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ARTICLE

Calculative Practices in International Environmental Governance: In (Partial) Defence of Indicators

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Abstract
The role of calculative practices such as goals and indicators in international environmental governance causes concern among many observers, who view them as promoting a reductivist approach to the non-human world and privileging economic understandings of environmental governance above all others. Yet they possess enormous potential to provide insights into the non-human world that could be of great benefit to governance. This article takes seriously critical perspectives of calculative practices, while exploring a weakness in much of the critical literature, namely a failure to examine assumptions about the nature of scientific knowledge and the manner in which it is, and ought to be, taken up by policy makers. I contend that both the design of environmental regimes and critical analyses of these regimes bear the marks of the influence, albeit indirect, of early 20th century views on the superiority of scientific knowledge and its unique capacity to ground decision making. I argue that a richer, more nuanced account of the co-production of ecological metrics such as goals and indicators and their potential contributions to ecosystem governance and sustainability is necessary. With such accounts, scholars and political authorities would be in a better position to address the very real pitfalls and dangers of calculative practices while not feeling compelled to forego these potentially powerful approaches.

Keywords: Sustainability, International law and politics, Science, Critical theory, Indicators, Calculative practices

1. INTRODUCTION

> The empirical basis of objective science has thus nothing 'absolute' about it. Science does not rest upon solid bedrock. The bold structure of its theories rises, as it were, above a

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> swamp. It is like a building erected on piles. The piles are driven down from above into the swamp, but not down to any natural or 'given' base; and if we stop driving the piles deeper, it is not because we have reached firm ground. We simply stop when we are satisfied that the piles are firm enough to carry the structure, at least for the time being.[1]

Scholars of international law and politics have watched with concern as sustainability governance institutions come increasingly to rely on metrics such as indicators, goals, and targets to define and pursue sustainability objectives. The recent adoption by the United Nations (UN) of the 2030 Sustainable Development Goals (SDGs), succeeding and greatly expanding upon the Millennium Development Goals (MDGs) project, is indicative of a turn towards data-driven approaches that seem to bypass both law and politics in favour of closer interactions between science and economics.[2] That science is at the heart of efforts to address sustainable development is inevitable: political authorities and other actors depend on scientific insights in comprehending environmental degradation and its drivers. However, the increased prominence of these calculative practices in international environmental governance has alarmed many observers, who fear that they flatten complex and highly contoured landscapes, privilege expert-driven discourse over the voices of ordinary people and local communities, exacerbate the predominance of economic logic in collective decision making, and ultimately contribute to the commodification of the non-human world. The design and operation of many influential international sustainability institutions and organizations tend to privilege a particular perspective on science as an enterprise the usefulness of which to governance resides in its capacity to generate objective facts possessing objective validity. This perspective has been carefully and effectively criticized by a range of actors including, increasingly, scientists who work within these organizations. Yet, the structure and decision-making processes within these organizations have responded inadequately to these criticisms to date.

There is a very real risk that sustainability governance will continue on what appears to be its current path: excessive dependence on scientific inputs, economic analysis, and a truncated form of short-term politics pursuing narrowly defined objectives. However, richer and more empirically grounded perspectives on how scientists develop their insights could make important contributions to sustainability governance. Such perspectives are widely available in social science and humanities literature on science. The focus of this article is not to present proposals, inspired by this literature, for more robust institutional design, but rather to take seriously, and seek to respond to, the critics of metrics and calculative practices. A common thread running through many critiques of calculative practices is a particular view of the nature of scientific knowledge: reductive, lacking means of communication with other disciplines and ways of knowing, and inclined to assume that its own specific narrow insights constitute all that one needs to know about a phenomenon. I argue that the scientific

1 K.R. Popper, *The Logic of Scientific Discovery* (Routledge Classics, 2002), p. 94.

2 Sustainable Development Goals, available at: https://sustainabledevelopment.un.org/sdgs. Millennium Development Goals, available at: https://www.un.org/milleniumgoals.

enterprise critiqued in this literature is grounded less on considerations of how scientists work, how they view their work, and what they consider the implications of scientific knowledge to be, and more on a flattened perspective on science reflected through the prism of sustainable development institutions and organizations. The question, then, is whether, given a richer conception of science, the critique would retain its bite. I conclude that it does to an important extent, making a valuable contribution to the structure and process of sustainability decision making. However, we should not entirely forego the deep and broad insights that scientific knowledge makes available, and the enormous potential of bringing these insights to bear on environmental and sustainability problems in the form of metrics and calculative practices. Rather, we should work towards better decision making while concurrently keeping squarely in mind the challenges that the critics advance, and seeking to respond to them on an ongoing basis.

In what follows I will provide a brief overview of the development and use of calculative practices, with a focus on the SDGs and on the concept of ecosystem services. I will then consider prominent strands of criticism of indicators and similar practices, notably those influenced by Foucauldian, Frankfurt School, and Marxist frameworks. I then hone in on and seek to challenge the representations of science to be found in this literature. If such perceptions of scientific knowledge are challenged and science as knowledge embedded in human epistemology generally is taken seriously, I argue in the final section, the potential contributions of indicators as boundary objects, at the frontiers of science, politics and law, become more evident.

2. METRICS FOR SUSTAINABILITY: THE SDGs AND ECOSYSTEM SERVICES

The definition of an indicator given by Kevin Davis, Benedict Kingsbury and Sally Engle Merry is a good point of departure for an exploration of the calculative practices built around them:

> An indicator is a named collection of rank-ordered data that purports to represent the past or projected performance of different units. The data are generated through a process that simplifies raw data about a complex social phenomenon. The data, in this simplified and processed form, are capable of being used to compare particular units of analysis (such as countries, institutions, or corporations), synchronically or over time, and to evaluate their performance by reference to one or more standards.[3]

Three of the central features of indicators to which this definition draws our attention are (i) their ordinal structure, fostering comparison and generating expectations of improvement; (ii) simplification of complex phenomena; and (iii) amenability to evaluative practices.[4] We do not have to go far to seek the evaluative, normative or

3 K.E. Davis, B. Kingsbury & S. Engle Merry, 'Indicators as a Technology of Global Governance' (2012) 46(1) *Law & Society Review*, pp. 71–104, at 73–4.

4 Ibid., p. 75.

ideological dimensions of indicators, but indicators are very often framed or presented in a manner that pushes these dimensions into the background. As Davis and his co-authors put it, they are 'placeholders' for a theory or ideology in which a desired state of affairs is envisaged.[5] This obfuscation of the judgment and policy preferences that inevitably attend the creation of indicators is facilitated by their technical nature. Scientists and other experts familiar with this process may be able to see the framing and selections, along with many of the assumptions and preferences, embedded therein. As I hope to illustrate in the discussion that follows, indicators and other metrics are usefully understood as hybrids[6] or boundary objects,[7] co-produced by scientists, policy makers, and other actors.

The use of goals, targets, and indicators to track progress towards sustainability objectives looms particularly large since the adoption of the MDGs in 2000,[8] followed by the 2015 adoption of their successor project, the SDGs.[9] The SDGs comprise 17 goals, all articulated at a very high level of generality, and include no poverty, zero hunger, life below water, life on land, and so forth.[10] Somewhat more specific targets are established for each goal, and indicators, which are more specific still, are adopted to measure progress towards the targets.[11] However, there is a great deal of distance between goals and targets, and between targets and indicators. The more specific metrics do not purport to capture the more general in all their dimensions. Rather, they address only a narrow subset of issues or problems contained within the more general category. The rather matter-of-fact presentation of these packages obscures expert analysis, judgments, and choices, as well as preferences and assumptions.[12] While a great deal of often highly technical information is available on the indicators themselves and the means to generate values for them, the processes through which indicators are designed and myriad decisions about them are made remain obscure.[13]

5 Ibid., p. 77.

6 C. Miller, 'Hybrid Management: Boundary Organizations, Science Policy, and Environmental Governance in the Climate Regime' (2001) 26(4) *Science, Technology, & Human Values*, pp. 478–500; S. Jasanoff, *States of Knowledge: The Co-Production of Science and Social Order* (Routledge, 2004).

