SYSTEMS ENABLERS AND BARRIERS TO DELIVERING IMPACT FROM SCIENCE

Approach & findings from systems analysis

July 2022

iPEN

Turbocharging Impact

WHAT'S IN THIS RESOURCE?

This resource provides:

BACKGROUND

- An overview of our systems analysis — approach and findings (including what prompted this work)
- Some information on systems thinking that has guided the work (see **Appendix**), including the concept of 'leverage', which has informed our thinking about where and how to intervene in a system

WHAT WE FOUND?

- This section summarises our findings and presents two linked conceptual frameworks
  - A description of the 'impact creation cycle' to capture all the various activities involved in creating impact from research
  - A summary of the thematic areas that enabled or got in the way of delivering impact that emerged as part of our inductive analysis

A SYSTEMS PERSPECTIVE

- Here we give you a glimpse of how we have examined the RSI system and its behaviour using some systems approaches
- We used this approach to ensure we don't repeat the flaws that 'normal' linear thinking can result in

SO WHAT?

- We describe the relevance of this research

WHO IS iPEN?

- Collaborative network started in 2014 across all seven Crown Research Institutes

- Focus on *turbocharging* impact across all seven CRIs via strengthened evaluative capacity

- Collaboratively developing shared tools, resources, and other support to build everyone's capability and reduce duplication of effort

BACKGROUND

ORIGINS OF SYSTEM PROJECT

- iPEN became aware there were wider 'systemic' barriers and enablers to impact when undertaking the initial needs assessment work to guide the development of tools, training, and resources to increase the capability of CRI staff to deliver greater impact from their research.

- The Science New Zealand Board gave iPEN their support to explore these barriers and enablers more purposefully.

- We opted to apply systems thinking and some systems methods to this work in recognition of the fact that the RSI 'system' is a system. Systems approaches are a more methodologically appropriate way to explore both the challenges and opportunities.

More details about systems thinking are provided in the APPENDIX and about the process in the NEXT SLIDE

iPEN: TURBOCHARGING IMPACT

2018

1 — IPEN AMBITION TO TURBOCHARGE IMPACT
- Identified a need for targeted capability building programme of work across all CRIs
- Sought support and budget from CEs for the **TURBOCHARGING IMPACT PROJECT**
- Scoped work to contract expert support from 2019 (Kara)

2019

2 — NEEDS ASSESSMENT TO DELIVER MORE IMPACT
- Completed a **NEEDS ASSESSMENT** to help target support. Interviews with 103 and survey responses from 483
- Barriers and enablers to impact identified at *individual, organisational, and systems levels*
- An **ORGANISATIONAL BLUEPRINT** developed with accompanying recommendations for iPEN and CRIs

2020

3 — ADDRESSING NEEDS (INDIVIDUAL AND ORGANISATIONAL)
- Training modules based on needs: the **TRAINING WHEEL** is developed
- Acknowledgement that interventions beyond increasing staff capability are required to respond to system challenges

2021

4 — NEED TO ADDRESS OUTSTANDING GAPS
- Recognition that systemic challenges needed further exploration and validation in order to support any follow up/response
- **INITIAL ANALYSIS** of qualitative feedback using **SYSTEMS THINKING** identified **SEVEN POTENTIAL OPPORTUNITIES FOR ACTION**
- Support from CEs to complete follow-up work to explore / validate clear options for systemic action (late 2021)

2021 – 2022 (Nov - Mar)

5 — DEEPER EXPLORATION OF FACTORS INFLUENCING IMPACT (1)
- In-depth interviews with 7 'impactful' CRI scientists
- Initial themes identified of what helps and hinders impact using systems thinking framework
- Wider workshop to explore themes. Used a systems diagnostic tool to explore pain points and to identify possible interventions to address them

2022 (Mar - May)

6 — DEEPER EXPLORATION OF FACTORS INFLUENCING IMPACT (2)
- Further analysis of workshop feedback against initial themes – are they still correct?
- Development of the **IMPACT CREATION CYCLE** as a descriptive tool
- Exploration of linkages between the themes and (a) impact activity cycle and (b) the initial seven opportunities for action to check for gaps and any disconnects

2022 (May - June)

7 — VALIDATE & EXPLORE POSSIBLE ACTIONS
- Check consistency between our findings with a wider audience. Identify gaps or tensions/questions
- Explore possible actions by systems actors, considering potential 'leverage' of these action (see Donella Meadow's slide 29 & 31)

Future

Share analysis with other system stakeholders so barriers can be tackled and opportunities realised

6

SCOPE, LIMITATIONS, and OTHER CONSIDERATIONS

A CRI PERSPECTIVE

This analysis represents findings derived from feedback from those working in CRIs, who were predominantly (but not entirely) scientists or researchers. Although we have further tested the emerging findings with a wider range of stakeholders (including other system actors), it should be read as primarily a representation of the experience of CRIs. Further testing and refinement could be undertaken, noting that purposeful sampling (with those who understand what impact 'looks like') will remain an important principle if any additional validation is sought.

GROUNDED IN EVALUATION AND SYSTEMS THINKING

The disciplinary basis of the approach centred around evaluation perspectives and systems analysis. Questions centred around 'what it takes to maximise the impact of research'. Insights into other aspects of the RSI system, such as efficiency, were not specifically sought.

**NO COMPREHENSIVE FOCUS ON A MĀORI PERSPECTIVE AND EXPERIENCE**

This work did not seek to comprehensively explore barriers and enablers for the incorporation of Mātauranga Māori and Te Ao Māori. A separate and specific Māori-led analysis would need to be undertaken to understand if the barriers and enablers here are applicable to that context.
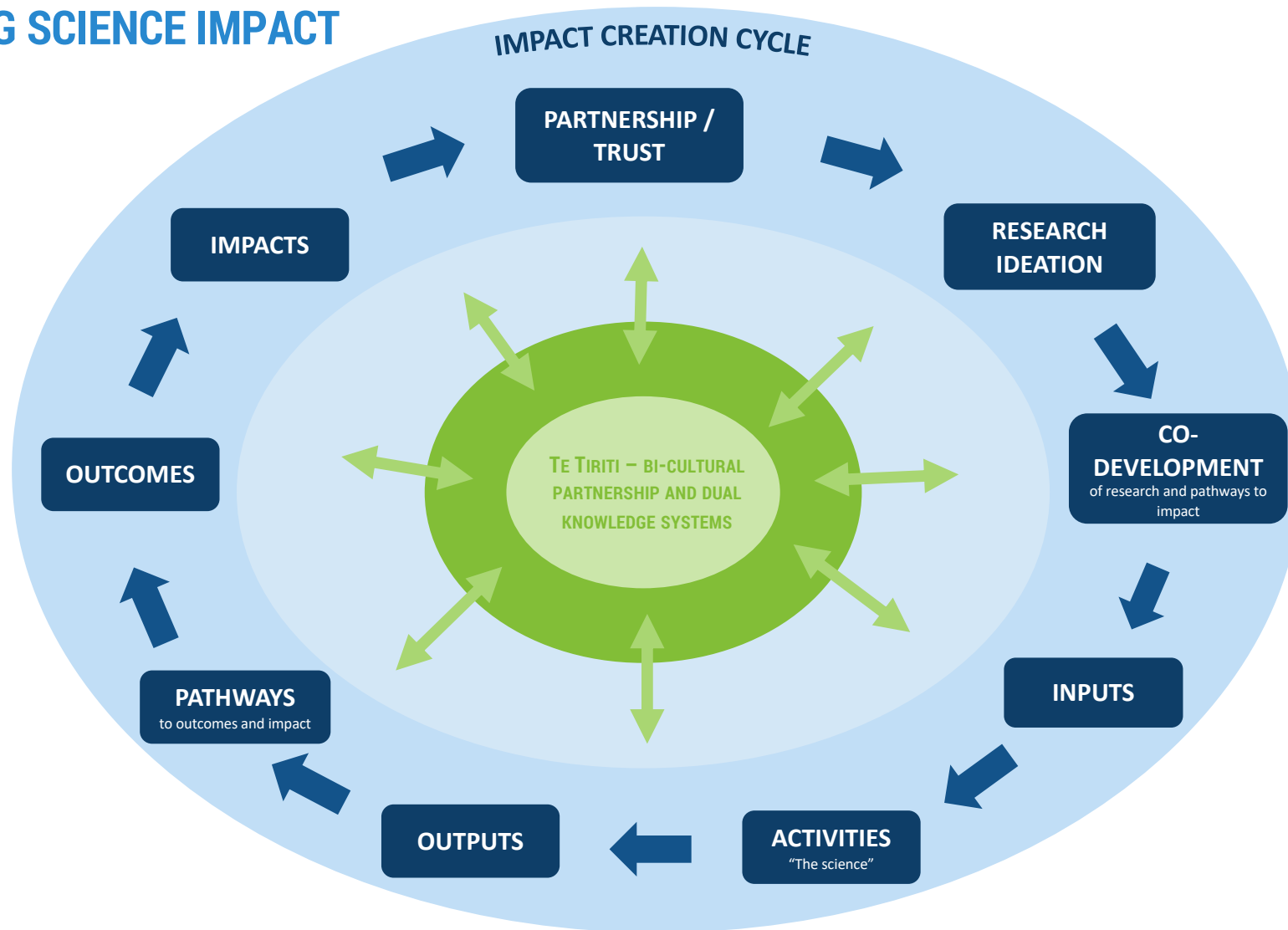
WHAT WE FOUND
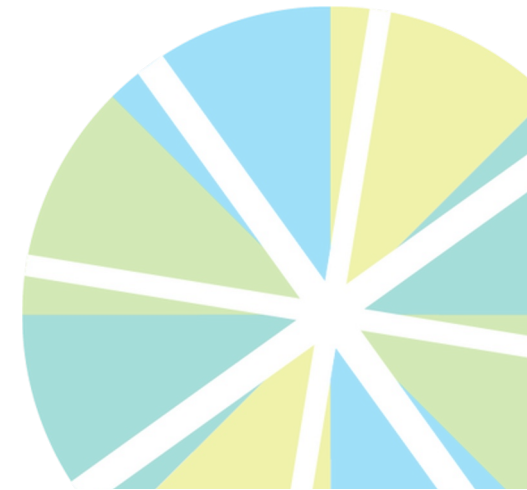
IMPACT CREATION CYCLE – WHAT IS IT?

