improving what is already working. There are potentially many risks that need to be managed. Change requires reframing, reorganizing, adding or detracting. Second loop questions are important for complicated problems, such as launching a boat in rough weather or choosing who could participate in a workshop.

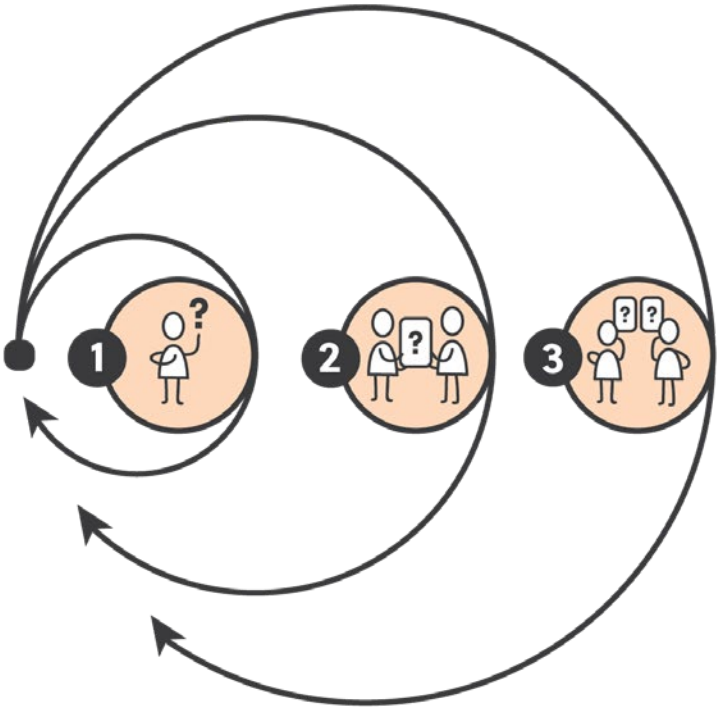
THIRD LOOP

How do we decide what is right? It is about understanding how the system works and how decisions get made based on values and norms. It then requires reflection on how to create transformational change through re-invention, innovation and creating something new.

The third learning loop is needed for complex issues where it is unclear what the correct pathway of action is and what success looks like. Building relationships with all stakeholders is crucial.

An example is bringing up a child, “it takes a whole village” to do it well.

In most projects all three learning loops are required.



MULTI-LOOP LEARNING

1. Are we doing things right?
2. Are we doing the right things?
3. How do we decide what is right?

Figure 14 Triple Loop Diagram source and more information on multiple- or triple- loop learning and how it can be integrated with adaptation thinking can be found in: Australian Government, Department of Home Affairs. 2019. Climate and Disaster Risk: What they are, why they matter and how to consider them in decision making. 3 Guidance on Vulnerability. CC-BY-4.0

Mastery

Mastery is about the focus on self-development through lifelong learning and practice.

Mastery is an iterative process that requires persistence and determination. Mastery is goal-directed and a purposeful practice, building on existing knowledge. It requires failure, problem solving, making use of patterns, and adjusting to changing contexts (Lawley and Tompkins, 2008).

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' others and changes in the system. Sterman (2002) suggests that 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'.

Efficacy

Efficacy is defined as "the ability to produce a desired or intended result."
(Oxford English Dictionary)

Efficacy 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, 2006).

Having a stronger sense of **self-efficacy** will lead to greater perseverance and an increased likelihood of success.

A strong sense of collective efficacy in a community will encourage participation in activities. **Collective efficacy** is significantly and positively associated with community adaptation responses, with prosocial orientation characterised by cooperativeness, helpfulness and sharing.

Proxy efficacy is the ability to influence through others, such as engaging with your local church or politician.

An example of **self-efficacy** is learning how to fish sustainably. **Collective efficacy** would be needed for a community to manage a shared reef sustainably. Community members could use **proxy efficacy** to influence their local government to protect the reef with new rules or resources.

If you would like to know how your to-do list can help in developing your own self efficacy and learning watch this Ted Talk video:

How your to-do list shapes your personality — and how to use it to remake who you are, by Brian R. Little https://ideas.ted.com/how-our-projects-shape-our-personalities-and-how-we-can-use-them-to-remake-who-we-are/

GROWING YOUR EFFICIENCY THROUGH MASTERY

An example of cultivating efficacy is how Roger Bannister managed to break the 4 minute mile in 1954.

Prior to Roger breaking the four-minute mile people thought it was physically impossible for a human to run that fast.

Roger and his coaches solved the 'brain barrier' by having other runners do short sections of the mile tack with him at faster speed (pacing him) so he thought that he was 'keeping up' with them. This allowed him to fool his brain into keeping his body moving at the necessary speed to break the time barrier.

Within 46 days, Bannister's rival, John Landy, ran a four-minute mile and broke the record with a time of 3 minutes 57.9 seconds. A year later, three runners ran four-minute miles in a single race. By the end of 1978, over 200 runners had broken the once impossible barrier of the four-minute mile.

"Do not go where the path may lead, go instead where there is no path and leave a trail."

— Ralph Waldo Emerson

Creativity and entrepreneurial skills

Knowledge brokers are entrepreneurial. They are proactive, looking for opportunities and not waiting for the change to happen. They create change within their networks and environments.

It is hard to walk that hasn't been cut, but you can provide a trail for others to follow. Creativity requires critical thinking, innovation, being adaptable, taking opportunities that arise, and continual learning and improving who they are and what they do. It also requires thinking outside the box.

Adaptation competencies

In addition to a wide range of skills, there are seven core competencies associated with knowledge brokering for climate adaptation:

1. **Future thinking:** Anticipatory skills which help people think about the future and make practical judgements.
2. **Integration:** Thinking differently, with the capacity to cope with nonlinearities, having a decent understanding of several disciplines and accommodating the belief and knowledge of others.
3. **Ambiguity:** Able to sit with the discomfort of not knowing and encourage others to do the same.
4. **Critical thinking:** reasoning skills, flexible thinking and the capacity to shift from one perspective to another.
5. **Systems thinking:** Understanding connections, feedback loops, drivers and scenarios of change.
6. **Strategic thinking:** Planning and self-regulation skills. It is identifying and then actioning steps to implement, including addressing any barriers.
7. **Normative:** The values, principles and goals of individuals and groups, such as having concern for others and thinking socially.

Like the other competencies, you don't have to have all of these seven competencies. Rather, you need to ensure that you can access them through your team members or consultants.

COMPETENCIES OF THE FUTURE

This list of competencies is not static and will continue to evolve as new competencies become essential for creating change.

For example, digital and technological competencies – e.g. the ability to engage with technology and understand and assess the credibility of information will become increasingly vital.

The art of adapting

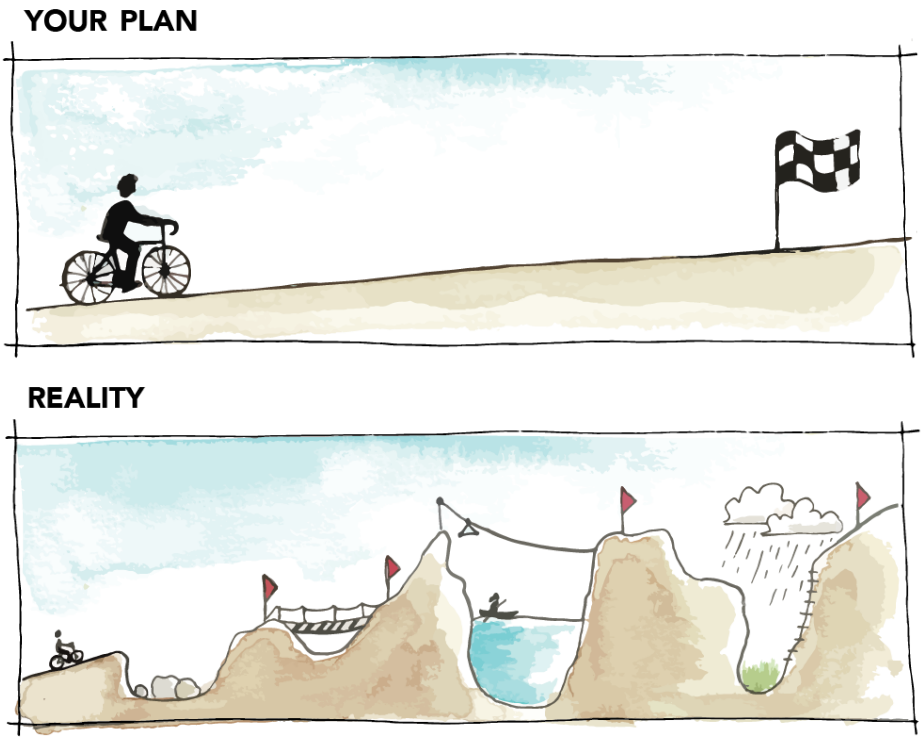


Figure 15 Your plan v reality.
Source: Doghousediaries comic
Redrawn by Dr Manuela Taboada, Queensland University of Technology

You are a change agent with a vision or goal [future thinking competency] of the change you want to achieve. You developed this vision with the community you are working with and your funder [interpersonal competency].

Creating this shared vision requires you to actively listen and gain a good understanding of the values, principles and goals of your community and funder [openness competency]. You will also need to:

- understand the context you are operating in [systems competency]
- be able to use your communication and influence skills [entrepreneurial competencies]
- facilitate a discussion, co-creating the shared vision [normative competency]
- develop an initial plan that will take you towards the goal by combining everyone's knowledge of the situation [strategic and integration competencies].

So far, the path looks straight and clear, so you jump on your bicycle and set off. Before long you realise the path isn't as clear as you thought, it is complicated and there are obstacles that you have to address such as the rocks and bridges. However, you are able to learn from what is happening [learning competency] and are flexible in your journey so that you adjust your plan to an alternative pathway [critical thinking competency] to achieve your goal.

Before long you notice a lake that your bicycle can't cross, so you sit with the ambiguity of not knowing how to cross this new complexity until you reach the lake. When you reach the lake, through discussion with others and your openness to new ideas and creativity enables you all to rebuild an old boat with your bicycle acting as an engine [integration] to cross the lake.

While the journey is long and often tiring, you know that by maintaining and cultivating the characteristics and competencies you need in yourself and with others, jointly you will be able to achieve your goals.

Want more?

Further ideas can be found at:

WEADAPT

www.weadapt.org/knowledge-base/climate-knowledge-brokers

SPREP, including the March 2021 article on scaling up knowledge brokering

www.sprep.org

Pacific Climate Change Science

www.pacificclimatechange science.org

Connecting competencies to adaptation decisions

Knowledge broker competencies are the know-how that enables adaptation decisions. The degree to which each competency is necessary differs along parts of the knowledge brokering spectrum.

General and interpersonal skills are vital across the knowledge-brokering spectrum. Once you get into knowledge brokering in complicated systems, all of the competencies become increasingly valuable and needed.

You personally don't need to have all these competencies, but you have to be willing to work with others who do.

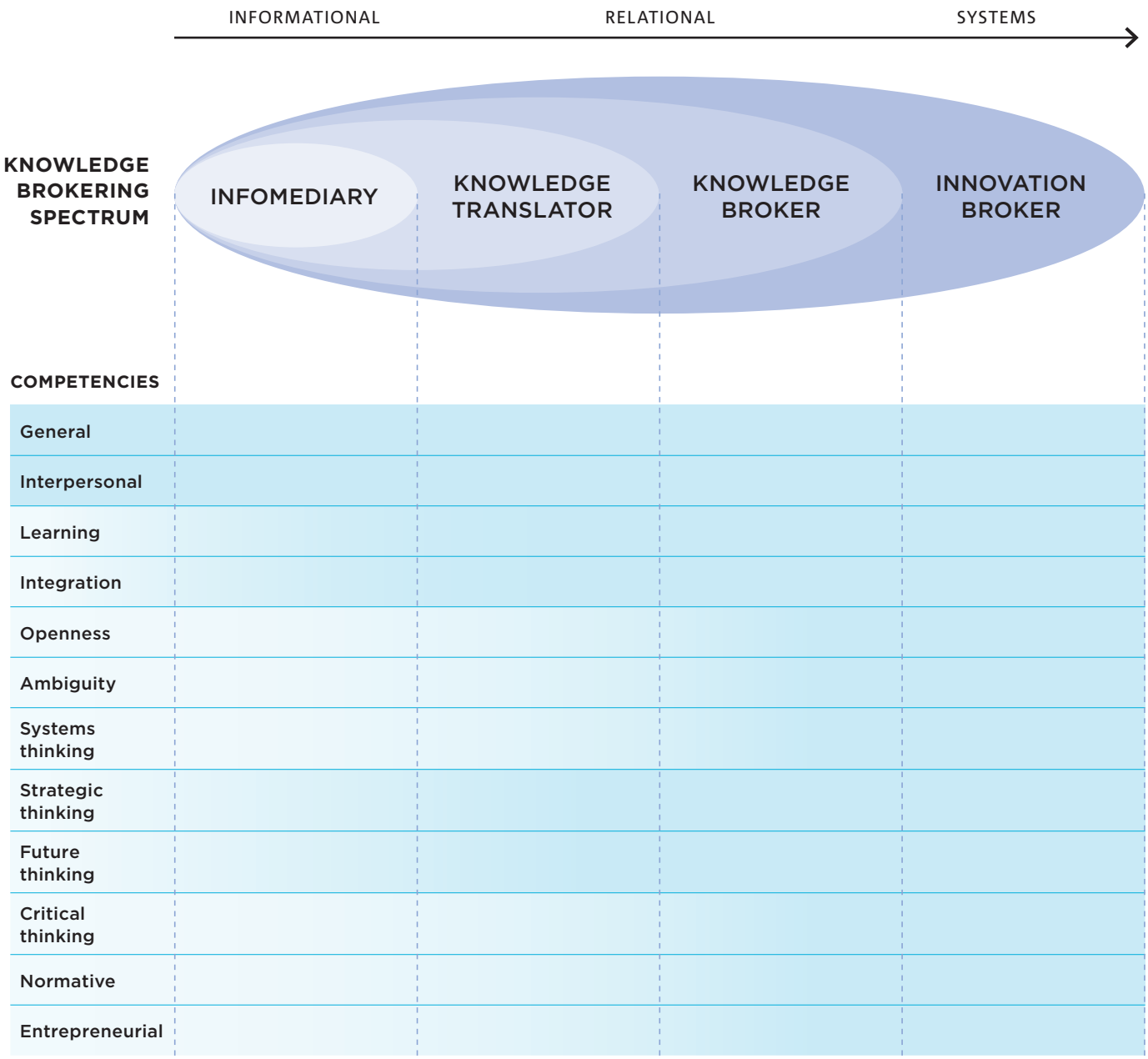


Figure 16 Competencies by knowledge broker type. Adapted from Harvey et al 2012 and Meharg, 2020.

