Conclusions

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We began this Research Guide with the goal of surveying the insights that scholars have brought to bear on the challenge of sustainable development over the past 20 years. We found a rapidly emerging field of sustainability science that nonetheless remains less than the sum of its diverse parts. We concluded (to paraphrase literary theorist Northrop Frye's observations on a comparably siloed field of scholarship) that there is no reason why the greater project to which numerous individual research programs are contributing should remain forever invisible to them, "as the coral atoll is invisible to the polyp" ([Frye 1957, 12](#)). We therefore attempted to fashion a synoptic perspective from which scholars can more readily see the remarkable progress in scientific understanding of sustainable development that is emerging from the work of the many efforts contributing to the field. The purpose of this synoptic perspective, distilled in the integrative Framework for Research in Sustainability Science presented [elsewhere](#) in this collection, is not to suggest some grand theory of the field: we remain middle-range theorists to the core. Rather, it is to highlight the union set of elements and relationships that various research approaches have shown to be especially useful in explaining nature–society interactions in particular contexts, and that therefore merit serious consideration in the formulation of future sustainability research.

From the synoptic perspective we have fashioned here, it is clear that multiple lines of research now support the long-held intuition that the Anthropocene is at its core a complex adaptive system centered in the intertwined, coevolving interactions of nature and society. Because that system is complex, it will surprise us. Because it is adaptive, innovation and other sources of novelty will drive it, making how it works tomorrow different from how it worked yesterday. Because it is heterogeneous, experience in one location will be an important but perilous guide to action in another. And because the actors who inhabit the system have their own agency and goals, power struggles will play central roles in shaping its pathways of development.

Given these properties of the Anthropocene System, sustainability science has a substantial ability to understand, but a limited ability to predict, how development pathways will actually unfold, or how particular interventions meant to guide those pathways toward sustainability will actually work out. The effective pursuit of sustainability therefore requires that researchers partner with frontline agitators to learn by doing. To be sure, this means working collaboratively to design interventions (technologies, policies, visions) that are as smart and research-informed as possible. But it also means treating those interventions as experiments, being flexible enough to revise them as more information becomes available and mustering the courage to quickly abandon them when they don't work out as planned.

Fostering such a social learning approach to the pursuit of sustainability requires a number of operational capacities. This Research Guide highlights research on six such capacities: the capacity to measure sustainable development, the capacity to promote equity, the capacity to support adaption, the capacity to foster transformations, the capacity to link knowledge with action, and the capacity to devise governance arrangements that allow people to work together in exercising the other capacities (see Figure 2). The evidence reviewed here suggests that significant progress in building these six capacities is necessary for the successful pursuit of sustainability. This capacity building, however, needs to move beyond its own silos. The capacities we have highlighted often appear to interact with one another as potential complements (e.g., the capacity for promoting equity will be stronger if it is backed by better capacity for measuring equity). Capacities can also, however, exist in tension with one another (e.g., actors wedded to adaptation strategies may well overlook or dismiss the need for transformation). Research that informs our understanding of how to build and implement the necessary capacities in an integrated fashion would go a long way toward making sustainability science more than the sum of its parts.

Figure 2 : Capacities for Sustainable Development
 Six interdependent capacities are necessary for the successful pursuit of sustainability: (a) capacity to measure progress toward sustainable development, (b) capacity to promote equity within and between generations, (c) capacity to adapt to shocks and surprises, (d) capacity to transform the system onto more sustainable development pathways, (e) capacity to link knowledge with action for sustainability, and (f) capacity to devise governance arrangements that allow people to work together in exercising the other capacities.

The practical advantage of the capacities perspective outlined here is that society has already built a significant understanding of how to foster such capacities. They can therefore be implemented today by front-line agitators pursuing sustainability at levels from the local to the global and across multiple contexts and action situations. Further strengthening and integrating these capacities should almost certainly be a high priority for sustainability science research going forward. That said, the past twenty years of research provide ample evidence that we ought to proceed humbly and reflexively not only as scholars but also as inhabitants of the complex, ever-changing Anthropocene System that we are seeking to understand. New surprises surely await, and additional capacities not yet identified will doubtless prove to be important in our collective efforts to inform agitation for the successful pursuit of sustainability.

One such surprise enveloped the world as we were finalizing the first edition of this Research Guide: the SARS-CoV-2 pandemic. Like everyone else, we watched the virus kill family members and colleagues, disrupt development pathways, and trigger cascades of assaults on human well-being. The full implications of SARS-CoV-2 for sustainable development will take years to fully comprehend. Already clear, however, is that contemporary development pathways with their growing inequalities have exacerbated both the spread and the impacts of the virus. Viewed through the lens of sustainability science, SARS-CoV-2 is an all-encompassing disruption posing substantial challenges for humanity's capacities to promote inclusive well-being. That said, this pandemic, like others the world has weathered, will one day be over. When it is, we will continue to face unsustainable development pathways, held in place by path-dependent regimes and powerful, self-interested actors. Promoting transformations toward more sustainable development pathways will remain the defining challenge of our time.

Citations

1. Frye, Northrop. 1957. *Anatomy of Criticism: Four Essays*. Princeton, NJ: Princeton University Press. [↗](#)