7 S.L. Star & J.R. Griesemer, 'Institutional Ecology, Translations and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39' (1989) 19(3) *Social Studies of Science*, pp. 387–420, at 393.

8 United Nations Millennium Declaration (8 Sept. 2000), UN Doc. A/55/L.2.

9 UN General Assembly, 'Transforming Our World: The 2030 Agenda for Sustainable Development' (21 Oct. 2015), UN Doc. A/RES/70/1.

10 Ibid.

11 UN Economic and Social Council, 'Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators' (19 Feb. 2016), UN Doc. E/CN.3/2016/2/Rev.1, Annex IV. There are 230 indicators listed, but a small number are associated with more than one target.

12 S. Engle Merry, *The Seductions of Quantification* (University of Chicago Press, 2016), pp. 5, 19–20.

13 On problems with arbitrariness and lack of conceptual frameworks in the indication and specification of indicators see D. Niemeijer & R.S. de Groot, 'A Conceptual Framework for Selecting Environmental Indicator Sets' (2008) 8(1) *Ecological Indicators*, pp. 14–25; T. Hák, S. Janouskova & B. Moldan, 'Sustainable Development Goals: A Need for Relevant Indicators' (2016) 60 *Ecological Indicators*, pp. 565–73.

A brief look at SDG 15, life on land, will provide some insight into the functions of these packages, as well as the multiple audiences to which they are addressed. The first target reads as follows: 'By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements'.[14] The second indicator associated with this target is 15.1.2: 'Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type'.[15] This is a fairly straightforward indicator, representing a phenomenon that is readily quantifiable. It nevertheless poses serious challenges which must be met with agreed definitions, methodologies for collecting and analyzing data and, importantly, guidelines regarding the use of the resulting values for policy and planning purposes.[16] The International Union for the Conservation of Nature (IUCN), which has partnered with the UN to address these challenges, has produced a series of definitions, descriptions of methodology, criteria, and guidelines covering close to 200 pages to structure the research and analysis used to gather and analyze data for the purpose of applying this indicator.[17] For example, the specification in indicator 15.1.2 of *important* sites for protection necessitates a means of identifying and delineating such sites. The IUCN has developed a methodology for this identification. The range of terms that stand to be defined at the outset of this project conveys the complexity of the project. These include biodiversity, contribution to global biodiversity, persistence, significance, and site.[18] Terms such as 'threatened species' have been defined by various regulatory agencies, but the identification of sites of importance for such species requires the establishment of criteria pertaining, for example, to the percentage of the global population of threatened species, and of specimens capable of reproduction found on the site; to the percentage of the global extent of threatened ecosystem types; to the presence of wholly intact ecological communities; and to the likelihood that a site may serve as a refugium for populations fleeing from ecosystems under stress.[19]

These technocratic, expert-driven dimensions of the SDGs resemble the iceberg of which the high-level goals and targets are the tip. The analogy is apt in more ways than one: the work of the IUCN and other partner organizations, while well publicized

14 UN General Assembly, 'Global Indicator Framework for the Sustainable Development Goals and Targets of the 2030 Agenda for Sustainable Development' (6 July 2017), UN Doc. A/RES/71/313, Annex.

15 Ibid.

16 On the appropriateness of indicators for purposes other than those for which they were designed, see K. Pistor, 'Re-Construction of Private Indicators for Public Purposes', in K.E. Davis et al. (eds), *Governance by Indicators: Global Power through Quantification and Rankings* (Oxford University Press, 2012), pp. 165–79.

17 IUCN, 'Protected Area Categories', available at: https://www.iucn.org/theme/protected-areas/about/protected-area-categories. The categories range from strict nature reserve to protected area with sustainable use of natural resources: see N. Dudley (ed.), *Guidelines for Applying Protected Area Management Categories: Developing Capacity for a Protected Planet* (IUCN, 2013); IUCN, *A Global Standard for the Identification of Key Biodiversity Areas* (IUCN, 2016), available at: https://portals.iucn.org/library/node/46259.

18 IUCN, *A Global Standard for the Identification of Key Biodiversity Areas*, ibid.

19 Ibid.

and documented, is mostly invisible to large segments of the Goals' intended audiences because of its complexity, detail, and dependence on expert knowledge. Given the scope and scale of the SDGs, it is hardly surprising that they address multiple audiences in very different ways, performing a complex range of functions. These functions range from rhetorical (e.g., awareness raising, persuasion, engagement, and mobilization) to technocratic (e.g., developing methodologies and building and analyzing data sets). The SDGs attempt to address criticism levelled at the MDGs regarding the technocratic nature of the project. For example, they were adopted through a process that gave comparatively greater access to state representatives and civil society.[20] The multifaceted nature of the SDGs has important implications for the development of targets and indicators. From a technical point of view, a good indicator possesses certain qualities that may be of far less interest for the public-facing, communicative facets of the project.[21] Targets and indicators do not attempt to represent or account for the full scope of each goal, but rather operate as proxies for the much more complex phenomena on which they seek to shed light. Indicators may be seen as synecdoche for those phenomena. Changes at higher levels of generality ought to be roughly tracked by changes to the proxy, and comparing measurements of the proxy across time and space ought to produce informative comparisons of the larger phenomenon. The information and insights generated by measurements of such proxies can be of great value as long as the distinction between part and whole is kept squarely in mind and the significant limitations on insights derived from the proxy are clearly acknowledged. However, this vigilance regarding the weaknesses and limitations of indicators may be difficult for non-experts to maintain. As for those whose interests are promoted by deploying indicators in misleading ways, their task is made easier by the ambiguous relationship between part and whole.

The targets and indicators discussed above are relatively well supported by scientifically accepted methodologies and reasonably high-quality data sets. However, this is not true across the board.[22] The attempt to establish a comprehensive set of goals encompassing all essential elements of sustainable development has prompted the adoption of goals for which targets are difficult to identify, and indicators for which either reliable sources of data or widely accepted methodologies are currently unavailable.[23] Given the multifaceted nature of the objectives and functions of the SDGs, the

[20] M. Langford, 'Lost in Transformation? The Politics of the Sustainable Development Goals' (2016) 30(2) *Ethics & International Affairs*, pp. 167–76, at 170. The participatory dimension of the negotiation of the SDGs is described in glowing terms in O. Fox & P. Stoett, 'Citizen Participation in the UN Sustainable Development Goals Consultation Process: Toward Global Democratic Governance?' (2016) 22(4) *Global Governance*, pp. 555–73.

[21] Hák, Janouskova & Moldan, n. 13 above.

[22] Ibid.

[23] The indicators are divided into three tiers to reflect this. An indicator is designated Tier 1 if it 'is conceptually clear, has an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50[%] of countries and of the population in every region where the indicator is relevant'. A Tier 2 indicator 'is conceptually clear, has an internationally established methodology and standards are available, but data are not regularly produced by countries'; while for Tier 3, '[n]o internationally established methodology or standards are yet available for the indicator, but methodology/standards are being (or will be) developed or tested'. The indicator discussed above,

inclusion of indicators that are currently unmeasurable and goals with a very high number of inoperable indicators may be a defensible strategy. However, this does raise the question of where the boundaries lie with regard to the utility of metrics to public policy. There is a very real risk of overreach, possibly leading to disappointment and disaffection when the SDG project inevitably fails to deliver on its promises.[24] This risk is enhanced by the manner in which the SDGs were launched, in a modestly titled document 'Transforming our World: The 2030 Agenda for Sustainable Development',[25] which presents the SDGs as a charter,[26] – implying a constitution-like status – and a roadmap,[27] evocative of a planning approach. To my reading, the SDGs are neither. The Goals are careful to avoid implications that rights and obligations are created, perhaps going rather too far in this respect, as it is difficult to identify lines of responsibility for their realization.[28] They certainly do not supplant existing international environmental and sustainability law, nor do they purport to organize and structure those bodies of law as a constitution-like text might. The roadmap metaphor is, at best, an exaggeration. Only a portion of the targets are actually framed as such and the sets of targets corresponding to each goal do not purport to cover every dimension of those goals, thus outlining the series of steps needed for their achievement. The SDGs nevertheless do have the potential – along with projects such as the Aichi Targets[29] adopted by the parties to the Convention on Biological Diversity (CBD),[30] and data-gathering and reporting obligations under the Paris Agreement[31] – to provide much-needed feedback on international environmental and sustainability law beyond mere compliance. This offers the possibility of providing insights into the extent to which the substantive obligations of legal regimes are being met and into the suitability of these obligations in light of the regimes' stated goals. No doubt these analyses would make for depressing reading, but they could provide valuable data that might serve to strengthen the regimes in meaningful ways.

