A system leverage points approach to governance for sustainable development

Mitzi Bolton

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Abstract
Governments are inherently responsible for citizens' well-being. Given that achieving sustainable development [“Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs”—(WCED in Our common future, Oxford University Press, New York, 1987)] is core to the attainment and maintenance of citizens' well-being, and increasingly understood to require major transformations in integrated social, technological and ecological systems (Sachs et al. in The decade of action for the sustainable development goals: sustainable development report 2021, Cambridge, 2021), it follows that governments have a significant role in shaping transformations. Muted progress on long-standing social, environmental, and economic challenges alongside spiralling public budgets and intergenerational debt suggests, however, that public governance systems are inadequate to facilitate the transformations urgently required. Conceptualising the practice of public decision-making as a complex system, this paper investigates whether known influences on public decision-makers can be linked to Meadows’ (Leverage points: places to intervene in a system, Sustainability Institute, North Charleston, 1999) leverage point framework. Finding meaningful connections, it further explores how the leverage point framework can be employed to engage decision-making influences as enablers of desirable public outcomes. It is contended that shifting decision-makers’ focus one step beyond currently prevalent leverage points will set in motion the transformations in governance required to facilitate sustainable development.

Keywords Leverage points · Systems · Sustainable development · Governance · Government · Public sector

Introduction
The world faces an ever-evolving raft of complex, interconnected, enduring problems to address and consider. Planetary boundaries are being exceeded or increasingly tested (Rockström et al. 2009; Steffen et al. 2015), with direct and flow-on impacts between boundaries (Lade et al. 2020), including climate change (IPCC 2021) and biodiversity loss (FAO 2019; IPBES 2019) and their respective consequences for access to basic human needs, quality of life, and migration patterns (Kaczan and Orgill-Meyer 2020). While front of mind for many as we seek to manage and rebuild from the pandemic, the need to mitigate the risk of future zoonotic diseases (De Sadeleer and Godfroid 2020) is yet another long-standing significant challenge to face. Complex and wicked problems are also visible through rising inequalities across and within countries (Wilkinson and Pickett 2009; Stiglitz 2015; Balestra and Tonkin 2018; Alvaredo et al. 2018), which impact trust, shared visions of a desirable society (Bain et al. 2019), and the institutions of government responsible for delivering those visions (McGrath 2017).

The above concerns and many more are compounded by muted or insufficient progress on the international agreements intended to help address them, such as the United Nations Sustainable Development Goals (SDGs) (UNGA 2015). Similarly, Australia’s Report on Government Services (RoGS) annually documents how slow and inadequate progress is in many areas of national and subnational social policy (such as education, justice, emergency management, health, community services like child protection, and housing and homelessness) (PC 2022). This is despite repeated attempts at reform. The SDGs and RoGS articulate and track progress on shared visions, but also demonstrate that merely
coming up with plans and frameworks achieves little without their effective implementation. Thus, attention also needs to be given to what stops governments from delivering on shared visions, like the SDGs and RoGS, and steps taken to improve the effectiveness and efficiency of their efforts.

Every decision within government forms an aspect of public governance. Every actor within government, be they elected, members of the judiciary or public servants, forms part of that governance infrastructure. While elected officials may set the co-ordinates for where society is going through their promises or announcements, how the destination is reached is heavily influenced by public servants at all levels. Whether through influencing political decisions, or developing and implementing policy and legislation to provide for them, public servants are what power government action. That is, much of the governance of government action occurs through the public service—the worker bees of government. Hence, the capability and capacity of our public sectors heavily influence success in achieving the desired public policy outcomes. Correspondingly, in this paper, governance is specifically considered from the perspective of activities leading to and arising from public-sector decisions and, in particular, the role of public servants as public decision-makers.

Simply declaring that public servants need to do more or are somehow wilfully failing in their responsibilities is, however, unhelpful. Public servants are not working to actively impede enhancement or protection of our way of life; it is their way of life too. Indeed, many choose their careers to address complex problems more actively. They are, however, constrained in their attempts to do so by a multitude of influencing factors (Bolton 2020). Public decision-makers fail to consistently achieve stated objectives not because of corruption, laziness, or lack of will—though on occasion these will play a role—but rather the complexity of the operating environment they find themselves in.

Nevertheless, the repeated failure to deliver on community expectations across public policy domains is not something that can be brushed aside or accepted as ‘the way things are’, or ‘the best we can do’. On the contrary, the pandemic has highlighted that we can and must do things differently to address shared problems quickly (WHO 2021; Apuzzo and Kirkpatrick 2020). If our way of life is to be enhanced or maintained within planetary boundaries, new governance approaches deliberately targeting weaknesses in current methods are needed.

**A systems governance approach**

One such approach could be to recognise public decision-making for what it is—a complex system—and bring systems thinking into the equation. We live in systems, we work in systems, and yet we try to solve problems within them by taking a siloed or linear approach. It is illogical to think this could work, and yet, we do it over and over again. Government especially is largely structured in siloes, from minister to street-level bureaucrat. Moreover, there can be a tendency to view public problems through the lens of what matters in the moment or a single policy domain, rather than to sit with and find ways to conceptualise the, at times, Escher-like whole. Recognising this, Meadows’ work on leverage points (LPs) provides a useful framework for understanding where and why political and government decisions become ‘stuck’ (Meadows 1999, 2008; see Box 1).

#### Box 1: System leverage points, as defined by Meadows (1999)

1. The power to transcend paradigms
2. The mindset or paradigm out of which the system—its goals, structure, rules, delays, parameters—arises
3. The goals of the system
4. The power to add, change, evolve, or self-organise system structure
5. The rules of the system (such as incentives, punishments, constraints)
6. The structure of information flows (who does and does not have access to what kinds of information)
7. The gain around driving positive feedback loops
8. The strength of negative feedback loops, relative to the impacts they are trying to correct against
9. The lengths of delays, relative to the rate of system change
10. The structure of material stocks and flows (such as transport networks, population, age structures)
11. The sizes of buffers and other stabilising stocks, relative to their flows
12. Constants, parameters, numbers (such as subsidies, taxes, standards)

On balance, Meadows argued the levers can be ordered hierarchically: she considered shallower leverage points within the hierarchy (e.g. numerical parameters, the size and structure of buffers, and stocks and flows within the system) easier to change, but ultimately less impactful upon the overall functioning of the system—though also argued, this is where much of our public debate focuses; in the middle, she identified leverage points relating to the system’s overall design and feedback mechanisms; finally, she argued deeper leverage points within the hierarchy (e.g. transcending paradigms, the mindset from which systems emerge, and the goals of the system) are harder to employ but more likely to lead to system transformation if successfully applied.

A significant caveat is that systems are complex and unpredictable. It is entirely possible that in some instances, the linearity implied by Meadows’ framework and its application within this paper will not exist. Indeed, Meadows
noted differing contexts may mean that positions within the framework shift on occasion (for example, delays may operate as deeper points of leverage where their length is able to be altered). Still, while recognising this and perhaps illuminating the difficulty of breaking from linear thinking, the leverage points are generally discussed in a hierarchical fashion by Meadows and much of the literature and that recognition and approach are also applied here.

An increasingly popular way to visualise the leverage points in recent years has been the introduction of the ‘iceberg model’ (Bosch and Smith 2007; Davelaar 2021). The iceberg represents lower-order leverage points as the visible ice (being shallower, more tangible, and easier to predict the behaviour of), while middle- to higher-order leverage points are represented by ice below the surface (being deeper, harder to conceptualise, and predict, but more impactful if engaged). Extending the iceberg metaphor to the public decision context, attention tends to be focussed on the overt and easily engaged decision or problem elements (the lower-order or shallow leverage points). However, as with icebergs, it is the more covert or less tangible elements (the higher-order or deeper leverage points) which hold the greatest potential for transformative impact.

For example, debates about the amount of social support or welfare provided to citizens are often topical and impassioned, but largely unresolved, as regardless of whether people are offered $x or $x + y in welfare payments, the debate is focused on applying the lowest-order leverage points (numerical parameters) and the system will essentially continue to function as it has before. The value of ‘y’ will make a difference to some individuals, but the system itself will not change. A more significant change to the system would, for instance, be the introduction of a universal basic income which would more radically alter the structure and rules of the welfare system.

