

**AUTHORS:**

John R. van Breda¹ 
 Astrid Treffry-Goatley^{2,3} 

AFFILIATIONS:

¹Centre for Sustainability Transitions (CST), Stellenbosch University, Stellenbosch, South Africa

²Centre for Epidemic Response and Innovation, Stellenbosch University, Stellenbosch, South Africa

³Division of Research Development, Stellenbosch University, Stellenbosch, South Africa

CORRESPONDENCE TO:

John van Breda

EMAIL:

jrvb@sun.ac.za

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Doing just sustainability transitions: Facing the legitimisation crisis in the Anthropocene today

Significance:

Undertaking just sustainability transitions in the context of the Anthropocene presents a complex societal challenge. This challenge is compounded by a systematic breakdown of confidence in the institution of science-making – the legitimisation crisis. In this Commentary, we argue that addressing this challenge involves collaboration with diverse stakeholders and the application of agile research methodologies. Through innovative research tools, such as thick mapping and virtual reality, researchers and stakeholders can co-create and test new institutional arrangements that promote justice and sustainability. In this way, the scientific community can regain and maintain public trust while effectively addressing pressing global challenges.

Introduction***The challenge: Tackling societal transformation in the Anthropocene***

As humanity grapples with the long-term consequences of anthropogenic actions, there is an increasing need for transformative social movements, including ‘just sustainability transitions’ (JST).^{1,2} JST aims to improve the well-being of humans and other species while addressing the injustices associated with environmental degradation and species annihilation.³ It is a deliberate attempt to move away from unsustainable and unjust societal conditions towards more sustainable and just alternatives, thus echoing Polanyi’s⁴ concept of a ‘double movement’. Scientific research is critical in this movement. Yet engaging with transformative social processes in an anthropogenic context is too complex to be tackled within academia alone. Indeed, we are no longer working with natural processes that have evolved independently over time but with earth systems profoundly altered by humans. These changes are marked by persistent injustices in our society: by societal processes that favour the wealthy at the expense of the poor. Therefore, tackling JST requires a fresh and flexible methodological approach that moves between and beyond disciplines and often involves non-academics as key partners.