15.1.2, is a Tier 1 indicator. Goal 12, sustainable consumption and production patterns, features a large number of indicators in Tier 2 (such as 12.2.1: Material footprint, material footprint per capita, and material footprint per GDP) and Tier 3 (such as 12.8.1: Extent to which (i) global citizenship education and (ii) education for sustainable development (including climate change education) are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment).

24 There is empirical evidence of a correlation between MDG indicators for which data is poor and a lack of progress towards targets: A. Jacob, 'Mind the Gap: Analyzing the Impact of Data Gap in Millennium Development Goals' (MDGs) Indicators on the Progress toward MDGs' (2017) 93(C) *World Development*, pp. 260–78. See also E. Afful-Dadzie, A. Afful-Dadzie & Z. Kominkova Oplatkova, 'Measuring Progress of the Millennium Development Goals: A Fuzzy Comprehensive Evaluation Approach' (2014) 28(1) *Applied Artificial Intelligence*, pp. 1–15.

25 'Transforming Our World', n. 9 above.

26 Ibid., p. 51.

27 Ibid., p. 53.

28 M. Bexell & K. Jönsson, 'Responsibility and the United Nations' Sustainable Development Goals' (2017) 44(1) *Forum for Development Studies*, pp. 13–29.

29 Aichi Biodiversity Targets, available at: https://www.cbd.int/sp/targets.

30 Rio de Janeiro (Brazil), 5 June 1992, in force 29 Dec. 1993, available at: http://www.cbd.int/convention/text.

31 Paris (France), 12 Dec. 2015, in force 4 Nov. 2016, available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

Another potentially great benefit for the development of feedback loops for international regimes is a concept that is even more controversial than the MDGs and SDGs – namely ecosystem services. An influential definition of this term proposed by Robert Costanza and his co-authors is 'the benefits human populations derive, directly or indirectly, from ecosystem functions' such as 'the habitat, biological or system properties or processes of ecosystems'.[32] The ecosystem service that is perhaps most well-known is carbon sequestration, or the capacity of vegetation and soil to absorb carbon and keep it, for some period of time, out of the atmosphere. As a result of the existence of markets for carbon emissions permits, which in turn are created by international and domestic emissions reduction regimes, carbon sequestration units are readily monetized. This is not the case for all, or even most, ecosystem services, but the very measurement of such services opens up this possibility and, in the eyes of many critics, renders the concept untenable.[33] Beyond the risks inherent in monetization of ecosystem services, many critics observe that the reduction of a landscape to a series of numerical values does a kind of violence to the rich and complex phenomenon being observed. For example, a forest rendered in carbon sequestration units becomes readily comparable with an electrical generation plant that burns natural gas in place of coal.[34] It is also possible, however, to compare the ecosystem services provided by an impoverished landscape, such as a monoculture plantation, with those provided by a richer and more diverse stand of trees and other vegetation.

The concept of ecosystem services is often embedded in economic language and logic. For example, 'stocks' of 'natural capital' generate a 'flow of services that may be used to transform materials, or the spatial configuration of materials, to enhance the welfare of humans'.[35] Such an approach is off-putting to critics who seek more authentic and holistic understandings of the non-human world. However, many ecosystem services experts argue that if data on the benefits of ecosystem services such as flood control, resistance to infestation or disease, or circulation of nutrients cannot readily be introduced into policy and public discussions, they will be excluded from consideration altogether. As Costanza and his co-authors argue, 'the general population's information about the world, especially when it comes to ecosystem services, is extremely limited. We can expect many ecosystem services to go almost unnoticed by the vast majority of people, especially when they are public, non-excludable services that never enter the private, excludable market'.[36] In other words, proponents of ecosystem services are not seeking to push back against a rich conception of the non-human world, but against a profoundly impoverished one. Many proponents take a strategic approach: the concept is presented 'as a pragmatic and transitory short-term

[32] R. Costanza et al., 'The Value of the World's Ecosystem Services and Natural Capital' (1997) 387 *Nature*, pp. 253–60, at 253.

[33] E. Gómez-Baggethun et al., 'Concepts and Methods in Ecosystem Services Valuation', in M. Potschin et al. (eds), *Routledge Handbook of Ecosystem Services* (Routledge, 2016), pp. 99–111.

[34] C. Methmann, 'The Sky Is the Limit: Global Warming as Global Governmentality' (2013) 19(1) *European Journal of International Relations*, pp. 69–91, at 80.

[35] Costanza et al., n. 32 above, p. 254.

[36] R. Costanza, 'Ecosystem Services in Theory and Practice', in Potschin et al., n. 33 above, pp. 15–24, at 17.

tool to communicate the value of biodiversity using a language that reflects dominant political and economic views', deployed in response to the failure of environmental policy to halt or reverse biodiversity and habitat loss.[37] All knowledge is mediated and all observation requires interpretation. Metrics represent one way of looking at the world, but other frames and ways of knowing remain available. We become adept at shifting from frame to frame to analyze problems; political authorities and other decision makers should therefore be expected to look at problems from a range of perspectives, making use of metrics but not permitting them to control their analyses from beginning to end. The problem with this proposition, to which we now turn, is that the frames provided by metrics are very powerful.[38]

3. CRITIQUE OF CALCULATIVE PRACTICES

The calculative practices exemplified by goals and indicators have been described and analyzed as instances of governmentality,[39] environmentality,[40] and, more recently, measurementality,[41] following Foucauldian methodologies and theoretical insights. Other scholars draw on the writings of Karl Polanyi, as well as on Marxism and critical theory. Concepts such as ecosystem services and the identification of goals and indicators necessarily require simplification, abstraction, and reduction, leaving them vulnerable to the criticism that they provide only a very narrow perspective on the world. This perspective, moreover, has hegemonic tendencies, dovetailing far too conveniently with the interests of already powerful elites. Observers justifiably question arguments that the provision of information enhances human freedom by enhancing the capacities of individual actors to comprehend their own interests and make decisions to protect and promote them. As Nikolas Rose has argued, the means of measuring, calculating, and analyzing can be understood as rule or governance at a distance, permitting deeper penetration and greater coverage of fields that, according to liberal conceptions of society and the state, are understood as zones of freedom. These means are also difficult to detect, and their effects are harder to assess and resist.[42]

[37] E. Gómez-Baggethun & M. Ruiz-Pérez, 'Economic Valuation and the Commodification of Ecosystem Services' (2011) 35(5) *Progress in Physical Geography*, pp. 613–28, at 614.

[38] B. Kingsbury, K.E. Davis & S. Engle Merry (eds), *The Quiet Power of Indicators: Measuring Governance, Corruption, and the Rule of Law* (Cambridge University Press, 2015).