The value of systems thinking as a tool to enhance the achievement of sustainability has been drawing increased attention. Fischer and Riechers (2019) argue that Meadows’ framework is an ‘under-recognised’ tool in the field of sustainability and propose that, ‘conceptual, qualitative empirical or quantitative empirical work’ drawing on the strengths of the framework may, ‘yield both practical and theoretical advances’. Egerer et al. (2021) applied leverage points as a weighting system to understand and prioritise climate change adaptation measures within the Saxony agricultural sector. Further, a recent special issue on the topic identifies nine questions to help drive research and practice aimed at sustainability transformations through the application and consideration of leverage points (Leventon et al. 2021a). Relatively, the Earth System Governance (2018) community¹ presented a research framework aimed at mobilising and coordinating research efforts reflecting the rapid evolution, emergence, and increase in complexity of the challenges humanity faces. This framework has four focal points: transformations, inequality, the Anthropocene, and diversity. Transformations are particularly relevant here, and the need for them is articulated by Burch et al. (2019) from three angles: (1) governance for transformations—decision-making that facilitates the conditions necessary for transformations to occur; (2) governance of transformations—decision-making that regulates or oversees transformations underway; and (3) transformations in governance—alterations to the how and what of the decision-making practice itself.

The complex problems flagged earlier suggest that successful governance for and of transformations has been lacking to date: The conditions for transformation have not been widely established, and where they have (e.g. in relation to altered food and energy systems to help address the climate crisis), the anticipated transformations have not been as swift or impactful as hoped. In recognition of this, perhaps our governance systems need to transform first so as to better position the lead out of more sustainable futures. Given the complex and contested governance operating space that exists, and the muted impact of the hundreds of billions spent to achieve desired public outcomes (PC 2021), it is hard to argue transformations in governance are not required.

The aforementioned multitude of influencing factors decision-makers must contend with are also complex, not only in number but also in function. Decision-making influences have both transformation-enabling and -inhibiting traits. Similarly, influences are both characteristics of the public decision-making system that leverage points can act upon and, pending the circumstances, themselves be expressions of leverage points. Further, influences can represent multiple levers, with the dominant lever expressed in any particular situation depending on the decision context and actors involved. For example: evidence² is acted on by and a product of the system, through which parameters are created and responded to; however, evidence may similarly act as negative (LP8) or reinforcing feedback loops (LP7), pushing the system in one direction or another.

The variable nature and role of decision-making influences, as structural or actor-based system elements, add additional complexity: some of the influences are relatively fixed in nature (e.g. the Institutions³ within which

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1. A network of researchers recognising the need for enhanced “governance mechanisms to cope with the current transitions in the biogeochemical systems of the planet” (Burch et al. 2019).

2. The suite of decision-making influences are defined in Appendix A. Those mentioned explicitly in the text are also defined in footnotes: Evidence reflects, consideration of evidence or information in decision-making, what ‘counts’ as evidence (e.g. qualitative and quantitative), and availability of data.

3. Institutions—the characteristics of the machinery of government, such as the Victorian Public Sector and departments and agencies within it as individual and combined institutions, as well as the structure of those institutions and administrative tools to support their
decision-making occurs. Legislation⁴ that imposes require-
ments upon decision-makers); some influences manifest in
different ways pending the actions of individuals (e.g. the
Personal characteristics of decision-makers,⁵ the Engagement⁶ approaches taken to communicate decisions, and
indeed the Framing⁷ of such engagement); and still others
have the ability to reflect both structures and actors (e.g. Complexity⁸). This latter variability in influence nature is
perhaps what stymies some decision-makers from becom-
ing policy entrepreneurs within their roles, as they do not
realise the extent of their capacity as actors with the ability
to influence system outcomes (Bolton 2020).

Considering the increased scholarly interest, the dem-
onstrated need to accelerate sustainability and governance
transformations, and the previously identified influences
upon public decision-makers, this paper seeks to answer
the following research question: can the influences on pub-
lic decision-makers be linked to the leverage point frame-
work? If so, what does that suggest about where efforts can
be focused to drive transformations in governance for more
sustainable outcomes?

Defining the system under consideration as the space
and processes embodied by public decision-makers and the
institutions within which they act to deliver optimal public
outcomes, this paper commences by empirically exploring
the relationships between decision-making influences and
leverage points. With these in hand, consideration is given to
how these impact who has authority to consider
transformations, and the previously identified influences
onstrated need to accelerate sustainability and governance
functioning. Further, how these influence public decisions.

Personal characteristics of public decision-makers—the skills,
experience, attributes, and personal capabilities of public decision-
makers. This includes their values and motivation, willingness or per-
ceived ability to be frank and fearless, and self-perceived ability to
influence public decisions.

Engagement—how (and if) communication with stakeholders
occurs and the framing of that messaging.

Framing—discussed in the sense raised by Lakoff (2014), and Tver-
sky and Kahneman (1981), and how it is used to present ideas more
or less favourably.

Complexity—the array of considerations within and of decisions,
and how this leads to increased uncertainty and public decision-mak-
ers feeling overwhelmed.

Footnote 3 (continued)
functioning. Further, how these impact who has authority to consider
and make a public decision and also government inertia (designed
and unintentional) in responding to perceived needs for public deci-
sions.

⁴ Legislation—the legal requirements acting as opportunities and
barriers, such as inbuilt policy resilience.

⁵ Personal characteristics of public decision-makers—the skills,
experience, attributes, and personal capabilities of public decision-
makers. This includes their values and motivation, willingness or per-
ceived ability to be frank and fearless, and self-perceived ability to
influence public decisions.

⁶ Engagement—how (and if) communication with stakeholders
occurs and the framing of that messaging.

⁷ Framing—discussed in the sense raised by Lakoff (2014), and Tver-
sky and Kahneman (1981), and how it is used to present ideas more
or less favourably.

⁸ Complexity—the array of considerations within and of decisions,
and how this leads to increased uncertainty and public decision-mak-
ers feeling overwhelmed.

Footnote 4 continued

The results of this latter process enabled simple cal-
culation of the number of intersecting decision-making

Footnote 8 continued

tempered by a recognition that the choices made through our
governance systems today will heavily determine the nature
of the Anthropocene⁹ experienced by future generations.

Methods

Identification of system variables

Public decision-making system variables or influences were
identified previously through inductive thematic analysis
of interviews conducted with 35 current or former public
servants associated with the Victorian Public Sector (VPS).
The VPS is the subnational civil service responsible for sup-
pporting the State of Victoria, one of Australia’s six feder-
ated states. Participants ranged in seniority from frontline
or street-level bureaucrats to organisational leaders, and
collectively represented all 2017–18 Victorian government
departments. Interview topics included decision-making
approaches and considerations, definitions of evidence and
sustainable development, awareness of the SDGs, and par-
ticipant’s suggestions of changes needed to enhance public
decision-making. The interviews did not explicitly reference
system leverage points or thinking, nor were participants
explicitly asked to identify factors influencing their deci-
dions which, as stated, were subsequently identified through
inductive thematic analysis. The full list of decision-making
influences and their definitions is provided in Appendix A.

Analysis of influence–leverage point relationships

The 40 decision-making influences identified through the
prior thematic analysis were each considered in terms of
their potential to act as each of Meadows’ 12 system leverage
points. This involved: (1) repeatedly reading the descrip-
tions Meadows (1999, 2008) provides, in conjunction with
the author-developed definitions for each decision-making
influence and the interview text coded to those influences;
(2) making annotations as to why a potential match
was considered to exist or not; and (3) repeating the lat-
ter steps 4–7 days later to confirm the decision, until no
further changes were recorded (this occurred after a fifth
review). The final rationale for the matches made is included
in Appendix B, and further debate on the matches identified
through this process is welcomed.

The results of this latter process enabled simple cal-
culation of the number of intersecting decision-making

Footnote 9 continued

⁹ Crutzen (2002) introduced the idea of the Anthropocene as a new
geological age, arguing mankind’s impact on the planet has become
a ‘significant geological force’ which has shifted planetary function-
ing from the relatively stable functioning of the Holocene to unknown
territory.
influences per leverage point (LP). Considering the number of matches as a marker of opportunities for the leverage points to be applied, the latter process similarly enabled consideration of which leverage points have the most potential to be active within the public decision-making system in Victoria.

Recognising the frailty of using a total numbers approach only, the literature was searched for other leverage point ranking methods and, finding nothing of relevance at the time, novel alternate ranking approaches were developed and tested. The most meaningful of these, a reverse linear weighting, applied Meadow’s heuristic of a hierarchy to provide a comparative value to each leverage point. Leverage point 1, the power to transcend paradigms, having the most power to alter a system was given twelve points. LP2, the mindset out of which systems arise, being the second most powerful was given eleven points, and so on, down to LP12, constants, parameters, numbers, which, having the least power, was given one point. The number of intersecting decision-making influences per LP was then multiplied by these corresponding weights to better reflect Meadows’ hierarchy within the ranking of leverage point prevalence in the VPS (i.e. leverage point 1: 12 weighted points × 7 influences intersected = 84).

While still a simple measure and, as aforenoted, in some contexts the linearity it implies may not be reflective of systems functioning, for the purposes of a general comparative approach to the total number of matches, this weighted approach was found to be valuable. Assigning values to leverage points to enable ranking is also an approach taken by Egerer et al. (2021).