- As we conducted our deeper research and analysis, we identified the need to develop a detailed description of all the activities and steps required if science and research are to be impactful.

- We've called this the **IMPACT CREATION CYCLE (see over page).**

- We recognise that this impact creation cycle needs to be considered within the wider considerations around Te Tiriti, and needs to recognise dual knowledge systems.

- Many aspects of this impact creation cycle are likely to be very similar from a Te Ao Maori perspective and context, fully understanding this would need further work.
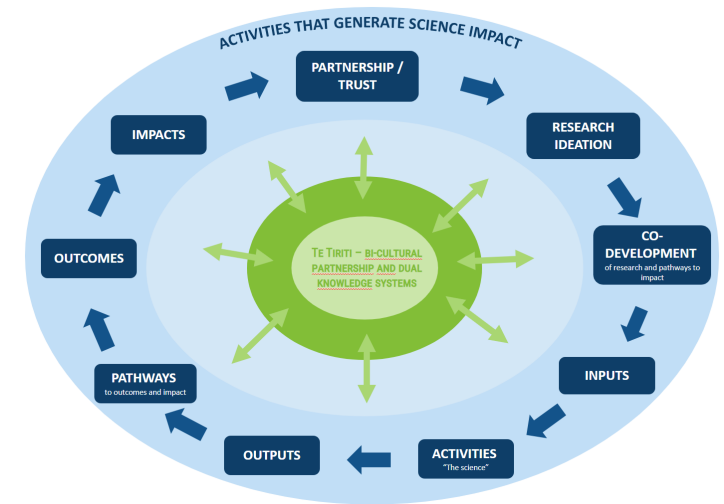
THE CYCLE THAT IS CENTRAL TO GENERATING SCIENCE IMPACT

(Simplified: non-linear process, feedback loops not shown)

IMPACT CREATION CYCLE

PARTNERSHIP / TRUST

RESEARCH IDEATION

CO-DEVELOPMENT of research and pathways to impact

INPUTS

ACTIVITIES "The science"

OUTPUTS

PATHWAYS to outcomes and impact

OUTCOMES

IMPACTS

TE TIRITI – BI-CULTURAL PARTNERSHIP AND DUAL KNOWLEDGE SYSTEMS
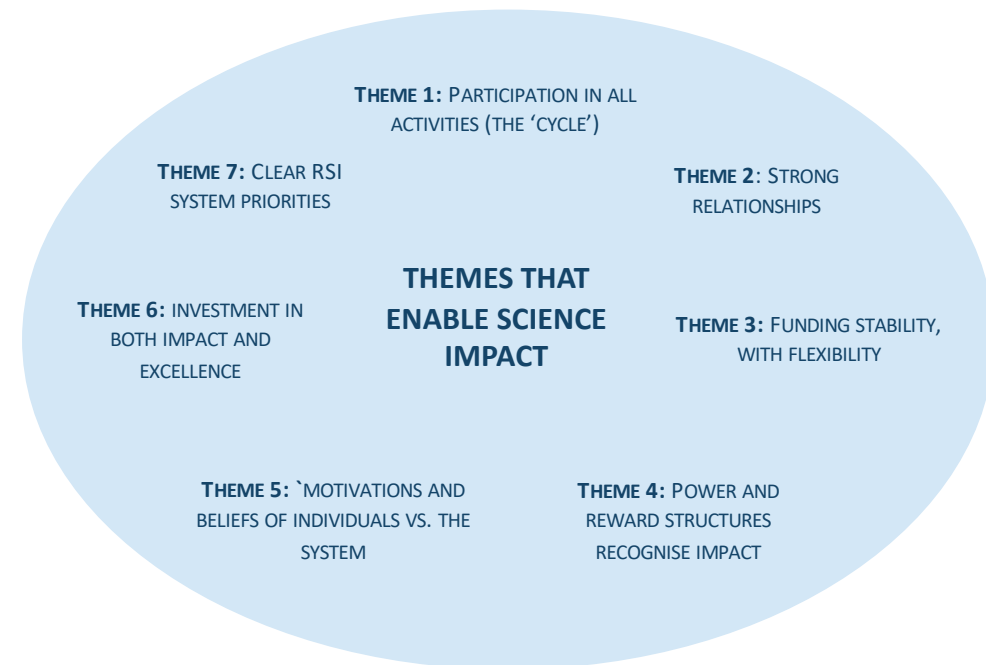
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WHAT ARE THESE 'components' NEEDED FOR IMPACT CREATION?

COMPONENT	DESCRIPTION
Partnerships/Trust	The relationships that individuals, teams, and organisations have with others who are needed to identify, plan, and deliver research and action / progress the outputs of the research.
Research ideation	The process where you generate ideas and solutions, often through sessions such as prototyping, brainstorming, problem definition, worst possible idea, and a wealth of other ideation techniques. Ideally done in partnership.
Co-development of research and pathways to impact	Ensures stakeholders/partners are engaged and play an active role in developing and delivering research activities, outputs and pathways to outcomes and impact. Increases the likelihood of impact.
Inputs	The 'things' we need to do our research, including our staff, funding, facilities, knowledge and IP. It can also include intangibles such as relationships, as well as documentation that guides or influences the direction or how we do our research (e.g., policy documents, declarations and agreements, and legislation). *MBIE definition: Resources that support research activities.*
Activities	The things we do to deliver research. This includes both research/science activities and supporting activities (finance, planning, legal, insights, monitoring and evaluation). *MBIE definition: Activities that, directly or indirectly, generate new knowledge and new applications of knowledge, including identifying research problems and opportunities.*
Outputs	The things we deliver from our science and research. This includes publications, reports, presentations, guidance material and resources, communications, and IP. *MBIE definition: The knowledge and skills that are developed by activities.*
Pathways to outcomes and impacts	How outputs are translated to outcomes and impacts. Roles/concepts of outreach, commercialisation, knowledge mobilization, tech transfer, knowledge brokering, knowledge transfer all fit here.
Outcomes	This is typically the direct results of the use of outputs, such as something being done more efficiently or effectively, or an entirely new activity (sometimes considered the difference made in the short and medium term). *MBIE definition: Mechanisms that lead to impacts by use or application of outputs*
Impacts	Changes to the economy, society, and the environment (sometimes also called long-term outcomes) that are difficult to measure because they involve multiple contributors. Includes direct and indirect, intended and unintended, positive and negative changes. *MBIE definition: A change to the economy, society, or environment, beyond contribution to knowledge and skills in research organisations.*

ENABLING THEMES – WHAT ARE THEY?

- Our inductive analysis identified seven themes (in addition to the encompassing theme around Te Tiriti and a bi-cultural context) that either enable or get in the way of delivering impact from research and science.

- Themes link back to the supporting environment necessary to maximise the impact from science.

- These themes are applicable at the national, organisational (CRI), portfolio and individual project levels.

THEME 1: PARTICIPATION IN ALL ACTIVITIES (THE 'CYCLE')