[39] S. Hamilton, 'The Measure of All Things? The Anthropocene as a Global Biopolitics of Carbon' (2016) 24(1) *European Journal of International Relations*, pp. 33–57; K. Bäckstrand & E. Lövbrand, 'Planting Trees to Mitigate Climate Change: Contested Discourses of Ecological Modernization, Green Governmentality and Civic Environmentalism' (2006) 6(1) *Global Environmental Politics*, pp. 50–75.

[40] A. Agrawal, *Environmentality: Technologies of Government and the Making of Subjects* (Duke University Press, 2005).

[41] E. Turnhout, K. Neves & E. de Lijster, '"Measurementality" in Biodiversity Governance: Knowledge, Transparency, and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)' (2014) 46(3) *Environment and Planning A: Economy and Space*, pp. 581–97.

[42] N.S. Rose, *Powers of Freedom: Reframing Political Thought* (Cambridge University Press, 1999), p. 50. The author builds on the Callon and Latour concept of action at a distance: M. Callon & B. Latour, 'Unscrewing the Big Leviathan: How Actors Macro-Structure Reality and How Sociologists Help Them to Do So', in K. Knorr-Cetina & A.V. Cicourel (eds), *Advances in Social Theory and*

3.1. *Foucault: The Disciplined, Self-Governing Actor*

Michel Foucault's work on governmentality and biopower readily lends itself to an analysis of governance regimes for environmental protection and the promotion of development,[43] and provides important insights for an analysis of calculative practices such as indicators.[44] Foucault contests the account of liberalism according to which sovereign power came to be limited from without by laws that granted protection for fundamental rights. He draws attention instead to conceptions of appropriate objectives of government and the most efficient, effective means of meeting those objectives, namely, ensuring the prosperity of the nation.[45] As Rose puts it:

> As a diagram of rule, liberalism sought to limit the scope of political authority, and to exercise vigilance over it, delimiting certain 'natural' spheres – markets, citizens, civil society – that were outwith the legitimate scope of political interference. Yet good government would depend on the well-being of these domains; hence political authority simultaneously acquired the obligations to foster the self-organizing capacities of those natural spheres.[46]

With the advent of American neoliberalism comes an extension of economic logic to non-economic spheres. The legal subject is replaced by *homo economicus*: all dimensions of one's life and activities are susceptible to transcription into an economic register, thus providing profound insights into the susceptibility of individuals to the influence of changes in incentive structures. The self-limitation of governance and the withdrawal of the sovereign from the market does not, Foucault notes, result in less governance, but rather in the adoption of new technologies of government. The newfound intelligibility of non-economic domains makes it possible to guide conduct by making changes to the environment in which that conduct takes place, rather than by imposing norms on individual actors.[47]

Foucault identifies forms of power operating at a fine-grained, microphysical level – capillary power – which produces complacent bodies, and which could operate to regulate entire populations as well as the natural resources on which populations depend. This process began with the rationalization of agriculture and expanded to encompass new technologies for managing natural resources, representing land, human labour or equipment as productive units the contributions of which were subject to calculation and rational management.[48] The mode of such rational management need not involve the imposition upon individuals of norms, and sanctions for violations; it can, instead, be pursued through changes to incentive structures such as taxes, investments in more

Methodology: Toward an Integration of Micro-and Macro-sociologies, Vol 1 (Routledge & Kegan Paul, 1981), pp. 277–303.

43 See, e.g., P. Rutherford, 'The Entry of Life into History', in E. Darier (ed.), *Discourses of the Environment* (Blackwell, 1999), pp. 37–62.

44 Engle Merry, n. 12 above, pp. 28–9.

45 M. Foucault, *Naissance de La Biopolitique* (Gallimard; Seuil, 2004), pp. 12–4.

46 Rose, n. 42 above, p. 49.

47 Foucault, n. 45 above, pp. 249–74.

48 M. Foucault, *Surveiller et punir: Naissance de la prison* (Gallimard, 1975); M. Foucault & F. Gros, *Histoire de la sexualité* (Gallimard, 1976).

efficient methods of production, and the simple process of counting and comparing. As Engle Merry puts it, '[o]ne effect of power is what gets measured'.[49]

Foucault's concepts of governmentality and biopower have been brought to bear on a wide range of governance institutions and practices in the field of environment and development. Running throughout this literature is a concern with the flattening, reductive effect of calculative practices, presenting rich and complex phenomena such as ecosystems or communities engaged in production and trade as carbon units, nutrient flows, levels of personal debt, and so on. These calculative practices become dangerous through their hegemonic tendencies, occupying virtually all of the discursive space at the expense of other interpretations or points of view based, for example, on aesthetics or ethics.[50] The danger, then, is not that calculated practices frame observations of the world – no observation of the world is possible without a frame – but that certain frames are far more influential than others. Knowledge framed in this manner can thus cease to appear to be mediated knowledge at all, appearing simply to be observations about facts in the world.[51]

This hegemonic tendency provides the basis for another aspect of the critique of calculative practices, namely depoliticization. To the extent that expert discourse is presented as non-normative, based on purely objective forms of knowing, the decisions and judgments that inevitably lie behind the selection of goals and indicators, as well as data collection and analysis, are obscured. Equally obscured are the interests that tend to be served by these decisions. For example, relatively modest, incremental policy measures are preferred to more fundamental changes to the organization of economies and societies. Often mentioned in this context is the rarely questioned ongoing exploitation of natural resources in the name of further economic growth, as well as the lack of attention to economic and social inequality.[52] There is a reading of the international sustainability governance landscape that strongly supports the depoliticization argument. Metrics such as the SDGs facilitate a highly technocratic approach: scientific knowledge is presented to political authorities, not in the form of raw data or arguments supported by evidence, but as metrics that stand in the stead of richer and more complex accounts of underlying phenomena. Their status as proxies rather than as comprehensive representations is obscured. Legal obligation and political authority have no obvious foothold on this terrain.[53]

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49 Engle Merry, n. 12 above, p. 29; K.E. Davis, B. Kingsbury & S. Engle Merry, 'Introduction: The Local-Global Life of Indicators: Law, Power, and Resistance', in Kingsbury, Davis & Engle Merry, n. 38 above, pp. 1–26, at 1, 2.

50 Methmann, n. 34 above, p. 81.

51 Engle Merry, n. 12 above, pp. 19ff.

52 Methmann, n. 34 above, p. 71 (arguing that '[the Clean Development Mechanism under the Kyoto Protocol] brings about a way of governing the earth's carbon cycle which purports to save the climate but in fact protects business as usual from climate protection. The failure of the CDM is the success of a depoliticization of climate change politics'); Turnhout, Neves & Lijster, n. 41 above, p. 583.

53 M. Koskenniemi, 'Declaratory Legislation: Towards a Genealogy of Neoliberal Legalism', in R. Liivoja & J. Petman (eds), *International Law-Making: Essays in Honour of Jan Klabbers* (Routledge, 2014), pp. 17–38, at 18–9.

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The depoliticization critique refers to interests that are served by calculative practices under cover of objectivity and scientific rigour: business as usual continues to favour already well-positioned actors. Governmentality points to a discourse of freedom promoted by the (apparent) roll-back of governmental intervention in favour of placing at the disposal of individual actors a range of tools, instruments, and information that permit them to develop their own capacity to promote goals such as reduction of greenhouse gas (GHG) emissions. According to a Foucauldian analysis, this results in the construction of the self-disciplining, responsible subject. Tools such as carbon footprint calculators make it possible for individuals to alter their behaviour in strategic ways that promote environmental goals.[54] The goal, and the means to calculate progress towards it, are both given in this scenario. While this might seem unproblematic in this context, there are many other contexts in which decisions about what counts as a good agricultural practice or an optimum level of investment in local commerce have already been taken elsewhere, generally by experts who may question the capacity of lay persons to conduct their own analyses.[55] Another issue with placing responsibility in the hands of individuals is the potential to obscure structural obstacles and deflect attention away from other actors that contribute to the problem. The general thrust of these arguments is to deny that the retreat of the state has produced more freedom overall: actors are being governed at a distance through these calculative practices.[56] Furthermore, the fact that market mechanisms and economic incentives are often at work in or around these calculative practices gives rise to the contention that the actors who are both freed and capacitated by such practices are economic actors.[57]

Scholarship inspired by Foucault draws attention to the power of calculative practices to discipline and govern while maintaining the appearance of freedom and choice. The capacity of these practices to create novel commodities such as tradable emissions permits is also a target of critical scholarship, for which Polanyi's concept of false commodities is an important starting point.

