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THE METHOD

CHAPTER 2:
Systems Thinking and Behaviour

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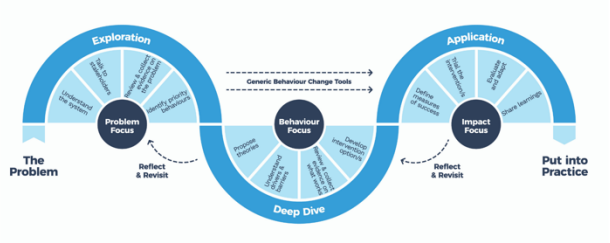

INTRODUCTION

How can a country encourage citizens to recycle correctly? In response to the 2017-18 'waste crisis[1]' in Australia, Amy Arbery's Behavioural Analysis Team in the federal government's environment department were asked to provide advice for the cross-jurisdictional working group. The group was developing an action plan for the National Waste Policy 2018, which included a focus on how to reduce contamination and encourage correct household kerbside recycling. Recognising a need for improving education and awareness activities at all levels of government, and the potential of a national campaign, many stakeholders were arguing for more community education. However, from a systems and behaviour perspective, this raised some potential issues:

- *A focus on education implicitly assumes the primary problem is that Australian households lack the knowledge, skills and/or motivation to correctly sort the material, and keep problematic items out.*
- *Even if this is partly correct, education may be necessary, but not sufficient to solve the problem*
- *A campaign at a national scale risks assuming that the context of behaviour is the same throughout Australia.*

Indeed, our research found that Australia has collectively and unintentionally made it very hard for even highly motivated, knowledgeable and capable people to do the right thing when it comes to household recycling, wherever they are. To provide good advice, Amy's team needed to clearly define the problem, establish where household recycling behaviours sit within it, and identify what factors might be influencing waste outcomes. Conveniently, they had just helped form an initiative linking state and federal governments with behavioural researchers - the BehaviourWorks Australia Waste and Circular Economy Collaboration*. Together, we approached this challenge using systems thinking to understand the different systems recycling behaviours interact with, and used this to inform our advice and a shared agenda for developing and testing behavioural public policy interventions. This chapter uses the example of the waste crisis to show a number of ways systems thinking helps tackle behaviour change challenges.*

SYSTEMS THINKING AND BEHAVIOUR CHANGE

Systems thinking is 'the art and science of making reliable inferences about (system) behaviour by developing an increasingly deep understanding of underlying structure' (Richmond, 1994). Systems analyses are often motivated by valued (or problematic) emergent properties of systems– for example health and wellbeing, ecosystem function, prosperity, and, yes, the quality of recycling and its consequences.

While systems thinking 'simply' involves analysing a situation or problem of interest, and representing it as a series of elements or parts and their interacting relationships, it can be challenging. Systems literature, and practice, is laden with jargon and specialist techniques which can make it seem harder than it is. Even if it is not always easy, it's very useful. In particular, 'wicked' policy problems are inherently persistent and recurring - their

[1] Until late 2017, Australia, like many high-income countries, exported mixed household recyclables (plastics, glass, paper, cardboard etc.) predominantly to China. Citing local health and environment impacts, and poor economic value, China's import standard for acceptable contamination reduced to 0.5%. At the time in Australia, ~10-30% by weight of kerbside recycling was 'contamination' (i.e., soft plastics, clothes, rotting food, nappies, composite packaging etc.). See Jenni Downes' article outlining the issues in The Conversation, and our rapid evidence and practice review.

complex root causes defy narrow problem definitions and simplistic responses. It is typical of wicked policy problems that multiple agencies and players may hold parts of the problem, solutions, and mandate to act on it. They are very difficult to clearly define or resolve without a systems thinking perspective, and examining the problem through the lens of behaviour in context can help make the situation, and opportunities to improve it, clearer for all involved.