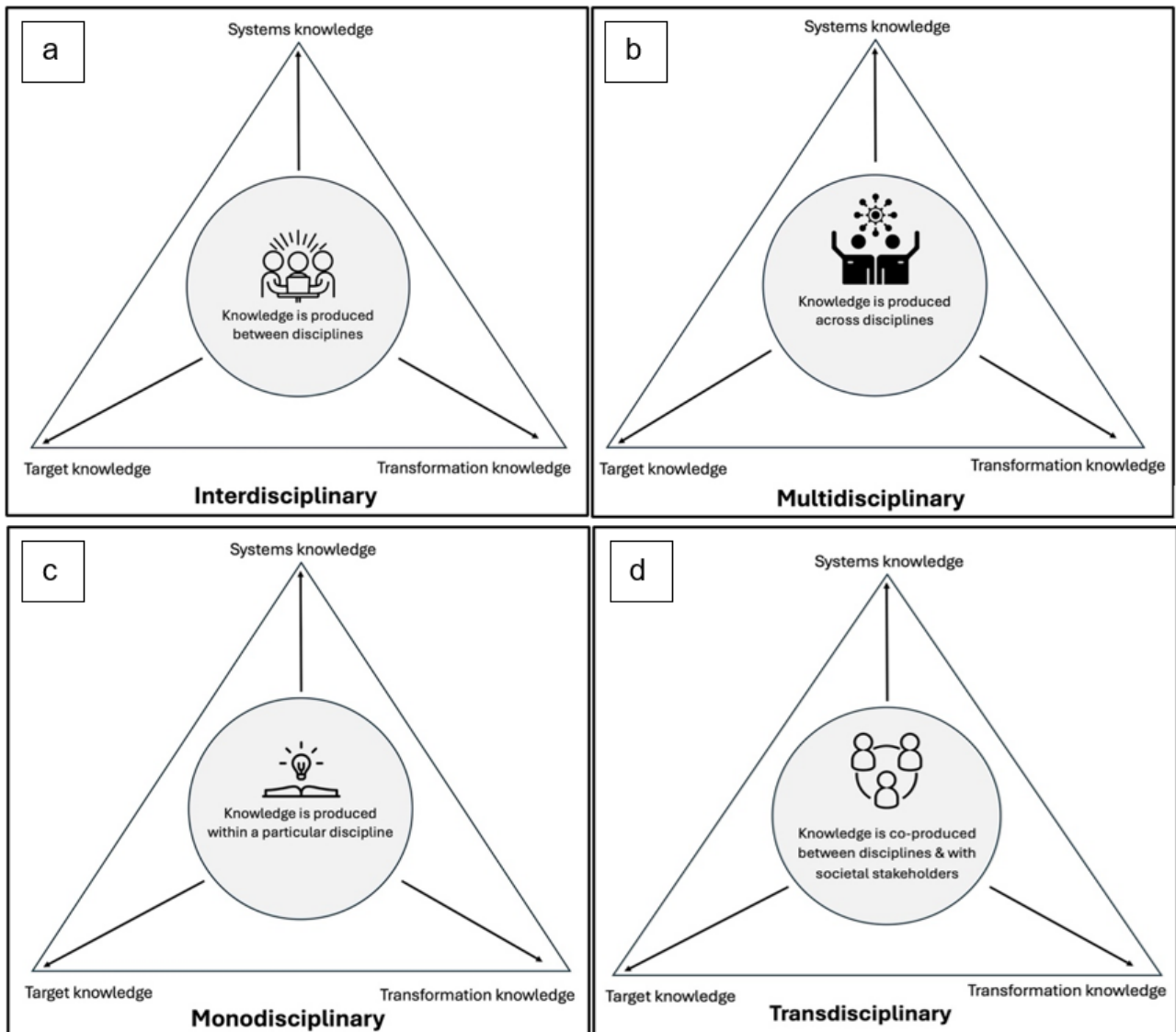
Multiple forms of knowledge require multiple methodological approaches. Engaging with JST processes requires understanding (Verstehen) and explaining (Erklärung) the conditions responsible for current unsustainable and unjust situations and exploring how to change (Verändern) these conditions. This complex challenge requires active collaboration between academic and non-academic partners, including informal stakeholders (citizens) and formal stakeholders, who have been mandated to speak on behalf of others. Together, these diverse research teams can co-produce three kinds of knowledge⁵:

1. Systems knowledge – factual knowledge of the causal dynamics of, for example, unsustainable/unjust situations.
2. Target knowledge – normative knowledge on what should be done to move away from these unjust/unsustainable situations.
3. Transformation knowledge – strategic knowledge on how to transition toward more desirable future situations.

These three different kinds of knowledge are associated with corresponding epistemic objects, including problem statements and research questions.⁶⁻⁸ Yet none of these knowledge forms is exclusive to any particular research methodology. Conversely, each one can be produced through mono-, multi-, inter-, or trans-disciplinary research processes (Figure 1). Additionally, each of these processes has related characteristics and benefits. For example, when working towards transformative knowledge in the context of JST, research teams often adopt transdisciplinary methodologies as these approaches involve co-producing knowledge with non-academic stakeholders to advance social change. However, at the project’s outset, it is not always apparent which methodology will be the most effective, and, in many cases, it is only possible to identify the best approach through the research process itself. Therefore, we recommend that scholars embrace methodological agility. This is discussed in more detail below.

What is methodological agility, and why do we recommend it?

Methodological agility is a meta-level research strategy in which research teams work to respond to the emerging needs of a project by switching between the research methodologies highlighted above.⁹ We recommend methodological agility because we have found that applying a single dominant methodology to address complex societal challenges can advance instrumental, ‘one-size-fits-all’ solutions which ignore contextual differences and lead to path dependencies¹⁰⁻¹³, contributing to the legitimisation crisis discussed by Habermas¹⁴. This crisis represents a widespread lack of conviction in the normative/prescriptive production of ‘scientific facts’ about the world in isolation from society. For example, this crisis was evident in certain public reactions to the use of science to drive national policymaking during COVID-19.^{15,16} However, the adoption of methodological agility can help researchers to re-build legitimacy by co-constructing just and sustainable pathways, rather than relying on fixed, unsustainable institutional arrangements. Moreover, in a context in which the institution of science-making is questioned and calls are made to include the public in scientific research, methodological agility and collaborative research approaches, in particular, emerge as powerful tools within the academy. Nonetheless, mono-, multi- and inter-disciplinary methodologies remain equally valid and are often key components of methodological agility strategies and related transdisciplinary research processes. Below, we highlight how researchers can draw on methodological agility to navigate dynamic contextual conditions that emerge, particularly when engaging with societal issues, such as JST.