3.2. *Polanyi: False Commodities*

Polanyi describes land, labour, and money as false commodities: unlike real commodities, they are not produced for exchange on markets, though they nevertheless are so exchanged.[58] The development of indicators to identify and measure ecosystem services takes the creation of false commodities to a new level. Current methodologies work with the categories of provisioning (e.g., food, energy, and water); regulation and

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54 E. Lövbrand & J. Stripple, 'Disrupting the Public–Private Distinction: Excavating the Government of Carbon Markets Post-Copenhagen' (2012) 30(4) *Environment and Planning C: Government and Policy*, pp. 658–74, at 663; S. Ilcan & L. Phillips, 'Developmentalities and Calculative Practices: The Millennium Development Goals' (2010) 42(4) *Antipode*, pp. 844–74.

55 Rose, n. 42 above, pp. 87–88; Ilcan & Phillips, ibid.

56 Rose, n. 42 above, p. 49; Lövbrand & Stripple, n. 54 above; Ilcan & Phillips, n. 54 above.

57 Ilcan & Phillips, n. 54 above, p. 847; N. Castree, 'Neoliberalising Nature: The Logics of Deregulation and Reregulation' (2008) 40(1) *Environment and Planning A: Economy and Space*, pp. 131–52, at 143.

58 K. Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time* (Beacon, 2001), pp. 35–6.

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maintenance (e.g., filtration, sequestration, and stabilization of erosion rates); and cultural (including recreational uses, aesthetic value, and spiritual or symbolic significance) services.[59] These methodologies are powerful tools for rendering the evaluation of landscapes more sophisticated and multi-dimensional, thereby potentially providing additional reasons for their preservation. From a Polanyian perspective, however, the identification and measurement of ecosystem services is an expansion of the disembedding of the economy from society. Polanyi traces the historical processes of the enclosure movement in 15th and 16th century England, criticizing the assumption that the ultimate increase in the value and productivity of farmland secured by enclosure should be the main, or sole, means of evaluating the movement. Polanyi cites an early 17th century document which evaluated enclosure through the logic of *quid pro quo*: the poor secure habitation while the rich may pursue improvement,[60] and notes that '[t]his formula appears to take for granted the essence of purely economic progress, which is to achieve improvement at the price of social dislocation'.[61] Prior to the advent of self-regulating markets, Polanyi argues, the production and distribution of goods were organized through often elaborate social institutions that existed not for their own sake but for a range of social, cultural, spiritual, and economic reasons. In short, economic production and exchange were embedded in social institutions, and organized not around efficiency or increased production but reciprocity and redistribution.[62] He writes:

> [N]o society can exist without a system of some kind which ensures order in the production and distribution of goods. But that does not imply the existence of separate economic institutions; normally, the economic order is merely a function of the social order. Neither under tribal nor under feudal nor under mercantile conditions was there … a separate economic system in society. Nineteenth-century society, in which economic activity was isolated and imputed to a distinctive economic motive, was a singular departure.[63]

With the disembedding of the economy from society through the creation of self-regulating markets connected to international flows of goods, enormous social upheaval was caused, creating pressure on governments to respond not to the root causes of this upheaval but to its most blatant effects. These responses took the form of, for instance, regulation of working conditions, public health, and public works.[64] This combination of disembedding of the economy from society and regulatory responses to ease its worst effects is described by Polanyi as a double movement.[65]

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[59] This is the Common International Classification of Ecosystem Services (CICES) developed by Potschin and Haines-Young for the European Environmental Agency, available at: https://cices.eu. Without a doubt, the last category is the most technically and philosophically challenging, and by far the most controversial, including among scholars generally supportive of ecosystem services valuation: see Gómez-Baggethun & Ruiz-Pérez, n. 37 above.

[60] Polanyi, n. 58 above, p. 36.

[61] ibid.

[62] Ibid., Ch. 4.

[63] Ibid., p. 74.

[64] Ibid., pp. 152ff.

[65] Ibid., pp. 151ff.

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Polanyi's account of the commodification of land, labour, and money provides important critical insights into the concept of ecosystem services, especially when the provision of these services – for example, through the planting of vegetation that sequesters atmospheric carbon – can be monetized or otherwise commodified. He discusses the essentially feudal nature of land ownership and transfer that prevailed in England and France until well into the Industrial Revolution, as well as the organization of labour through guilds, both of which were replaced gradually by market exchange,[66] while money came to be commodified through banking and state finance.[67] The commodification of land, labour, and money, argues Polanyi, had far-reaching consequences:

> The commodity fiction … supplies a vital organizing principle in regard to the whole of society affecting almost all its institutions in the most varied way, namely, the principle according to which no arrangement or behavior should be allowed to exist that might prevent the actual functioning of the market mechanism on the lines of the commodity fiction.

Now, with regard to labour, land, and money such a postulate cannot be upheld. To allow the market mechanism to be the sole director of the fate of human beings and their natural environment – indeed, even of the amount and use of purchasing power – would result in the demolition of society.[68]

Particularly relevant to sustainable development is Polanyi's account of the dangers of commodifying land: 'Nature would be reduced to its elements, neighborhoods and landscapes defiled, rivers polluted, military safety jeopardized, the power to produce food and raw materials destroyed'.[69] Similarly, he argues, deploying labour means deploying human beings, 'affecting … the human being who happens to be the bearer of this peculiar commodity. In disposing of a man's labor power the system would, incidentally, dispose of the physical, psychological, and moral entity "man" attached to that tag'.[70] One could respond that labour laws, environmental protection statutes, and regulation of the banking industry, among other initiatives, prevent the advent of this dystopia, but Polanyi, along with contemporary scholars applying his insights to contemporary environmental protection regimes, dismisses such efforts as inadequate attempts to alleviate the worst impacts of the disembedding of the economy from society without addressing the root cause, the disembedding itself.[71] The short-term logic of emissions permit trading can interfere with more long-term planning around switching to renewable energy sources or more fundamental changes such as altered consumption patterns.[72] Carbon markets will thus need to be heavily regulated

[66] Ibid., pp. 73–4.

[67] Ibid., p. 76.

[68] Ibid.

[69] Ibid.

[70] Ibid.

[71] Ibid., p. 136. See also J. O'Connor, *Natural Causes: Essays in Ecological Marxism* (Guilford Press, 1998), pp. 144ff (for a discussion of the role of the state in attempting to secure and protect the three conditions of production identified by Marx: (i) personal conditions (in particular, labour); (ii) communal, general conditions of social production (namely infrastructure and education); and (iii) natural conditions).