General	General competencies include but are not limited to, being able to read, write and operate standard software, such as email, word and excel. English language skills to be able to access information and engage with international partners and donors. Project planning and management skills, risk management skills and business development skills
Interpersonal	The social skills that enable connection to others, build trust and social networks, to understand and work effectively with others.
Learning	Learning orientation and having the skills to do so, including 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	Includes the cultivation of an open mind and being open to new or different world views, values, ideas, and processes, enabling brokers to see opportunities that others do not.
Ambiguity	Being able to sit with the discomfort of not knowing and being able to help others do the same.
Systems thinking	Understanding connections, feedback loops, drivers and scenarios of change enables agents to understand better the context they are operating in, see the connections between things, and identify intervention points.
Strategic thinking	Planning and self-regulation skills. Identifying and then actioning steps to implement, including addressing any barriers.
Future thinking	Anticipatory skills 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, thinkings ocially or environmentally. To enable social change, an agent first needs to be aware of their own norms and values.
Entrepreneurial	Thinking outside the box, communication and influencing skills, including the ability to engage with politics and understand the institutions that support innovation.

Competencies by knowledge broker type

As you move across the spectrum of brokers from Infomediary to Innovation brokers you need a greater number and depth to your skills and competencies, as well as access to a greater number of competencies through others to address challenges.

<table>
<tr><th>COMPETENCY & DEFINITION</th><th>INFOMEDIARY</th><th>KNOWLEDGE BROKER</th><th>INNOVATION BROKER</th></tr>
<tr><td>General
General competencies include but are not limited to being able to read, write and operate standard software, such as email, word and excel. English language skills to be able to access information and engage with international partners and donors. Project planning and management skills, risk management skills and business development skills.</td><td colspan="3">General competencies are vital skills for all types of brokers, although some competencies, such as project planning and risk management skills, you can access through others if you do not have the time or skills yourself. These competencies will need to be more developed as you start to engage with complex and complex problems.</td></tr>
<tr><td rowspan="2">Interpersonal
The social skills that enable connection to others, build trust and social networks, to understand and work effectively with others.</td><td colspan="3">Interpersonal competencies are perhaps the most important competency for all types of brokers.</td></tr>
<tr><td>For an infomediary, these competencies will be vital for building trust and working with others so that the information they are providing is considered and used by stakeholders. Critically this is not a competency that can be outsourced. It is a valuable competency to cultivate in your team and stakeholders.</td><td>Knowledge brokers will need to have well-developed interpersonal skills to connect to and create networks for sourcing information and enabling change.</td><td>Innovation brokers will have significant interpersonal expertise allowing them to work across multiple networks of different types and levels, building trusted collations for change.</td></tr>
<tr><td>Learning
Learning orientation and having the skills to do so, including social learning, critical reflection and reflexivity</td><td>Solutions are discovered through individual and collective learning, and often the solution itself will involve ongoing adaptive learning (see Triple Loop Learning in Module on Monitoring Evaluation and Learning).</td><td colspan="2">A key growth area for knowledge and innovation brokers is this awareness that there are no easy or obvious answers to complicated problems. As a knowledge broker in complicated systems, it can be helpful to operate within the second learning loop: “Are we asking the right questions”, with innovation brokers also exploring “How do we decide what the right questions are?”.</td></tr>
<tr><td>Integration
Thinking differently, with the capacity to cope with nonlinearities, having a decent understanding of several disciplines and accommodating the belief and knowledge of others</td><td>For infomediaries, this will include searching for and combining or collating different types of knowledge and communicating it in an accessible and useful way for others, for example, integrating climate information and crop data for agriculture departments.</td><td>Knowledge brokering is all about learning from different knowledge systems, perspectives, and cultures and weaving them together in helpful ways.</td><td>Innovation brokers will require further developed integration competencies to incorporate the many different knowledge types and perspectives to understand and address challenges in a complex system.</td></tr>
</table>

COMPETENCY & DEFINITION	INFOMEDIARY	KNOWLEDGE BROKER	INNOVATION BROKER
Openness Includes the cultivation of an open mind and being open to new or different world views, values, ideas, and processes, enabling brokers to see opportunities that others do not.	Being open to new ways of doing is a precursor for deeper learning and is linked to creativity. Being willing to listen, observe and change, rather than sticking to what you know and what has worked in the past.		For innovation brokers who need to help stakeholders develop creative solutions to complex problems, developing their openness competencies will be strongly connected to the 2nd and 3rd learning loops.
Ambiguity Being able to sit with the discomfort of not knowing and being able to help others do the same.	Cultivating the ability to engage with ambiguity is an important competency for all of us as the world becomes more complex. For an infomediary, this may include helping stakeholders understand the uncertainty and limitations of climate projections.	Complicated systems involving multiple knowledge systems and values can feature deeper kinds of ambiguity. For example, values can be very private and not readily discussed in public settings, particularly for people who feel marginalised. Pathways towards solving a problem can also be ambiguous, especially if different knowledge and value systems imply different priorities for action. More generally, complicated systems have many interacting components that can be difficult to identify and understand.	Complex systems involving multiple knowledge systems and values feature deeper kinds of ambiguity. There are many interacting components that can be difficult to identify and understand. Data is often also ambiguous. You, your team and the people you work with need to be able to navigate ambiguity.
Systems Thinking Understanding connections, feedback loops, drivers and scenarios of change enables agents to understand better the context they are operating in, see the connections between things, and identify intervention points.	Infomediaries often work in contexts that have clear causes and effects. Systems thinking is still useful in this context to ensure the questions and answers fit within the broader socio-political context. Systems thinking competencies are useful to learn, but can also be outsourced with insights incorporated into your planning and implementation.	Systems thinking is needed in complicated systems because these systems often require understanding different kinds of system interactions. For example, there can be interactions between different sectors (e.g. impacts of land-use change on water quality, or the influence of economic policies and incentives on resource exploitation patterns), different geographic locations (e.g. downstream impacts of upstream water resource development), different temporal scales (e.g. decisions now that will lock in consequences for coming decades), and between different knowledge or value systems (e.g. individual interests in conflict with collective interests).	Systems thinking is needed in complex systems because different kinds of systems interact. You need to understand the context. For example, there can be interactions between different sectors (e.g. impacts of land use change on water quality, or the influence of economic policies and incentives on resource exploitation patterns), different geographic locations (e.g. downstream impacts of upstream water resource development), different temporal scales (e.g. decisions now that will lock in consequences for coming decades), and between different knowledge or value systems (e.g. individual interests in conflict with collective interests). These effects are even more pronounced in complex systems.

COMPETENCY & DEFINITION	INFOMEDIARY	KNOWLEDGE BROKER	INNOVATION BROKER
Strategic Thinking Planning and self-regulation skills. Identifying and then actioning steps to implement, including addressing any barriers	Planning and ensuring you have a clear understanding of what your goals are, who is doing what and when they are doing it is important. Working with different people in different roles and organisations involves a lot of communication, consulting, and awareness of and compliance with local rules and regulations. These will become more complicated as you move into complicated and complex systems. Strategic thinking is closely linked to learning to ensure you still meet your goals.		As you will aim to change how the system operates, you must have strategic thinking or access to well-developed strategic thinking. Thinking strategically may require thinking many steps ahead of where you are now and engaging with a diverse set of stakeholders in anticipation of being able to enact future decisions.
Future Thinking Anticipatory skills help people think about the future and make practical judgements	If you are asking people to imagine a fundamentally different future, how do you help people imagine possible impacts on the things they care about? Future change may be incremental (in a clear system), involve larger structural change (complicated system) or fundamental transformation (in complex systems).		
Critical Thinking Critical thinking skills include reasoning skills, flexible thinking and the capacity to shift from one perspective to another	Can you critique the information and knowledge you are hearing or seeing, make sense of it, and identify gaps or different ways of understanding the problem? Critiquing information becomes harder as you move into complicated and complex systems where multiple knowledges, information sources and values need to be integrated.		
Normative The values, principles and goals of individuals and groups, such as having concern for others and thinking socially or environmentally. To enable social change, an agent first needs to be aware of their own norms and values	Normative awareness (of yourself and others) becomes important when different values exist among all people involved. Normative competencies are difficult to outsource, although if your team has a high level of trust and good communication, it is possible to share your collective insights.	Part of knowledge brokering is about surfacing everyone's values and objectives (including your own). Different knowledge systems and values interpret the same events and information differently and have different beliefs about what should be done, even if shared goals exist. Negotiating these can be challenging as there is not always a clear right or wrong.	
Entrepreneurial (creative thinking) Thinking outside the box, communication and influencing skills, including engaging with politics and understanding the institutions that support innovation.	Entrepreneurial competencies may not be required for infomediaries who are engaging in knowledge transfer; however, they can still be valuable	Being entrepreneurial involves thinking outside the box and creating things we have never seen before, imagining very different outcomes and making them possible. This competency is a vital aspect of the innovation broker team. For knowledge brokers, you want to be able to spot when this is needed (and work with creatives who can help spark that).	

What do infomediaries do?

Good general and interpersonal competencies will be sufficient for acquiring and collating information. However, to translate information into the problem context, even at this most straightforward end of the spectrum, it is helpful to have developed many of these other competencies.

The infomediary role is not simple, even when making "simple/clear" decisions. It is not one-way communication. It involves careful listening and awareness of what perspectives and knowledge are being excluded (e.g. specialist knowledge on climate and crop physiology may be included, but knowledge of the social and political dynamics of the agricultural system excluded). It's helpful to involve different people who bring diverse knowledge and experience.

The figure below shows some of the roles and steps an infomediary usually needs to take when navigating a complex problem.

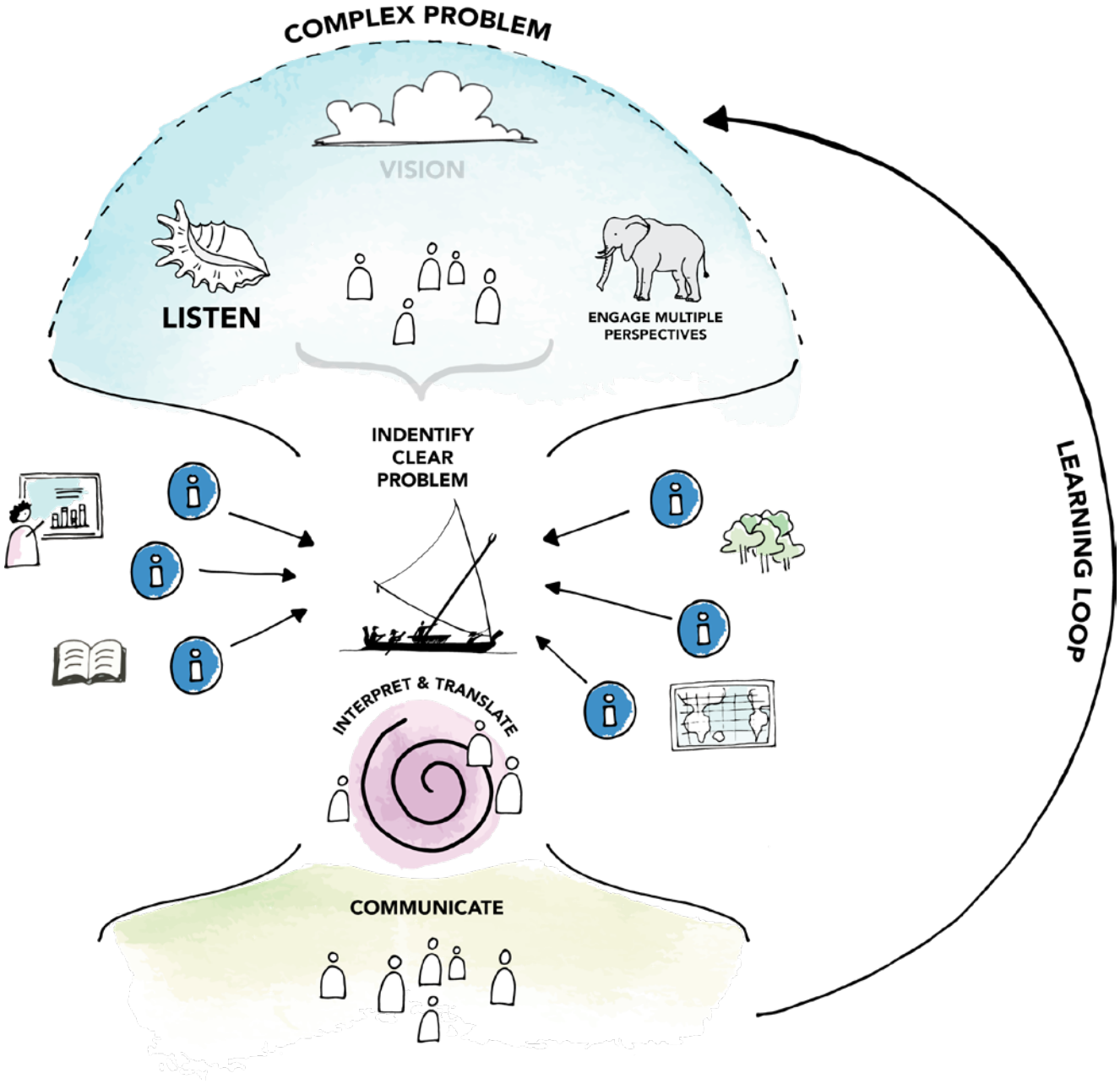
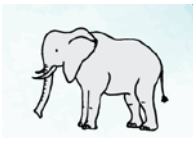


Figure 17 What infomediaries do. Diagram design by the CSIRO team.
Artwork by Dr Manuela Taboada, Queensland University of Technology

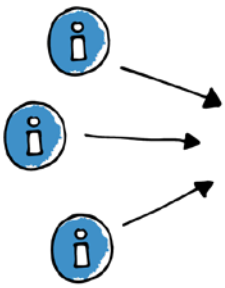


Listen and identify information needs

Infomediaries working in complex space help others navigate [**boat**] the problems and opportunities. This requires that they listen [**shell**] to stakeholders/clients/funders/beneficiaries about their problem description and identify **clear** problems and information needs (usually within a more complex context).

First and foremost, we cannot emphasise enough how important it is to listen to people about what they think the problem is. Different people can have different ideas about the problem [**elephant**] and what is needed to address it. It is worth taking time to foster listening between people to develop a shared understanding of some clear questions and the kind of information needed to answer those questions in a useful way.

There will be times when this is not possible, which is a sign that it is a more complicated or complex system.



Search and collate information

An infomediary then searches for and collates available information [**information icon**]. At this point, you are not expected to have all the information at your fingertips, which will involve those general and interpersonal skills as you seek out appropriate sources of knowledge and expertise.

For example, it may involve talking with weather experts in your local bureau of meteorology, asking for health or crop data from government departments or speaking with locals to learn about the impacts of extreme weather events. You may need to bring together different people who bring different skills into analysing and interpreting the information.