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Figure 1: The process of producing three different kinds of knowledge through the four methodological processes.

Methodological agility and the role of synergetic methods

When working with transformative societal processes, research teams can face two kinds of change: change in real-life situations *and* changes in the understanding of these situations. These transformations are, respectively, associated with ontological complexity and epistemological complexity.¹⁷ Above we highlighted how engaging with JST often involves collaboration with formal and informal stakeholders to co-produce systems, target, and transformation knowledge. In our experience, a certain nimbleness *during* the research process can help one to navigate the emerging complexities and open up opportunities for the co-generation of epistemologically diverse knowledge systems.

By nature, methodological flexibility is seldom planned. Rather, appropriate methods are applied in response to contextual changes as they arise. However, this does not imply that ‘anything goes’¹⁸ or that known methods are abandoned. On the contrary, specific methodologies (processes, principles and methods) tend to be associated with certain research processes. For example, when a transdisciplinary approach is adopted in JST-related research, certain synergetic methods become useful. In synergetic approaches, mixed-methods are used synergistically to respond to the specific needs of the project and to explore the complex issue at hand. In using the term ‘synergetic’, we are referencing the concept

of ‘synergetic satisfiers’ as defined in *Human Scale Development*, where, in the discussion on ‘Needs, Satisfiers and Economic Goods’, the author Max-Neef explains that synergetic satisfiers serve to “satisfy a given need, simultaneously stimulating and contributing to the fulfilment of other needs”¹⁹. A good example here is that of a mother breastfeeding her baby, thus satisfying the baby’s needs for *subsistence, affection and security* at the same time with the single act of breastfeeding. While many methods can be applied in an agile or synergetic manner, thick mapping is an integrated approach that can enable research teams to create multi-layered representations of complex real-life situations.

Thick mapping: Layering diverse data

Using innovative combinations of qualitative and quantitative methods, research teams can apply this tool to build rich depictions of current *and* future states of specific problem situations.^{20,21} The two-fold aim behind thick mapping is to (1) better understand the intricacies involved in determining the current state of an issue and (2) facilitate informed decision-making to help shape possible future states. For example, when working on JST challenges, systems knowledge can be co-produced by using a wide variety of quantitative methods for capturing detailed aspects of the infrastructural, technological, and ecological systems contributing to the unsustainability of the current situation. In 2022, Carvalhaes and

colleagues²² published a study on Hurricane Maria in Puerto Rico, where thick mapping was leveraged by combining ethnographic and geospatial methods. For example, different layers of data were layered and aggregated against ethnographic information to explore resilience capabilities in relation to the extreme weather event at hand (hurricane). Through this process, the authors gained insight into how affected individuals made sense of their lived experiences of Hurricane Maria and how this knowledge was embedded in institutional, ecological, and infrastructural systems.

Thick mapping methods

In Supplementary table 1, we share a list of tools that research teams can apply to create thick maps. Different methods and various combinations of these tools can be applied by teams to meet the project context. However, this list is not a definitive list for JST-related research. New methods are constantly being developed and applied to advance this field. Here we list three examples of innovative tools which are being applied in explorative JST studies: virtual reality, participatory and bioacoustics methods.

Virtual reality tools: Virtual reality approaches are emerging as popular research tools when tackling complex societal transformations.^{23,24} For example, virtual reality tools can enable research participants to (re) imagine more ‘just’ and ‘sustainable’ future states (target knowledge), and also devise multiple transitioning pathways (transformation knowledge). This process can help initiate the development of more desirable future states, as participants can explore *adjacent possibilities*, which can be situated *within* the current situation, or in a significantly different space *from* their context. A practical example of this approach was the first author’s use of virtual reality approaches to engage participants in the co-design and co-construction of the iShack in the informal settlement of Enkanini, which lies in the town of Stellenbosch in South Africa.²⁵