[72] Methmann, n. 34 above.

to maintain their legitimacy and viability but, as Becky Mansfield argues, this regulation 'is not about fundamentally challenging the market system, … it is about altering the market system in order to maintain it'.[73]

3.3. *Ecological Marxism*

Polanyian and Marxist critiques of the commodification of ecosystem services follow similar trajectories, focusing on exploitation and ultimately degradation of the very source of capitalist growth and expansion. Marxist scholars of ecology see capitalism and nature as closely intertwined, and the degradation of nature as a result of exploitation under conditions of late capitalism as a fundamental ecological contradiction.[74] James O'Connor argues that the economic and ecological crises of capitalism are interdependent.[75] Similarly, Christoph Görg notes that the attempted mastery of nature undermines the conditions for continued economic growth, and thus gives rise to the need for some kind of restraint or constraint to avoid undermining the conditions for capitalism. We have witnessed in the last 50 years or so an apparent acknowledgement that the exploitation of nature cannot continue on its current track, but, as Görg asks:

> Has society now acknowledged that nature cannot be subsumed entirely and that we must try to respect nature's own logic? Or are we dealing with a *reflexive form of the mastery of nature*, one that takes into account that we may face negative consequences but that does not affect our goals?[76]

Görg notes that critical theorists also tend to take too literally the contention that late capitalism has a totalizing effect: that it subsumes all of nature and places it at the disposal of the economy.[77] For instance, he argues, Theodor Adorno failed to recognize that the ecological contradiction at the heart of capitalism could lead to new phases of capitalism.[78] Such a possibility might be present, Görg argues, if the *Eigenlogik*, or the unique logic, of nature could be recognized. He does not see much evidence of such recognition; rather, instruments such as carbon budgets and footprints or indicators of ecosystem services suggest that the mastery project is simply being extended and

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73 B. Mansfield, 'Rules of Privatization: Contradictions in Neoliberal Regulation of North Pacific Fisheries' (2004) 94(3) *Annals of the Association of American Geographers*, pp. 565–84.

74 O'Connor, n. 71 above, Ch. 8.

75 Ibid., pp. 182ff.

76 C. Görg, 'Societal Relationships with Nature: A Dialectical Approach to Environmental Politics', in A. Biro (ed.), *Critical Ecologies: The Frankfurt School and Contemporary Environmental Crises* (University of Toronto Press, 2011), pp. 43–72, at 59.

77 See, e.g., Gómez-Baggethun et al., n. 33 above, p. 99 (who note that monetary valuation is just one means of valuation, and by far the most controversial); M. Skroch & L. López-Hoffman, 'Saving Nature under the Big Tent of Ecosystem Services: A Response to Adams and Redford' (2010) 24(1) *Conservation Biology*, pp. 325–7, at 325. Gómez-Baggethun and Ruiz-Pérez note that this conflation of the economic framing of ecosystem services with their monetization, and monetization with commercialization, ought to be resisted, insisting on distinctions between goods/services and commodities, and between use value and exchange value: Gómez-Baggethun & Ruiz-Pérez, n. 37 above, pp. 620, 623. For a brief overview of non-monetary evaluation of ecosystem services, see J.O. Kenter, 'Deliberative and Non-Monetary Valuation', in Potschin et al., n. 33 above, pp. 271–88.

78 Görg, n. 76 above, p. 57.

refined.[79] While seeing little indication of a greening of capitalism that goes beyond reflexive mastery, Görg concludes that '[c]ritical theory … should reconstruct the contradictions and struggles among various kinds of societal relationships with nature and try to estimate their impacts on nature and society – and not contribute to the chorus hailing the end of nature'.[80] Görg, in seeking to reconstruct critical theory such that it can be applied to current problems of ecological devastation, argues that we cannot do without the insights provided to us by sciences such as ecology or meteorology.[81] However, he notes that 'environmental research and environmental policy often refer uncritically to those results, making the assumption that natural science results are immune from political struggles and power relations and that they represent "the truth" about nature'.[82] To what does this literature owe its truncated view of science? Some insights can be derived from a consideration of the critique of enlightenment by Max Horkheimer and Adorno, to which at least some of the governmentality and much of the Marxist and critical theory literature owe a direct or indirect debt. This intellectual legacy is not the only contributing factor. The representation of science which Adorno and Horkheimer present, heavily reliant on logical empiricism, is clearly a major, though apparently indirect, influence on international governance institutions. This is likely to help to explain how goals and indicators have been moved to the centre of environmental governance architecture rather than being cast in a supporting role.

4. THE CRITICAL CONSTRUCTION OF SCIENCE

While the literature considered up to this point focuses most of its attention on economic ways of knowing, Horkheimer and Adorno attend to science, describing the scientific enterprise as mastery over nature through knowledge produced by systematic enquiry, the goal of which is not understanding for its own sake but acting on nature for the benefit of humans. Understanding for its own sake and not for instrumental purposes was, argue Horkheimer and Adorno, associated with a mythical view of the world, which endowed the natural world with essential, hidden, and magical properties.[83] Key to the extraction of meaning from the world were reduction, homogenization, and unity. By representing everything as an abstract quantity, the same forms of logic could be applied to any problem: 'The same equations govern bourgeois justice and commodity exchange'.[84] Horkheimer and Adorno draw attention to the effacement of all that cannot be expressed in the neutral, objective language of science:

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79 Ibid., p. 60. In a similar vein, Gómez-Baggethun and Ruiz-Pérez argue that 'within the ideological, institutional and economic context in which ecosystem services science operates it is not realistic to assume that monetary valuation can be used without acting as a driver of commodification': Gómez-Baggethun & Ruiz-Pérez, n. 37 above, p. 624.

80 Görg, n. 76 above, p. 61.

81 Both O'Connor and Görg draw on ecology to yield insights into the non-human world, and O'Connor, in particular, refers often to ecological literature. As a result, both perceive the scientific acknowledgement of complexity, uncertainty, contingency and chaos: Görg, n. 76 above; O'Connor, n. 71 above.

82 Görg, n. 76 above.

83 M. Horkheimer & T.W. Adorno, *Dialectic of Enlightenment: Philosophical Fragments* (G. Schmid Noerr ed., E. Jephcott tr., Stanford University Press, 2002), pp. 1–3.

84 Ibid., p. 4.

> Nature … is what can be registered mathematically; even what cannot be assimilated, the insoluble and irrational, is fenced in by mathematical theorems. For the scientific temper, any deviation of thought from the business of manipulating the actual, any stepping outside the jurisdiction of existence, is no less senseless and self-destructive than it would be for the magician to step outside the magic circle drawn for his incantation; … . The mastery of nature draws the circle in which the critique of pure reason holds thought spellbound.[85]

Through science, Horkheimer and Adorno state, the diversity of the non-human world is reduced to matter: '[n]ature, stripped of qualities, becomes the chaotic stuff of mere classification'; 'the scientific object is petrified'.[86] In short, the wisdom of science is barren.[87]

The view of science held by Horkheimer and Adorno may have been influenced to some extent by the prevalence of logical empiricism, a philosophy of science with deep roots in the Vienna Circle and the Berlin Society for Empirical Philosophy, active in the inter-war period. The influence of logical empiricism has waned,[88] largely as a result of a far more heterogeneous intellectual landscape following the contributions of Thomas Kuhn and other sceptics of logical empiricism.[89] However, when it comes to structuring scientific inputs into decision-making processes embedded in sustainability governance regimes, we see its influence clearly, if indirectly, at work.

There are good reasons for the resonance of a logical empirical approach to science within sustainability regimes. The contentious nature of the issues with which sustainable governance is concerned prompts calls to rise above narrow, short-term self-interest and to engage in concerted and cooperative action in the collective interest. The identification of such a collective interest implies the existence of a body of universally valid knowledge, with science being apparently the only remaining contender to fill such a role. This assumption about the nature of science does not necessarily mean that science is understood to be superior to other forms of human knowledge, but when highly controversial decisions stand to be made, one looks for some solid foundation capable of attracting consensus, such as 'fact'. This reasoning echoes conclusions of prominent logical empiricists, notably regarding the superiority of science over other forms of human knowledge and, as a result of its (alleged) distance from metaphysics, its unique suitability as a basis for action, including in the political sphere.

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85 Ibid., p. 19.