### Results

#### Influences–leverage points relationships

Table 1 provides an overview of the influence–leverage point relationships identified. It illustrates that all decision-making influences have the potential to operate as multiple leverage points and vice versa. It further shows a universal relationship between influences and reinforcing feedback loops (LP7), and a near universal relationship between decision-making influences and the power to alter system structures (LP4).

An annotated rationale for each of the 220 identified relationships is included in Appendix B. The results of this analysis are likely to have applicability to other jurisdictions for two reasons: (1) participants spanned the gamut of roles, responsibilities, and policy areas, ranging in seniority from frontline or street-level bureaucrats to organisational leaders across the sector; (2) the Victorian Public Sector operates within a Westminster system of government and serves a population of approximately 6.7 million people (ABS 2020), attributes which are likely to be reflected elsewhere.

**Priority leverage points in the Victorian Public Sector**

Ranking leverage points by the total number of related decision-making influences (Table 2, column 2, ‘influences intersected’) further demonstrates that LP7, reinforcing feedback loops (40/40 matches), and LP4, the ability to evolve or change the system (39/40 matches), are the most accessible leverage points within the public decision-making system in Victoria. ‘Accessibility’ is considered from the perspective of the number of opportunities to effect change on the system, as it could be argued that an increased number of opportunities to intervene makes a decision-making influence or leverage point more likely to be used and applied within governance processes, and, therefore, more practically valuable to decision-makers. The latter leverage points, LP4 and LP7, each have almost double the potential number of influence–leverage point interactions as the next, LP11, the size of buffers (22/40).

When the reverse linear weighting is applied, the power to alter system structures (LP4) and reinforcing feedback loops (LP7) remain the most dominant leverage points, followed by LP3, the origins of paradigms (see Table 2, column 4 ‘weighted ranking’). That is, when considered through the lens of the 40 influences decision-makers must contend with, the dominant leverage points under both frequency and weighted analysis are the ability to evolve or change the system (LP4) and reinforcing feedback loops (LP7).

### Discussion

#### Leverage points as catalysts for enabling influences

This analysis found that the decision-making influences upon public decision-makers can clearly be linked to system leverage points. Where they are, one of the most striking things is the universal relationship between decision-making influences and reinforcing feedback loops (LP7), and the almost universal relationship between influences and the leverage point of self-organisation or system evolution (LP4). This is not to suggest that every influence reinforces the status quo or alters the system structure in the same way—a reinforcing feedback loop for Ministers\(^\text{10}\) would be different

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\(^{10}\) Ministers—the position, interests, incentives, and capabilities of ministers (grouped, as ministers are not the primary focus of this research).
Table 1 Presence of relationships between leverage points and public decision-making influences

| Influence | Leverage point (attributed weight) | 12. Constants, parameters, numbers (1) | 11. Size of buffers (2) | 10. Structure (3) | 9. Length of delays (4) | 8. Negative feedback loops (5) | 7. Positive feedback loops (6) | 6. Information flows (7) | 5. Rules of the system (8) | 4. Ability to evolve or change the system (9) | 3. System goals (10) | 2. Origins of paradigms (11) | 1. Ability to transcend paradigms (12) |
|-----------|-----------------------------------|----------------------------------------|-------------------------|-------------------|------------------------|-------------------------------|-------------------------------|-----------------------------|---------------------------------|---------------------------------|------------------|-------------------|------------------|
| Alignment of SD and PDs |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Appetite for change |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Businesses/non-govt. actors |                               | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Central and review agencies |                               | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Cognitive biases |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Commitment to concepts |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Complexity |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Culture |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Economics |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Election cycles |                               | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Engagement |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Evaluation |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Evidence |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Framing |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Funding |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Governance |                               | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Implementation |                             | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Institutions |                               | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Jurisdiction |                               | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Leadership |                               | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Legislation |                               | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Mandate |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Media |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |
| Ministers |                                   | X                                       | X                       | X                 | X                      | X                             | X                             | X                           | X                               | X                               | X                              | X                              |

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Table 1 (continued)

| Leverage point (attributed weight) | 12. Constants, parameters, numbers (1) | 11. Size of buffers (2) | 10. Structure (3) | 9. Length of delays (4) | 8. Negative feedback loops (5) | 7. Positive feedback loops (6) | 6. Information flows (7) | 5. Rules of the system (8) | 4. Ability to evolve or change the system (9) | 3. System goals (10) | 2. Origins of paradigms (11) | 1. Ability to transcend paradigms (12) |
|-----------------------------------|----------------------------------------|------------------------|-------------------|----------------------|-------------------------------|-----------------------------|------------------------|--------------------------|------------------------------------------|------------------|--------------------------|------------------------------------------|
| Paradigms                         | X                                      | X                      | X                 | X                    | X                             | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| PDMers’ understanding              | X                                      | X                      | X                 | X                    | X                             | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| PDMing considerations              | X                                      | X                      | X                 | X                    | X                             | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| PDMing processes                  | X                                      | X                      | X                 | X                    | X                             | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| Personal characteristics of PDMers |                                        |                        |                   |                      |                               | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| Politics                           | X                                      | X                      | X                 | X                    | X                             | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| Public awareness                   | X                                      | X                      | X                 | X                    |                               | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| R/ship—bureaucracy and ministers   | X                                      | X                      | X                 | X                    |                               | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| R/ship—PDMers and community       | X                                      | X                      | X                 | X                    |                               | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| Resources—capability/capacity      | X                                      | X                      | X                 | X                    |                               | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| Risk                               | X                                      | X                      | X                 | X                    |                               | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| Role of Gov Scale                  | X                                      | X                      | X                 | X                    |                               | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| Strategic planning                 | X                                      | X                      | X                 | X                    |                               | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| Time                               | X                                      | X                      | X                 | X                    |                               | X                           | X                      | X                        | X                                         | X                | X                        | X                                         |
| Toral number of leverage point–Influence relationships | 13                                     | 22                     | 8                 | 20                   | 16                            | 40                          | 17                     | 20                       | 39                         | 3                | 15                       | 7                                         |

Notes: Definitions of each influence are provided in Appendix A. Influences intersecting with a leverage point are indicated by a cross (X). The weighting given to each leverage point is noted in italics in each column heading, and the number of leverage points intersected by each influence is noted in the bottom row.

*PDMing* public decision-making, *PDMer* public decision-maker; *PDs* public decisions, *SD* sustainable development
to a feedback loop for \textit{Evidence}\textsuperscript{11} or \textit{Risk}.\textsuperscript{12} Nevertheless, reinforcing feedback loops exist for all of the influences.

These commonalities shift consideration beyond which \textit{influences} are best placed to stimulate system change, to which \textit{leverage points} have the most potential to do so. That is, knowing the decision-making \textit{influences} within this decision-making system, and that they can have both positive and detrimental impacts, we can turn our minds to which \textit{leverage points} can be applied to encourage positive influence expression. The benefit of this is that, rather than focusing on determining which decision-making \textit{influences} are most impactful and determining how to individually master all forty of them to activate transformations, efforts can instead be applied to particular \textit{leverage points} to simultaneously drive change across multiple influences and throughout the decision-making system. For example, if a concerted effort were made to identify, confirm and, where necessary, alter reinforcing feedback loops within the public decision-making system, the behaviour and outcomes of multiple if not all influences within that system would be altered.

In a way, this approach is trying to achieve the same outcome as Abson et al. (2017). In exploring the potential to group leverage points based on shared characteristics (intent, design, feedbacks, and parameters), they mused that further research is needed to determine if there is a differentiated effect between a single or combined leverage point focus. The suggestion here is that a single lever focus reflecting an aggregation of \textit{influences} upon public decision-making may be more transparent and impactful. That is, a single lever approach may make it easier to identify existing path dependencies and the likely flow-on impacts of deliberate system change. A single leverage point focus may also see attention on the whole system rather than subcomponents within it (Kim 1999), giving rise to greater appreciation of the overall context and synergies. Similarly, a deliberate choice to apply a single leverage point across all or many decision-making \textit{influences} may streamline the focus of system reformers enhancing efficiency through reduced need to identify and corral the ‘energy for change’ recognised as necessary by Birney (2021).