For instance, an initial step in our work with the Waste and Circular Economy Collaboration involved working with Amy's team to conduct a rapid evidence and practice review (see Chapter 1 for more information on evidence reviews) and stakeholder workshop of government, community and business groups. Figure 1 summarises some of the drivers of misunderstanding and confusion thought to contribution to incorrect recycling behaviours that emerged from the review and workshop. Translated into systems thinking, these themes highlight that integrated solutions are required, many of which involve making correct recycling the path of least resistance to achieve desirable waste outcomes (Kaufman et al., 2020).

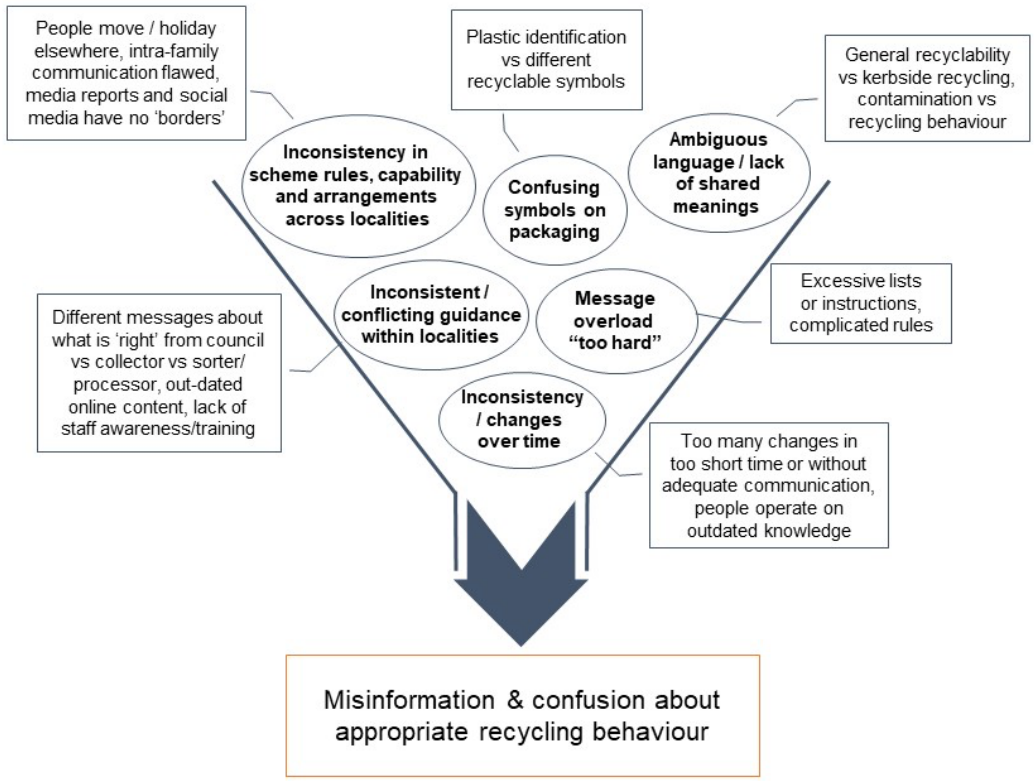

Figure 1: Some of the contributors to misinformation and confusion about correct recycling behaviour.

As Figure 1 shows, the evidence suggested that a range of 'upstream' factors influence peoples understanding, and those understandings themselves reflect broader arrangements across economic, social, technical and biophysical systems. Systems thinking can help us to explicitly take into account how broader contextual factors influence human behaviour, integrate different information and views, and build a mutual understanding and shared response agenda to a problem (Brown et al., 2010; Vayda, 1996).

This is one of the ways systems thinking can highlight where integrated solutions are required that involve making changes at different levels in the system. Without the system thinking element, we likely would have focused on the real, but limited, opportunities to improve the quality of kerbside recycling through behavioural

interventions. But recycling behaviours are constrained by, and contribute to, entities and relationships well beyond the boundaries of the household. So, instead of focusing only on the 'presenting problem' of the waste crisis and the contributions of household recycling behaviours, using systems thinking helped partners in the Waste and Circular Economy Collaboration identify and agree on the need for behavioural public policy experiments across the waste system (see Figure 2).