86 Ibid., pp. 6–7.

87 Ibid., p. 8.

88 The entry for logical positivism in the Cambridge Dictionary of Philosophy indicates that this school is mainly of historical interest: '[w]hile there are still philosophers who accept some of the logical positivists' theses, many of the central doctrines of the theory came under considerable attack in the second half of the twentieth century': R. Audi & P. Audi, 'Logical Positivism', *The Cambridge Dictionary of Philosophy* (Cambridge University Press, 2015); but see T. Uebel, 'Logical Empiricism', in M. Curd & S. Psillos (eds), *The Routledge Companion to Philosophy of Science*, 2nd edn (Routledge, 2014), pp. 90–102 (who argues that the school suffered from 'hostile caricatures' and has since rebounded). See also S. Gattei, *Thomas Kuhn's 'Linguistic Turn' and the Legacy of Logical Empiricism: Incommensurability, Rationality and the Search for Truth* (Ashgate, 2008) (on the continuity between logical empiricism and the more sociologically informed theories championed in the 1950s and onwards).

89 Gattei, ibid., pp. 17ff.

Hans Reichenbach would have been a likely target for Horkheimer and Adorno, with his pursuit of distinctions between empirical and 'merely' conventional knowledge and his depiction of science as possessing its own formal logic, inaccessible to lay persons.[90] For Reichenbach, common threads that unite the various adherents of logical empiricism include 'a strict disavowal of the metaphor language of metaphysics and … a submission to the postulates of intellectual discipline'.[91] Reichenbach's drawing of connections among meaning, truth, and physical existence seek to establish scientific knowledge as bearing a unique relationship with truth, resulting in the denigration of non-scientific ways of knowing. Through his development of a probability theory of truth he states that the only knowledge that counts is empirically derived knowledge of the physical world, being the only knowledge that can be used as a basis of action in the present to predict future consequences. This theory is expressed through two principles. Firstly, 'a proposition has meaning if, and only if, it is verifiable as true or false'.[92] Secondly, 'two sentences have the same meaning if they obtain the same determination as true or false by every possible observation'.[93] He does not go quite so far as to deny that poetic or spiritual utterances have no meaning; he acknowledges that they may be capable of producing certain effects on one's interlocutors.[94] To such 'suggestive' language he accords super-empirical meaning.[95] Propositions about the physical world are of importance not only because of their verifiability but also because they are bases of action. While he concedes that suggestive utterances such as religious beliefs can generate principles such as prohibitions which the faithful respect, he argues that they cannot be converted directly into empirical concepts that serve as the basis of the same action: '[t]he "super-empirical content" of the proposition … is not utilizable, not convertible'.[96] Reichenbach views the surplus value generated by the spiritual or aesthetic perspective uniquely from the point of view of science, according it no real value at all. What cannot be converted is simply not utilizable; the action is in the empirical realm of verifiable propositions.

Reichenbach then makes a further move: he denies the action-generating capacity of super-empirical utterances:

90 P. Mirowski, 'The Scientific Dimensions of Social Knowledge and Their Distant Echoes in 20th-Century American Philosophy of Science' (2004) 35(2) *Studies in History and Philosophy of Science Part A*, pp. 283–326, at 294.

91 H. Reichenbach, *Experience and Prediction: An Analysis of the Foundations and Structure of Knowledge* (University of Chicago Press, 1961), p. v. That logical empiricism held such sway in the 1930s to the 1950s may go some way to explaining why Horkheimer and Adorno took such a relentlessly pessimistic view of science, not acknowledging its many contributions and insights, as Leiss notes in W. Leiss, 'Modern Science, Enlightenment, and the Domination of Nature: No Exit?', in Biro, n. 76, pp. 21–42, at 30.

92 Reichenbach, ibid., p. 30. Reichenbach does not insist on absolute verifiability, which he acknowledges would be impossible as direct, empirical observations cannot be combined to produce indirect observations that are themselves absolutely verifiable, but only observations to which a certain weight may be assigned according to their probability: ibid., pp. 46–53, 71.

93 Reichenbach, ibid., p. 31.

94 Ibid., pp. 58–9.

95 Ibid., p. 64.

96 Ibid., p. 68.

> It is just this [probabilistic] theory of meaning which is distinguished by the postulate of a relation between meaning and action. The line of separation in the domain of meaning, as far as it is determined by the postulate of utilizability of statements, cuts through the domain of empirical meaning; it leaves the merely logical meaning on the same side as super-empirical meaning, determining both as comprehending inconvertible statements. On the other side of the line, we find both physical truth meaning and probability meaning; but the first only because it is connected with the second – only because true sentences may lead to sentences having a weight, can they serve as a basis for action.[97]

Clearly, Reichenbach is not satisfied with condemning metaphysics to scientific irrelevance; he wants to undermine it completely.

5. THE STRANGE PERSISTENCE OF LOGICAL EMPIRICISM

The most influential institutions of international environmental and sustainability governance remain heavily invested in certain assumptions about science, and about the nature and means of its contribution to governance. Indicators and other metrics are very far from being the only or even the predominant tools, techniques, or approaches to governance in the international landscape, but they are emblematic of a certain logic which resonates throughout that landscape. One can be forgiven for seeing the architecture of international environmental governance as consisting essentially of the presentation of scientific knowledge as objective fact readily transcribed into standards, indicators, and goals, many of which can be monetized and thereby implemented by means of economic incentives. Meanwhile, formal and informal processes of opinion- and will-formation that result in political decisions, as well as legal norms that can give rise to judgments regarding obligation, responsibility, and right, are much less prominent.

We cannot perceive the world in unmediated ways, and the frames which we use in observation and analysis cannot match the complexity of the world point for point. We could therefore understand concepts such as ecosystem services and the goals and indicators that are used to measure them as means of gaining some understanding of the non-human world and of translating that understanding into forms readily taken up by governance institutions. It seems clear that the degree of confidence that scientists have in findings about the devastating impacts on earth systems of continued high levels of GHG emissions does not in and of itself provide knowledge of what ought to be done, except at a fairly high level of generality: action must be taken to reduce concentrations of atmospheric carbon. Any action taken will produce winners and losers in the human and the non-human worlds; legal and political responses to environmental degradation must proceed under conditions of uncertainty and complexity. Therefore, indicators of various social, economic, political, and ecological phenomena could be extremely useful in gauging the consequences of various governance interventions, so that courses could be corrected and relationships better understood. Yet, how are we to work with these indicators, particularly in light of the critiques of reliance on goals, indicators, and other calculative techniques?

[97] Ibid., pp. 71–2.

In the first place, the political nature of indicators must be frankly acknowledged. A logical epistemic approach to science would not allow this. When experts speak *qua* experts, metaphysics ought to take no part in their utterances. Yet, indicators are obviously not the product of pure expert knowledge-production processes; as noted above, they are boundary objects that, when looked at from different points of view, take on different aspects. Boundary objects, argue Susan Leigh Star and James Griesemer, are concepts that are developed when actors possessing different forms of knowledge must collaborate and therefore require some means of translating central concepts belonging to one social world into terms that can be grasped by inhabitants of another. To be effective at these points of intersection between social worlds boundary objects must be:

> both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. … They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation.[98]

This process of translation does not involve the simple movement of meaning from one context to another. Boundary objects retain different meanings in different social worlds, but they are reconciled through labour-intensive processes that make it possible for different actors to interact with reference to them.[99] Star and Griesemer build on Bruno Latour and Michel Callon's concept of *intéressement*, a process through which an actor recruits participants (or allies) and reinterprets their interests in ways that align with his or her own interests.[100] This process of reinterpretation cannot be unidirectional, as actors 'must maintain the integrity of the interests of the other audiences in order to retain them as allies'.[101] Translation is a collective effort; translations must remain somewhat recognizable to allies in different social worlds even as the meanings ascribed to them in those respective worlds remain distinct.

Following Niklas Luhmann, it is impossible for the environment to be apprehended directly from within society.[102] Furthermore, each social system observes its environment in light of its own logic and objectives, foregrounding certain features and ignoring others.[103] Luhmann describes this phenomenon in terms of the resonance of certain features of the environment for a given system: when a social system (such as science) observes its environment, it cannot take in the totality of information or data that could be drawn from the environment and transformed into information capable of being assessed and analyzed. Sense can be made of the world only in highly selective ways

[98] Star & Griesemer, n. 7 above, p. 393.