But which leverage point ought to receive this attention? Applying a purist approach, one would adopt the leverage point hypothesised to be most impactful, transcendence of paradigms (LP1). However, transcending paradigms within public decisions is arguably out of reach for many public servants and thankfully so, as some might question the legitimacy of non-elected officials seeking to drive transcendence of paradigms within public decisions (Leventon et al. 2021a). Returning to the findings here, one could apply the leverage points that all or most of the decision-making \textit{influences} are interacting with, the power to alter system structures (LP4) and reinforcing feedback loops (LP7). However, given that any change made within these leverage points would still be operating at the level of the existing dominant

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Leverage Point (attributed weight)} & \textbf{Influences intersected (#)} & \textbf{Frequency ranking$^*$} & \textbf{Weighted ranking$^*$} \\
\hline
12. Constants, parameters, numbers (1) & 13 & 9 & 12 \\
11. Size of buffers (2) & 22 & 3 & 9 \\
10. Structure (3) & 8 & 10 & 11 \\
9. Length of delays, relative to system change (4) & 20 & 4 & 7 \\
8. Negative feedback loops (5) & 16 & 7 & 7 \\
7. Positive/reinforcing feedback loops (6) & 40 & 1 & 2 \\
6. Information flows (7) & 17 & 6 & 5 \\
5. Rules of the system (8) & 20 & 4 & 4 \\
4. Ability to evolve or change the system (9) & 39 & 2 & 1 \\
3. System goals (10) & 3 & 12 & 10 \\
2. Origins of paradigms (11) & 15 & 8 & 3 \\
1. Ability to transcend paradigms (12) & 7 & 11 & 6 \\
\hline
\end{tabular}
\caption{The prominence of leverage points intersecting with influences}
\end{table}

Notes: values are formatted (coloured) to aid visual review of importance; blue are most important, white of middling importance and red of least importance. More vibrant colours indicate scale extremities

$^*$Based on the total number of decision-making \textit{influences} intersected; $^*$weighting calculated by multiplying the attributed LP weight (i.e. assigning a score of 12 to LP1, a score of 11 to LP2, etc.) by the number of decision-making \textit{influences} intersected

\textsuperscript{11} Evidence—consideration of evidence or information in decision-making, what ‘counts’ as evidence (e.g. qualitative and quantitative), and availability of data.

\textsuperscript{12} Risk—Appetites for taking decisions outside of tried-and-true approaches, and behaviours driven by an avoidance of criticism.
system dynamics, it is arguable that the system will respond by seeking to restore its current equilibrium. Perhaps instead, efforts could be focussed on the leverage points one step deeper than each of those considered to have the potential to be universally active within the current decision-making system (i.e. LP4 -> LP3; LP7 -> LP6) (see Fig. 1). As is discussed in the following sections, applying a deeper leverage point in this way could drive system change by effectively disturbing the status quo just enough to override it. Hence, a one-deeper approach may balance the practical constraints and considerations of decision-making within public institutions with the need for transformation in governance, in a democratically sound way.

**Altering system structures with altered system goals**

As noted, almost all influences have the potential to alter system structures (LP4), thus LP4 is a lever with the potential to be highly impactful within current governance arrangements. Focussing on the next leverage point deeper in the hierarchy to change or clearly restate system goals (LP3) will provide opportunity to deliberately construct a holistic narrative for action around which the system will respond and likely shift. If this approach were desired, then a focus on the decision-making influences identified as having the potential to alter system goals (i.e. Economics, Role of Government, and Commitment to Concepts) could help.

For example, while our policy-making commitment to the concept of sustainable development is questionable at times (Bolton 2021; Sachs et al. 2021), advocacy and affirmation of it continues. Furthermore, agitation for an altered focus on economics and the role of government are increasingly visible in both academic and government circles. For example, there are now a proliferation of people (Jackson 2009, 2021; Piketty 2014; Bregman 2016; Raworth 2017; Cottam 2018; Trebeck and Williams 2019; Coscieme et al. 2019; Mazzucato 2021) and even some governments (Wellbeing Economy Alliance 2021; New Zealand Government 2019) looking to change economic paradigms, and reaffirm the role of government to enhance efforts toward a just and prosperous life for all. Similarly, regulatory practice has been seen to evolve from prescription to co- and self-regulatory regimes (Sparrow 2020) and even general duties (Edwards et al. 2020). Hence, it seems there is some recognition of the systemic impact altered expression of the decision-making influences of Economics, the Role of Government, and Commitment to Concepts has upon system goals, and a preliminary willingness to deviate from current paths. Revisiting system goals may also have additional benefits, such as stimulating a virtuous cycle to alter or at least revisit the acceptability of the mindsets which led to our current system. However, while noble and potentially quite effective, as demonstrated by the incorporation of such considerations in

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13 *Economics*—Understanding and application of different schools of thought, growth as a goal, externalities, monetary/financial costs, and Maslow’s hierarchy of needs.

14 *Role of government*—conceptions of the purpose of public decision-makers and government as a whole, and the impact this has on licenses to act and individual decisions to influence (or not) particular outcomes.

15 *Commitment to concepts*—acceptance and application of sustainable development or the SDGs, reflections on the application and impact of these concepts/tools on public decision-making.
formal public decisions (New Zealand Government 2019), few public servants will feel comfortable driving changes in system goals without already having some indicative authority to do so from elected or senior officials. That is, even if it is theoretically possible for public servants to alter system goals, individuals’ core beliefs or wider societal norms on the role of the public sector may prevent them from doing so (Sabatier 1987), suggesting this leverage point is also inaccessible to many public decision-makers.

**Addressing reinforcing feedback loops through altered information flows**

The association of recurring reinforcing feedback loops with each decision-making influence in this system explains why switched-on, well-meaning, self-efficacious, public decision-makers may give up on achieving stated objectives. Having repeatedly hit up against these loops they reason there is nothing more they can do. To use the iceberg analogy, reinforcing feedback loops sits just below the water line—if we look, we can see them but, we do have to look, and, when we do, we may struggle to see beneath them with our existing tools. Encouragingly, considering the relationships between influences and leverage points (Table 1) once again highlights other levers exist. Shifting governance attention one point deeper, from reinforcing feedback loops (LP7) to the structure of information flows (LP6), may aid managed disruption of the underperforming status quo.

Conveniently, some significant, accessible, and well-recognised decision-making influences, such as Cognitive biases, Collaboration, Engagement, Evaluation, Evidence, and Framing, have the potential to alter information flows. Similarly, a focus on altered information flows is also an approach that aligns with popular and ever-increasing calls for evidence-based or informed decision-making to be an integral part of public decision-making processes (OECD 2020; Head 2008). Moreover, practical examples of an altered information flow approach already exist. For example, cross-government networks that facilitate information exchange and learning (both across and within jurisdictional boundaries), staff-led initiatives to focus attention on desired objectives (Bryant and Thomson 2021), and investment in improved data management systems (EPA 2013, 39; VAGO 2013, 19–20). There is also increasing interest and appetite for the use of technology as potential decision-making aids (PC 2020).

As fields which excel in collecting and presenting information in novel ways, artificial intelligence (AI) and data science provide an array of example tools which could sit within an information flow altering toolbox. By providing new pathways for existing or previously uncollected data to reach decision-makers in novel and status quo-disrupting formats, these technologies can shift the governance focus above reinforcing feedback loops (Miller 2020).

Brenner (2012) notes a risk of ‘drowning in a sea of data and thirsting for some theoretical framework with which to understand it’. AI and advanced data science tools can help avoid this trap. These tools excel at creating novel information flows to connect information (new or pre-existing) and decision-makers in new ways. These flows draw attention to hereto unrecognised knowledge and enable robust predictions and assessment of possible futures. In doing so, they better position decision-makers to make informed, holistic policy improvements. For example, Bayesian networks, a form of causal probabilistic modelling, can cut through intractable data-collection loops to identify and rationalise priority interventions. This enables decision-makers to shift their focus from data collection and analysis to the business cases for one to two calculated front runners. Further, applying approaches in a modelled context first, per the Bayesian Network example, may provide additional comfort to decision-makers looking to employ LP-informed approaches. Such modelling provides timely, but safe opportunities to test and explore solutions before implementing them at scale or directly within the community. At a grander scale, the UK Ministry of Justice has commenced linking tens of millions of data records to better understand interaction patterns within their social and criminal justice systems to enable a more holistic approach to identifying ‘what works’ (ADR UK 2021; Office for National Statistics 2021). If successful, this approach could mark a shift towards more fully understanding the impact public institutions and point in system decisions have on individual’s life trajectories, and where changes in well-meaning but ultimately poor decisions and processes are required.

Examples such as these ought to provide confidence to public decision-makers that enhancing information flows (LP6) is an accessible, yet systematically deep, leverage point which can be adopted or at least piloted more widely. However, while AI and advanced data science hold much promise, the latter example applications are far from the norm, and ultimately a suite of tools that support enhanced and novel

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16 Cognitive biases defined here as, “Heuristics, personal anecdotes and pain points that influence decisions, and their associated unintended consequences.”

17 Collaboration defined here as, “How actors work together, particular public decision-makers and parliamentarians.”

18 Engagement defined here as, “How (and if) communication with stakeholders occurs and the framing of that messaging.”

19 Evaluation defined here as, “Both consideration or focus on outcomes and evaluation of public decisions”.

20 Evidence defined here as, “Consideration of evidence or information in decision-making, what ‘counts’ as evidence (e.g. qualitative and quantitative), and availability of data.”

21 Framing defined here in the sense raised by Lakoff (2014), and Tversky and Kahneman (1981), and how language is used to present ideas more/less favourably.
information flows is needed to cater to the varied needs and appetites of differing decision-makers in differing contexts.