Digital storytelling and participatory research: Because JST research seeks to advance epistemic justice, digital storytelling, which is a participatory visual method, is relevant here. Digital storytelling is a well-established research approach that can enable the involvement of non-academic stakeholders in the research process and to influence policy.^{26,27} Moreover, as a narrative-based tool, it can enable stakeholders to generate data by drawing on their lived experiences of a specific issue.²⁸ For example, in an ongoing project, the second author, Treffry-Goatley, is collaborating with citizens from four resource-poor settings of sub-Saharan Africa to create digital stories about the impact of extreme weather events on mental health. These narrative data will be created in participatory research workshops held at each site and will be layered with various quantitative data sources, including health outcomes, statistical analyses of survey data, and weather monitoring reports to build evidence and to devise effective strategies.

Bioacoustics: While PR can help to include marginal human voices in JST research, bioacoustics has been used in a variety of contexts to record the ‘voices’ of non-human actors, including fauna and flora.²⁹ Indeed, in a recent article in *Nature Communications*, Müller and colleagues³⁰ noted that numerous “taxonomic groups, including amphibians, birds, mammals, and insects include a considerable proportion of species that vocalize or otherwise use sound to communicate, making acoustic monitoring of these groups a particularly promising tool for biodiversity responses”. For example, during times of drought, trees produce specific

sounds. This discovery could assist scientists in determining when trees are drought-stricken and require urgent watering.³¹

Ethical considerations when using thick mapping

Deciding what data should be included is one of the key ethical challenges of co-constructing thick maps. Indeed, the risk of excluding marginalised perspectives from thick maps is a significant ethical issue for research teams to consider. To navigate this challenge, we recommend the application of the ‘foregrounding and backgrounding’ approach³², in which data are moved between the ‘background’ or ‘foreground’ as and when needed. While one needs to still pay attention to which voices are ‘foregrounded’ or ‘backgrounded’, importantly, data are never permanently excluded or included. On the contrary, the data are saved to be used in response to emerging contexts and issues. Moreover, specific ‘voices’ and data can be highlighted where needed. This approach can help one to navigate the complexity of JST processes as it allows all JST pathways to be treated as equiprobable and adjacent possibilities.^{33,34} This approach can also allow one to build layers of data. For example, one can add qualitative layers to quantitative systems knowledge to foster a deeper understanding of the complexities and contradictions of the current anthropogenic crisis. This can be achieved by, for example, using narrative-based methods for capturing peoples’ lived experiences, as narratives, of any unjust social and institutional arrangements contributing to the inequalities of the current situation (see the example relating to Hurricane Maria above).