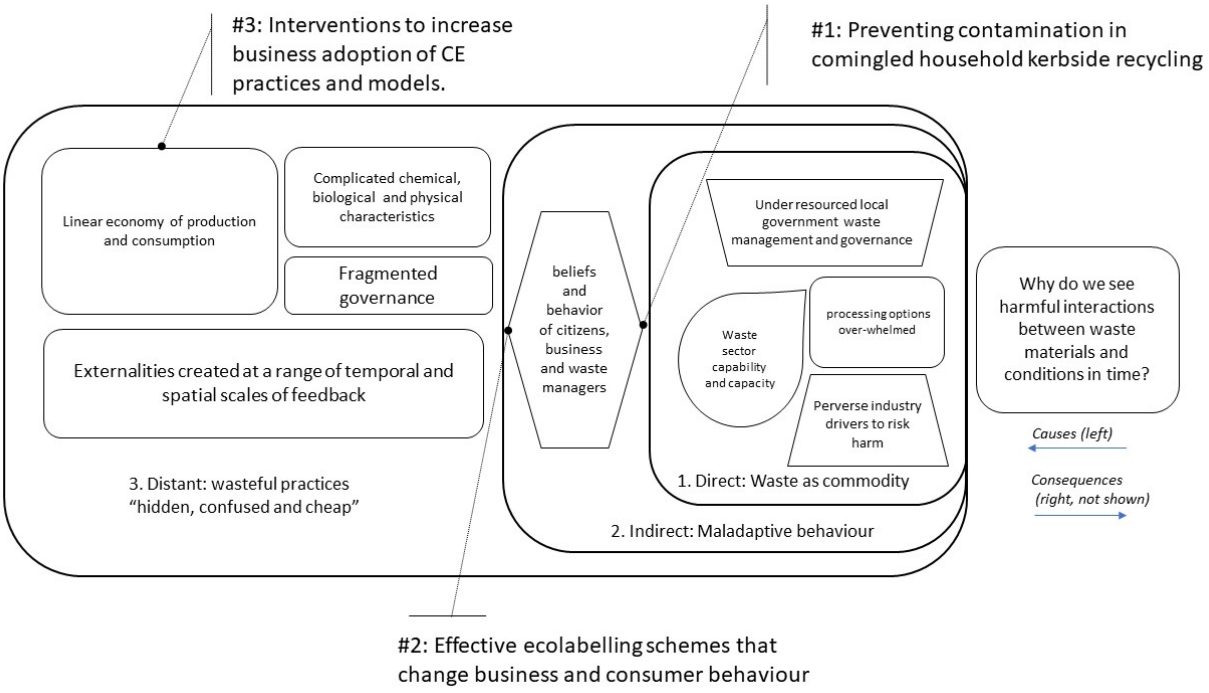

Figure 2: Using systems thinking via causal (and effect) mapping to frame a behavioural public policy research collaboration[2].

This example highlights that when we consider a given policy problem using systems thinking, we can helpfully translate our understanding of it into the following generalisable terms and concepts:

> *A system is composed of discernible parts/elements/agents that interact to constrain each other's behaviour. Mutual constraints, operating between the parts of the system, limit the range of behaviours available to the system as a whole, and delimit its boundaries – defining its 'emergent' (or synergistic) properties. System behaviour arises from the internally-generated forces imposed on parts of the system by other parts of the system – i.e., within and across different nested hierarchical scales of organisation over time, space and levels of complexity (Dyball et al., 2005; Hirschheim, 1983; Meadows and Wright, 2008; Richmond, 1994).*

[2] This diagram draws on a much more detailed system map produced by Clarke (2018).

How do systems thinking and behaviour change approaches complement each other?