The need for caution

There is, of course, a need for caution when intervening in systems and to be particularly cognizant of proverbial butterfly wings in generating change elsewhere. Any plans to intervene may benefit from a third-party reference group or steering committee, providing advice but not approvals, to ensure those leading systems work do not lose sight of critical connections and consequences.

Still, systems are constantly incrementally changing, whether by design or in response to shifts within the other systems they are a part of. Further, part of our governance considerations when choosing whether or not to ‘dance’ with system change must be whether existing systems are fit for purpose and operating as desired. As articulated earlier, this is arguably not the case in relation to governance for and of sustainability transformations.

Further, consideration of what our institutions need to be and do to facilitate a good Anthropocene must focus not just on the how and the what of our institutions, but also the when. The sixth IPCC Report (2021) notes both, “climate change is already affecting every inhabited region across the globe with human influence contributing to many observed changes in weather and climate extremes”, and that, “global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered”, because, “there are already substantial committed changes associated with past greenhouse gas emissions”. More succinctly, there is little time to act. In the context of the Anthropocene and the planet’s threatened tipping points, there is a need for well-considered and efficient catalysts of change now.

Given the need for caution in stimulating transformative system change, limited time in which to undertake those transformations before further adverse consequences are ‘locked in’, existing decision-making influences inhibiting those necessary transformations, and, public servants’ (dis) comfort with their role in such transformations, it would seem prudent to focus on holistic, efficient, transparent, and accessible mechanisms for change to our governance systems. Altering information flows can meet these criteria.

Making space for public decision-maker agency

Hypothetically, enhancing information flows (LP6) overcomes a critical driver of disappointing public decisions, reinforcing feedback loops (LP7). Enhancing information flows also appears to be a more accessible lever to everyday bureaucrats and therefore more likely to be mainstreamed within business-as-usual decision-making than changes to system goals (LP3): it is one thing to challenge reinforcing feedback loops within your decision-making sphere, but quite another to question dominant societal paradigms.

Starting with more accessible levers may act as a gateway to alter public decision-maker mindsets and empower them to see their influence and role-modelling potential within the system (Nielsen et al. 2021). This may also enable greater consideration of the how and why of decision-maker, community, and organisational values (Horcea-Milcu et al. 2019), allowing the ‘inner dimensions’ described by Woiwode et al. (2021), as well as more traditionally focussed upon techno-scientific advances, to begin to influence sustainability transformations.

In time, by demonstrating the value and pathway to employing deeper leverage points, introducing novel information flows (LP6) may engender greater comfort and authorisation for public decision-makers to embrace deeper leverage points. It may also see greater application of what Newell et al. (2021) refer to as ‘spiral’ scaling of transformation, where the pathway forward involves dynamic shifts between the use of shallow and deep scale interventions, pending the outcomes of public decision outcomes along the way—a leap–consolidate–repeat approach to transformation. That is, applying a one deeper approach now may help stretch us beyond the use of systems thinking as a framework for navigating current paradigms toward a broader realisation of the nested nature of the systems within which we live and work (Leventon 2021a, b).

In the meantime, creating a toolbox of approaches that can be employed across a range of public decision-making settings may empower public decision-makers to exercise their individual agency to apply tools one step deeper. Doing so may disrupt the reinforcing feedback loops that have prevented the achievement of collective aspirations and set transformations in governance in motion.

Conclusions

Humanity is at an inflection point: business as usual is not possible if the well-being of current and future generations is to be secured. Continuing to careen down a road of unsolved complex issues risks a significant question for democracy and public institutions: if governments and societies do not endeavour to improve imperfect things for the betterment of all, what is their role?

This paper sought to explore how transformations in governance might be enabled. The suggestions here are not posited to usurp or upend existing democratic processes, quite the opposite. The core objective of this research is to enable democratically expressed aspirations to be realised within the realities of our governance and planetary systems. It couples: prior research identifying barriers to public decision-making for and of the sustainability transformations global, national and subnational governments have
repeatedly reaffirmed; calls to increase empirical research on applications of Donella Meadows’ leverage point framework within sustainability science; and the recent Earth System Governance transformation agenda.

Influences upon public decision-makers were repeatedly linked to Meadows’ framework, enabling a better understanding of which leverage points are currently dominant within the public decision-making system of Victoria. It is clear in this assessment that two moderately to highly powerful leverage points are routinely present within Victoria’s governance system: reinforcing feedback loops and the ability to alter system structures.

With this knowledge in hand and reflecting on Meadows’ core leverage point argument (that higher-order influences are harder to apply but also more impactful), this paper contends that employing tools reflecting leverage points one step deeper in the hierarchy may enable decision-makers to disrupt current system machinations.

It would be remiss not to acknowledge that there is danger and unpredictability in system change, certainly there is a danger that the leverage point framework cannot be applied with the linearity implied. However, it is also imperative to consider the very real and well-recognised risks of not altering the unsustainable trajectory current governance systems enable. While deploying deeper leverage points would require careful planning and orchestration to anticipate and mitigate perverse outcomes, doing so would likely prove transformational and deliver efficient, transparent, change-making and actor’s behaviours.

Employing an approach which enhances information flows within public decision-making processes through the increased use of existing and novel approaches appears to be a relatively accessible and benign way to achieve stated public objectives. A future research agenda could look to confirm or dispel the one step deeper model through the identification and piloting of a suite of information flow enhancing tools. Having a suite would enable the uptake of deeper leverage points in a way that best fits the decision-making context and personal agency of the decision-makers involved. Enabling public decision-makers to counteract dominant feedback loops in democratically sound ways may just be the lever needed to master the influences currently holding them, and us, back from achieving our goals for sustainable development and a good life for all.

Alignment of sustainable development and public decisions—reflects discussion on assumptions about alignment between sustainable development (SD) or the sustainable development goals (SDGs) and public decisions (PDs), as well as considerations and perspectives on the principles of SD.

Appetite for change—talks to expectations, willingness or calls for change, i.e. alignment with social values, how compatible SD is with other values, and the recognition of need for the SDGs within Australia.

Businesses/non-government actors—applications of ESD by actors with influence outside of government and lobbying of government by those actors.

Central and review agencies—the role of central and pain points that influence decisions, and their associated unintended consequences.

Commitment to concepts—acceptance and application of sustainable development or the SDGs, reflections on the application, and impact of these concepts/tools on public decision-making.

Complexity—within and of decisions, how this leads to increased uncertainty and public decision-makers feeling overwhelmed.

Culture—considerations of culture, people or frameworks, and their impact on public decision-making practices.

Economics—understanding and application of different schools of thought, growth as a goal, externalities, monetary/financial costs, and Maslow’s hierarchy of needs.

Election cycles—the impact of elections on decision-making and actor’s behaviours.

Engagement—how (and if) communication with stakeholders occurs and the framing of that messaging.

Evaluation—both consideration and focus on outcomes and evaluation of public decisions.

Evidence—consideration of evidence or information in decision-making, what ‘counts’ as evidence (e.g. qualitative and quantitative), and availability of data.

Framing—covers framing in the sense raised by Lakoff (2014), and Tversky and Kahneman (1981), and how it is used to present ideas more/less favourably.

Funding—availability of economic resources to facilitate public decisions to be made and implemented.

Governance—arrangements within and across public decisions to ensure their rigour, such as accountability, KPIs and transparency.

Appendix A: Influences and their definitions

Definitions of the 40 influences (identified through inductive thematic analysis of 35 public servant interviews) are as follows:

22 Lakoff, George. 2014. The All New Don’t Think Of An Elephant. USA: Chelsea Green Publishing.

Tversky, Amos, and Daniel Kahneman. 1981. “The Framing Of Decisions And The Psychology Of Choice.” Science 211:453–458. https://doi.org/10.1126/science.7455683.
Implementation—putting decisions into practice, including whether stakeholders have the capabilities necessary and expected of them to achieve the desired outcomes.

Institutions—characteristics of the machinery of government, such as the Victorian Public Sector and departments and agencies within it as individual and combined institutions, as well as the structure of those institutions and administrative tools to support their functioning, plus how these impact who has authority to consider and make a public decision and also government inertia (designed and unintentional) in responding to perceived needs for public decisions.

Jurisdiction—consideration of where the Head of Power for a decision sits across jurisdictions, as well as how that impacts willingness to act.

Leadership—covers the concept of leadership as well as the need or demonstration of leadership by individuals, senior officials, ministers and/or organisations.

Legislation—legal requirements acting as opportunities and barriers, such as inbuilt policy resilience (inertia).

Mandate—the provision or lack of authority (e.g. crises, external scrutiny, political/party driven, expectations and responsibilities conferred on organisations) to make a decision in a particular area.

Media—presence, use and impact of the media in shaping public decisions.