THEME 7: CLEAR RSI SYSTEM PRIORITIES

THEME 2: STRONG RELATIONSHIPS

THEME 6: INVESTMENT IN BOTH IMPACT AND EXCELLENCE

THEMES THAT ENABLE SCIENCE IMPACT

THEME 3: FUNDING STABILITY, WITH FLEXIBILITY

THEME 5: `MOTIVATIONS AND BELIEFS OF INDIVIDUALS VS. THE SYSTEM

THEME 4: POWER AND REWARD STRUCTURES RECOGNISE IMPACT

ENABLING THEMES DESCRIPTIONS

See 'EXPLORATION OF THEMES' (Slides 24-34) for deeper insights

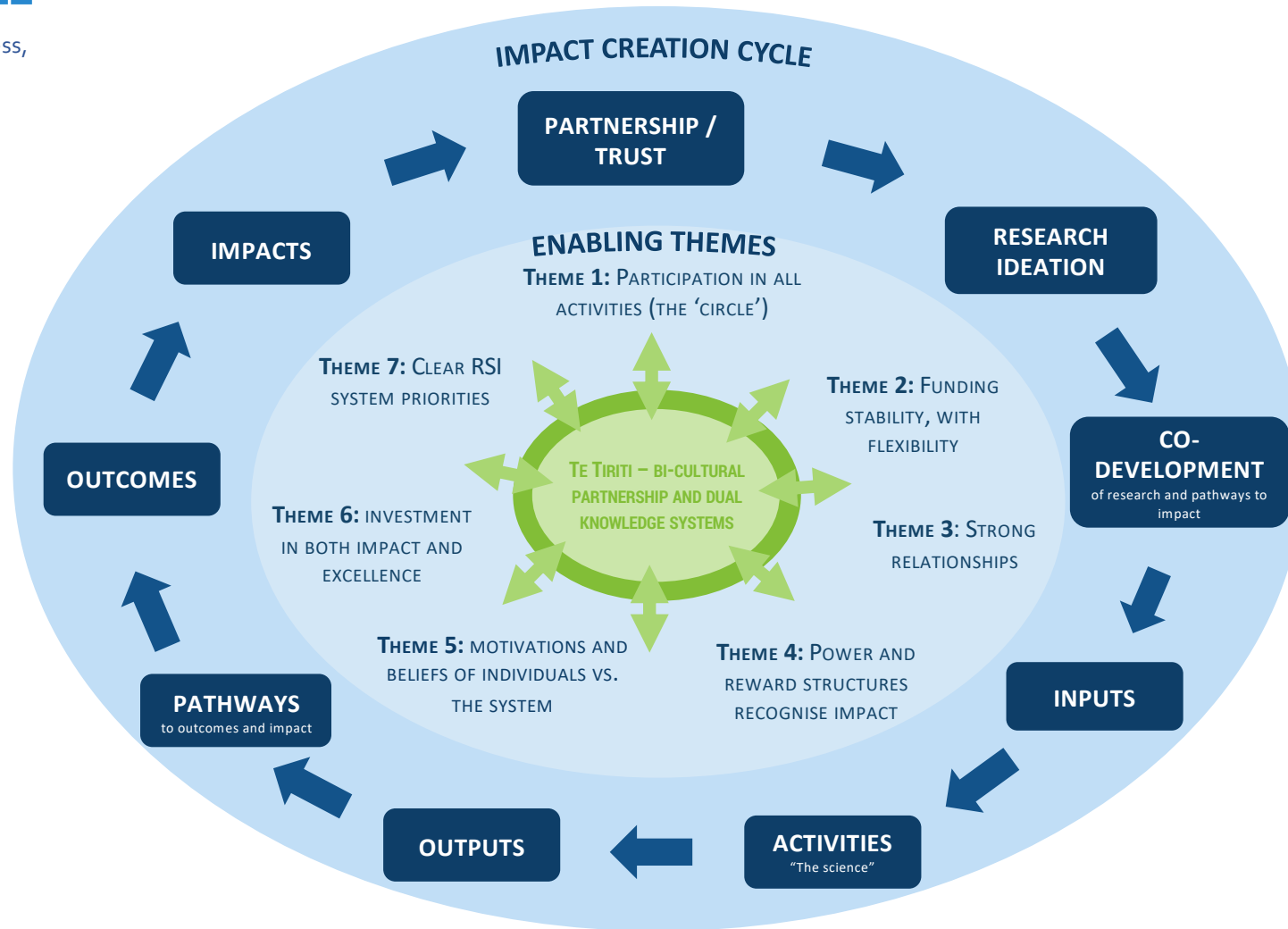| THEME	DESCRIPTION
THEME 1: PARTICIPATION IN ALL ACTIVITIES (THE 'CYCLE')	A wide range of activities are needed to deliver impact from science (impact creation cycle). Additional to 'science production' activities of input-activity-output, there needs to be an increase of focus on activities including relationship building, ideation and co-development, supporting pathways to impact, support users at the outcome stage and evaluation of outcomes and impact. Some of these activities aren't routinely considered, supported, or funded, but when they are it has made a real difference to achieving impact
THEME 2: FUNDING STABILITY, WITH FLEXIBILITY	Funding is required to attend to all the activities required around the impact creation cycle. Adequate stable funding over sufficient timeframes as well as flexibility during programmes are essential to creating conditions for impactful science. SSIF funding has helped.
THEME 3: STRONG RELATIONSHIPS	<u>Relationships are key to the delivery of impact</u>. Developing and maintaining them takes time, resources and skills. However, the way science is currently contracted often results in insufficient resources for these activities. Scientists often `creatively' pull resources from other sources or compensate for this deficit using their own time, carefully rationing their inputs across multiple projects. Relationships (and the trust they create) are particularly important when working alongside Māori. The system currently rewards activities other than relationship building, e.g. strong publishing records.
THEME 4: POWER AND REWARD STRUCTURES RECOGNISE IMPACT	Power and reward structures shape behaviour. These factors operate at different scales in the system, and cascade through levels and processes . Reward includes funding, peer approval, citations, career progression. It is biased towards what is currently valued and measured. Reward processes currently fail to adequately incentivise impact, rather continuing to recognise and endorse science excellence. Funders and the wider science fraternity hold these levers in place.
THEME 5: MOTIVATIONS AND BELIEFS OF INDIVIDUALS VS. THE SYSTEM	Individuals who are highly motivated to deliver impact find ways to do this, but often this is 'in-spite of' rather than because of the system. Although there are opportunities for the system and individuals to pursue impact pathways (e.g. via SSIF), organisational and systemic barriers prevent them from sustaining pathways to impact.
THEME 6: INVESTMENT IN BOTH IMPACT AND EXCELLENCE	The system currently largely considers science excellence first, and then impact, and presupposes that science excellence must happen before science impact. Feedback from those delivering impact noted that in many cases impact results from the sequential building of knowledge, often brick-by-brick.
THEME 7: CLEAR RSI SYSTEM PRIORITIES	The research community lacks clarity around what is regarded as important. Because there are no clear signals about priorities, resources are dissipated around a largely investigator-led research agenda, a lack of co-ordination around complex critical challenges and/or wasted effort competing for funding, replicating investment in capability and infrastructure.

THE COMPLEX RELATIONSHIP BETWEEN ENABLING THEMES AND THE IMPACT CREATION CYCLE

(SIMPLIFIED: non-linear process, feedback loops not shown)

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IMPACT CREATION CYCLE

PARTNERSHIP / TRUST

RESEARCH IDEATION

IMPACTS

ENABLING THEMES

Theme 1: Participation in all activities (the 'circle')

Theme 7: Clear RSI system priorities

Theme 2: Funding stability, with flexibility

Te Tiriti – bi-cultural partnership and dual knowledge systems

CO-DEVELOPMENT of research and pathways to impact

OUTCOMES

Theme 6: investment in both impact and excellence

Theme 3: Strong relationships

Theme 5: motivations and beliefs of individuals vs. the system

Theme 4: Power and reward structures recognise impact

INPUTS

PATHWAYS to outcomes and impact

OUTPUTS

ACTIVITIES "The science"

LINKS TO LITERATURE

The themes we have identified have also been identified in international literature on the impact of various mission-led organisations. That research, like ours, has identified the importance of:

- relationships and the time needed to build them
- clear priorities to efficiently and effectively guide research efforts
- involving a more diverse range of people in the 'team' (policy, communications, etc.) with staffing composition that reflects the value of these skills and roles
- Acknowledging that impact is usually achieved over long time periods via non-linear pathways
- Metrics that better reflect the pathways over the shorter term
- The prevailing research culture and reward structures (publish or peril), and their effects on obstructing, disincentivising, or demotivating researchers to pursue impact creation activities

SELECTED RESOURCES:

1. Research culture: embedding inclusive excellence (The Royal Society (UK), no date) and associated activities.

2. *Five organisational features that enable successful interdisciplinary marine research.* Blythe & Cvitanovic (2020)

3. *Strategies for building and managing 'trust' to enable knowledge exchange at the interface of environmental science and policy.* Cvitanovic et al. (2021)

4. *Assessing research impact potential: using the transdisciplinary Outcome Spaces Framework with New Zealand's National Science Challenges.* Duncan et al. (2020)

5. *Building university-based boundary organisations that facilitate impacts on environmental policy and practice.* Cvitanovic et al. (2018)

TAKING A SYSTEMS PERSPECTIVE

Systems thinking is a holistic approach to analysis that focuses on the way that a system's constituent parts interrelate, and how systems work over time and within the context of larger systems. According to systems thinking, system behaviour results from the effects of reinforcing and balancing processes.
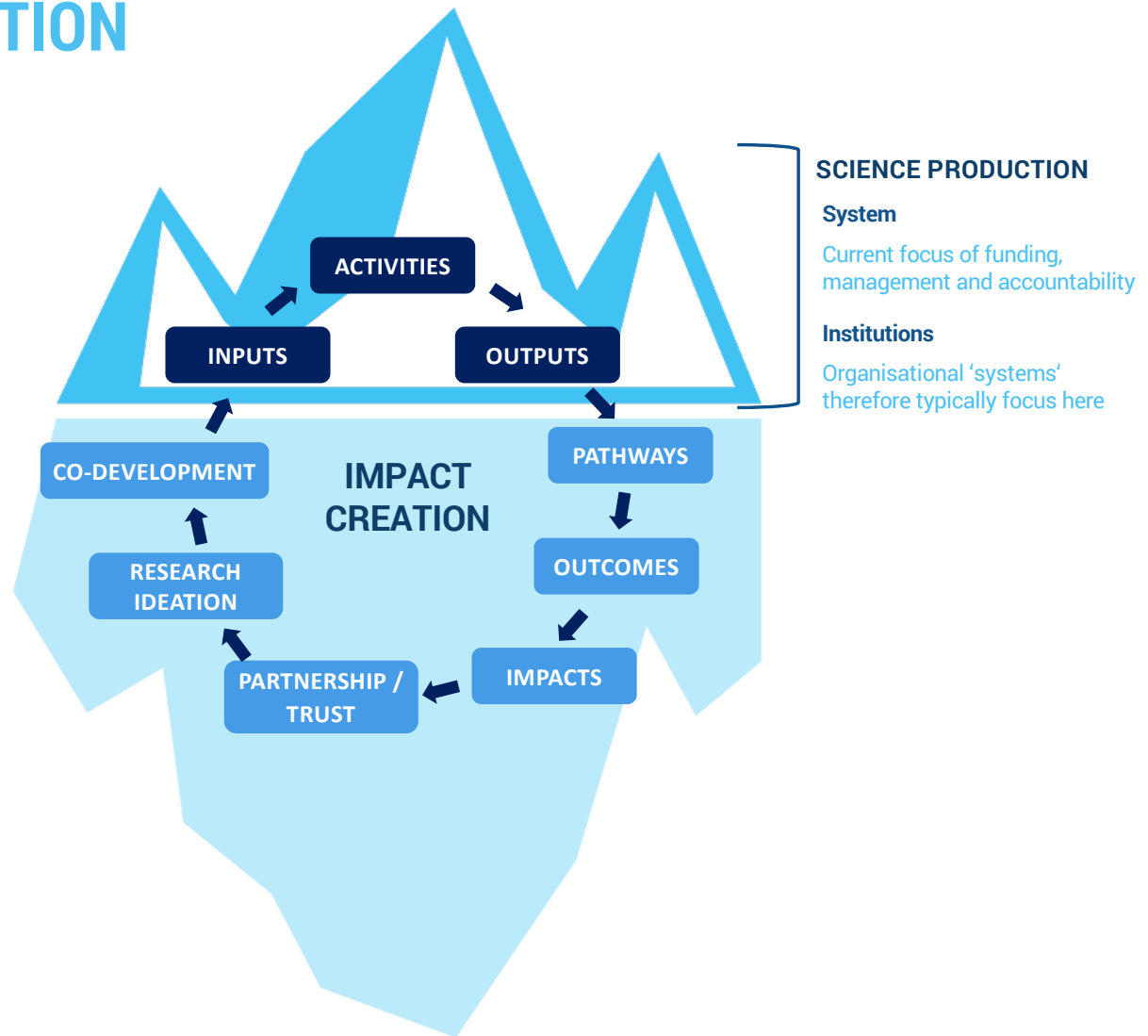
What is systems thinking? - Definition from WhatIs.com (techtarget.com)