Applying a whole-of system approach to a problem generates a rich understanding of the issues and numerous associated behaviours, but can be less directly influential on the behaviours themselves. This is because systems thinking encourages us to consider organic, integrated wholes, composed of interrelated parts and subsystems. It highlights how change may be needed in multiple parts, and how improvements in one area may have unintended negative consequences in another. It's not always clear where or how rapid, substantial intentional change can be 'made' to happen, nor even how to change any one element without engaging with many (although analytical principles discussed in the 'do it yourself' example below help).

Conversely, focusing in on behaviours can be incredibly insightful and impactful for understanding and influencing a specific behaviour by a given population, but can cause problems if done too 'early' – i.e., without the contextual understanding of the causes and consequences of behaviour at a system level. Behavioural science tends to encourage us to apply powerful analytical 'reductionist' thinking to parts of the system, and attempts to identify the complicated but identifiable elements that need to be influenced to change individual behaviour. This is typically done through a carefully crafted intervention, based on a deep understanding of the reasons why people do or do not enact a specific behaviour in a time and place. However, this risks excluding broader perspectives and evidence, downplaying interactions with contextual factors, and the unintended consequences of intervening.

These contrasts suggest that both systems thinking and focused behaviour change[3] techniques are needed at various stages of behavioural public policy to balance the advantages and risks of both. Human behaviour is caused by, and effects, multiple interacting systems (e.g. social, economic and environmental). The more complex or 'wicked' a policy problem is, the more critical it is that you consider systems when seeking behaviour change. In short, just focusing on a single behaviour or outcome within a small slice of the system can lead to unintended and undesired outcomes, problem mis-identification, and potentially re-enforce or exacerbate the starting problem, or create others just as bad or worse[4] .

Recognising this, BehaviourWorks uses systems thinking most explicitly in the 'Exploration' phase of The Method: to consider the whole of an issue, identify the different parts and players involved with the issue and consider how they are related. This often helps reframe our understanding of the problem, and 'whose behaviour could change how', and therefore the intervention and behaviour change options. This is important pragmatically also, because a lot of attention and resources are focused on just one or a few behaviour changes for most of the later stages of The Method (Deep Dive, Application). However, systems thinking is still useful in these later stages, particularly when considering intervention implementation and scaling interventions from a successful trial (Best and Holmes, 2010).

Tools facilitating systems thinking are diverse, from quick workshop exercises, to extended stakeholder engagement, modelling and more. The specific tool we introduce here – cause and effect mapping - is just one of many systems tools useful in behavioural public policy and beyond.

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[3] That are also integrative and interdisciplinary, not locked into narrow models of human behaviour.

[4] See this pre-print of a recently submitted journal paper for a longer discussion of these issues in the context of socio-technical transitions and behaviour change (Kaufman et al 2021).

USING CAUSE AND EFFECT MAPPING

So how do you start? People building sophisticated models frequently start with pen, paper and sticky-notes, and you can too. The process outlined below (with much iteration over three workshops and a desktop review) was used to produce the maps framing waste behaviour change interventions shown in Figure 2 .