Ministers—the position, interests, incentives, and capabilities of ministers (grouped, as ministers are not the primary focus of this research).

Paradigms—the impact of established ‘rules’ within a society that govern the way it thinks and acts in determining what is possible within public decision-making, including the presence of luck or serendipity, and focus on the short-term (n.b. growth is covered separately under economics).

Public decision-makers’ understanding—public decision-makers’ understandings (including definitions) and awareness of sustainable development and the SDGs, including confusion with one another and the Millennium Development Goals (MDGs).

Public decision-making considerations—success of prior or parallel projects, availability and reliance on technology, and government priorities (including overall public decision-making goals, competing priorities across portfolios, the comparative priority of ESD and SDG impacting their status as goals within decisions). Also includes less commonly mentioned factors considered in making public decisions.

Public decision-making processes—the stages and act of making public decisions, from understanding and follow through of the whole public decision-making process to individual components such as problem definition, options identification and analyses, and recognition of the importance of separating stages to retain objectivity. Also includes the transparency of the process and how it is communicated within briefing notes.

Personal characteristics of public decision-makers’—the skills, experience, attributes, and personal capabilities of public decision-makers. This includes their values and motivation, willingness or perceived ability to be frank and fearless, and self-perceived ability to influence public decisions. For example, dichotomies were present between those felt they could have meaningful impact, compared to those who felt their impact was tightly constrained and/or that it was not their role to try to influence outcomes.

Politics—the impact of political beliefs, gameplay, party dynamics, power struggles and allegiances.

Public awareness—public understanding, awareness of and support for SD or the SDGs.

Relationship between bureaucracy and ministers—how public decision-makers and their ministers interact and view each other.

Relationship between Public decision-makers and community—how public decision-makers and the community interact and view each other, the trust between them and the impact of this on connections between them.

Resources—capability/capacity—the amount of full time equivalent (FTE) staff available and the relevance of their skills and experience to the task at hand, as well as the use of consultants and citizen scientists to undertake work considered to be within the remit of public decision-makers. Also, a general catch all for where ‘resources’ are mentioned outside of the context covered in other resource-relevant influences (e.g. around data, funding, time, institutions).

Risk—aptitudes for taking decisions outside of tried-and-true approaches, and behaviours driven by an avoidance of criticism.

Role of public decision-makers/government—conceptions of the purpose of public decision-makers and government as a whole, and the impact this has on licenses to act and individual decisions to influence (or not) particular outcomes.

Scale—the size of problems requiring public decisions.

Strategic planning—proactively utilising processes to anticipate future policy needs and drive consideration of a more strategic than reactive view, culminating in reports that set agenda and measurable goals.

Time—both as a capacity-limiting resource and as a consideration within public decisions.

Appendix B: Influences and leverage points

Detailed annotations as to why influences were deemed to act or have the potential to act as leverage points. Connections are based on the question, Does the influence act as (or have potential to act as) a Leverage Point in public decision-making for sustainable development?
| Influence | Leverage point |
|-----------|----------------|
| 12. Constants, parameters, numbers | 11. Size of buffers |
| 10. Structure | 9. Length of delays, relative to system change |
| 8. Negative feedback loops | 7. Reinforcing feedback loops |
| 6. Information flows | 5. Rules of the system |
| 4. Ability to evolve or change the system | 3. System goals |
| 2. Origins of paradigms | 1. Ability to transcend paradigms |
| **Alignment of sustainable development (SD) and public decisions** | **Assumptions** stabilise/reinforce the status quo, but also create inconsistencies in application of sustainable development or the SDGs as different assumptions persist |
| **Appetite for change** | **Determines responsiveness of change** |
| **Determines rate of response to undesirable outcomes** | **Presents in multiple ways pending culture: fear of change, comfort with status quo, constant desire for new, relentless change seeking out utopian comfort. Once established creates cycle that persists** |
| **Hard to predict, crises can act to create 'jumpiness', but typically collective appetite is slow to change/operating at a different speed to the system** | **Challenging assumptions would enable gaps to be identified, leading to sustainable change** |
| **Culture of assumed alignment between policy objectives and SD/SDGs** | **There are no limits on what can be, if it is wanted** |
| Influence | Leverage point |
|-----------|---------------|
| 1. Ability to transcend paradigms |  |
| 2. Origins of paradigms |  |
| 3. System goals |  |
| 4. Ability to evolve or change the system |  |
| 5. Rules of the system |  |
| 6. Information flows |  |
| 7. Reinforcing feedback loops | Lobby decision-makers to get desired outcomes, success encourages future lobbying of decision-makers |
| 8. Negative feedback loops | Share/withhold information that informs public decisions |
| 9. Length of delays, relative to system change |  |
| 10. Structure |  |
| 11. Size of buffers, parameters, numbers | (Where disagreeing) advise decision-makers where outcomes are not what is desired; impact tends to be moderated by how confident actors are |
| 12. Constants, parameters, numbers |  |

**Businesses/non-government actors**

(Where disagreeing) advise decision-makers where outcomes are not what is desired; impact tends to be moderated by how confident actors are.

**Lobby decision-makers** to get desired outcomes, success encourages future lobbying of decision-makers.

**Share/withhold information** that informs public decisions.

**Able to influence the rules**

**Can lobby and influence change to occur/not**

**Central and review agencies**

**Act to pull agencies and departments together in the same direction (create consistency and resistance to ‘jumpiness’)**

Advising decision-makers if decision is missing something/if implementation is not achieving desired outcomes.

Belief that departments are achieving SD means consideration of SD is not required by central/review agencies, resulting in such considerations being deprioritised by departments relative to other mandated/checked consideration.

**Set rules for the public sector and decision-making within it**

**Able to drive change in system due to role and figurative proximity to department**

Advising and reinforcing how and what the public sector ought to think about, focus on and approach its work.
| Influence | Leverage point |
|-----------|---------------|
| 1. Ability to Transcend paradigms | 2. Origins of paradigms |
| 3. System goals | 4. Ability to evolve or change the system |
| 5. Rules of the system | 6. Information flows |
| 7. Reinforcing feedback loops | 8. Negative feedback loops |
| 9. Length of delays, relative to system change | 10. Structure |
| 11. Size of buffers, parameters | 12. Constants, numbers |
| Cognitive biases | Heuristics slow and obfuscate information moving in the system |
| Lock in thinking | Heuristics reinforce thinking |
| Heuristics reinforce thinking | Impact how information is recognised, received, and used |
| Recognising them allows for evolution | Heuristics mould new information to fit existing conceptions of the world |
| Challenging biases allows them to be broken | |
| Collaboration | Determines rate of response |
| Provide opportunity to learn what is/ not working and desired | Where teams experience group think/ lack of diverse views, false/limited beliefs can be reinforced |
| Increase opportunities for information exchange | Can drive innovation |
| Commitment to concept of sustainable development | Level of commitment to SD drives action toward/ away from SD |
| Commitments reflect/shape system rules | Impacts ability to challenge unaligned system goals |
| Commitments form the system goals | Commitments potential to create new paradigms via recognition of finite planet and inequalities |
| Complexity | Greater complexity yields a greater number of parameters to consider, and to drive/ inhibit action |
| Increases difficulty of predicting delay effects: can slow/unexpectedly speed up the system | Where issues seem overly complex, attempts will not be made to holistically address them, leading to reduced understanding of situations and greater belief that situations are too complex to holistically address |
| Provides multiple opportunities and permutations for change, determines types of evolution possible | |
| Influence | Leverage point |
|-----------|----------------|
| Culture   | Determines how we respond to a change or opportunity to act; how we work together impacts the flow of information and action in the system |
|           | Impacts rate of action and information exchange within the system |
|           | Can act as a measure of the health of decision-making activities |
| Eco-nomics| Provides many of the constants, parameters and metrics within Westminster decision-making |
|           | Market can act as a measure of public decision success or failure |
|           | Increased focus on growth drives fixation on growth at the expense of other understandings of the breadth and possible applications of economics |

| Culture | Determines ability and likelihood of changing what the rules are |
|         | Petri dish for what is accepted, determines mindsets of decision-makers, influences stakeholder responses |
|         | Can facilitate collective transcendence of paradigms |
| Eco-nomics | Determines what ought to be considered and happens in response to a public decision |
|           | Markets and economic standards determine what ought to be considered and happens in response to a public decision |
|           | Different schools of economic thought can influence the shape of the decision-making system in differing directions |
|           | Economic prosperity (often conflated with growth) seen as goal |
|           | Success of neoliberal perspectives in the second half of the twentieth century |

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|           | Economic prosperity (often conflated with growth) seen as goal |
|           | Success of neoliberal perspectives in the second half of the twentieth century |
| Influence | Leverage point |
|-----------|---------------|
| 12. Constants, parameters, numbers | 11. Size of buffers |
| 10. Structure | 9. Length of delays, relative to system change |
| 8. Negative feedback loops | 7. Reinforcing feedback loops |
| 6. Information flows | 5. Rules of the system |
| 4. Ability to evolve or change the system | 3. System goals |
| 2. Origins of paradigms | 1. Ability to transcend paradigms |