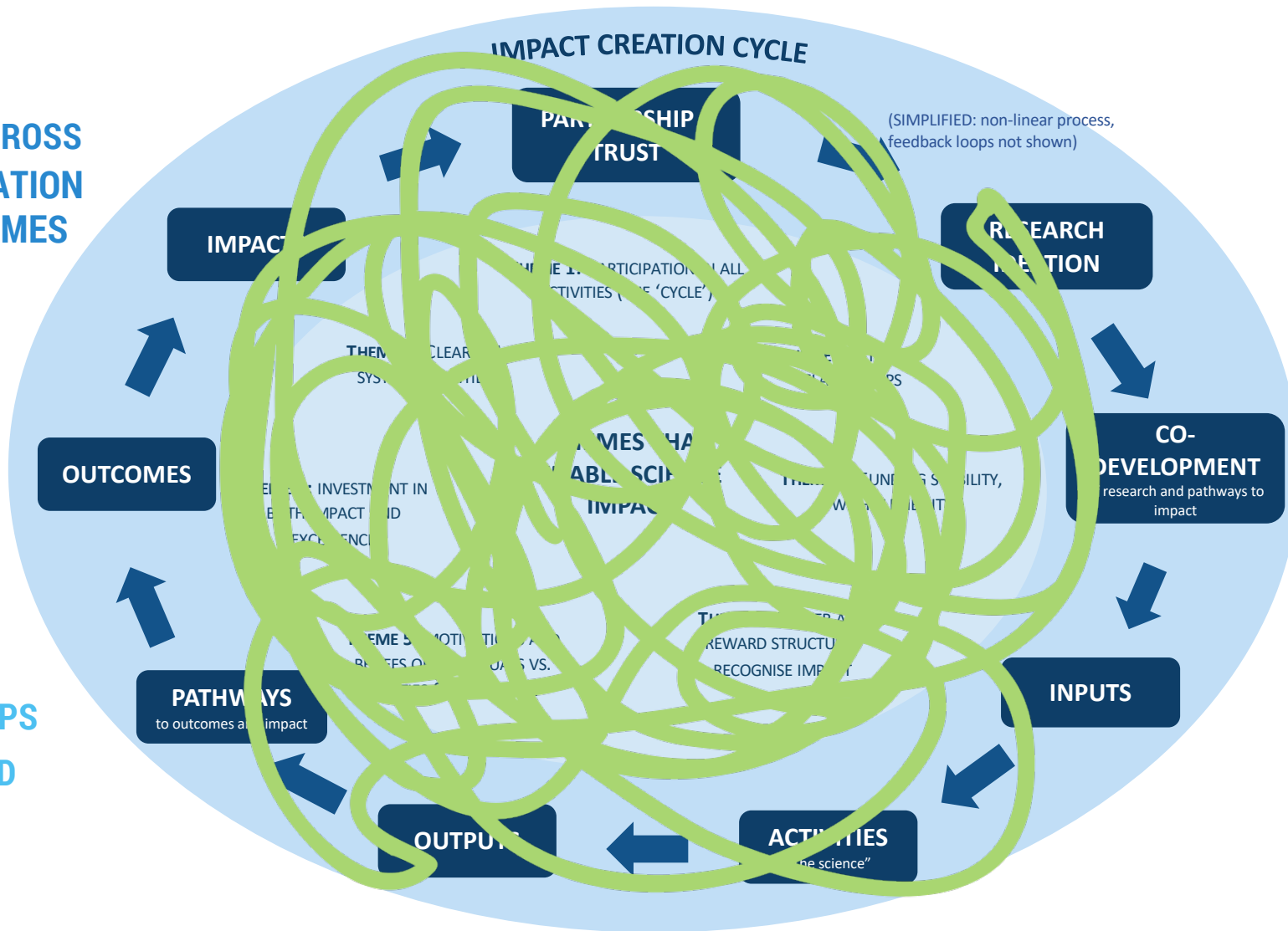# HOW THE IMPACT CREATION CYCLE RELATES TO SYSTEMS THINKING

How impact happens and is known to have happened, versus 'science production'

When the impact creation cycle is mapped to the iceberg concept in systems thinking (see Appendix: slide 35), we see that **much of what it takes to deliver impact currently sits 'below the line' of investment and management focus.** This is not to say they don't occur, rather there is a relative lack of focus and support in these areas.

SCIENCE PRODUCTION

System

Current focus of funding, management and accountability

Institutions

Organisational 'systems' therefore typically focus here

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THERE ARE CONNECTIONS BETWEEN AND ACROSS THE IMPACT CREATION ACTIVITIES & THEMES

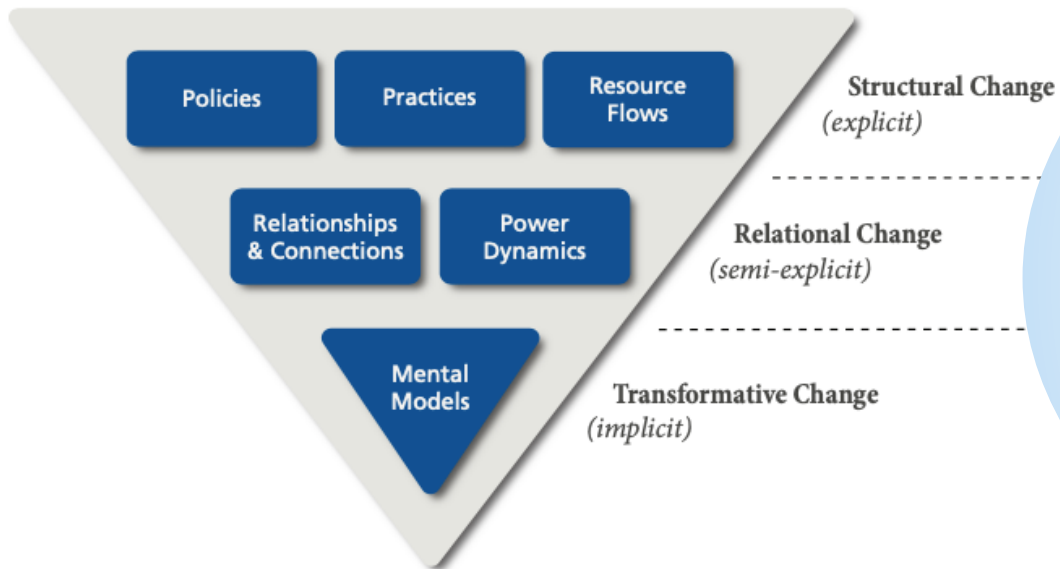**BECAUSE IT'S A SYSTEM THE RELATIONSHIPS ARE COMPLEX AND MESSY**

IMPACT CREATION CYCLE

(SIMPLIFIED: non-linear process, feedback loops not shown)

PARTNERSHIP & TRUST

IMPACT

RESEARCH IDEATION

OUTCOMES

CO-DEVELOPMENT
research and pathways to impact

PATHWAYS
to outcomes and impact

INPUTS

OUTPUTS

ACTIVITIES

HOW THE KEY THEMES LINK TO THE CONDITIONS OF SYSTEMS CHANGE

Kania, Kramer & Senge (2018) have described **six interdependent conditions** that often play a significant role in holding 'problems' / 'challenges' in place. They **tend exist with varying degrees of visibility** to actors in the system.

Six Conditions of Systems Change

Policies · Practices · Resource Flows — **Structural Change** *(explicit)*

Relationships & Connections · Power Dynamics — **Relational Change** *(semi-explicit)*

Mental Models — **Transformative Change** *(implicit)*

TE TIRITI – BI-CULTURAL PARTNERSHIP AND DUAL KNOWLEDGE SYSTEMS

- PARTICIPATION IN ALL ACTIVITIES IN THE IMPACT CREATION CYCLE
- FUNDING STABILITY AND FLEXIBILITY

- STRONG RELATIONSHIPS
- POWER AND REWARD STRUCTURES RECOGNISE IMPACT

- MOTIVATIONS AND BELIEFS OF INDIVIDUALS VS. THE SYSTEM
- INVESTMENT IN BOTH IMPACT AND EXCELLENCE
- CLEAR RSI SYSTEM PRIORITIES

Click here to view the whole resource: *The Water for Systems Change*

EXPLORING THE LINKAGES AND DYNAMICS

- By taking a systems approach, we are acknowledging that the components are interconnected, sometimes in unexpected ways, that cause it to 'behave' unpredictably.

- System dynamic modelling (like **causal loop diagrams**) are tools to try and better capture and then explore and understand these connections and ways systems function.