Interpret and translate

You may find yourself as a bridge between people who are providing information and people who are trying to make sense of that information in ways that are useful to them [**swirl**].

You may need to work with many people to make sense of the information coming to you. Don't expect to do everything by yourself, and be sure that every project will be very different and present unexpected challenges.

Learn

As an infomediary, it is also important to check whether the information and knowledge you provide are being understood correctly and useful for addressing the problem. Remember the importance of operating within the three learning loops.

Communicate

Collating and interpreting the information is only useful if you can communicate in a way that is accessible and useful for others. This process requires careful listening and learning as you try different ways of communicating the information.

This communication stage is also important for communicating any limitations or assumptions made in gathering or analysing the information in the first place. For example, in your clear problem, you may assume that temperature changes are more important than other climate change drivers, such as rainfall changes or extreme events.

What do knowledge brokers do?

More than knowledge translation, knowledge brokers co-produce knowledge with decision-makers and those affected by decisions. This process requires knowledge brokers to have access to a whole spectrum of broader and deeper competencies than those developed by an infomediary.

For example, it may be sufficient for an infomediary to have average interpersonal skills and be open to learning. But a knowledge broker needs to have strong interpersonal skills and normative competencies and be able to engage with ambiguity.

Co-production is defined by Norström et al (2020) as:

"Iterative and collaborative processes involving diverse types of expertise, knowledge and actors to produce context-specific knowledge and pathways towards a sustainable future."

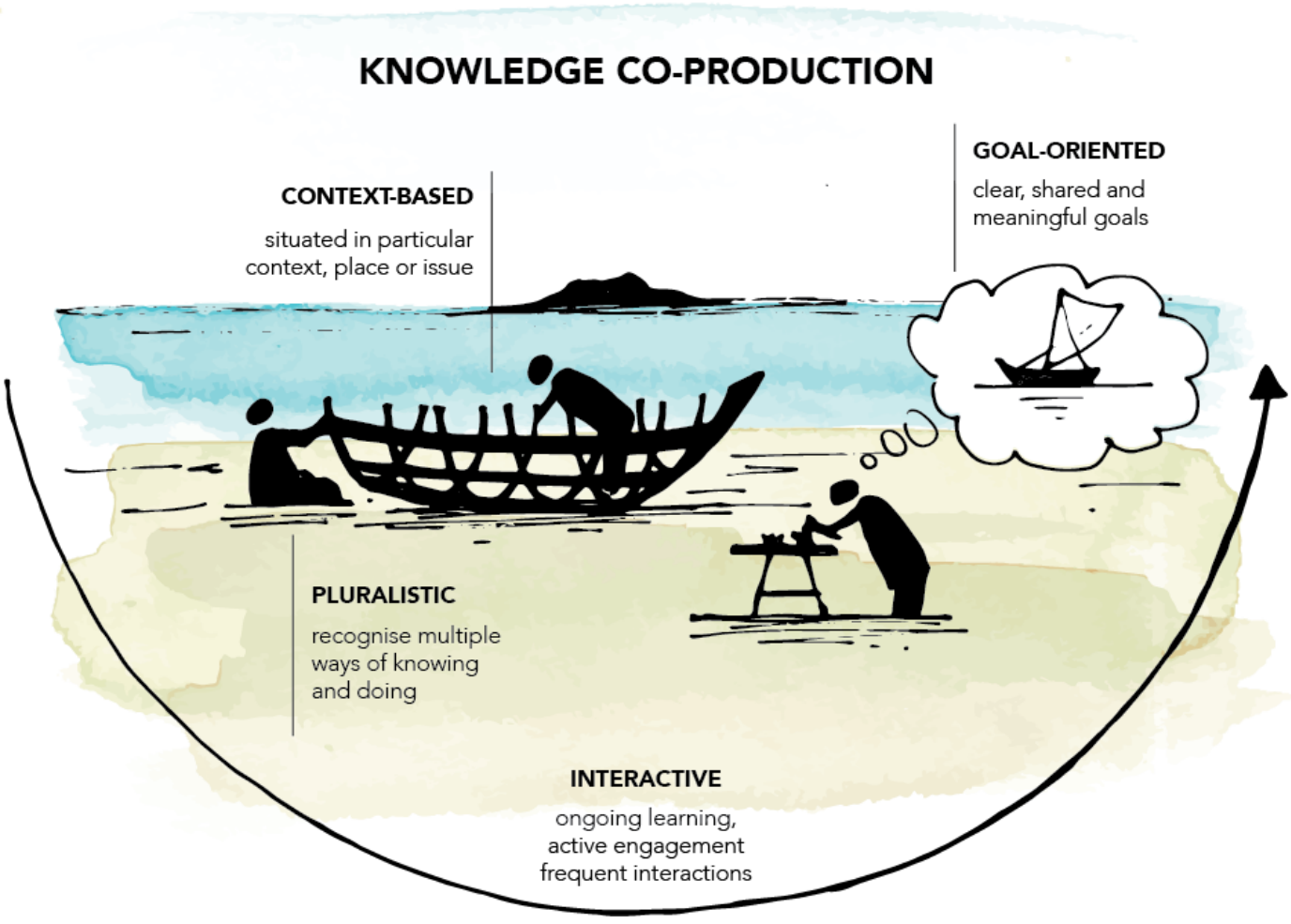


Figure 18 Co-production. Design concepts by the CSIRO team.
Artwork by Dr Manuela Taboada, Queensland University of Technology

There are four principles for knowledge co-production in sustainability research:

CONTEXT-BASED

Situate the process in a particular context, place or issue.

GOAL ORIENTED

Articulate clearly-defined, shared and meaningful goals that are related to the challenge at hand.

PLURALISTIC

Explicitly recognise the different ways of knowing and doing.

INTERACTIVE

Allow for ongoing learning among actors, active engagement and frequent interactions.

BUILDING A BOAT EXAMPLE

You need to understand the context before you start building, including does the boat have to stay in a river, or estuary or go on the high seas, how many people the boat needs to carry, and what suitable materials are available **(CONTEXT-BASED)**. For example, building a canoe is very different from building an ocean liner.

Once the context is understood, the team building the boat needs to have shared and meaningful goals around the type of boat to be built, time frames and budget **(GOAL ORIENTATED)**. The team also requires different skills and knowledges to ensure it floats and is fit for purpose, including, at a minimum, a hull, propulsion mechanism (motor or sailing or paddle), mechanical, navigation, safety and other systems. These knowledges are highly contextualised, especially if the boats are built locally, like the wooden boats and canoes in the Pacific **(PLURALISTIC)**.

As the boat is built, team members must constantly interact and learn from each other **(INTERACTIVE).** Often the team leader is the knowledge broker, ensuring that the boat building stays on track. However, they could not build the boat alone.

What do innovation brokers do?

Innovation brokers have to hold space for multiple voices and multiple options. They have to be flexible and give up preconceived ideas.

Generally, interpersonal skills and learning skills are crucial for solving complex problems. Innovation brokers need to build on the skills and competencies required for a knowledge broker and access a greater number of competencies to address challenges. In particular, entrepreneurial competencies are required to think outside the box, create things we have never seen before, and imagine very different outcomes and make them possible.

Innovation brokers

Analyse the context and look for relevant opportunities, problems, and solutions. They help build a shared vision.

Facilitate linkages between actors and identify complementary skills and resources essential to build and navigate the balloon.

They understand the system and facilitate interaction across it through multiple processes, including:

- action planning, and other tools
- identification and support to develop leaders that can manage multi-stakeholder processes
- translation of knowledge between actors
- building of trust
- motivating stakeholders
- managing conflict

Pacific islanders are good navigators. By building skills and competencies as you go down the river. With existing knowledge, you can sail or motor with a boat, but what happens when you get to the sea or as issues become more complex?

You need to find other modes of transport to get you to your destination more quickly and effectively, overcoming the crocodiles and sharks more easily and with a more strategic vision. One way to do this is to float into the air to see the whole picture and have 360-degree vision.

Innovation Brokers' role is to navigate and facilitate the creation of new solutions with diverse stakeholders and think outside the box.

INNOVATION BROKER EXAMPLE

CSIRO and local partners implemented the development of a maize cluster in Indonesia under a DFAT-funded project. The project initially started exploring drought-resistant maize and mungbean intercropping to improve soils, create more stable incomes, and enhance resilience to drought events. Initially, only researchers and the community were involved. However, it soon became clear that there were gaps in the innovation team and that stakeholders who supplied agri-inputs and finance were needed. The local research institution also knew that they could not reach scale. Therefore, they brokered a relationship with an agribusiness that established a number of small training centres to showcase the intercropping technologies and sell drought-resistant seeds and fertilisers. The local research institution with CSIRO brokered a relationship with a local bank to ensure credit for farmers, with the risk being born initially by the project.

The first year's success resulted in the local government wishing to scale the interventions across the island through a cluster. The net result was buy-in across multiple stakeholders to grow maize with mungbean, which has built resilience for the region.

Figure 19 Innovation brokers can see the big picture. Design concept by the CSIRO team.
Artwork by Dr Manuela Taboada, Queensland University of Technology

References and additional resources

If you would like to watch a YouTube video on this module, please see https://www.youtube.com/watch?v=DHDoKf1GiO0

Resources

WOOP

Wish, Objective, Obstacle, and Plan, or **"WOOP"**, is a science-based mental strategy that people can use to find and fulfil their wishes, set preferences, and change their habits. It was developed by Professor Gabriele Oettingen and her team.

In the links below you can find information about Prof. Oettingen and the basics of how WOOP works:

- https://woopmylife.org/
- https://as.nyu.edu/content/nyu-as/as/faculty/gabriele-oettingen.html

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Systems thinking

This module gives you a glimpse of systems theory and helps prepare you to make decisions in complex contexts.

At the end of the module, you should be able to:

1. **Understand systems thinking, including drivers and pressures.**
2. **Understand how to navigate uncertainties and risks in systems.**
3. **Know how to make better decisions as a knowledge broker in a complex world.**

What is a system?

> "A system is a set of things… interconnected in such a way that they produce their own pattern of behavior over time."
>
> — Meadows, 2008

A system is composed of related and dependent elements which, when they interact, form a unitary, complex whole.

It also may not always be clear what the system boundaries are. Often we have to define this based on what we are looking at, but there are always (or nearly always) external influences and drivers that can affect the system we are interested in.

An example of a system is the human body. Another example is an agricultural system composed of biophysical aspects (e.g. soil, water, crops, livestock, climate, etc.) underpinned by social-political and economic components.

Systems approaches aim to understand how a whole system works and interacts with other systems.

Knowledge brokers need to understand the system in which they operate to identify key issues and solutions that can help the system change to a more desirable state.

A complex world in constant change

The world is a complex system, and globalisation has made everyone and everything more connected than ever before. Wherever you work and whomever you work with, you will be highly connected to other levels of the system, such as the province, the nation, the region and the world, through transport, trade, internet communications and information flows.

Consequently, our world has become more dynamic and unpredictable because something that happens in one part of the system will rapidly affect another. We increasingly face systems challenges that cannot be solved in piecemeal and incremental ways. The COVID-19 pandemic is a clear example of this, as is climate change.

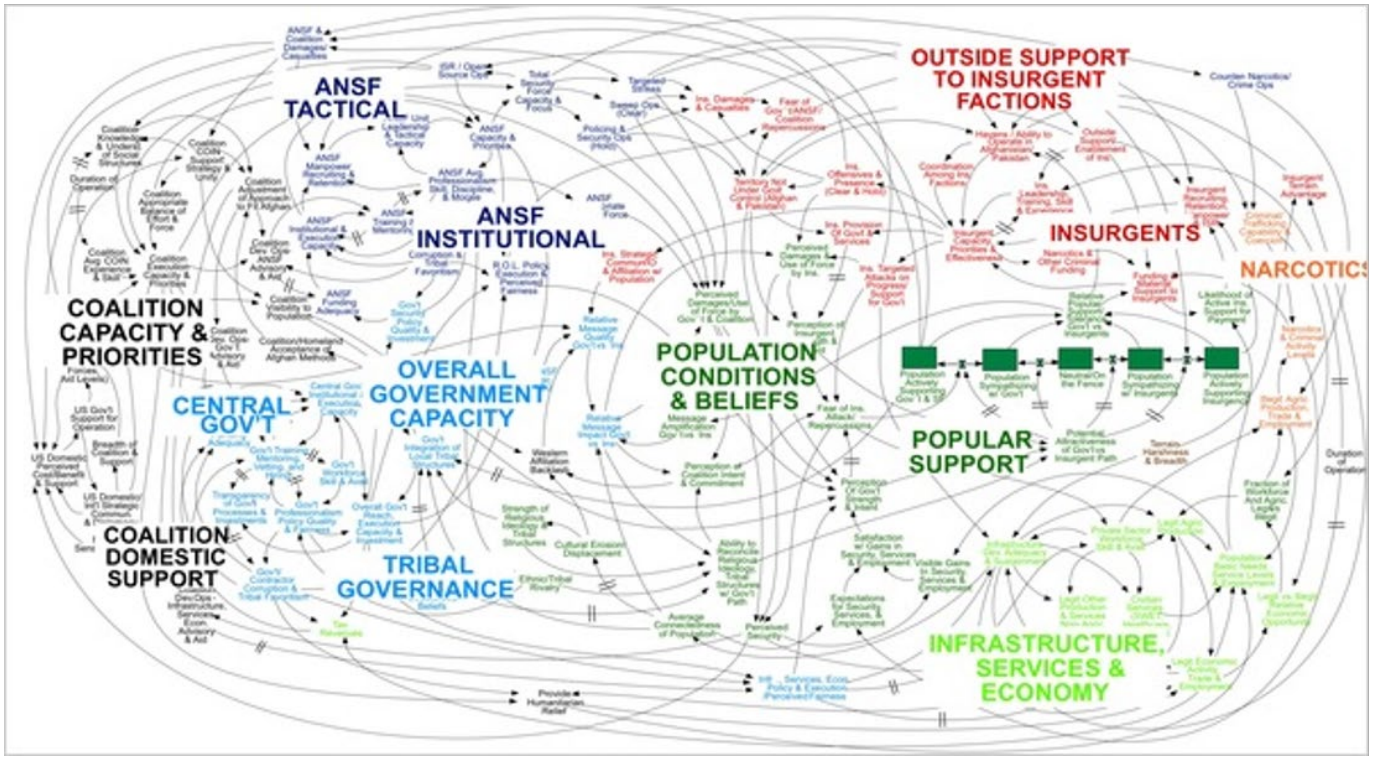


Figure 20 A description of a complex system – a visual representation of elements of war in Afghanistan highlighting the complexity of the issues. Sourced from Duncan Green (2016)

Systems thinking

Systems thinking is a way of understanding the world, which takes account of complex relationships between the various systems. It helps articulate the problem, and our assumptions and identify possible intervention points. It expands the range of choices and possibilities, especially if it is used in multi-stakeholder processes.