**Election cycles**
- **Timing of elections**
  - Form constant frame in which decision-making is considered
- **Fixed evaluation mechanism**
- **Source of feedback on what is desired, and whether goals are perceived to have been met**
- **Cycle drives thinking and public decisions aligned with the cycle, and rewards those who offer public decisions that marry with it (i.e. decisions that can be made and implemented in one cycle)**
- **Catalyst for hiding or providing information**
- **Determine who has control of the rule book and for how long**
- **Provide opportunity to recalibrate what is important**
- **Set expectations around what is possible and when; opportunity for new paradigms to emerge**

**Engagement**
- **Can enhance or delay receipt of feedback or inhibit timely decisions**
- **Provides opportunity to learn what is/ not working and desired**
- **Arriving at an accepted decision based on "targeted" engagement, encourages future decisions to rely on that "targeted" audience or a similarly small cohort**
- **Brings new information into system**
- **Provides opportunity to create new structures, flows and feedback loops**

**Evaluation**
- **Allows for gradual change rather than shocks**
- **Timeliness of, determines ability to know if a decision is having the desired effect**
- **Allows for correction of system**
- **Limited evaluation reduces ability to recognise the benefits of evaluation, leading to less evaluation**
- **Drives information capture and altered behaviours**
- **Catalyst for system change**
| Influence | Leverage point |
|-----------|----------------|
| 1. Ability to transcend paradigms | 2. Origins of paradigms |
| 3. System goals | 4. Ability to evolve or change the system |
| 5. Rules of the system | 6. Information flows |
| 7. Reinforcing feedback loops | 8. Negative feedback loops |
| 9. Length of delays, relative to system change | 10. Structure |
| 11. Size of buffers | 12. Constants, parameters, numbers |

| Evidence | Provides information about the system (sets hard parameters) |
|---------|-------------------------------------------------------------|
| Accessibility and timely use of information determines the length of delays | Negative feedback is by definition evidence |
| Arriving at an accepted decision based on limited or subjective evidence, can encourage future decisions to also rely on limited or subjective evidence | Can create new loops if it is available, accessible, usable, cleansed, meaningful, and complete |
| Determines what is, e.g., natural laws | Largest source of new information to the system, which can challenge understandings and change narrative of what is important and how system ought to operate |
| Informs, and is informed by, what is accepted as 'true' |

| Framing | Successfully presenting arguments in a particular perspective, rewards that perspective and discourages consideration or future presentations of other perspectives |
|---------|-------------------------------------------------------------------------------------------------------------------------------------|
| Presenting or signalling only part of the information creates info asymmetries | Introduces or changes narratives on what is important to, and overall functioning of the system |
| Framing of evidence and narrative shapes what society holds to be true | Enables the storyteller to shape the stories to be whatever they want them to be |

| Funding | Amount committed, shapes scope of possible change |
|---------|--------------------------------------------------|
| Accessibility to, determines rate at which system can operate | Timeless of, relative to identified need |
| Limited funding reduces ability to intervene, limited demonstrable intervention can lead to further reduced funding | Where available provides capacity to consider and implement change beyond the 'meat and potatoes of government' |
| Influence                          | Leverage point                                                                 |
|-----------------------------------|-------------------------------------------------------------------------------|
| 12. Constants, 11. Size of buffers |                                                                                     |
| 10. Structure                      | 9. Length of delays, relative to system change                                   |
| 8. Negative feedback loops         | 7. Reinforcing feedback loops                                                  |
| 6. Information flows               | 5. Rules of the system                                                          |
| 4. Ability to evolve or change the system | Can alter who has power, and the approach taken to operate the system             |
| 3. System goals                    | 2. Origins of paradigms                                                         |
| 1. Ability to transcend paradigms  | Replaces what is accepted, shapes decision-maker mindsets                       |

**Governance**

- Stabilises system by locking in what is acceptable, limiting reactionary change
- Determines how subsystems operate
- Drives accountability
- Less transparency drives less accountability, less accountability drives less transparency
- Requires to document approaches leads to altered behaviour
- Determines who is responsible for what
- Can alter who has power, and the approach taken to operate the system

**Implementation**

- Timeliness of, relative to identified need
- The more that is delivered that more that is expected
- Opportunity to gather and test information
- Purpose is to enact change in the system; better implemented programs evolve

**Institutions**

- Act to pull agencies/departments together in the same direction (create consistency across decision-makers)
- Locks in thinking (like mortar holding Meadows pipes in place)
- Institutional inertia/enduring nature drives conservatism/status quo
- Determines who is responsible for what
- Power to create new structures (e.g., machinery of government changes); or, limit change
- Reinforces what is accepted, determines mindsets of decision-makers
| Influence | Leverage point |
|-----------|----------------|
| 12. Constants, 11. Size of buffers | 10. Structure, 9. Length of delays, relative to system change, 8. Negative feedback loops, 7. Reinforcing feedback loops, 6. Information flows, 5. Rules of the system |
| 4. Ability to evolve or change the system, 3. System goals, 2. Origins of paradigms | 1. Ability to transcend paradigms |

| Jurisdiction | Provides consistency on which matters are considered by whom to what degree within the system | Head of power determines if/where public decisions can proceed, i.e. sets structures |
|--------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Inaction because of a belief that another jurisdiction is responsible (without reviewing the Head of Power) will leave control of the issue (perhaps falsely) with a particular jurisdiction, and inaction by other jurisdictions will continue | Determines who is responsible for what |
| Where unclear/not being exercised, other jurisdictions can choose to act (e.g., States creating policy in absence of national policy; Tas Dams Case) |

| Leadership | Leads to greater un/certainty and reduced/increased respect for those considered to be in leadership positions, making it harder/easier for leaders to obtain the authority to exercise leadership |
|------------|----------------------------------------------------------------------------------------------------------------------------------|
| When exercised can set what the rules are and who has control/influence over them |
| When exercised can evolve/innovate/challenge status quo, and drive change |
| Ability to challenge or reinforce paradigms |
| Great leaders able to lift those around them above paradigms, and see leadership as action rather than role |
| Influence | Leverage point |
|-----------|----------------|
| 12. Constants, 11. Size of parameters, numbers | Can act as a constant where there is resistance to legislative change |
| 10. Structure | Legislative inertia, regulatory timelines |
| 9. Length of delays, relative to system change | Articulates goals and sets out how to achieve them (inherent part of Westminster system) |
| 8. Negative feedback loops | Timeliness of legislative change to reflect needs of system |
| 7. Reinforcing feedback loops | Where legislative tools are unused or unreviewed, there is (often) no provocation to consider if they should be used or reviewed |
| 6. Information flows | Can create information requirements |
| 5. Rules of the system | Set out the shared ideas what society |
| 4. Ability to evolve or change the system | Can be remade if desired. Sunsetting requirements prompt consideration to evolve |
| 3. System goals | Mandate to act drives action which, if done well, generates additional mandates |
| 2. Origins of paradigms | Reinforces system rules |
| 1. Ability to Transcend paradigms | Provides impetus for change where inconsistent with existing paradigms |

**Legislation**
- Revises system weaknesses, catalyst for change
- Increases interaction and likelihood of media attention; also, reflects back what activities are received positively, encourages more of those activities
- Role is to share info/act as clearing-house and interpreter of info. Changing nature of media and media cycles leads to changed decision-maker behaviour/information loops

**Mandate**
- Responsiveness to report on an issue drives speed with which decisions are made
- Reflects back views of society, shines a light where things are not operating as desired
- Media interaction increases interaction and likelihood of media attention; also, reflects back what activities are received positively, encourages more of those activities
- Role is to share info/act as clearing-house and interpreter of info. Changing nature of media and media cycles leads to changed decision-maker behaviour/information loops