- Another 'diagnostic tool' is the concept of **system archetypes** (a pattern). These describe typical patterns of behaviour in a system, and can help us understand why systems function in particular ways (and also to ensure any changes/interventions don't replicate these)

- We have identified several archetypes that are 'playing out' in the New Zealand RSI system in different ways.

We are flagging to you for transparency in our analytical process.
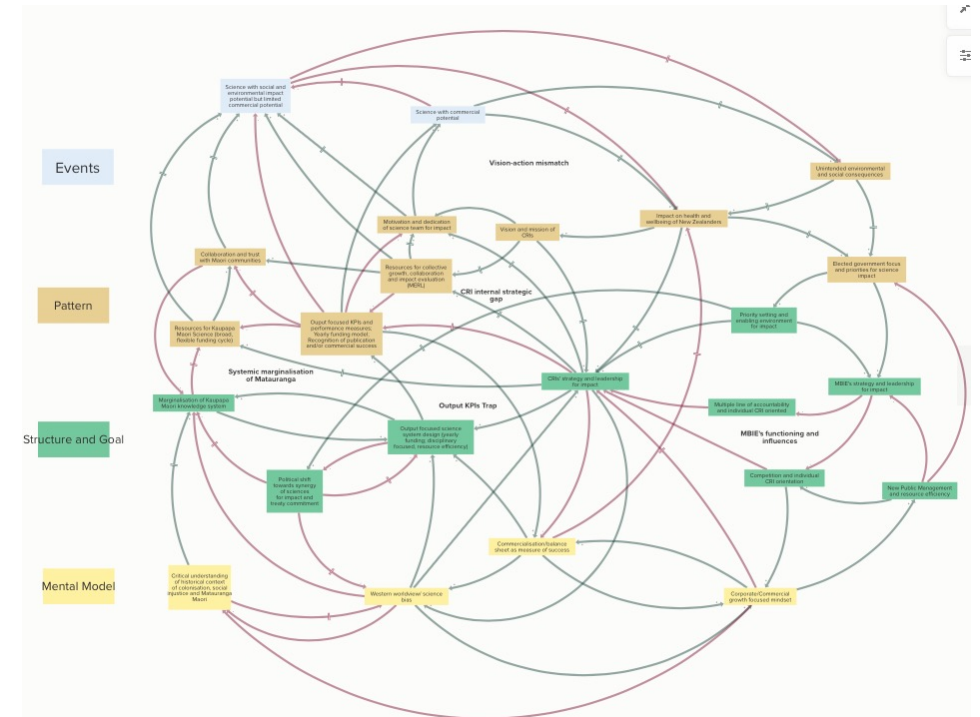
SUMMARY OF THE SYSTEM INSIGHTS
(generalisations)

1. We are in a KPI trap; one that is output and activity-focused.

2. We see a systemic reinforcement of the marginalisation of Mātauranga Māori, from macro to micro levels.

3. When resources are limited for relationship development and impact creation activities (including evaluation), negative flow-on effects can occur across other parts of the system.

4. Whilst the system talks impact, its design means that the resources required are not specifically provisioned, yet CRIs must 'keep the lights on'. This tension propagates through the system at all levels.

5. Confusion around RSI system priorities has created a drift and dispersal of effort. Delayed feedback loops have resulted in poor systems learning and adaptation.

Explore the whole causal loop diagram via this <u>KUMU link</u>
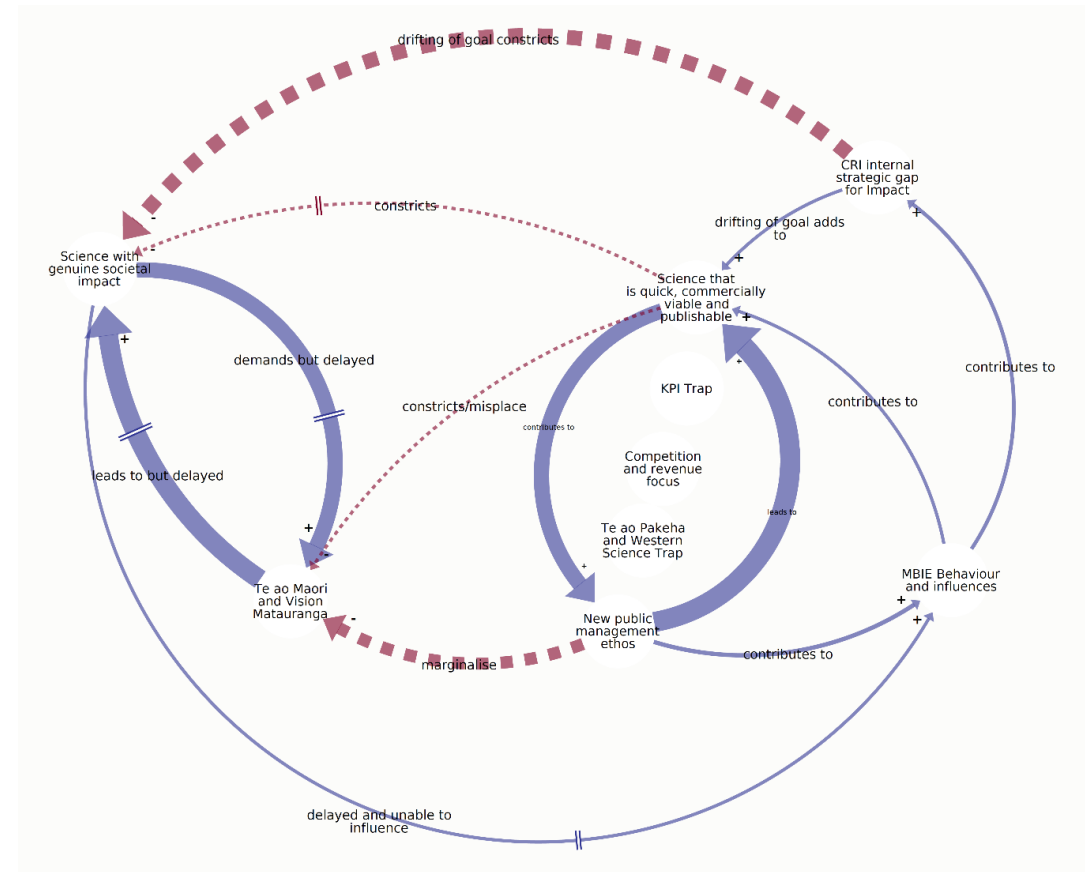
SO WHAT?

What are the implications of this analysis?

What does this mean for CRIs and the science system?

1. There are significant opportunities to more fully support researchers to deliver impact

2. Systems thinking helps us identify areas that would be more effective to target for intervention. In other words changes at a deeper level will have ripple/flow-on effects. They can trigger or make other changes easier, or more likely to happen, as the system 'self-organises' in response to 'deeper level' changes.

3. Systems thinking tells us that it is not useful to look at addressing issues individually. Otherwise:
   - treating symptoms, not causes
   - Missing easy wins
   - Some interventions no or limited effects unless others accounted for (e.g. training people in pathways if there is no investment/process/avenue and no career recognition)

4. It's important to engage broad stakeholders in identifying solutions to the current barriers, including industry, policy makers, Māori, representatives from the tertiary sector as well as entrepreneurial investors

EXPLORATION OF THEMES

OVERARCHING: TE TIRITI – BI-CULTURAL PARTNERSHIP AND DUAL KNOWLEDGE SYSTEMS

The seven themes we identified clearly link to barriers and enablers regarding Te Tiriti, Te Ao Māori and Mātauranga Māori, but often in even more 'powerful' ways. These quotes exemplify this, and highlight the value in this being explored in a more targeted way.

MĀORI RESEARCHERS ARE PARTICULARLY STRETCHED TO ADDRESS DEFICITS AROUND THE IMPACT CREATION CYCLE, FOR MĀORI AND FOR SCIENCE, WHICH CAN COME AT A COST TO THEIR OWN ASPIRATIONS

"one of the issues that the entire vision Mātauranga sort of tick box system has created is a huge amount of demand for Māori researchers on projects. And then we end up with more and more of our time dedicated across projects to help other people meet the requirements in their projects, especially when you have very important projects with very important senior scientists who you want to work with…[it] allows you very little time to develop your own research as a Māori researcher.

And especially when the majority of that time written into other people's projects for Vision Mātauranga is primarily engagement work as opposed to science work…. [but] if you're trying to build your resume as a researcher or in the PBRF, 'publish or perish' attitudes….If you're not doing the science, and you're not getting those publications, and you're not pushing theory and innovating, then you're going to stagnate. [And] there's very little recognition, if you're going to spend half your year 'having cups of tea with people'."

RELATIONSHIPS WITH MĀORI NEED ADDITIONAL INPUTS OR PRIORITIES (and therefore funding)

…. [Its] totally up to the Government and the ministries to decide if they want to have Treaty partnerships in research or not. If you want to have Treaty partnerships, then you need to pay for those…. if you want to have Treaty partnerships that means that most of the [costs] are going to be doubled.' Because that's what it means. ….the message is a bit contradictory."

TIME and RELATIONSHIPS

"I have been engaging with my Māori collaborators, for five years now, since I started [here], so it's mostly a matter of time, work, and keep working together and showing genuine interest in engaging, and engaging beyond the scope of one single project."

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THEME 1: PARTICIPATION IN ALL ACTIVITIES (THE 'CYCLE')

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- Scientists/researchers recognise that a wide range of activities are needed to deliver impact from science (around the impact creation cycle)

- Some of these activities aren't routinely considered, supported, or funded, but when they are it has made a real difference to achieving impact

- These activities include relationship building (which also takes TIME) to identify and co-develop and deliver projects, generate 'non-science' related communications / knowledge dissemination outputs and undertake other activities that help 'deliver' pathways to impact

- A range of challenges drive people away from doing these activities (or they do them in their own time)

LINKED TO: reward structures (and consequently what you spend your time on), strong relationships (feeling able to invest time in building and maintaining these), RSI priorities (e.g. to support/incentivise collaboration), and personal motivations (people do it anyway, but can come at a personal cost)

"The activities people describe as pivotal to achieving the greatest impact are not funded"

"the conclusion was that whenever we're doing research, we need to really take into consideration communication as part of the budget that we draw up, rather, not thinking of only the science and finding a solution, because at the end of the day, you present a solution to people to use. "

"the mind shift has to come in terms of including some of that stuff upfront in the project. Because you get to the end, and the extension is never added until more recently. You're starting to get some of that creeping into projects. But it's never enough."