"Systems thinking explicitly recognises that we are a part of the system that we seek to understand and influence. It provides tools to assess and discuss causes, influences and interactions, and identify barriers to and opportunities for change."

Definition by: The Australian Government, Department of Home Affairs. 2019. Climate and Disaster Risk: What they are, why they matter and how to consider them in decision making. 3 Guidance on Vulnerability.

Identifying and understanding your system, drivers and pressures

When understanding your system, there are three aspects knowledge brokers need to think about:

1. The boundaries of your system.
2. The system context.
3. The drivers and pressures on your system.

Understanding the boundary of your system

An important first step is identifying the part of the system you are interested in (i.e. defining boundaries). This definition could be a location, a community, a town, a province or a region. While that is the focus of your interest, you must recognise that it is interconnected to other levels of the system above and below.

The boundaries should not be too narrow since this can restrict the identification of solutions. However, if too large, the system concerned may be unmanageable. The boundaries can be expanded as new systems issues emerge.

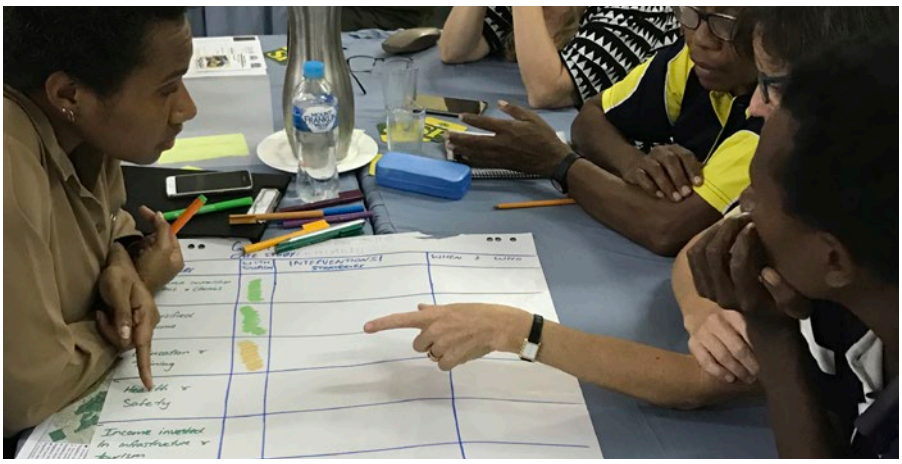
"Draw the boundaries of the system in a way which makes system change a viable activity" — Leadbeater & Winhall, 2020

You must also understand the **formal** and **informal** processes underpinning the system.

- Formal aspects are often well articulated through policy, rules and regulations.
- Informal aspects such as cultural norms are often important at a local community level (see the **Governance Mapping Tool** (KBSP Manual Vol 2), which can help you map informal and formal decision-making arrangements).

Understanding the system context

By better understanding the context you are operating in and seeing the connections between things, you can identify intervention points where it may be possible to create significant change.



Knowledge brokers need a good understanding of the systems they are working in and the context, including the social, political, economic and environmental aspects.

Within systems, there is both content and process complexity that influence the context and can be described as follows:

Content complexity

Problems are 'multidimensional'. They are interrelated and have feedback loops so that one event or issue is related to another such that the more the first changes, the more the other one becomes acute or improves.

Process complexity

Many stakeholders are involved in a system, creating issues and generating solutions. Stakeholders have different viewpoints, values and objectives, which often are at odds with each other.

It is important to understand how people interact with their system. People or the environment are not considered in isolation. Understand what has happened historically, as this can impact how the system works, the drivers and pressures, and how decisions are made.

Decisions that need to be made and solutions that are generated are often complex, involving an understanding of the system and requiring deep collaboration with multiple stakeholders. Systems solutions are also often emergent, requiring ongoing engagement processes that build trust, transparency, adaptability, and learning.

For projects or programs, you need to think about:

- **Where** are you working and why?
- **Why are you interested** in doing this project, **why are others** interested?
- **Who** needs to be involved, including decision makers, key actors in the system? When thinking about who should be involved also think about what you can do to address power imbalances and ensure a diversity of participants.
- **What** do you need to do, and **when** and **how** would it be best to do it?

Systems drivers and pressures

You need to identify the drivers of change that are acting upon your system of interest, and which will potentially shift or change your system in the future.

The drivers may be emanating from the same level of the system (e.g. local population growth), or from levels above (e.g. national land clearing policy, climate change, global pandemics).

Drivers are the factors that cause change. e.g. changes in climate, population, technology, economics.

Pressures are the more immediate factors that affect the environment. e.g. urbanisation, food productions, mining.

Source: Australian State of the Environment (2011)

There are many systems drivers which, as a knowledge broker, you may need to understand to help you support communities to make decisions about their future.

It is important to consider multiple drivers of change in systems.

This module focuses on **climate change** and **population growth**, which are the primary drivers of future change for communities in the Pacific and other regions of the world.

Climate pressures

Usually, a "Business as Usual" emissions scenario, where the following pressures can be analysed:

- Temperature increase
- Rainfall change (annual and seasonal)
- Storm intensity
- Sea level rise
- Ocean acidification

Human pressures

Population growth and density is one of the most common drivers that causes pressures such as:

- Harvesting of natural resources (water, timber, fisheries, etc.)
- Land-use change from building infrastructure
- Natural resource use (e.g. firewood)
- Pollution

COCONUT RHINOCEROUS BEETLE – IMPACTING FOOD SECURITY AND LIVELIHOODS

An example of a driver is the recent arrival from South-east Asia of the Coconut Rhinocerous beetle (*Oryctes rhinoceros)* in the Pacific. It is rapid damaging and destroying coconut, betel nut, sago and oil palm, bananas, sugarcane and tree ferns impacting food security and livelihoods of many families across the region. The loss of coconut palms in coastal areas is also resulting in increased erosion as these trees are vital for erosion protection. Previously it was controlled by a virus and cooler temepratures. As temperatures increase with climate change so the range and rate of spread of the beetle will be even faster.

Knowledge brokers from Australian and Pacific research institutions are working together with communities and government to develop strategies to control the bettle's spread and minimise the impact.

CYCLONES

Cyclones have always been a part of life for most of the countries in the Pacific (pressure). High winds and increased wave levels can be devastating in terms of the damage and destruction of infrasture, housing, crops and coastal resources like mangroves and coral reefs. While communities have found ways to adapt, these events severely impact their ability to meet basic living standards and feed themselves. Women, children and the elderly are the most vulnerable.

As sea temperatures increase with climate change (driver) cyclones are becoming more frequent and more intense, causing even more damage and stressors for communities, with some households never recovering between events. Households are becoming increasingly vulnerable and unable to build sustainable livelihoods.

EXTERNAL DRIVERS AND IMPACTS ON FOOD SECURITY – UKRAINE RUSSIAN WAR

Often drivers can come from outside of the Pacific and compound existing pressures. An example is the Ukraine Russian war which started in 2022 while the impacts of the COVID-19 pandemic were ongoing. This war resulted in a rapid increase in costs of fertilisers and fuel due to the embargo against Russian exports and the difficulties in shifting goods out of Ukraine. In addition, Ukraine and Russia produce 25% of the world's wheat. The net result has been difficulties for farmers to obtain fertilisers compounded by increased costs due to rising fuel prices.

These issues have challenged food production systems around the world, including in the Pacific, with many areas reducing production. Rising fuel costs have also created challenges for transporting agri-food commodities from rural to urban areas. The cost of wheat products has also increased substantially. The net result is that urban and even rural communities are spending an increasing proportion of their incomes to meet basic food needs or reducing food consumption. The long term implications are still unclear, but this has the potential to adversely impact on nutrition of households, which was already decreasing in many places due to changes in food access due to lockdowns during the height of COVID-19 pandemic. It is clear that overlapping drivers in the system are challenging food security.

REFLECTION QUESTION – What are the main drivers of change for your system of interest, and how might these shift by 2030, 2050 and 2100?

Compiling information on drivers and pressures can be difficult, but it is important for planning adaptation

Useful things to consider when analysing drivers of change are:

Time slices

Definition – intervals of time you want to present back to your stakeholders.

Generally, CSIRO has found that 2030 (not too far in the future) and 2050 (about a generation) are useful time-slices to consider. Sometimes 2100 is also informative but is often highly uncertain, and considered as too far into the future, and therefore not as relevant.

Future scenarios for drivers and pressures

Because climate change is uncertain, having multiple future scenarios of climate pressures is useful. Perhaps the most useful scenario is the 'worst case' or 'Business as Usual' scenario, which assumes that global greenhouse gas emissions are not mitigated (see the module on Climate Information for more on how to access climate data and scenarios).

Population growth is uncertain and may vary depending on growth rates and migration. Again, future scenarios based on different possible growth rates will be useful. The 'Business as Usual' scenario usually is based on the current growth rate and, therefore, not as relevant.

Population growth pressures

Population growth is a significant driver of a system, which increases pressures on natural resources such as utilisation, pollution, and land use.

Natural resource utilisation

Many natural resources will have a finite yield that can be harvested, and overharvesting will reduce its status and yield. The population cannot grow indefinitely across a finite ecosystem. There is a limit to the population that the ecosystem's natural resources can support. This limit is called the carrying capacity.

Pollution

Pollution is another population-driven pressure. Pollution increases as the population grows, negatively impacting the volume and quality of goods and services the ecosystem can provide.

Land use

Land use also intensifies and changes as the population grows. To support an increasing population, land within the ecosystem is converted to housing or infrastructure, which can reduce the amount of land available for agriculture or the remaining native ecosystems, or both.

Population data sources

There two sources of population data that CSIRO has used for projects in the Pacific region: national censuses and the United Nations World Population Prospects.

EXAMPLES OF NATIONAL CENSUS DATA

PNG National Statistical Office:
https://www.nso.gov.pg/statistics/population/

Solomon Islands National Statistics Office:
https://www.statistics.gov.sb/statistics/social-statistics/population

The data available from individual country censuses varies, but reports may include historic population data as well as population projections. Data is collated at different levels, depending on how the census was conducted, and may be available for national, provincial, local government or ward areas. Unfortunately, not all data is necessarily available at all spatial or projected scales.

INTERNATIONAL POPULATION STATISTICS

World Population Prospects – United Nations Population Division of the department of Economic and Social Affairs:
https://population.un.org/wpp/DataSources/

The UN dataset is at national level only and includes historic population data that have been compiled from census reports from countries across the globe. It also includes population projections at national level based on fertility, mortality and migration modelling. These projections can be somewhat uncertain.

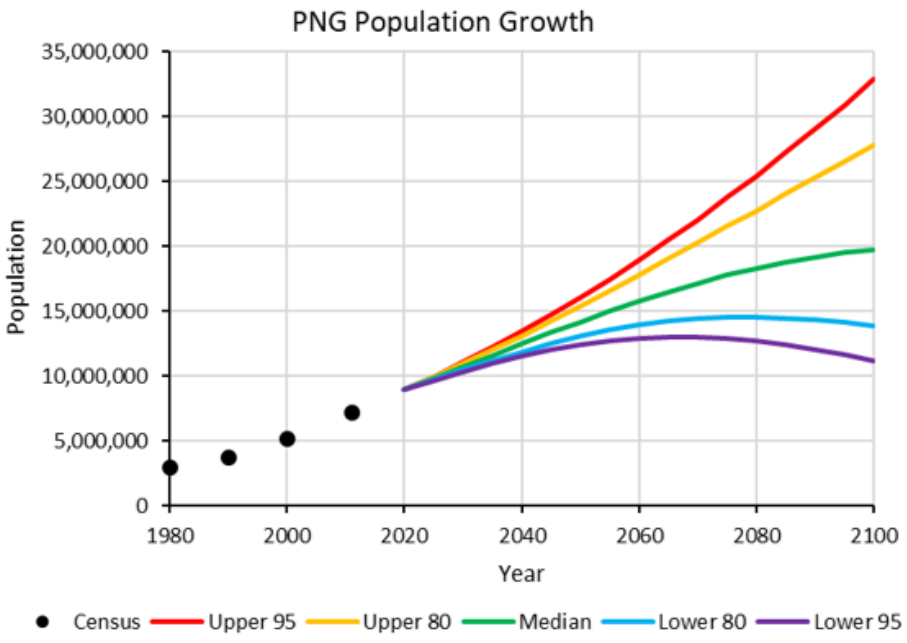


Figure 21 Historical and projected population growth in Papua New Guinea (1980-2100). The graph shows Papua New Guinea's historic population and probabilistic population projections from the UN dataset. The projections show there is great variability and therefore uncertainty across the range of probabilistic percentiles. Source: United Nations Probabilistic Population Projections based on the World Population Prospects 2019

Estimating population projections

Where your case study is at a spatial scale where population projections are not available, these projections can be estimated.

Follow these steps for a way to do it:

STEP 1 CALCULATING THE POPULATION GROWTH RATE

Beginning with historic population data from national census reports, the historic growth rate can be calculated as the change in population over time.

It is subjective which data intervals to include in this calculation and knowledge of the drivers of historic trends is helpful.

The population density growth rate is simply the population growth rate divided by the land area occupied by that population.

STEP 2 CALCULATING POPULATION PROJECTIONS

Beginning with historic population data from national census reports, the historic growth rate can be calculated as the change in population over time.

It is subjective which data intervals to include in this calculation and knowledge of the drivers of historic trends is helpful.

The population density growth rate is simply the population growth rate divided by the land area occupied by that population.

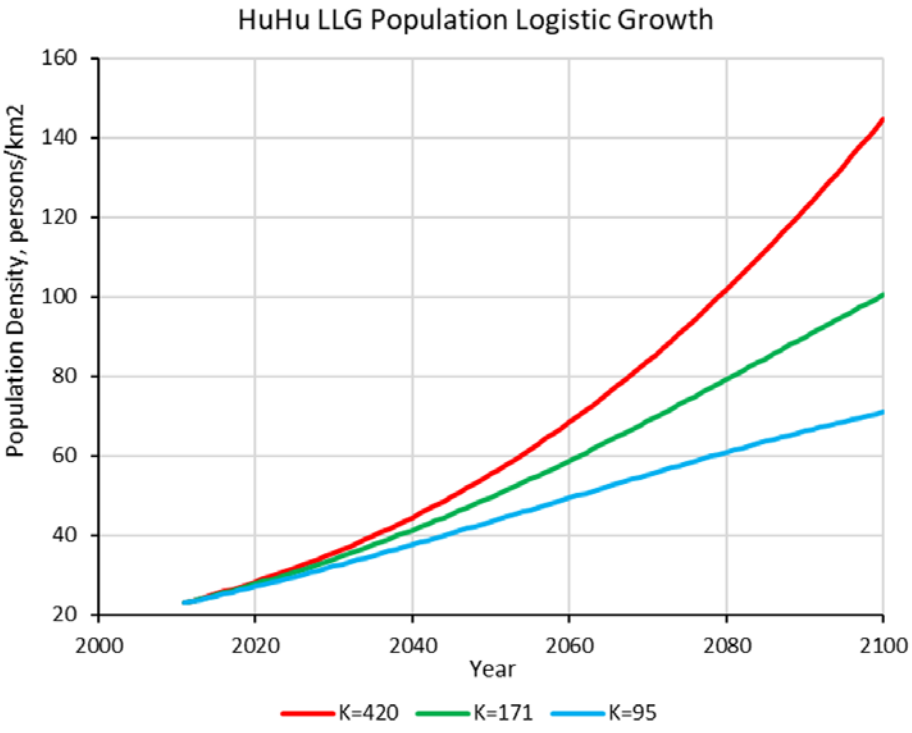


Figure 22 The graph shows population density projections to the end of the century used in the Huhu local-level government case study for three different carrying capacities. It is clear that future population densities are quite sensitive to the carrying capacity used to calculate them, leading to much uncertainty in these projections.