**Media**
- Can act as a constant where there is resistance to legislative change
- Legislative inertia, regulatory timelines
- Articulates goals and sets out how to achieve them (inherent part of Westminster system)
- Timeliness of legislative change to reflect needs of system
- Where legislative tools are unused or unreviewed, there is (often) no provocation to consider if they should be used or reviewed
- Can create information requirements
- Set out the shared ideas what society
- Can be remade if desired. Sunsetting requirements prompt consideration to evolve
- Mandate to act drives action which, if done well, generates additional mandates
- Reinforces system rules
- Provides impetus for change where inconsistent with existing paradigms
- Reinforce/question what is accepted
| Influence | Leverage point | 1. Ability to transcend paradigms | 2. Origins of paradigms | 3. System goals | 4. Ability to evolve or change the system | 5. Rules of the system | 6. Information flows | 7. Reinforcing feedback loops | 8. Negative feedback loops | 9. Length of delays, relative to system change | 10. Structure | 11. Size of buffers | 12. Constants, parameters, numbers |
|-----------|----------------|----------------------------------|------------------------|----------------|-----------------------------------|-------------------------|-----------------|----------------------|----------------------|-------------------------------|-----------------|----------------|--------------------------|
| Ministers | Key decision-makers | Turn the system on/off, facilitate system goals | Actions that retain or improve party standing and electoral support encourage actions to retain standing/support | Pending seniority can set the rules | Have strongest ability to change the system, within party/societal acceptance limits. Desire for legacy can lead to system change | | | | | | | | |
| Paradigms | Act as constants | Level of acceptance and embeddedness of paradigms determine how responsive the system is to new ideas and pressures | Current thinking locks in rewarding and perpetuation of those paradigms | Set the limits of rules, shape them, and inhibit different thinking (existing paradigms do not want to be changed) | | | | | | | | | |
| Public decision-makers' understanding | Degree of openness determines whether action is proposed/taken (closed mindsets can act as a limiting constant) | Greater knowledge levels act to limit under/overreactions | Limited understanding (closed-mindedness) reinforces thinking and actions, and decreases likelihood of seeking to increase/broaden understanding | Improved understanding/awareness of opportunities can lead to increased innovation, or recognition of need for evolution | | | | | | | | |
| Influence Area                  | Leverage Point                                                                 | Public Decision-Making Considerations                                                                 |
|--------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|                                | 12. Constants, 11. Size of buffers                                            | Prioritising x over y, sees more emphasis on x and greater priority given to it going forward          |
|                                | 10. Structure                                                                  | Influence what is seen as important/the constraints decision-makers work in                           |
|                                | 9. Length of delays, relative to system change                                 | Provide opportunity to discuss alternate visions for what and how things are done; documented success elsewhere gives confidence to try change locally |
|                                | 8. Negative feedback loops                                                     | (Not) following process and arriving at an accepted decision, rewards (not) following process in future |
|                                | 7. Reinforcing feedback loops                                                  | Processes drive collection, sharing and creation of information                                        |
|                                | 6. Information                                                                 | Determine who, what and how decisions can be made, and scope for change                                |
|                                | 5. Rules of the system                                                         | Processes such as options identification and evaluation drive consideration of alternate approaches     |
|                                | 4. Ability to evolve or change the system                                      | Self-belief/belief in ability to effect change that drives attempts to do so                            |
|                                | 3. System goals                                                                | Where people realise they are not constrained by existing paradigms they can enact change             |
|                                | 2. Origins of paradigms                                                       |                                                                                                       |
|                                | 1. Ability to Transcend paradigms                                             |                                                                                                       |

**Public Decision-Making Processes**

(Should) act as constants, however, often aren’t employed consistently

Provide consistency to limit knee-jerk reactions

Facilitate operation of structure

Speed of processes determines relative delays

(Not) following process and arriving at an accepted decision, rewards (not) following process in future

Processes drive collection, sharing and creation of information

Determine who, what and how decisions can be made, and scope for change

Processes such as options identification and evaluation drive consideration of alternate approaches

**Personal Characteristics of Public Decision-Makers**

Determine trajectory of decision-makers outputs, outputs shape self-confidence, self-confidence determines future trajectories

Self-belief/belief in ability to effect change that drives attempts to do so

Where people realise they are not constrained by existing paradigms they can enact change
| Influence | Leverage point |
|-----------|---------------|
| 12. Constants, 11. Size of parameters, buffers | 10. Structure |
| 9. Length of delays, relative to system change | 8. Negative feedback loops |
| 7. Reinforcing feedback loops | 6. Information flows |
| 5. Rules of the system | 4. Ability to evolve or change the system |
| 3. System goals | 2. Origins of paradigms |
| 1. Ability to Transcend paradigms |
| **Politics** | **Leverages** |
| Drives speed with which decisions are made | Shine a light on questionable decisions of others |
| (Dis)incentives drive politically favourable action, and further (dis) incentivises future actions | Can create new rules (not legislation) that bind future govs e.g. accepted jurisdictional credit ratings |
| Changes per conditions; contest of ideals on how the system should operate |
| **Public awareness** | **Leverages** |
| Speed and level of understanding determine whether issues can be responded to at the rate required, e.g. climate change | Advise decision-makers where policy and implementation are not achieving desired outcomes |
| Limited understanding reinforces current thinking and actions, and limited mandate for change | Where greater may help catalyse change |
| Influence | Leverage point |
|-----------|----------------|
| 12. Constants, 11. Size of parameters, numbers | 10. Structure, 9. Length of delays, relative to system change |
| 8. Negative feedback loops | 7. Reinforcing feedback loops |
| 6. Information flows | 5. Rules of the system |
| 4. Ability to evolve or change the system | 3. System goals |
| 2. Origins of paradigms | 1. Ability to transcend paradigms |

**Relationship—bureaucracy and ministers**
- Quality of relationship: Determines willingness to accept advice/direction, and extent to which boundaries can be safely pushed.
- Good relationships: Provide timely turnarounds and running of the system; poor relationships can result in information being ignored or knee jerk reactions.
- Mechanism to obtain negative feedback: (Dis)trustful relationships create/reduce friction, avoidance, and manipulation, leading to greater (dis)trust which reinforces the weakness/strength of relationships.
- Can be used to influence changes to the rules, feedbacks, and structure.

**Relationship—Public decision-makers and community**
- Quality of relationship: Determines willingness to accept decisions/feedback, and limits over/under reactions to community concerns.
- Good relationships: Provide timely information/feedback to the system; poor relationships can result in information being ignored or knee jerk reactions.
- Mechanism to obtain negative feedback: Disrespectful or distrustful relationships lead to increased friction in interactions and apathy toward participation, resulting in reduced desire to interact from all parties, leading to greater disrespect/distrust.
- Can be used to influence changes to the rules, feedbacks, and structure.
| Influence | Leverage point |
|-----------|---------------|
| 12. Constants, parameters, numbers | 11. Size of buffers |
| 10. Structure | 9. Length of delays, relative to system change |
| 8. Negative feedback loops | 7. Reinforcing feedback loops |
| 6. Information flows | 5. Rules of the system |
| 4. Ability to evolve or change the system | 3. System goals |
| 2. Origins of paradigms | 1. Ability to transcend paradigms |

**Resources—capability/capacity**

| Size and skill of workforce | Determine speed with which decisions can be made | Limited resourcing reduces ability to intervene, limited demonstrable interventions leads to reduced resourcing (until a crisis hits) | Given opportunity, skilled staff are uniquely placed to consider and implement system change, i.e. to think beyond the ‘meat and potatoes of government’ |
| The size of these act as determinants of the speed at which the system can operate | | | |

**Risk**

| Appetite determines activity, creates consistency across decisions | Fear of risk arising from change further cements the status quo and fears of challenging it | Appetites impact how information is couched and responded to, to avoid unfavourable outcomes (fear drives behaviour) | Appetites determine the options and constraints of the system |
| Appetite determines willingness to question paradigms | | | |

**Role of government**

| Where clearly articulated, acts as constant within the system (who decides and does what) | Clarity of role provides consistency, purpose, direction to avoid kneejerk reactions | Creates requirements for how the system is laid out and operates | Governments act in accordance with interpretations of role reinforcing expectations/remit and shaping future interpretations |
| Governments create boundaries on who can do what | May evolve slowly balancing need to maintain relevance with need to act as a buffer to fads; Or, as seen recently, shift to extremes in response to societal dissatisfaction | Clear role creates balance to maintain confidence in government and democracy | Ideologies on the role of government shape the paradigms that underpin governance systems, and the scope for change |
| Influence | Leverage point |
|-----------|---------------|
| 12. Constants, 11. Size of parameters, buffers | 10. Structure 9. Length of delays, relative to system change 8. Negative feedback loops 7. Reinforcing feedback loops 6. Information 5. Rules of the system 4. Ability to evolve or change the system 3. System goals 2. Origins of paradigms 1. Ability to Transcend paradigms |

**Scale**  
Influences number of parameters to consider, and which drive or inhibit action (akin to size of Meadows' bathtub)  
Things that are considered too large to address will be left unaddressed in favour of smaller scale issues, reinforcing decision-maker skill development and continued focus on smaller scale issues  
Size of a problem influences recognition of need for system change, and degree to which change occurs

**Strategic planning**  
Creates opportunity to foresee issues and create multiple pathways to pivot pending circumstance, i.e. provides distance from crises  
Foresight assists in making delays appropriate to the system  
Demonstrated use renewes license to do it (but other influences often act to limit this loop existing)  
Creates opportunities for new information loops to be made through broadening of decision-maker mindset  
Creates space for System 2/ deliberative thinking increasing opportunities for innovation and change at a holistic level
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Declarations

Conflict of interests None.

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