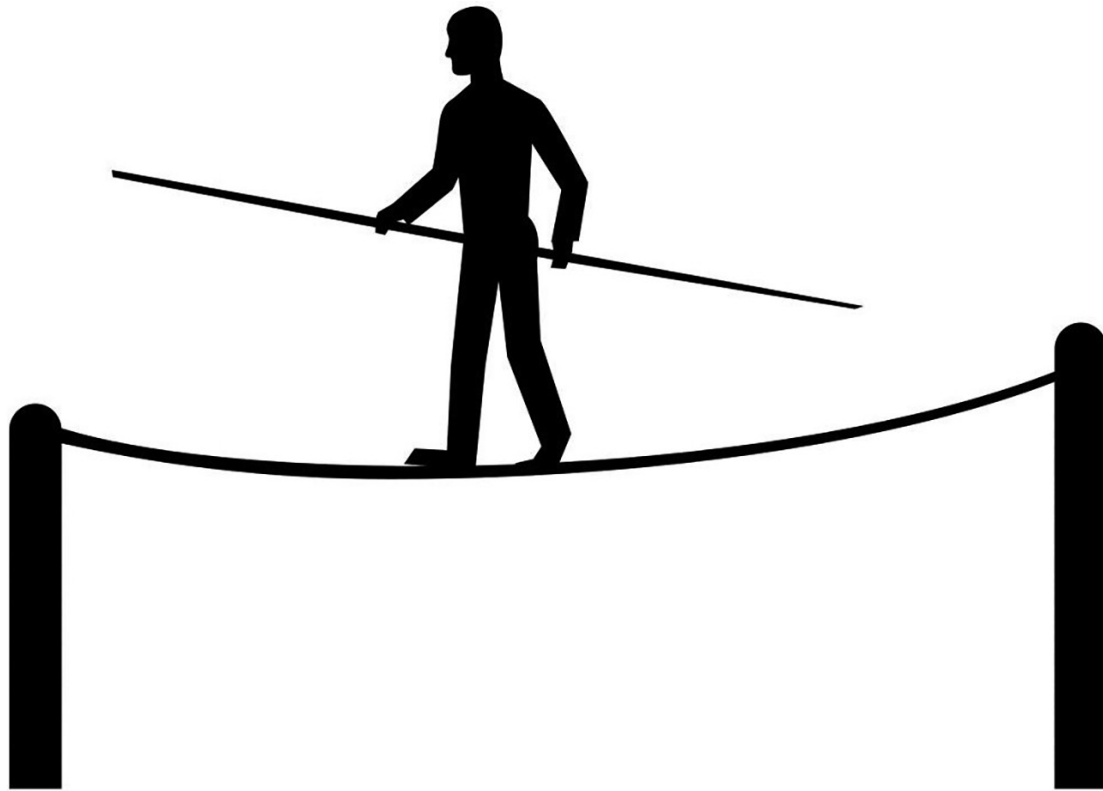
In addition to the general ethical challenges which are associated with thick mapping, each of the innovative tools outlined above also has its own inherent ethical considerations that need to be addressed. Ethical issues associated with participatory visual research, including digital storytelling, are discussed by Black and colleagues³⁵. Additionally, ethical challenges can arise in the application of virtual reality research approaches. Indeed, while virtual reality can offer interested stakeholder groups safe (virtual) spaces to meet and explore present and future possibilities, learning how to move between real and virtual spaces amid research processes can be a challenge. The agility needed for this is depicted by the fleet-footedness of the mythical Hermes figure in Figure 2, who was known to deliver messages from the gods to the people, and vice versa.

It is important to remember, when switching between these co-created virtual and real places and spaces, that Hermes was not a ‘neutral’ messenger. Rather, according to legend, he was also known to be a trickster, who employed unethical and deceitful tactics during his ‘mediating’ work.^{36,37} Certainly, when employing virtual reality tools (and any other method), one needs to always remain conscious of ethical concerns and critically transparent about the (potential) risks involved. Like tightrope walking (Figure 3) employing these innovative tools requires careful practice. One needs to learn how to maintain a balance between advancing the project objectives and safeguarding the well-being of participants. It is essential to always work within the agreed-upon ethical principles and practices and adopt an inclusive logic, as articulated in the notion of the *included middle*.^{38,39} Nonetheless, ascertaining how to achieve this balance, while engaged in complex JST processes, remains one of the biggest challenges in developing methodological agility.



Source: Original image created by the authors using Microsoft PowerPoint.

Figure 2: Oscillating between virtual and real worlds.



Project objectives

Ethical concerns

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Figure 3: 'Tightrope walking' between ethical concerns and project objectives.

Conclusion

Advancing JST in the context of the prevailing legitimisation crisis and the Anthropocene may be complex, but it is not an intractable challenge. In this piece, we suggest that methodological agility can help scholars to respond constructively to this challenge. In summary, this requires research teams to learn where, when, and how to:

- adopt mono-, multi-, inter-, and trans-disciplinary methodologies;
- co-produce systems, target, and transformation knowledge, using synergic methods;
- apply quantitative and qualitative methods to co-construct thick maps; and
- explore real vs virtual domains to create co-designed safe spaces to (re)imagine more 'just' and 'sustainable' futures.

Methodological agility is an ontological learning process embedded in contextual conditions. There are no shortcuts. Yet we have recommended tools that can assist researchers to successfully navigate this process. We have focused on the benefits of using thick mapping and have unpacked three methods that can be incorporated into this mixed-methods approach. Additional methods that we recommend for thick mapping are listed in [Supplementary table 1](#). Nonetheless, there will be many more ways and means that are not referenced in this paper. This list will expand as new tools emerge in response to technological advances and shifting contextual conditions. We encourage readers to reach out to us with research approaches and experiences and to join us on our learning journey. Additionally, we emphasise the need to remain critically aware of any ethical concerns that arise in research. Failing to maintain this ethical focus can undermine the credibility of the scientific project and further the legitimisation crisis.