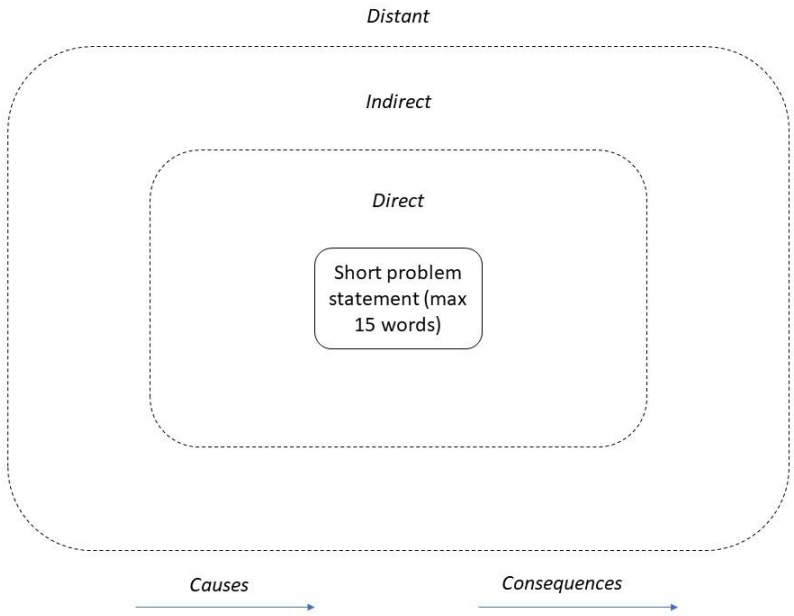

Figure 3: A simple cause and effect system map template

1. Sketch the above diagram (Figure 3) on a large piece of paper, showing a problem, and expanding bands of cause and effect on the problem.
2. Write the central situation, problem or opportunity in a short statement, simply and factually stating the subject of interest: i.e. 'Two thirds of Australians are overweight or obese'.
3. Brainstorm different reasons you think this problem exists, and list them individually on small sticky notes, as you will want to move them around as you start the next step (one issue/reason per note).
4. Place them in the diagram based on how directly or indirectly you think they contribute to the problem. Is it a cause of the problem? Place it to the left. A consequence? To the right. If it appears to be both, you may want to break it down into two related, but different elements, and connect with arrows (see 6.).
5. Channel your inner child by asking repeatedly 'why (does this problem exist)?', with each question stepping back along chains of entities and relationships, adding elements as they occur. We use three 'bands' of causation above, but simple proximity works too.
6. In addition to proximity to the problem, how are these elements inter-related?
    a. Illustrate relationships by adding arrows showing how you think one element influences another, with the thickness of the arrow showing how strong you think this influence is.
    b. Each connection gets its own arrow (no single double-headed arrows! – this can misrepresent two way influences as equal).
    c. Consider if the link is positive (+) or negative (-) – so a simple positive loop would get two arrows and a (+) sign.
7. Take a break. Looking again, see if you can identify any of the following relationships and features:

a. ‘Causal chains’ of elements and relationships that influence the problem. Sometimes targeting behaviour change at or near the root of the chain is much better value for effort.
b. ‘Cat’s claws’– elements with many arrows leading into them. Think of a cat’s claw in a jumper – you need to unpick each one (driver) to remove it. Do not target them lightly!
c. ‘Octopus arms’ – sometimes an element influences many others, and could be high value for effort to target.
d. ‘Here be dragons’/‘call a friend’ – elements will appear on your map that seem well out of your ability to influence or mandate to act.[5] Consider which ones need to be recognised as ‘too hard/risky’, or ‘parked for now’. But also consider whether partnering with others, who can more legitimately, efficiently and/or effectively target that element, is wiser.
e. ‘Fact, or opinion’ – consider which elements and relationships you know a lot about, which ones you might only think you do, and ones which need more evidence and analysis. This is a step where fresh or diverse eyes and minds can be helpful.

After 2 hours at this, you should be in a much better position to answer questions like:

- What is the problem, really?
- What is the context of the problem? What do we need to know more about?
- What are the important elements contributing to, and flowing from, the problem?
- Whose behaviour could change to improve the situation?
- What intended and unintended consequences from intervening can we anticipate?

ADVANCED APPLICATIONS

While the above is relatively easy on your own or in a small group, systems maps are representations, not reality, and there is the risk of embedding existing ‘group think’, assumptions, power dynamics, ‘false’ certainty, incorrect beliefs and biases. Experts can help reduce this risk by being ‘critical friends’ and applying evidence informed reflection and peer review through, for example:

- Facilitation and integrating diverse perspectives – people can reasonably disagree about complex situations, and indeed unpacking the conflict can be very insightful.
- Knowledge translation of rigorous, quality assured inputs like evidence reviews, data analytics, research.
- Rigorous and internally consistent systems models. Sophisticated methods and analytical tools abound. For example, agent based modelling of behaviour change interventions (Hansen et al., 2019; Schlüter et al., 2017).
- Methods and experience in managing, communicating and interpreting systems maps - they get unwieldy and dense quickly.
- Translating the map to ‘whose behaviour could change how’ and where behaviour change ‘sits’ (as a cause and consequence) within the problem (see later Method Book chapters).