REMEMBER: You don't have to do this alone!

It is usually helpful to ask for input from specialists to get projections that will better suit your particular project.

Navigating systems

Uncertainty in complex systems

Operating in complex systems means encountering uncertainty. Knowledge brokers must be aware of existing and future uncertainty.

Uncertainty is increased where there are interactions from multiple drivers on your system of interest, such as climate change and population growth. It can be helpful to be aware of the different kinds of uncertainty or 'unknowns' encountered when making decisions

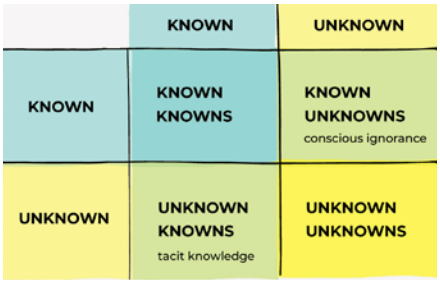


Figure 23 Types of unknowns.
Artwork by Dr Manuela Taboada, Queensland University of Technology

Embracing uncertainty

There are many types of unknowns.

Sometimes an important role for a knowledge broker is to help others understand uncertainty and complexity and what that means for decision-making.

Every situation will be different.

Even if there is a large amount of uncertainty, don't try and reduce the uncertainty, or try to pick the most likely future. Instead, focus on insights most likely to hold true despite the uncertainty.

Help people understand the assumptions behind the information you present on drivers and pressures, including climate projections.

KNOWN KNOWNS **are the things you know you know about.**	For example, you know that your water tank is filled from rain falling on your roof and how much rain falls on your roof if you measure it with a rain gauge.
UNKNOWN KNOWNS **are the things you don't realise that you know or find very hard to explain to others.**	For example, some people know how to foster a sense of trust and safety in the people around them, and yet they may never have tried to break down all the steps involved so that they could explain in detail to others how they do it. Even if they try to teach others, other people may never be able to do it as well.
KNOWN UNKNOWNS **are the things that you know are deficiencies.**	For example, climate scientists know a lot about the uncertainties in climate change. They can tell us about the unknown parts of the science, and often they can give sophisticated descriptions of the probability of different outcomes. This allows us to plan based on what is likely or unlikely, even though we don't know everything we would like to know.
UNKNOWN UNKNOWNS **are the things that catch you out because you are not prepared for the fact that you do not know about them, and you only find out about them after they have impacted you. When thinking about future risks, you always have these unknown unknowns in mind.**	For example, before the COVID-19 pandemic, people knew that pandemics were possible, so the possibility of future pandemics was a known unknown, but everyone learnt things about the pandemic's impacts that never occurred them to think about. During the pandemic, many people left the cities and returned to their villages or home towns, causing pressure on village resources. Some people have not anticipated this, while this was a natural response during crisis for others.

Navigating uncertainty

When navigating uncertainty, focus on things that people care about instead of trying to find a simple answer to future uncertainty.

For example, if you are being asked...

... *"All those possible futures are confusing – can't we just pick the most likely?"*	... *"All this uncertainty is getting in the way of us making decisions – what can we do to reduce it?"*	... *"The complexity is confusing – please simplify it and tell us what we need to know?"*
Possible consequences might be ... You risk locking in decisions for only one future. These may be maladaptive in other futures that are equally or more likely.	**Possible consequences might be ...** You risk not taking useful actions now. Some uncertainties are not reducible.	**Possible consequences might be ...** A simpler story doesn't make the complexity go away. You risk reducing your options and making decisions based on assumptions that will not hold in many circumstances.
Try asking this instead ... *"Can we identify what we really care about and look after those things no matter what future is ahead of us?"*	**Try asking this instead ...** *"What decision-making processes will help us make future-ready decisions even when there is high uncertainty?"*	**Try asking this instead ...** *"What practices will help us accept and engage with complex realities rather than seek to simplify and avoid them?"*

Image by Tom Greenwood

Risk in a complex system

When considering uncertainty in systems, you also need to consider risk.

The IPCC defines **"risk"** as "the **potential for adverse consequences** where something of value is at stake and where the occurrence and degree of an outcome is uncertain".

It is also often defined as the likelihood of a hazard and impact. There are two types of risk: **perceived risk** and **actual risk.**

Perceived risk can drive behaviour.

Understanding **actual risk** can help determine the most appropriate response.

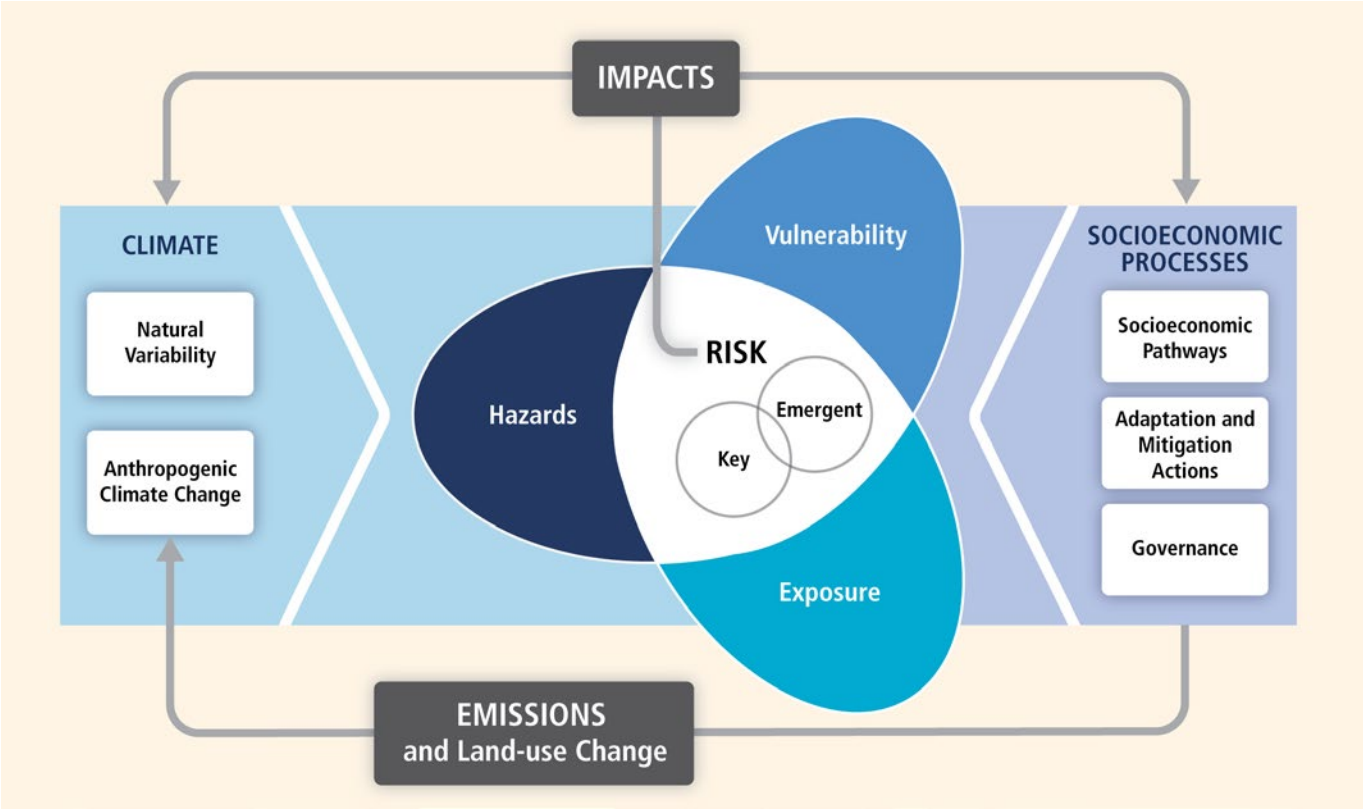


Figure 24 Risk Management Strategy Source: Figure 19-1 from Oppenheimer, M., M. Campos, R. Warren, J. Birkmann, G. Luber, B.C. O'Neill, and K. Takahashi, 2014: Emergent risks and key vulnerabilities. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1039-1099.

When considering the impacts of climate change, there is the potential for adverse consequences due to a specific climate hazard and potential adverse consequences due to adaptation or mitigation responses to that hazard.

The adverse consequences might be on lives, livelihoods, health and well-being, ecosystems, economic, social and cultural assets, services (including ecosystem services), and infrastructure.

In a complex system, other drivers will also interact with climate change, leading to other 'emergent' risks.

When knowledge brokering, you will find some key risks to things that your communities care about, as well as emergent risks, which are harder to anticipate.

EXAMPLE 1: CHANGES IN RAINFALL

Changes in rainfall can adversely affect the availability of surface water for drinking.

In many locations, women and girls are responsible for collecting drinking water. The net result is women and girls have to spend increased labour and time fetching water for household use. For girls, this can reduce their ability to attend school.

At a household level, this can also result in water rationing, impacting hygiene and reducing meals cooked, resulting in declining nutrition.

EXAMPLE 2: BUILDING A SEA WALL

A policy to build sea walls in anticipation of sea-level rise could have adverse economic consequences and cascading impacts because sea walls are expensive. It could have adverse health impacts if water cannot drain away, resulting in stagnation.

Be broad in your thinking about risk. Think not only of the climate-related hazards but also of emergent risks that arise from our social responses to perceived risks.

Risk management strategies

In risk management, it can be helpful to recognise some of the different kinds of unknowns that we are dealing with in complicated and complex systems. The table below describes three challenges: complexity, uncertainty and ambiguity, and the associated risk management strategies.

CHALLENGE	RISK MANAGEMENT STRATEGY	DESCRIPTION
Complexity	Use best available knowledge to inform how to limit exposure and reduce vulnerability to hazards.	Complicated web of causal relationships where many intervening factors interact to affect the outcome of an event or activity.
Uncertainty	Improve capacity to cope with uncertainty and surprise (e.g. adaptation planning, building capacity for flexible responses, building buffers for absorbing shocks).	Lack of reliability or confidence in our understanding of cause-effect relationships.
Ambiguity	Participatory processes for resolving conflict and ensuring fair consideration of concerns when developing and implementing options they have ownership of solutions.	Conflicting views about the interpretation of risk and its acceptability.

Making decisions in a complex world

Living in such a complex world requires us to use systems thinking if we want to successfully navigate complex contexts where uncertainty and risk might make decision-making harder.

By better understanding the context you are operating in and seeing the connections between things, you will be able to identify intervention points, discover your own assumptions, formulate relevant questions, and hopefully prevent undertaking maladaptive activities.

In this section, you will find two approaches that might help you frame your decision-making process.

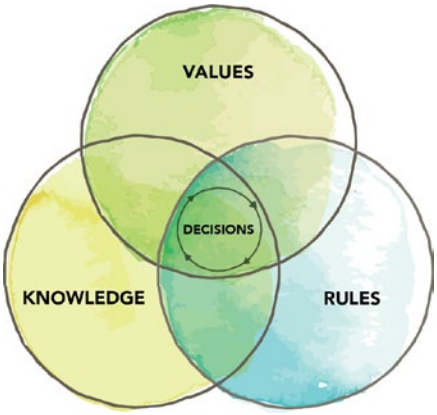


Figure 25 Values, rules and knowledge. Source: Gorddard et al (2016).
Artwork by Dr Manuela Taboada, Queensland University of Technology

Values, rules and knowledge

Understanding the values, rules and knowledge (VRK) involved in a certain context can be of great help when making complex decisions. According to this framework, decisions should be made based on the relationships between these three components.

- **VALUES We need to want the outcomes**
- **RULES We need to be allowed to implement the option to achieve the outcomes.**
- **KNOWLEDGE We need the knowledge to choose and implement an option.**

We often have good methods, precedents or personal experience for helping us choose among options in the central space (decision-making).

AN AUSTRALIAN EXAMPLE...

In Australia, we sometimes have a water supply problem due to drought. One way to improve this supply problem is to recycle water for drinking.

The knowledge for how to do this is well understood, in fact countries like England and Singapore have been doing it for years. The rules are in place to allow for the implementation of the recycling process, but the Australian public has concerns and doesn't share the value of recycling water. Work needs to be undertaken to better understand why and to potentially shift these values.

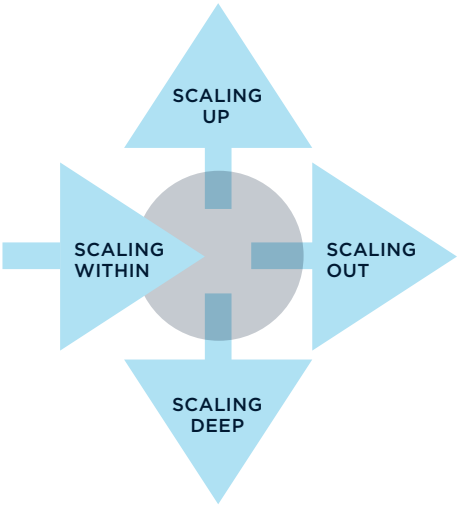


Figure 26 Scaling Up, Out, Deep and Within.
Design idea by Zelda Hilly

Scaling

For systemic change to occur, the impacts of projects and activities need to be durable and to diffuse across levels of the system. This is often referred to as 'scaling up', 'scaling out', 'scaling deep' and 'scaling in'.

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. This assumption is often false because there are **four main ways to scale:**

- **SCALE UP This is achieved through laws and policy,** e.g., taxes or environmental protection rules.
- **SCALE OUT This is achieved through replication when your model is applied in other contexts or communities.** e.g. in agriculture, it is common for farmers to copy their successful neighbours or other successful communities.
- **SCALE DEEP This is achieved by changing cultural norms** e.g. in Australia a good example is smoking — after many years of heavy behavioural change campaigns, there are now far few people smoking in the country.
- **SCALE WITHIN This is achieved through you and your organisation** e.g. in CSIRO and science more broadly, there has been a challenge to get more women to participate, particularly in leadership roles. CSIRO is actively implementing One Sage (Science in Australia Gender Equity) to change this.