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Declarations

We have no competing interests to declare. We have no AI or LLM used to declare. Both authors read and approved the final manuscript.

References

1. European Environment Agency (EEA). Briefing: Delivering justice in sustainability transitions [webpage on the Internet]. c2024 [cited 2024 Jul 14]. Available from: <https://www.eea.europa.eu/publications/delivering-justice-in-sustainability-transitions/>
2. Swilling M. Just transitions for a complex world: Reflections of an enraged incrementalist. London and New York: Routledge; 2019. <https://doi.org/10.4324/9780429057823>
3. International Union for Conservation of Nature (IUCN). IUCN Red List: Summary statistics of threatened species [webpage on the Internet]. c2004 [cited 2024 Sep 09]. Available from: <https://www.iucnredlist.org/about/background-history>
4. Polanyi K. The great transformation: The political and economic origins of our time. Boston, MA: Beacon Press; 2001.
5. Hadorn GH, Pohl C, editors. Handbook of transdisciplinary research. Dordrecht: Springer; 2008. <https://doi.org/10.1007/978-1-4020-6699-3>
6. Cetina KK. Epistemic cultures: How the sciences make knowledge. Cambridge, MA: Harvard University Press; 1999. <https://doi.org/10.2307/j.ctvw3q7f>
7. Knorr-Cetina KD. The manufacture of knowledge: An essay on the constructivist and contextual nature of science. Amsterdam: Elsevier Science; 2013. <https://doi.org/10.2307/3104685>