"I was just talking to some colleagues [about impact] …. And they said, Well, I don't talk to farmers at all. And it would be very helpful if I did [but] they're just too busy doing other things. You know, they're too busy doing funding and reporting and face time constraints."

THEME 2: FUNDING STABILITY, WITH FLEXIBILITY (1)

- Funding sources that are flexible and stable create a much more enabling environment to deliver impacts
- Flexibility gives more scope for 'other' activities to occur (see THEMES 1 & 2 in particular)
- Size and duration of investments relates to time spent on 'science admin' (funding applications and reporting) *versus* doing the actual 'science'
- SSIF funding is a partial enabler for providing flexibility to deliver impact, by:
  - Providing the 'glue' to help stitch together smaller 'bits' of research or fund less stretchy and less sexy research needed to underpin a wider programme or research continuum capable of addressing challenges/problems. This includes being able to `stitch projects together' over time to effectively deliver impact
  - Funding important 'basic' (not stretchy) research in sectors or with stakeholders that can't afford to fund necessary research, or where there is some work to do before it would be considered customer-ready

IMPACT OCCURS AS A COLLECTIVE EFFORT

"Impact is not something that is necessarily 100% related with your [a single] project.....And that's why I thought that seeing it as a project is not realistic. [its been] a research line [many projects that] has created quite a lot of impact."

FLEXIBILITY IN TIME USE HAS BEEN REALLY HELPFUL

"Relationships have been huge....having [my role which has more discretionary use of time] ...has meant I could cover my research time and time for attending [meetings like this] and meetings with other researchers from other institutions, which is very valuable."

ADMIN BURDEN MANAGING LOTS OF SMALL BITS OF FUNDING

"At the moment we have like, five or seven projects going alongside. So obviously, the management of that is very, very time consuming and very [mentally] consuming."

SSIF FUNDING HAS PROVIDED A MUCH NEEDED SOURCE OF STABILITY AND FLEXIBILITY IN SOME CASES

"Usually every project has their own specific objectives. But SSIF is what allows us to do the learning from all of them together.... SSIF is the one [that] lends us a little bit to flexibility to explore what nobody else wants to pay for."

SECURING RESOURCES OVER LENGTHY IMPACT PATHWAYS

"To be able to do that you have to be really creative, and with [our science happening over a] long-term process, it's kind of frustrating to have to do that all the time. You spend more time looking for funding than you do actually doing the work some of the time"

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THEME 2: FUNDING STABILITY, WITH FLEXIBILITY (2)

- Financial constraints combined with very tightly defined funding contracts:
  - mean time is rationed and managed towards delivering contracted outputs at the expense of other impact creation activities
  - leave little scope to adapt and change in ways that will achieve the desired impacts, which may compromise relationships
  - can disincentivise collaboration because of the need to 'look after' the time resources of the CRI and secure funding in the face of uncertainty
  - means that some funding sources are a poor fit with the CRI business model and do not fit their full-cost model

LINKED TO: <u>Relationships, and Power and Reward </u>(from having sufficient <u>flexibility </u>in your resourcing to undertake activities that nurture impact, and matching incentives/ability to do so) by <u>balancing investment</u> and <u>priorities</u> (which tends to influence resourcing and flexibility), and personal motivations (to do it 'somehow').

NOT BEING ABLE TO CODE TIME BUILDING RELATIONSHIPS UNDERMINES COLLABORATION

"timesheets...[can be] ... quite a big hinderance to collaborations... I have seen international visitors coming to New Zealand are finding the issue that people aren't wanting to come and talk to [them], or you can see they're looking at their watch. Because the only time they can spend is two hours...because then they have to work an extra two hours at home...[Because we] need to keep track of how much time [is] spent per project, but it's definitely preventing people from more collaborations."

COMMERCIAL COSTING DISINCENTIVISES SEEKING SOME OTHER FUNDING SOURCES

"Currently, the way the system is set up, if you go for a Fast Start, the funding that you will get will not cover the project rate as a CRI researcher. So you've got to seek special approval to be able to apply [and] inevitably, what will happen if you're successful is that you end up with fewer science hours than what you'd originally planned because of the budget but with the same expectations.... Rutherford's, I would say are actively discouraged for the same reason."

MORE FLEXIBLE FUNDING (E.G SSIF) AND AVOIDING THE NEED TO GENERATE REVENUE HAS GIVEN MORE OPPORTUNITY FOR DOING THE SCIENCE

"I've been very fortunate in that I've had big chunks of SSIF funding, where I could get those publications out. And I've purposefully kept very close ties with the universities, which again was an avenue for getting more publications out. I've had people [CRI colleagues] advocating for me so that I didn't get sucked more into the commercial [projects that are needed for revenue generation]."

THEME 3: STRONG RELATIONSHIPS (1)

- Relationships are key to the delivery of impact (see previous slide: THEME 1)
  - The ability to develop and maintain relationships takes time but often isn't 'costed' unless it's within a project, where it can be vulnerable to being traded-off against other activities (e.g. writing papers)
  - Alternatively, resources may be `creatively' pulled from other budgets, which favours scientists with well-resourced areas of science and presents challenges for new, emerging researchers (who need opportunities to develop their own networks), unless they can leverage relationships that have been built earlier and then just need to maintain them
  - Time/resource constraints exacerbate this further with time 'rationing', constraining the establishment of new relationships; maintaining existing relationships is generally prioritised

RELATIONSHIPS ARE ONE OF THE MOST IMPORTANT ENABLERS OF IMPACT

"Put the relationship with a stakeholder at the front. Do it early, do it properly, Do it well. Go there, visit them on their home ground. Get them to talk, listen to what they're saying. You know, that's really the most important thing."

RESOURCES ARE PROVISIONED FOR CONTRACTED SCIENCE ACTIVITIES, NOT RELATIONSHIPS OR ENGAGEMENT

"In the funding model for most CRIs, there is no way to resource or support long-term relationships beyond the life of a project [but] this is essential for long-term impact."

" ... trying to regularly engage with them [stakeholders] is really hard also, because I don't have necessarily official funding to do this or time to do this. And also, it's a bit scarey as a scientist, because you think they probably think what you're doing isn't good enough, you know, there's that barrier, it's hard to go out there. And sometimes you feel like you've made progress, but from their perspective, maybe it hasn't been quite enough. "

"it's money well spent to continue working on impact, but often, you're just trying to squeeze all the science into whatever dollar amount you're applying for, and there's seldom any money left."

THEME 3: STRONG RELATIONSHIPS (2)

- Having flexibility in how scientists use their time gives them scope to 'work with' stakeholders, which leads to much more successful outcomes and contributions to impact

- Relationships are not transactional. You can't start and stop them. Consequently, for them to be 'effective' they need to be worked on outside of project boundaries (before, after, between)

- Relationships are built between individuals first and foremost. Formal structures to 'manage' relationships at an organisational level are important, but cannot be a substitute for the fundamentally personal nature of relationships

- Effort in relationship building and the resources to support it (e.g. popular communications) are less `valued' than efforts put into traditional science excellence outputs

LINKED TO: Funding (need for flexibility as well as stability), reward structures (and therefore if people feel 'able' or incentivised to undertake some activities), personal motivation (people 'just do it' anyway).

ORGANISATIONAL SYSTEMS DON'T READILY ENABLE PEOPLE TO 'COST' THEIR TIME TO RELATIONSHIP BUILDING
".. we don't really have a funding line for projects that don't exist yet."

"you can't do something unless there's a timecode attached to it. Which does make it really difficult for things like engagement, especially when there's a desired percentage that you're supposed to be charging to overheads. And things like engagement for projects that don't exist yet, would be something that would be on overhead."

WORKING WITH STAKEHOLDERS IS THE MOST EFFECTIVE WAY TO HAVE IMPACT
"The enabler is clearly to go work with the people to create the science for the people who are going to use the science. In our case that is mostly councils and Māori…. So we have been trying to do papers to engage through conferences or, newsletters ….but [this is] much less [successful] than working directly with the people who are going to use the science."

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THEME 4: POWER AND REWARD STRUCTURES LINK TO IMPACT

- Power and reward structures *do* alter behaviour. They operate at different scales in the system, and cascade through levels and processes

- Reward includes funding, peer approval, citations, career progression. It is biased towards what is currently valued and measured, i.e. excellence and contract adherence

- Researchers feel they receive little reward and recognition for delivering impact

- Power includes the ability to define systems, define success criteria and confer reward. Therefore, funders (particularly MBIE) are a superpower and hold critical behavioural levers in the science system, as does the Western science fraternity

LINKED TO ALL OTHER THEMES: <u>Māori</u> have relatively lower ability to fund research, therefore low power. Reward is focused on a small number of the 'visible' <u>activities in the impact creation cycle.</u> <u>Relationships</u> outside of an active funded project are not rewarded so create a burden. <u>Funding</u> requirements (often expressed in contracts) value adherence to predetermined outputs, which are then linked to personal and organisational KPIs that focus on outputs. <u>Motivations and beliefs </u>define what is valued, measured, and rewarded, which currently is biased towards 'excellence' rather than <u>balanced investment</u> in impact in a meaningful way. Further, there are few clear signals to guide the <u>prioritisation of </u>some <u>impacts</u> over others, creating *little incentive to tackle high impact/priority issues where there is low opportunity for excellence and/or funding*

PUBLISH OR PERISH

"we're stuck in this system where it's the traditional publication in high impact journal output that is recognised and required to get that funding. So [I've been] quite selfish with my research time and made sure that I did get those publications out."