Different modes of scaling are crucial for achieving impact and benefit.
It is not always clear which will be the best scaling mode; often, it is not one single pathway.

Innovation brokering and climate change

Communities, community development and adaptation, are all part of a system. Due to globalisation, communities are tightly connected to drivers of issues from the global to the local level, but also between natural and human systems, resulting in complex and rapid change.

Climate change is one part of the system. When it interacts with other drivers, especially population growth, it generates high uncertainty about the future, with a range of complex risks and outcomes.

In these situations, brokers must deal with multiple issues when supporting decision-making about community adaptation and development. Also, many different stakeholders are often involved in decision-making, and the problems being addressed will require their different knowledge types to be integrated.

In complex decision-making contexts innovation brokers who can understand the system they are dealing with, the range of future uncertainties and risks, and facilitate decision-making about unknown futures, are required.

They will need a wide range of competencies, and in particular systems-thinking, future-thinking, critical-thinking, interpersonal skills, openness, creativity and comfort with ambiguity.

Rather than relying on one person to provide these skills, plus those of knowledge broker and knowledge translator or infomediary, it may be best to assemble a team of people with complementary skills who can work together.

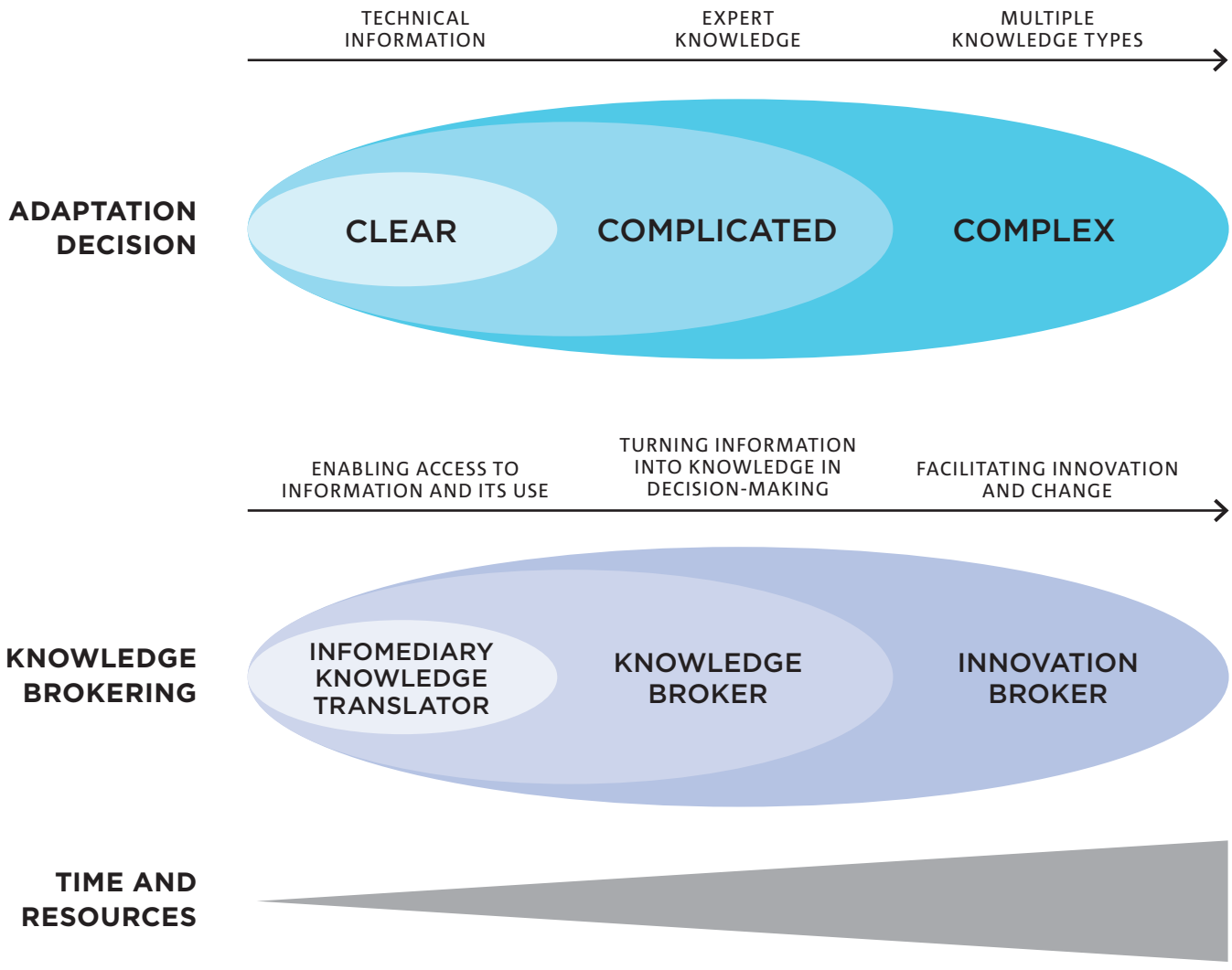


Figure 27 Types of knowledge brokers needed for clear, complicated, and complex adaptation decisions.

References and additional resources

If you would like to watch a YouTube video on this module, please see https://www.youtube.com/watch?v=htFmbUGmohA

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Seona Meharg (CSIRO): an integration scientist focused on the capacities and competencies needed for systemic change, and with experience in research evaluation and project management for transdisciplinary projects.

James Butler (CSIRO): a sustainability scientist with a background in agricultural economics, terrestrial, freshwater and marine ecology gained in southern Africa, Europe and Australia.

Emily Barbour (CSIRO): a research scientist in hydrology. Emily works on a diverse range of water issues focusing on collaboratively generating knowledge and tools to support decision making for complex environmental challenges.

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Sara Busilacchi (Independent research scientist): research scientist with a background in fisheries science with a focus on social-ecological systems thinking for the sustainability of small-scale fisheries in a changing world using collaborative and participatory approaches.

Anthony Nadelko (CSIRO): a research technician who investigates the environmental interactions, resource use efficiency and sustainability of natural and human-made ecosystems.

Samantha Stone-Jovicich (CSIRO): an anthropologist with an interest in strengthening science's contribution to on-the-ground impacts and a focus on complexity-aware monitoring, evaluation and learning (MEL) frameworks and tools to critically assess current research approaches and practices and to foster experimentation with new ways of thinking and practice to better bridge science and meaningful, lasting social change.

"None of us, including me, ever do great things. But we can all do small things, with great love, and together we can do something wonderful." — Mother Teresa

Monitoring, evaluation and learning

In this module, you will gain an understanding of some theories, tools and approaches/processes that can help you design your projects and activities, learn what works and what doesn't, and how to develop stories of impact.

At the end of the module, you should be able to:

1. **Understand what monitoring, evaluation and learning can do for your projects.**
2. **Have an awareness of why learning is important.**
3. **Be able to create your own Monitoring, Evaluation and Learning framework.**

This module is related to further learning that you can explore in the module on Theory of Change.

Why do some projects succeed?

Have you ever wondered why some projects have more impact than others? Or watched as a successful project failed to create change that lasted beyond a year or two after completion?

Monitoring, Evaluation and Learning (MEL) helps us to get better at designing, implementing and learning from projects to ensure that we learn from our mistakes and get better results the next time.

Two approaches and tools that can help you to improve the success of your projects are:

- Theory of Change
- Participatory MEL

Image by Tom Greenwood

What is Monitoring, Evaluation and Learning (MEL)?

Much like a Theory of Change, Monitoring, Evaluation and Learning is both a set of tools and processes that allow us to design better, implement, learn from and showcase the impact of our projects.

MONITORING

Tracking actions and their consequences.

- What is happening?
- What has changed?

EVALUATION

What actions/outcomes were of worth/value, for who and why?

- Did things go as planned?
- Why is this change or lack of change important?

LEARNING

A process and an outcome.

- **Process** – something experienced, for example an insight that could be used to inform a decision.
- **Outcome** – can be both individual or collective, such as new knowledge, an understanding, a new ability, etc

Why is MEL undertaken?

MEL is a valuable tool that can be a light touch or all-consuming. Before embarking on designing and implementing a MEL framework, it is worth thinking about why you are doing it, and what resources are necessary for what you hope to achieve.

Monitoring, Evaluation and Learning is undertaken by many groups for multiple reasons including:

- **Learning to do better** in your activities, projects, programs and policies, etc.
- **Accountability and transparency** in financial, social, ethical, regulatory and other aspects.
- **Impact assessments** demonstrating value, sharing success stories and other lessons for scaling.

Who is interested in MEL?

When designing your MEL framework it is important to consider why you are doing it and who will benefit, including:

- Project team
- Funding agencies
- Community
- Stakeholders

Benefits of doing MEL

Implementing effective MEL can be time and resource intensive. However, in a rapidly changing world, we will only learn to make better decisions and help others make better decisions by implementing strategies to learn and share that learning.

When done in collaboration with communities and stakeholders, MEL can increase efficacy, enable critical, strategic and future thinking and be empowering even when things don't go to plan. It helps to build resilience by showing how problems are solved.

MEL can also be used to remember and celebrate the good things that happen, which is important for knowledge brokering.

"Stories are a powerful way of learning and sharing as they help people make sense of events and predictions and turn facts into meaning. Project learning stories can enable people to see new opportunities, create new connections and new questions for further investigation which can trigger new ways of operating. Stories help people understand how the world is changing, why that change is occurring and what they can do in response." — Fincher et al 2014

Pacific ways of learning and sharing

People from the Pacific have a long history of storytelling and already appreciate how valuable it is for learning and sharing.

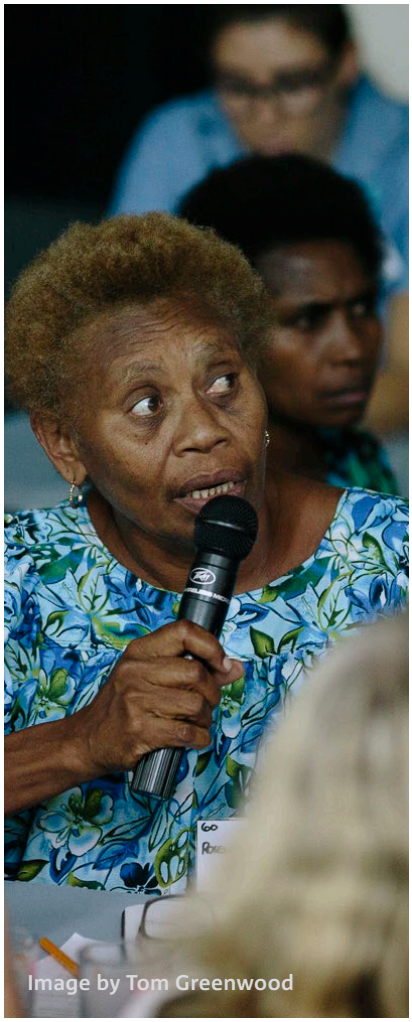

Image by Tom Greenwood

Tok stori

- is a Melanesian term for what Solomon Islanders do everyday – telling stories, creating a joint narrative, and making sense of life. But that's not the whole story.
- helps create and maintain relationships, it comes in multiple forms, and is helpful for an ever-increasing range of purposes.
- makes claims to ontology, methodology and method. Storying takes place in space and time. It reveals people as experts in their own lives.

Source: https://www.dlprog.org/opinions/talking-about-tok-stori

More on Tok Stori in leadership education can be found in:

Sanga, K., Reynolds, M., Houma, S., & Maebuta, J. (2021). Tok stori as pedagogy: An approach to school leadership education in Solomon Islands. *The Australian Journal of Indigenous Education, 50*(2), 377-384. doi:10.1017/jie.2020.31

Talanoa

Tongans, Samoans and Fijians share the term Talanoa.

"Talanoa is a process of inclusive, participatory and transparent dialogue. The purpose of Talanoa is to share stories, build empathy and make wise decisions for the collective good.

The process of Talanoa involves the sharing of ideas, skills and experience through storytelling.

During the process, participants build trust and advance knowledge through empathy and understanding. Blaming others and making critical observations are inconsistent with building mutual trust and respect, and therefore inconsistent with the Talanoa concept. Talanoa fosters stability and inclusiveness in dialogue, by creating a safe space that embraces mutual respect for a platform for decision making for a greater good."

Source: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement/2018-talanoa-dialogue-platform

Creating a MEL framework

A MEL framework is created and used in order to learn from the implementation of your adaptation program activities. A MEL framework often includes:

1. An articulation of the project Theory of Change (picture, narrative or both).
2. The questions the project is hoping to answer (what works, what doesn't and why).
3. A set of tools and processes for capturing qualitative and quantitative data associated with the monitoring process (e.g. surveys, interviews, biophysical indicators, number of outputs, participants, gender aspects etc.).
4. A timeline for collection, synthesis and reporting (to whom and for what).
5. Process for feeding lessons learnt back into the project.

Implementation of a MEL framework would ideally be aligned to other evaluation activities within your organisation or for funders' requirements for efficiency and also to share lessons.

Prior to implementing a MEL framework, consider:

- **DATA COLLECTION**
  - How and when will the MEL data be gathered?
- **LEADERSHIP**
  - Whose role will it be to undertake the suggested evaluation activities including data collection, synthesis and reporting?
- **ETHICAL CONSIDERATIONS**
  - What can you do to address any power imbalances and ensure you capture diverse perspectives?
- **GATHERING / SORTING DATA**
  - How will data and subsequent information/materials generated be stored?
- **AUDIENCE**
  - Who are the intended audience(s)?
- **USE OF MATERIALS**
  - How do you anticipate the materials generated will be used?
- **DISSEMINATION**
  - How will the materials generated be disseminated?
- **ANALYSIS**
  - Who will be responsible for linking any lessons into the project?

Image by Seona Meharg

MEL and Theory of Change

Theory of Change and MEL are part of an interactive project cycle where each informs the other. The Theory of Change enables the design or re-design of a project and the associated learning framework. As the project is implemented, the learning framework helps us understand what is working and what is not working, allowing adjustments to the project and the Theory of Change. This is an adaptive management cycle.

There are many tools and approaches that you can use to undertake monitoring, evaluation and learning. **Using multiple tools and approaches in the same project or activities is often a good idea to ensure you have captured all the intended and unintended insights, lessons and impact stories.**

A good place to start is with your Theory of Change, what were the outputs, outcomes and challenges you identified, and what would be a good way to identify and assess these.

One participatory evaluation tool and process that you can use to capture insights and lessons with your stakeholders can be found in the module on **Participatory MEL**.