[5] Remember it is typical of wicked policy problems that multiple agencies and players may hold parts of the problem, solutions, and mandate to act on it. Looking at behaviour in context can help make this clearer, and therefore the case for working together.

Indeed, mapping exercises can be enriched by a range of useful frameworks that prompt thinking about broader systems. This potentially engages disciplines across the natural and social sciences and humanities (Jackson, 2018). Linking different systems and behaviour can be both insightful, and practical. Consider for example how BehaviourWorks Australia's Jenni Downes' research maps the systems co-evolving with recycling behaviours. Integrating published research and applied behavioural policy tools in systems workshops with waste educators, she detailed a wide range of possible influences to consider and use in planning interventions. This can inform subsequent steps in The Method (see **Error! Reference source not found.**).

Figure 4: The systems causing, and effected by, recycling behaviour

Indeed, a range of frameworks situate behaviour in diverse policy contexts and explore the implications for changing individuals' behaviour, and the systems they are participating in – racism, health, sustainable consumption, energy, socio-ecological change, socio-technical transitions and more[6]. Systems thinking applied to behaviour change is a valuable way of bringing together diverse sources and types of evidence and knowledge, and grounding it in the practicalities of how do we help people perform a behaviour differently.

CONCLUSION

In the end, Amy's team were able to support the development of the action plan for the National Waste Policy 2018 [7] with advice incorporating systems perspectives. They underlined the overall importance of changes beyond the individual to make correct recycling easier. In particular, coordinating local, regional and national initiatives, and transforming systems that shape consumer behaviour. Taking a systemic approach to behavioural public policy, Amy and colleagues drew on inputs across The Method's Exploration phase, including a rapid evidence and practice review (see Chapter 1) on recycling contamination, a national stakeholder workshop, the

[6] See for example: Akenji, Lewis, Huizhen, and Chen, 2016; Bruckmeier and Pires, 2018; Darnton 2013; Feagin, 2013; Kaufman et al. 2021a, Kaufman et al. 2021b, Public Health England, 2018; Schell et al., 2020; Vayda, 1996.

[7] National Waste Policy Action plan, p. 10.

waste causal influence system map, and the shared knowledge and advice of staff and partners within the Waste and Circular Economy Collaboration. Overall, this work supported the need for policy initiatives reforming systems that frame recycling and sustainable consumption behaviour in Australia, including product design and labelling, business innovation to offer 'circular economy' products and services, local campaigns, and improved collecting and sorting systems, bin designs and more to support correct kerbside recycling behaviours (see BehaviourWorks Australia collaboration publications and products).

REFERENCES

Akenji, Lewis, Huizhen, Chen, 2016. A framework for sustainable lifestyles: Determinants and strategies (No. DTI/1717/PA). United Nations Environment Programme.

Best, A., Holmes, B., 2010. Systems thinking, knowledge and action: towards better models and methods. Evid. Policy J. Res. Debate Pract. 6, 145–159. https://doi.org/10.1332/174426410X502284

Brown, V.A., Harris, J.A., Russell, J.Y. (Eds.), 2010. Tackling wicked problems through the transdisciplinary imagination. Earthscan, London; Washington, DC.

Bruckmeier, K., Pires, I., 2018. Innovation as Transformation: Integrating the Socio-ecological Perspectives of Resilience and Sustainability, in: Pinto, H., Noronha, T., Vaz, E. (Eds.), Resilience and Regional Dynamics, Advances in Spatial Science. Springer International Publishing, Cham, pp. 209–231. https://doi.org/10.1007/978-3-319-95135-5_11

Clarke, J., 2018. EPA problem solving workshop report: Waste. Unpublished report produced by Minds at Work on behalf of the Victorian Government Department of Land, Water, Planning and Environment, EPA Victoria and Sustainability Victoria, Melbourne, Australia.