WHAT IS VALUED DRIVES BEHAVIOUR

"[the difficulty in getting] the okay to go and do it. ….I might have gone and attended 20 field days, but they weren't. Yes. But you didn't write a paper…. so it sort of wasn't counted as being recognised. I think there's been a bit of a shift lately. I think people now don't see it as such a waste of time."

LACK OF ACKNOWLEDGE VIA FORMAL STRUCTURES, REWARD FROM STAKEHOLDERS

"None of our work; deliverables, projects, outputs none of the work has [feels recognised]….I feel more rewarded by my experiences with the people I work with, including councils and Māori."

THEME 5: MOTIVATIONS AND BELIEFS OF INDIVIDUALS V. ENTITIES AND THE SYSTEM

- Scientists and researchers recognise the importance of delivering impact, and most are very strongly motivated to deliver impact

- They often need to find work-arounds to do the activities required to deliver impact. This creates pressure to pull resources from other budgets and/or sacrifice personal time

- The reason these 'trade-offs' need to be made is because the signals and processes in the current system don't align with the system rhetoric

LINKED TO: whether you'll try to participate in all the activities of the impact creation cycle, and prioritising relationship building as an important activity, which is linked to power and reward structures and the trade-offs that are made in how time is spent, and what is rewarded

GETTING PERMISSION HAS HISTORICALLY BEEN CHALLENGING FOR ACTIVITIES NOT RELATED TO GENERATING PUBLICATIONS

"[the difficulty in getting] the okay to go and do it. ….I might have gone and attended 20 field days, but they weren't recognised. 'Yes, but you didn't write a paper'…. so it sort of wasn't counted as being recognised. I think there's been a bit of a shift lately. I think people now don't see it as such a waste of time."

PRIORITISING WORKING WITH STAKEHOLDERS OVER PUBLICATIONS BECAUSE THAT'S WHAT'S IMPORTANT TO THEM

"some of the others were more focused on upping their journal paper records and stuff like that. But to me, it's not as important. [There's] no point in doing it unless you're going to actually get it out there….and it's quite cool when they actually respond to what you're doing….that's the kind of reward. It's not the monetary reward, it's the reward reward."

CREATIVITY AND RULE-BENDING TO MAKE IMPACT HAPPEN

"in terms of timesheets, I would say that I'm milestone-driven with them……So, sometimes I will borrow across projects, which I'm probably not supposed to be doing. But I will if I need to……[and] If you can get more people to the table, and then you end up actually being able to [get] those milestones completed, and you get to do all this other stuff that wraps round, what would [otherwise] just be a journal article that sits on a shelf."

THEME 6: INVESTMENT IN BOTH IMPACT AND EXCELLENCE

While the government states that it wants impact, the system settings don't always align with that ambition. This manifests itself in a range of ways at a range of different levels, highlighted in the previous slides. For example:

- Contracts don't normally contain milestones or fund at sufficient levels for impact creation activities.

- The prevailing global science culture also does not sufficiently recognise impact, which means that career progression is still largely driven by delivering academically excellent outputs.

- There are areas of important impact for New Zealand for which there is no specific funder.

- If impact is what is desired, then all the activities around the impact creation cycle need to be valued and adequately resourced.

LINKED TO: Power and reward (what people are incentivised to do) and Funding flexibility and stability (what is allowed and/or contracted to be done).

PRIORITISING EXCELLENCE OVER IMPACT

*"I had **mixed advice on where we should publish** …from the [project's] academic supervisor, who said you should go to Nature….and then from the colleagues who have more interaction with stakeholders on the ground [saying] we should be…fully open access….keeping onshore so [the knowledge] will reach the people who have contributed their data. …**And we went with the big journal**, but then **we have shared it very widely…as far as we could, but** it is a US publications and is **not an open access** journal. So, it **was a tension**."*

'BASIC' BUT IMPACTFUL SCIENCE WOULDN'T SEEM TO FIT UNDER CURRENT SETTINGS

"It would be impossible [to get MBIE] funding for this research today. It would just be too basic, and too un-stretchy…it wouldn't pass the science excellence…. But there's not a wide range of opportunities in New Zealand. And when you're working with an emerging industry, they don't have the money to pay for a lot of research themselves. They're there in the beginning of a long journey, and they have to invest every dollar they have into their own operation."

FUNDAMENTALLY, A GOOD OUTCOME FROM RESEARCH ISN'T PUBLICATIONS

"I think it's important to think about what is the most important outcome at the end of the day….for research, and for me, it would be the people who participated in that research not thinking it was a waste of their time"

THEME 7: CLEAR RSI SYSTEM PRIORITIES

- The funding pool is limited, constraining capacity to deliver. There is a sense resources are wasted on competing for funding across diverse areas because there are no clear signals about what is important.

- The current lack of clear strategic research priorities, when combinated with organisations that are relatively sector-aligned, can hamper collaboration (which people are genuinely interested in doing). At times this frustrates and disheartens scientists and researchers.

- Despite this, there are efforts at individual and organisational levels to have a dialogue on strategy and prioritisation where it is currently absent to alleviate these issues and better deliver impact.

- When priorities are unclear, CRIs can find themselves in a position of having to support diverse areas of capability and assets that may or not be nationally critical. This creates further fiscal pressure and risk.

LACK OF CLARITY AROUND WHAT IS REGARDED AS IMPORTANT, BUT SCARE RESOURCES NEED TO BE INVESTED 'WISELY'

"I'm not necessarily saying that we should go back to the that system with very, very specific research questions. But what it did provide was some direction and guidance from the Government about what research that they think is important and what research New Zealand should prioritise."

"At the moment, you can put in a proposal about anything… They [the funder] might think that they're doing a good thing by allowing whatever idea to come up and not direct the research, but it doesn't give us any indication of what is important to New Zealand."

LACK OF FOCUS ON PROBLEMS/PRIORITIES CREATES UNHELPFUL COMPETITION

"In New Zealand research, the CRIs all have their mandates…[but] we tend to be competing for projects among CRIs that should be solving a problem for a particular CRI that has been mandated to do it"

CHALLENGES TO COLLABORATING

"I think we're just time-short now. We used to sit down and talk science a lot more that we do now. We do alot less sharing then there used to be…meetings are taking up the time now."

APPENDIX

Systems thinking reference material

WHAT'S IN THE APPENDIX?

- The next three slides highlight some of the most commonly used diagrams that depict how we think when applying systems thinking, including a translation of these concepts to the RSI system (slide 39).

- All the diagrams reflect the concept of 'leverage', where in some parts of the system can create more lasting 'ripples' through more parts of the changes.

- In other words, some intervention will 'propagate' in more lasting ways, making them logical areas to priorities for action.

- Donella Meadow's refined this concept of leverage (slide 37) but based it on the iceberg concept (see slide 38).

- **Our thematic analysis used an adapted version of iceberg model** (the six conditions for systems change), as we found it was the best 'fit' for the themes that emerged from our inductive analysis, and for use when seeking feedback from other stakeholders.