8. Knorr Cetina K, Schatzki TR, von Savigny E, editors. *The practice turn in contemporary theory*. 1st ed. London and New York: Routledge; 2000. <https://doi.org/10.4324/9780203977453>
9. Van Breda J. Synergic methods for methodological agility. *Int J Sustain Dev Res*. 2022;8(2):52–65. <https://doi.org/10.11648/j.ijdsr.20220802.14>
10. Arthur WB. *Increasing returns and path dependence in the economy*. Ann Arbor, MI: University of Michigan Press; 2014. <https://doi.org/10.3998/mpub.10029>
11. Colchester J. Path dependency. *Complex Labs*. c2006 [cited 2018 Jun 19]. Available from: <https://www.complexityexplorer.org/explore/glossary/350-path-dependence>
12. Pieterse E. *City futures: Confronting the crisis of urban development*. London and New York: Zed Books; 2008. <https://doi.org/10.5040/9781350219199>
13. Simone A, Pieterse E. *New urban worlds: Inhabiting dissonant times*. Cambridge, UK: Polity; 2017.
14. Habermas J. *Legitimation crisis*. Boston, MA: Beacon Press; 1975. <https://doi.org/10.3817/0975025210>
15. Kofman A. Bruno Latour: The post-truth philosopher mounts a defense. *New York Times*. 2018 October 25 [cited 2024 Jul 14]. Available from: <https://www.nytimes.com/2018/10/25/magazine/bruno-latour-post-truth-philosopher-science.html>
16. Watts N, Amann J, Arnell N, Ayeb-Karlsson S, Beagley J, Belesova K, et al. The 2020 report of the *Lancet* Countdown on health and climate change: Responding to converging crises. *Lancet*. 2021;397(10269):129–170. [https://doi.org/10.1016/s0140-6736\(20\)32290-x](https://doi.org/10.1016/s0140-6736(20)32290-x)
17. Cilliers P. Making sense of a complex world, the third lens. In: Aaltonen M, editor. *The third lens multi-ontology sense-making and strategic decision-making*. London and New York: Taylor & Francis; 2017.
18. Feyerabend P. *Against method*. 3rd ed. London: Verso; 1993.
19. Max-Neef M. *The human scale development: Conception, application and further reflections*. London and New York: The Apex Press; 1991. p. 34.
20. Presner TS, Shepard D, Kawano Y. *HyperCities: Thick mapping in the digital humanities*. Cambridge, MA: Harvard University Press; 2014. <https://doi.org/10.3202/caa.reviews.2015.109>
21. Van Breda J. Co-constructing dynamic thick/deep maps for doing transformative transdisciplinary research (TTDR) in the context of complex sustainability transitions. *Int J Sustain Dev Res*. 2023;9:28. <https://doi.org/10.11648/j.ijdsr.20230902.12>
22. Carvalhaes T, Rinaldi V, Goh Z, Azad S, Uribe J, Ghandehari M. Integrating spatial and ethnographic methods for resilience research: A thick mapping approach for Hurricane Maria in Puerto Rico. *Ann Am Assoc Geogr*. 2022;112:2413–2435. <https://doi.org/10.1080/24694452.2022.2071200>
23. Hoffman J. Toward civic co-production: Using worldbuilding to go beyond participation in urban planning and enact more equitable cities. *Front Sustain Cities*. 2022;4, Art. #907541. <https://doi.org/10.3389/frsc.2022.907541>
24. Cechanowicz L, Cantrell B, McDowell A. World building and the future of media: A case study-Makoko 2036. *IEEE Technol Soc Mag*. 2016;35:28–38. <https://doi.org/10.1109/MTS.2016.2618678>
25. Van Breda J, Swilling M. *The guiding logics and principles for designing emergent transdisciplinary research processes: Learning experiences and reflections from a transdisciplinary urban case study in Enkanini informal settlement, South Africa*. *Sustain Sci*. 2018;14:823–841. <https://doi.org/10.1007/s11625-018-0606-x>
26. Lambert J, Hessler B. *Digital storytelling: Capturing lives, creating community*. 5th ed. London and New York: Routledge; 2018. <https://doi.org/10.4324/9781351266369>
27. Adelle C, Black G, Kroll F. Digital storytelling for policy impact: Perspectives from co-producing knowledge for food system governance in South Africa. *Evid Policy*. 2022;18(1):336–355. <https://doi.org/10.1332/174426421X16474528475330>
28. Treffry-Goatley H, Lessells R, Moletsane R, de Oliveira T, Gaede B. Digital storytelling: A tool to understand and promote HIV drug adherence in rural South Africa. *BMJ Med Humanit*. 2018;44:239–246. <https://doi.org/10.1136/medhum-2018-011474>
29. Teixeira D, Maron M, van Rensburg BJ. Bioacoustic monitoring of animal vocal behavior for conservation. *Conserv Sci Pract*. 2019;1:e72. <https://doi.org/10.1111/csp2.72>
30. Müller J, Mitesser O, Schaefer HM, Seibold S, Busse A, Kriegel P, et al. Soundscapes and deep learning enable tracking biodiversity recovery in tropical forests. *Nat Commun*. 2023;14, Art. #6191. <https://doi.org/10.1038/s41467-023-41693-w>
31. Ponomarenko A, Vincent O, Pietriga A, Cochard H, Badel É, Marmottant P. Ultrasonic emissions reveal individual cavitation bubbles in water-stressed wood. *J R Soc Interface*. 2014;11(99), Art. #20140480. <https://doi.org/10.1098/rsif.2014.0480>
32. Law J. *After method: Mess in social science research*. London and New York: Routledge; 2004.
33. Kauffman S. The “adjacent possible” is relational. In: Thurner S, editor. *43 visions for complexity*. Singapore: World Scientific Publishing; 2017. p. 23–24. https://doi.org/10.1142/9789813206854_0012
34. Snowden D. The adjacent possible [webpage on the Internet]. c2016 [cited 2018 Jun 23]. Available from: <https://thecyfin.co/the-adjacent-possible/?srsltid=AfmBOorMJQMhSpsRvHV2LXRqF-R2LyHVJ4DKjWL5tMHNzUNmhOUxfVlw>
35. Black GF, Davies A, Iskander D, Chambers M. Reflections on the ethics of participatory visual methods to engage communities in global health research. *Glob Bioeth*. 2018;29(1):22–38. <https://doi.org/10.1080/11287462.2017.1415722>
36. Ashton WA. What would Hermes do? *Folk Marketpl Conversat Crossroads Vernac Cult Econ*. 2019;234:312. <https://doi.org/10.7330/9781607327851.c011>
37. Doty WG. *A lifetime of troublemaking: Hermes as a trickster*. 2009:46–65.
38. Brenner JE. *Logic in reality*. Dordrecht: Springer; 2008. <https://doi.org/10.1007/978-1-4020-8375-4>
39. Nicolescu B. *Manifesto of transdisciplinarity*. Albany, NY: State University of New York Press; 2002. <https://doi.org/10.1353/book9032>