Darnton, A., Evans, D., Scotland, Scottish Government, 2013. Influencing behaviours: a technical guide to the ISM tool. Scottish Government, Edinburgh.

Dyball, R., Beavis, S., Kaufman, S., 2005. Complex adaptive systems: constructing mental models, in: Keen, M., Brown, V.A., Dyball, R. (Eds.), Social Learning in Environmental Management: Towards a Sustainable Future. Earthscan, London; Sterling, VA, pp. 41–59.

Feagin, J., 2013. Systemic Racism: A Theory of Oppression. Routledge, New York.

Hansen, P., Liu, X., Morrison, G.M., 2019. Agent-based modelling and socio-technical energy transitions: A systematic literature review. Energy Res. Soc. Sci. 49, 41–52. https://doi.org/10.1016/j.erss.2018.10.021

Hirschheim, R.A., 1983. Assessing participative systems design: Some conclusions from an exploratory study. Inf. Manage. 6, 317–327. https://doi.org/10.1016/0378-7206(83)90040-X

Jackson, M., 2018. Systems Research and Behavioral Science Journal [WWW Document]. URL https://onlinelibrary.wiley.com/journal/10991743a (accessed 10.31.18).

Kaufman, Stefan; Saeri, Alexander; Smith, Liam; Malek Pour, Shirin; Raven, Rob (2021a): Kaufman et al 2021 Behaviour change and sustainability transitions.pdf. Monash University. Unpublished pre-print submitted to Environmental Innovation and Socio-technical transitions (29/01/2021). https://doi.org/10.26180/13654502

Kaufman, Stefan; Kirchherr, Julian; Curtis, Jim; Downes, Jenni; Saeri, Alexander; Slattery, Peter; et al. (2021b): Barriers to the Circular Economy in Australia and the European Union (EU): A comparative mixed methods review. Monash University. Unpublished pre-print under review with the Journal of Cleaner Production. https://doi.org/10.26180/13654511

Kaufman, S., Meis-Harris, J., Spano, M., Downes, J., 2020. What 'works' behaviorally to reduce contamination of recycling at the kerbside (a rapid evidence and practice review). BWA Waste and CE collaboration, BehaviourWorks Australia, Monash Sustainable Development Institute, Monash University, Melbourne, Australia.

Meadows, D.H., Wright, D., 2008. Thinking in systems: a primer. Chelsea Green Pub, White River Junction, Vt.

Public Health England, 2018. Improving people's health: Applying behavioural and social sciences. Department of Health, London.

Richmond, B., 1994. Systems thinking/system dynamics: Let's just get on with it. Syst. Dyn. Rev. 10, 135–157. https://doi.org/10.1002/sdr.4260100204

Schell, C.J., Dyson, K., Fuentes, T.L., Roches, S.D., Harris, N.C., Miller, D.S., Woelfle-Erskine, C.A., Lambert, M.R., 2020. The ecological and evolutionary consequences of systemic racism in urban environments. Science 369. https://doi.org/10.1126/science.aay4497

Schlüter, M., Baeza, A., Dressler, G., Frank, K., Groeneveld, J., Jager, W., Janssen, M.A., McAllister, R.R.J., Müller, B., Orach, K., Schwarz, N., Wijermans, N., 2017. A framework for mapping and comparing behavioural theories in models of social-ecological systems. Ecol. Econ. 131, 21–35. https://doi.org/10.1016/j.ecolecon.2016.08.008

Vayda, A.P., 1996. Methods and Explanations in the Study of Human Actions and their Environmental Effects. Centre for International Forestry Research and World Wide Fund for Nature, Jakarta, Indonesia.