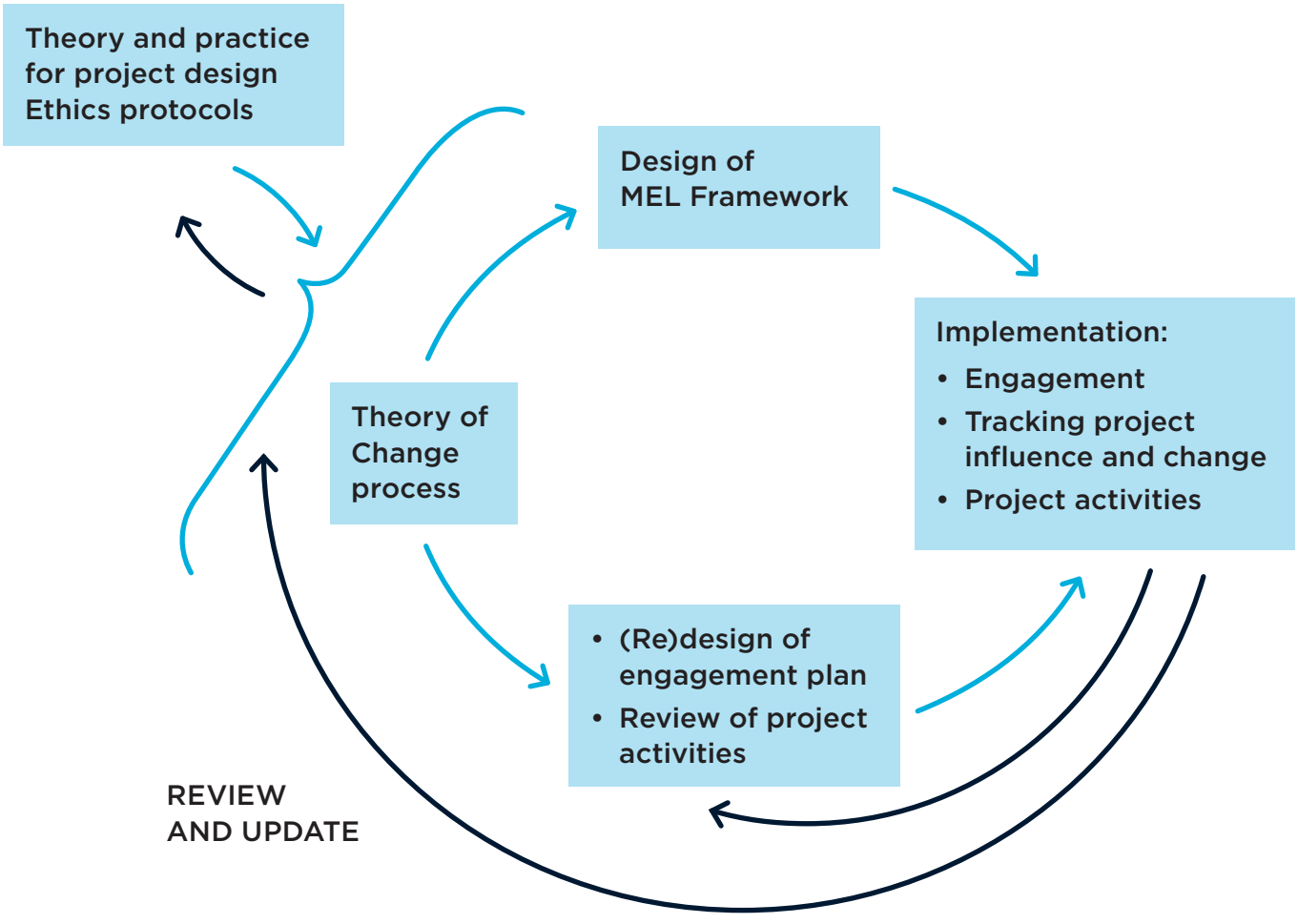

Figure 28 Connections between Theory of Change, Monitoring, Evaluation and Learning, and the project cycle
Adapted from image created by Dr Rachel Williams (CSIRO)

References and additional resources

If you would like to watch a YouTube video on this module, please see https://www.youtube.com/watch?v=beIXYMueFtk&t=799s

Resources

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Climate information

This module introduces some climate data sources and information available for the Pacific region.

After completing this module, you will better understand:

1. **Where and how to access various climate information;**
2. **When to get specialist assistance to support you;**
3. **Challenges of using climate data.**

Introduction

In this module, we assume that you have listened to stakeholders and identified a clear problem that requires climate information.

It is likely you will need to work with climate specialists to identify appropriate climate information and how to use it. Before doing so, it is useful to have an overview of the kinds of information that are available.

It is easy to be overwhelmed by the many kinds of climate information found in different places, so in this module, the focus is on easily accessible, general climate information for both historical and future periods.

This module introduces some climate information, along with associated guidance that is readily available.

Where possible, we focus on sources that are tailored specifically to the Pacific region.

Some definitions

- **CLIMATE DATA** – Historical climate observations along with direct model outputs covering historical and future periods.
- **CLIMATE PRODUCT** – A derived synthesis of climate data
- **CLIMATE INFORMATION** – Climate data, climate product and / or climate knowledge
- **CLIMATE SERVICE** – Climate information provided in a way that assists decision-making by individuals and organisations.
- **CLIMATE PROJECTIONS** – Changes to climate are simulated on the basis of a given set of input conditions—a given representative concentration pathway (RCP) scenario and the climate model in which it is used.
- **CLIMATE SCENARIOS** – These can be based on projections but will often require specific formulation so the impact model can use the climate change information.

Getting started on climate information

RCCAP – Regional Climate Consortium for Asia and the Pacific

www.rccap.org

The Regional Climate Consortium for Asia and the Pacific (RCCAP) website is a helpful place to start.

It provides links to recent updated climate change information for the Pacific, observed and modelled climate data, guidance on how to use climate information, and a set of case studies from the Pacific showing how this kind of climate information is used in vulnerability and impact assessments. It is also a good place to learn some of the basics, including definitions of common terms.

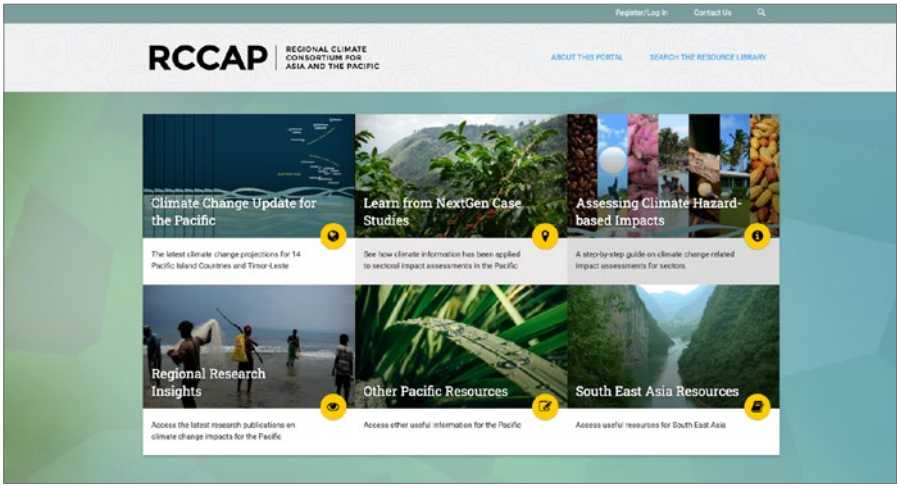

Figure 29 The Regional Climate Consortium for Asia and the Pacific (RCCAP) website

Other climate data sources

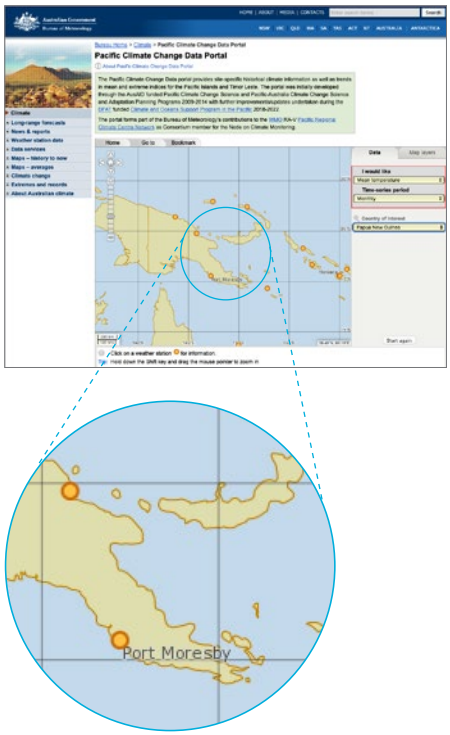

Figure 30 The orange circles indicate where temperature data is available in Papua New Guinea. Source: *http://www.bom.gov.au/climate/pccsp/*

There is a whole world of climate science out there. Many groups around the world are working on many different aspects of climate science, and there is also a lot of replication of modelling experiments so that we can understand how reliable and robust the science is.

Observed climate data in the Pacific

Climate observations recorded at official meteorological stations from across the Pacific region are a valuable resource for understanding past and current local climate.

The Australian Bureau of Meteorology hosts a **Pacific Climate Change Data Portal** (http://www.bom.gov.au/climate/pccsp/) where you can access readily available historical climate information.

Figure 30 shows you the locations where temperature data is available in Papua New Guinea.

There may be additional weather station and climate data available through local government and research agencies.

If weather station data is not available at a location of interest, there may be other valuable local knowledge of climate conditions, and there are global gridded climate products that attempt to fill in the gaps. Observed climate data is also vital for checking that these gridded data sets represent local climate well.

Gridded climate data

WorldClim (www.worldclim.org) provides high-resolution estimates of climate in places where we don't have measurements. It is open-source gridded climate data:

- WorldClim v1.4 (1960-1990 means); and
- WorldClim v2.1 (1970-2000 means).

Via WorldClim, there are monthly climate data for temperature, rainfall, solar radiation, wind speed and more.

A set of 19 bioclimatic variables are provided that are biologically relevant. They are commonly used by ecologists and agricultural researchers to relate ecological and agricultural responses to different aspects of climate change.

For example, extreme temperatures are important for some species, and so the maximum temperature of the warmest month (BIO5) could be a useful variable.

WorldClim can be useful in areas where you may not have an available record of past and current climate.

Projecting future climates is a core part of the science, this is conducted by many research groups around the world, each developing and running different global climate models.

The Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change (IPCC) has been collating, synthesising, and communicating the findings of the global climate research community since its formation in 1988. It follows a rigorous, multi-year process involving hundreds of scientists to review published research and prepare assessment reports that are released every few years.

The IPCC is currently in its Sixth Assessment cycle, which produces four assessment reports. The reports are the result of a rigorous, peer-reviewed process involving the research of thousands of scientists. The reports are very detailed and complex, and not intended for general audiences, but it is helpful to know of their existence because the authoritative messages of the IPCC are founded on these assessment reports:

1. **AR6 Climate Change 2021: The Physical Science Basis.**
   https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/
   Publication date: August 2021
2. **AR6 Climate Change 2022: Impacts, Adaptation and Vulnerability.**
   https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/
   Publication date: February 2022
3. **AR6 Climate Change 2022: Mitigation of Climate Change.**
   https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/
   Publication date: March 2022
4. **AR6 Synthesis Report: Climate Change 2022.**
   https://www.ipcc.ch/report/sixth-assessment-report-cycle/
   Publication date: September 2022

The full set of IPCC Assessment Reports, Special Reports and Methodology Reports can be found at: https://www.ipcc.ch/reports/

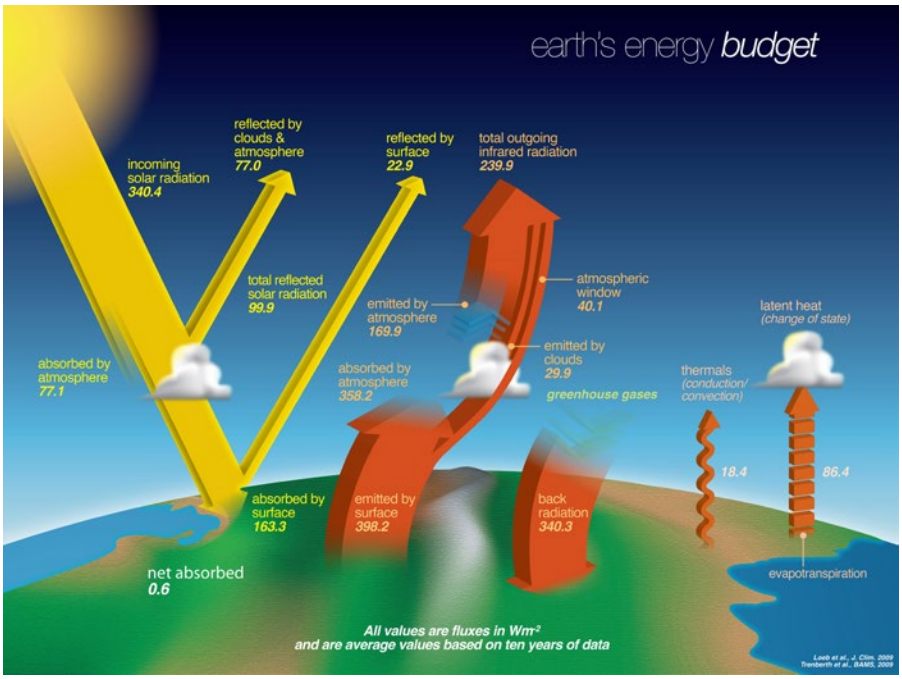

Figure 31 Earth's energy budget. Image credit: NASA

Climate scenarios

There are many uncertainties to navigate when exploring possible climate futures: we don't know what future greenhouse gas emissions will be, there are uncertainties in how the Earth's climate system will respond and how local climate will respond to global climate change, and there are many other sources of climate variability.

There are many different global climate models, and each model is the result of different choices in how to mathematically represent the climate system. The existence of so many models is useful for exploring uncertainties in the climate science. Climate scenarios define different emission pathways, and these are used in climate models to explore the consequences of different future greenhouse gas emissions.

Representative Concentration Pathways (RCP)

When you start looking for climate information, you will hear a lot about these things called RCPs. They have very strange names: RCP 2.6, 4.5, 6.9, and 8.5.

Representative Concentration Pathways (RCPs) are scenarios that describe assumptions about how greenhouse gas emissions, land use and land cover could change over time. The numbers 2.6, 4.5, 6.9 and 8.5 refer to the planet's radiative forcing. Radiative forcing is the difference between radiation incoming from the sun and outgoing radiation from the planet. Different greenhouse gas emissions and land use trajectories lead to different levels of radiative forcing, and the higher the radiative forcing, the more the planet warms. The RCPs refer to different levels of radiative forcing at the end of this century.

They are called "representative" concentration pathways because for any level of radiative forcing, there are many different possible pathways for reaching that point.

RCP 8.5 High Emissions

Under this scenario, global temperatures are very likely to increase by 3.3 to 5.7 degrees by the end of the century. Impacts on people and nature will result from changes in the climate. This scenario is often referred to as "business as usual" because emissions continue to rise at current rates, but this term adds confusion because it can mean different things to different people. Referring to it as a "high emissions" scenario is clearer.