- This maps directly back to the leverage points conceptual framework, which we've continued to use to identify opportunities for systemic intervention.
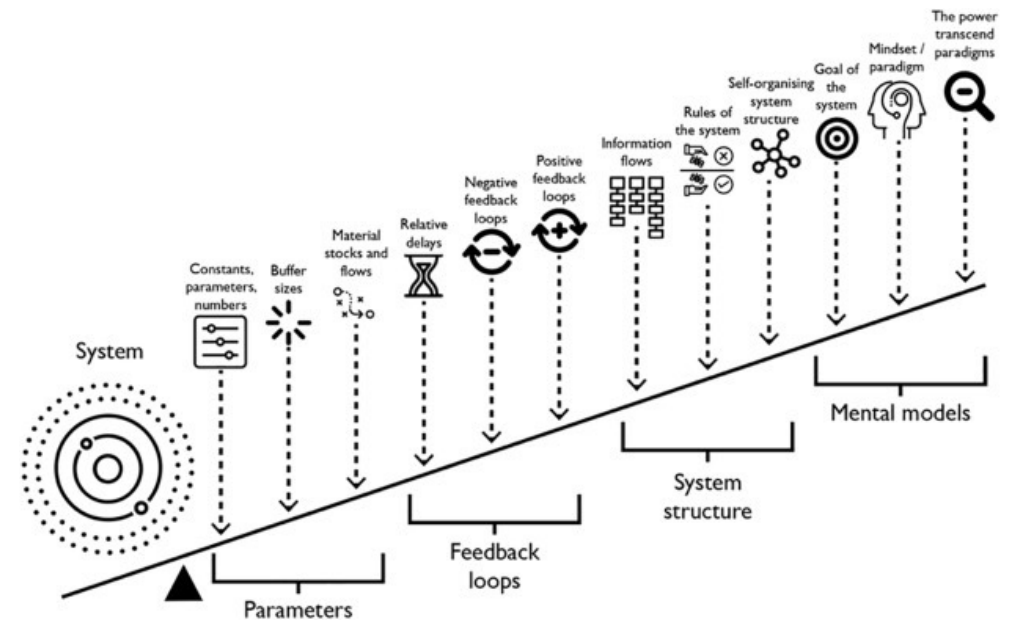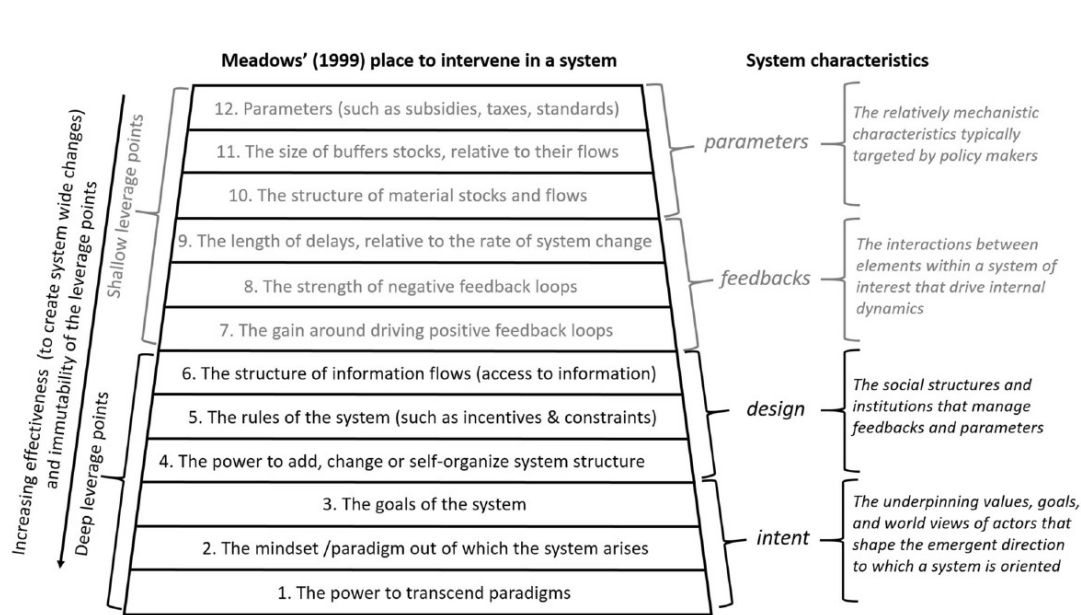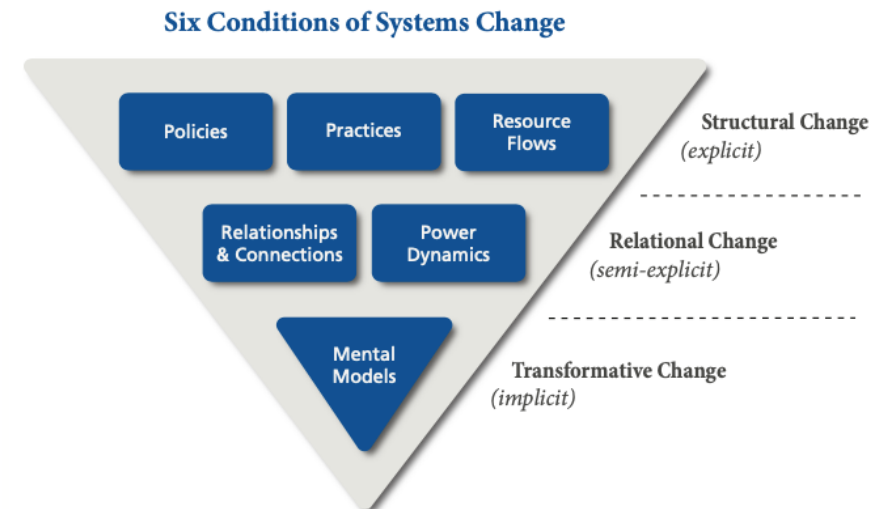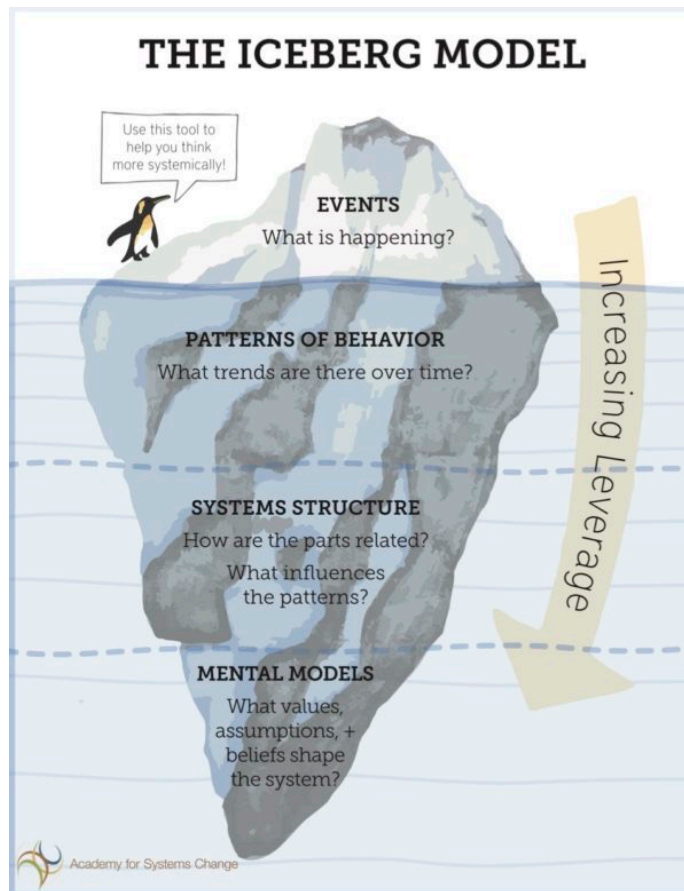
APPLYING SYSTEMS THINKING – LEVERAGE POINTS

Donella meadow's places to intervene in a system – click here to read more:
https://donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/

We used this to think about where change could be made to make a 'bigger difference'

The depiction of the leverage points below may be easier to quickly interpret:

APPLYING SYSTEMS THINKING – THE ICEBERG

THE ICEBERG MODEL

Use this tool to help you think more systemically!

EVENTS
What is happening?

PATTERNS OF BEHAVIOR
What trends are there over time?

Increasing Leverage

SYSTEMS STRUCTURE
How are the parts related?
What influences the patterns?

MENTAL MODELS
What values, assumptions, + beliefs shape the system?

Academy for Systems Change

Six Conditions of Systems Change

Policies | Practices | Resource Flows

Relationships & Connections | Power Dynamics

Mental Models

Structural Change *(explicit)*

Relational Change *(semi-explicit)*

Transformative Change *(implicit)*

The Water of systems change framework (above) identifies six conditions of systems change, that builds on the iceberg model (widely used in systems thinking) and Donella Meadows leverage points. This framework is often slightly easier to apply and use with 'non-experts'.

https://www.fsg.org/resource/water_of_systems_change/

USING SYSTEMS THINKING TO IDENTIFY AND ANALYSE BARRIERS TO IMPACT AND WAYS TO INFLUENCE THEM

- A systems theory framework of **'LEVERAGE POINTS'***. It shows that some 'interventions' contribute **shallow change** (Materials and Processes, where iPEN has focused its efforts until now) whereas others will lead to **deep change** (Intent and Design where there is opportunity for change).

Adapted from: https://doi.org/10.1002/pan3.13
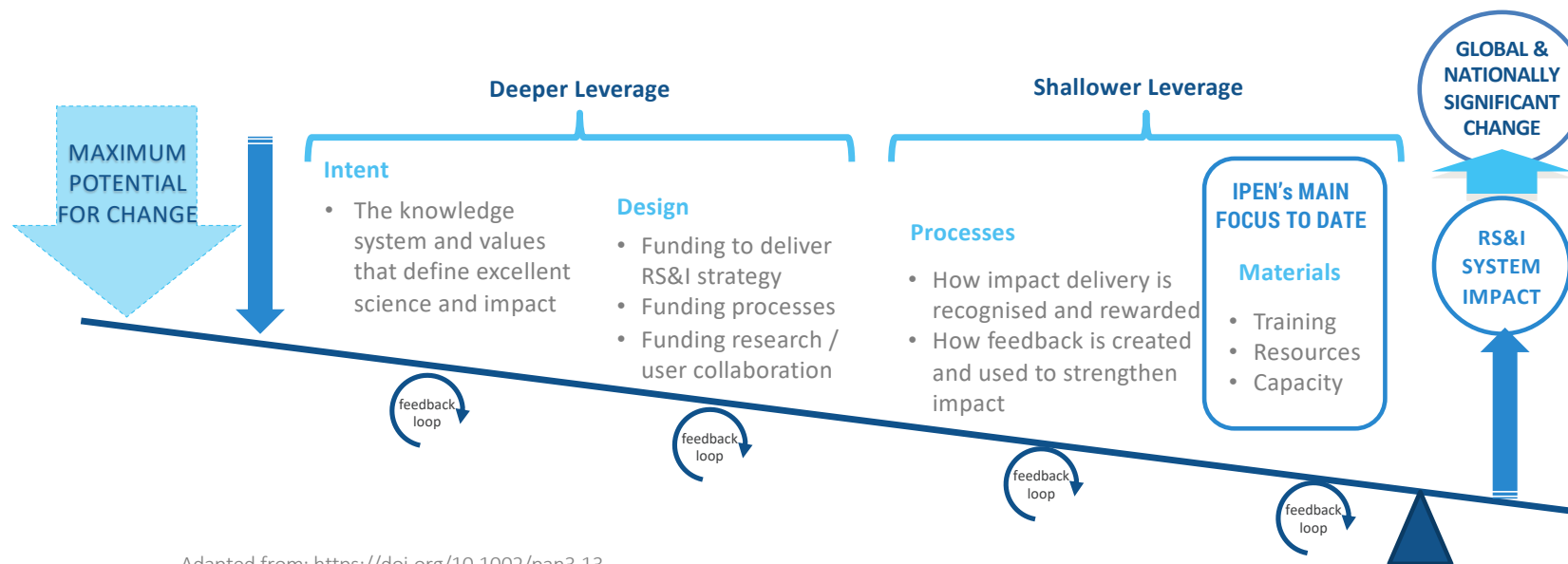
We identified and tested **7 opportunities to enable greater CRI impact in 2021.**