RCP 2.6 Low Emissions

Under this scenario, global temperature increase is very likely to stay below 2.4 degrees by the end of the century. This scenario will only come about if there are significant changes in policies, decisions, and actions all around the world. Under this scenario impacts on people will include impacts of societal transitions to new ways of operating that limit emissions.

Shared Socio-economic Pathways (SSPs)

There are new ways to present emissions pathways that also consider socio-economic trends. These are known as Shared Socio-economic Pathways (SSPs). Future work around climate projections will use these SSP descriptions instead of, or along with, the RCP descriptions.

In the IPCC 6th assessment, scenario names are in the format SSPx-y, where SSPx refers to the SSP, and y refers to the relevant RCP.
The table below summarises the estimated changes in global surface temperature for each scenario for different 20-year time periods.

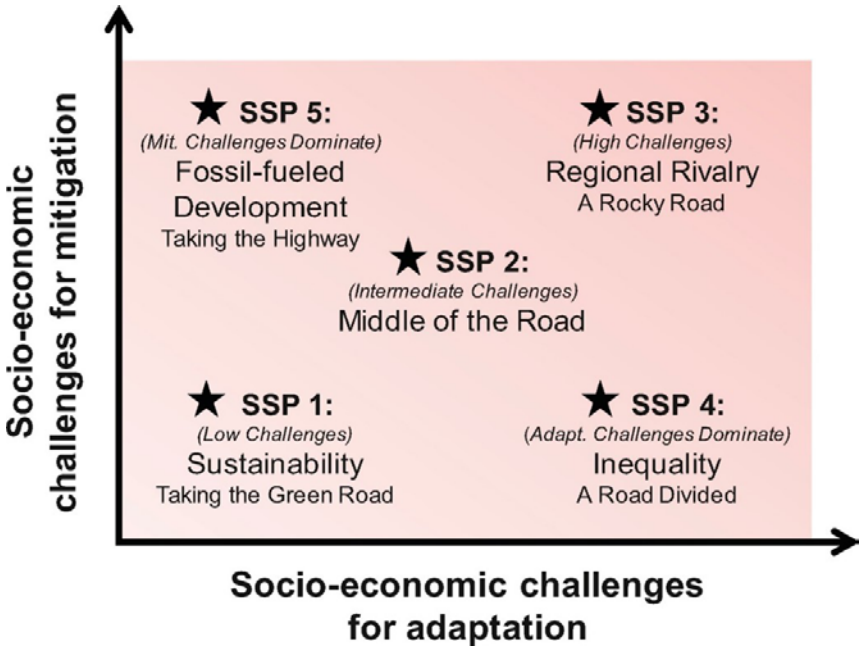

Figure 32 Shared Socio-economic Pathways (SSPs) Source: O'Neill, B.C et al 2017. The roads ahead: Narratives for shared socioeconomic pathways describing world futures in the 21st century. Global Environmental Change 42, 169–180. *https://doi.org/10.1016/j.gloenvcha.2015.01.004*

If the world does succeed in limiting climate change, it will be a very different world operating in very different ways, and so everyone will be adapting to those societal changes in addition to the direct impacts of climate change that have already been locked in. **Adaptation is needed in any future!**

Accessing climate projections

There is a wealth of modelled climate change projections available in large, online databases. In particular, the global intercomparison project, CMIP (Coupled Model Intercomparison Project), makes available model configurations and output results for all the scenarios and model experiments used in the IPCC assessments.

If you are not a climate scientist, these model datasets are difficult to understand and use, and so the IPCC has also created an interactive atlas for people to explore the latest findings. Learn more via https://interactive-atlas.ipcc.ch/

Many groups around the world have also undertaken further analysis and interpretation to create more accessible climate information products. It is too early for these products to be available using the most recent (CMIP6) results, however products developed using CMIP5 model runs are readily available, and they will be updated to CMIP6 over time.

When is specialist guidance needed?

When it comes to considering the specific implications of climate change in your project or system, you are likely to need more specialist guidance. Specialists can point you to the appropriate data for your needs and ensure you are aware of limitations and assumptions. This could include:

1. **Identifying appropriate climate-related questions that will help address your needs** e.g. how might a specific crop be impacted by future changes in temperature and rainfall?
2. **Choosing an appropriate future time frame.**
3. **Identifying what spatial resolution is relevant for analysis** e.g. will country-level averages be appropriate or is more location-specific analysis required?
4. **Identifying relevant climate scenarios** e.g. is it important to plan for extreme scenarios?
5. **Accessing guidance on conducting a climate hazard-based impact assessment, and tools for supporting this** e.g. the Pacific climate futures tool
6. **Interpreting uncertainty** e.g. should we be working with ranges of upper and lower estimates to ensure our decisions are robust to uncertainty?
7. **Assessing the confidence in and limitations of the findings, and judging whether available information is suitable for the intended purpose.**

REMEMBER: You are not alone!

It is not up to you to have all the answers, but it is helpful to be able to reach out to others and find the people who have the skills and knowledge specific to your system.

This could be within your own organisation, or more broadly in your knowledge brokering network, and wider networks of academics, local government agencies, and NGOs.

Don't forget that as a knowledge broker sometimes you will be helping people engage with highly uncertain or complex knowledge.

Next Generation Climate Projections for the Western Tropical Pacific

The Australia-Pacific Climate Partnership (APCP) has conducted a project entitled "Next Generation Climate Projections for the Western Tropical Pacific".

The project has generated reports for 15 Pacific Island countries, making the global climate science more relevant and accessible to a wider range of users in the Pacific.

These reports provide country-level summaries of historical and projected temperature, rainfall, cyclones, extreme rainfall, and sea level.

The reports also provide standardised future scenarios and climate change storylines useful for future planning, and there is guidance for assessing local impacts.

Figure 33 Current and Future Climate Reports for Papua New Guinea and the Solomon Islands. ***https://www.rccap.org/climate-change-update-for-the-pacific/***

"The climate crisis is both the easiest and the hardest issue we have ever faced. The easiest because we know what we must do. (...) The hardest because our current economics are still (...) destroying ecosystems in order to create everlasting economic growth." — Greta Thunberg

Climate stripes

The stripe pattern developed by Hawkins (2018) gives an indication of the variability, or ups and downs, in the temperature record. For Solomon Islands, we see a clear change from more blue (cooler than average) to more red (warmer than average) years since 1850, with more red bars, especially since 1995.

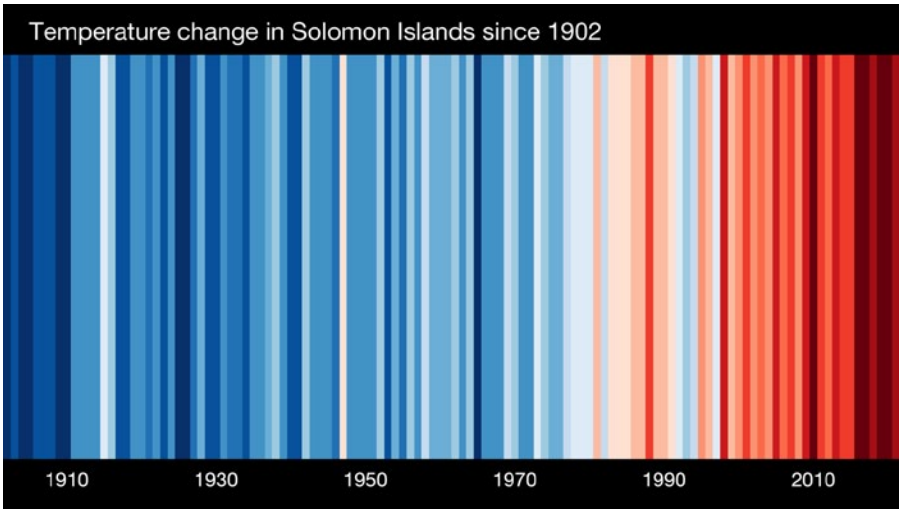

Figure 34 Climate Stripes for The Solomon Islands. Source: https://showyourstripes.info/

Projected change — near, medium and long term

This graphic shows change under a very high emissions pathway (RCP8.5) in the pink shaded band, and a very low emissions pathway (RCP2.6) in green, with the model averages shown as thick lines.

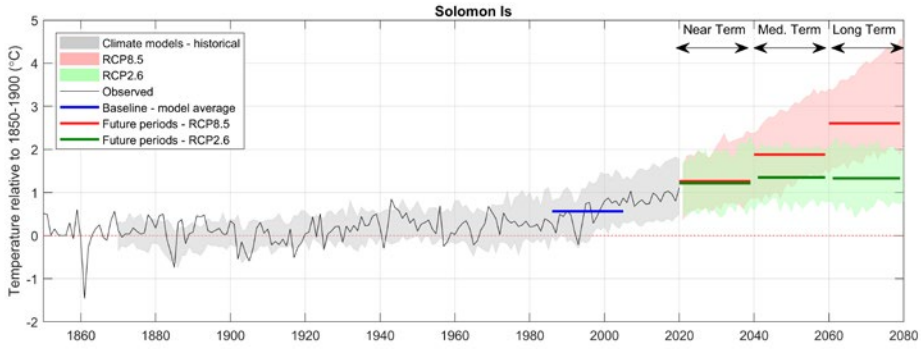

Figure 35 Emission pathways

Rainfall projection

This graphic shows change in the average rainfall and 6-month seasonal rainfall in the Solomon Islands region at different global warming levels relative to the 1986–2005 baseline.

The bars represent multi-model median and the 10th–90th percentile range.

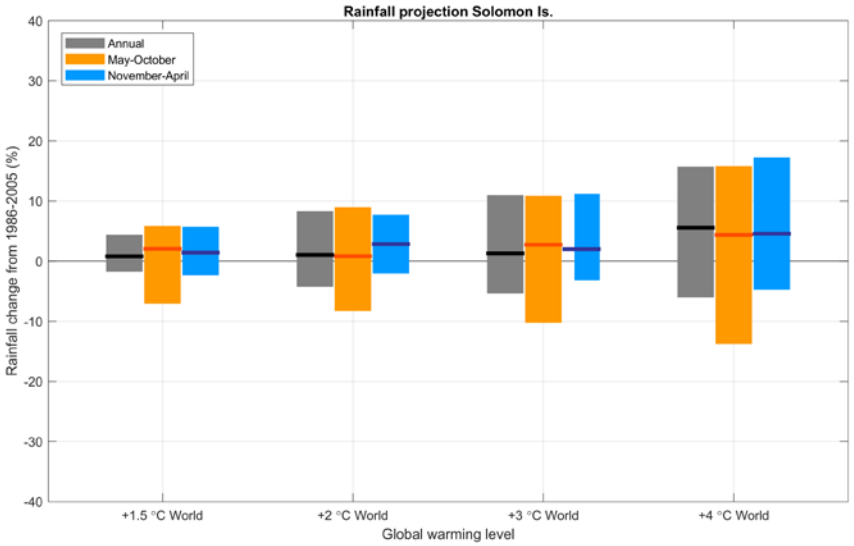

Figure 36 Rainfall projection. Images sourced from: CSIRO and SPREP (2021). 'NextGen' Projections for the Western Tropical Pacific: Current and Future Climate for Solomon Islands. Final report to the Australia-Pacific Climate Partnership for the Next Generation Climate Projections for the Western Tropical Pacific project. Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Secretariat of the Pacific Regional Environment Programme (SPREP), CSIRO Technical Report, Melbourne, Australia. *https://doi.org/10.25919/nge2-sr30 | https://www.rccap.org/climate-change-update-for-the-pacific/*

	Scenario 1* SPCZ moves north	Scenario 2* SPCZ moves south
Low emissions (RCP2.6)	***Warmer & drier*** • Annual temperature: +0.8°C • Annual rainfall: -5% • More heatwaves • Less humidity • More solar radiation • Heavier rainfall events • Greater tropical cyclone impacts • Sea level rise: 17-30 cm	***Much warmer & wetter*** • Annual temperature: +1.2°C • Annual rainfall: +10% • More heatwaves • More humidity • Less solar radiation • Much heavier rainfall events • Greater tropical cyclone impacts • Sea level rise: 17-30 cm
High emissions (RCP8.5)	***Much warmer & drier*** • Annual temperature: +1.2°C • Annual rainfall: -5% • More heatwaves • Less humidity • More solar radiation • Heavier rainfall events • Greater tropical cyclone impacts • Sea level rise: 21-37 cm	***Hotter & wetter*** • Annual temperature: +2.1°C • Annual rainfall: +10% • Many more heatwaves • More humidity • Less solar radiation • Much heavier rainfall events • Greater tropical cyclone impacts • Sea level rise: 21-37 cm

* These are indicative scenarios for an initial scan of impacts, but detailed impact/risk assessments may need to consider a more comprehensive range of scenarios tailored for specific regions, sectors or systems.

Figure 37 Standard scenarios for the Solomon Islands for the period 2040–2059 relative to 1986–2005 for low and high emission pathways and two climate change scenarios defined by the physical change 'storyline'. Source: CSIRO and SPREP (2021). 'NextGen' Projections for the Western Tropical Pacific: Current and Future Climate for Solomon Islands. Final report to the Australia-Pacific Climate Partnership for the Next Generation Climate Projections for the Western Tropical Pacific project. Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Secretariat of the Pacific Regional Environment Programme (SPREP), CSIRO Technical Report, Melbourne, Australia. *https://doi.org/10.25919/nge2-sr30*

References and additional resources

If you would like to watch a YouTube video on this module, please see https://www.youtube.com/watch?v=PpJwjJ_sOl8

Case studies

The following case studies offer a chance to understand how climate data has been used in different projects:

NEXTGEN CLIMATE HAZARD-BASED IMPACT ASSESSMENTS

https://www.rccap.org/pacific-guidance-and-case-studies/ case-studies/

- **Black pearl production vulnerability in the Cook Islands**
  https://www.rccap.org/library/item/61fc956b7402a
- **Cocoa production in Papua New Guinea**
  https://www.rccap.org/library/item/61fb1c5a1b2bf
- **Cocoa production in Samoa**
  https://www.rccap.org/library/item/61fc98e622dd9
- **Coffee production in Papua New Guinea**
  https://www.rccap.org/library/item/61fc8ff78e221
- **Root crop production in Fiji**
  https://www.rccap.org/library/item/61fc966e7e618

CLIMATE RISK ASSESSMENTS

- **Analysing the impact of climate change on sweet potato crops in Papua New Guinea**
  https://www.rccap.org/pacific-guidance-and-case-studies/ case-studies/papua-new-guinea/
- **Climate Change and Cocoa on the Guadalcanal Plain, Solomon Islands**
  https://www.rccap.org/pacific-guidance-and-case-studies/ case-studies/solomon-islands/

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Your notes

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