[99] Ibid., pp. 393–4.

[100] M. Callon, 'Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay' (1984) 32 *The Sociological Review*, pp. 196–233; B. Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Harvard University Press, 1988).

[101] Star & Griesemer, n. 7 above, p. 398.

[102] N. Luhmann, *Ökologische Kommunikation. Kann die moderne Gesellschaft sich auf ökologische Gefährden einstellen?*, 5th edn (VS Verlag, 2008), Ch. 4.

[103] Ibid., p. 22.

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from moment to moment.[104] Individual actors can communicate using the languages and logics of multiple systems and are thus capable of seeing an event or phenomenon from multiple perspectives at once.[105] Thus, a biologist can model negative feedback loops as Arctic ice recedes and shrub growth expands, potentially promoting accelerated rates of warming,[106] while being overwhelmed by the beauty, intricacy, and complexity of the Arctic landscape and by sadness in the face of its loss.[107] Much of the literature critiquing environmental indicators from the point of view of governmentality emphasizes the reductionism inherent in indicators: the world becomes the model used to analyze a series of measurements of carbon molecules.[108] The use of calculative techniques certainly encourages certain potentially insidious habits of thinking and speaking, but it remains possible to perceive a phenomenon from other points of view. This should be a central function of ecosystem services. A significant effort is required to build into ecosystem metrics or the governance environments in which they operate strong connections with worlds of meaning beyond those of economics and biology.

One of the most significant obstacles to interaction among social systems relevant for environmental governance is the highly unsophisticated understanding of science from the point of view of law and politics. The burden of logical empiricism is prevalent here in two ways. Firstly, more is expected of science than it can deliver. Secondly, when non-scientists begin to suspect that scientists are exercising judgment, or when they see how much uncertainty scientists are willing to tolerate as they produce knowledge about the non-human world, confidence in science risks being eroded.[109] Yet, when we understand science as human knowledge, produced in very human ways, opportunities for more extensive interactions between science and governance systems become available. As William Rehg argues, the points at which scientists make judgment calls – for example, about choice of methodology, identification of cut-off points for statistical significance, or parameters and assumptions incorporated into models – are potential points of interaction between scientists and non-scientists. Among themselves, scientists develop means of establishing the robustness of the judgments that they make, and

[104] Ibid., pp. 29ff. For an excellent and accessible account of Luhmann's theory, see M. King & C. Thornhill, *Niklas Luhmann's Theory of Politics and Law* (Palgrave MacMillan, 2006), particularly Ch. 5 'Risk and the Environment'.

[105] N. Luhmann, *Law as a Social System* (Oxford University Press, 2004), p. 413; King & Thornhill, ibid., pp. 32–3; Luhmann, n. 102 above, pp. 41ff.

[106] J. Settele et al., 'Terrestrial and Inland Water Systems', in C.B. Field et al. (eds), *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2014), pp. 271–359, at 314ff.

[107] Consider the phenomenon of climate grief: A. Cunsolo & N.R. Ellis, 'Ecological Grief as a Mental Health Response to Climate Change-Related Loss' (2018) 8 *Nature Climate Change*, pp. 275–81.

[108] Hamilton, n. 39 above.

[109] S. Beck et al., 'Towards a Reflexive Turn in the Governance of Global Environmental Expertise: The Cases of the IPCC and the IPBES' (2014) 23(2) *GAIA – Ecological Perspectives for Science and Society*, pp. 80–7; S. Beck, 'Between Tribalism and Trust: The IPCC under the "Public Microscope"' (2012) 7(2) *Nature & Culture*, pp. 151–73; R. Grundmann, 'The Legacy of Climategate: Revitalizing or Undermining Climate Science and Policy?' (2012) 3(3) *WIREs Climate Change*, pp. 281–8.

justifying them to one another.[110] Within regulatory bodies, decision-making processes about the standards by which these judgments and decisions are to be measured are occasionally formalized to some extent, and in some cases these formal bodies include lay members. The incorporation of lay members into these bodies is of crucial importance as one moves from knowledge generation for the purposes of advancing scientific knowledge to the realm of policy, where scientific investigation is carried out to determine risk and hazard and to inform political and legal decision making.[111]

The potted version of logical empiricism that has such a hold on the public imagination, and on the reconstruction of scientific knowledge within governance, is incompatible with these processes, which open up scientific judgment to the scrutiny of political authorities and citizens. This approach places few demands on political authorities, who can claim with some plausibility to have their hands tied until the experts deliver a sufficiently fine-tuned basis for action. When political authorities do seek to act, they often struggle to identify sources of authority and legitimacy on which their decisions could rest. Martti Koskenniemi has presented the dilemma very clearly: if science cannot produce 'true social knowledge with directive power' of the sort that Reichenbach believed he had identified, knowledge cannot drive governance. 'Instead of being based on theorems, our laws emerge as the mundane outcomes of the legislative will'.[112] Koskenniemi notes that it is well understood that '[f]or a society of imperfect humans, the principle of *voluntas* is safer than its alternative, the hubris of perfect knowledge'.[113] If we obfuscate the political decisions that are being made as goals are selected and indicators identified, or the judgments and choices that are made as models are built, we can, for a time at least, convince ourselves that the exercise of political will has not taken place, is not necessary and, indeed, that it would stand in the way of a proper and thoroughgoing solution to the problem of sustainability.

Restoring confidence in political authority could begin with the construction within law and politics of more sophisticated models of science that make clear the vital role played by policy, intuition, and judgment within science, based on a reinterpretation of Reichenbach's concept of surplus value: if the same conclusion can be arrived at through the logics of different social systems such as science and aesthetics, then the reasoning within each system generates surplus value for the other. By considering surplus value from a system theoretical point of view, the picture changes. Following Gunther Teubner, surplus value can give rise to a 'productive misunderstanding' in one system of the reasoning and conclusion reached in the other, which can then serve as the basis for a translation,[114] potentially crystallizing in a boundary

110 W. Rehg, *Cogent Science in Context: The Science Wars, Argumentation Theory, and Habermas* (The MIT Press 2009), Ch. 8.

111 Engle Merry, n. 12 above, pp. 216ff.

112 Koskenniemi, n. 53 above, p. 17.

113 Ibid., p. 18.

114 'Translation' here must be understood not as the transfer of meaning from one system to another but the creation of meaning within each system which is understood by each to be 'the same': J. Ellis, 'The Role of Translation in Transnational Governance' (2017) 22(2) *Tilburg Law Review*, pp. 165–84; Star & Griesemer, n. 7 above.

concept.[115] For example, following Rehg, the judgments that scientists make in the process of designing rigorous methodologies and reaching conclusions could constitute opportunities for political and legal authorities – indeed, any lay person – to ask for warrants for the reasonableness of those judgments.

Productive misunderstandings regarding the production of ecological knowledge could serve as the basis for guidelines, standards, and policies governing the translation of ecological knowledge into political terms, but one must take care about the construction of such standards. They could provide reassurance to political authorities and members of the public that ecologists are proceeding in the correct way in identifying ecosystem services and suitable indicators to measure them, but at the same time place so many constraints on the exercise of judgment of ecosystem scientists that the knowledge they provide to political authorities suffers from serious distortions. Many observers argue that this is precisely what has happened in climate science.[116] The point could be exaggerated, and often is; hybrid objects such as reports of the Intergovernmental Panel on Climate Change (IPCC) appear, from the perspective of any one contributing discipline, to distort that contribution. Were this not so, this would be likely to be a symptom of colonization of the process by a particular body of expert knowledge. In any event, the IPCC continues to address criticisms of its approach, for example, by developing more sophisticated approaches to the acknowledgement of scientific uncertainties.[117]

This drive for objective, universalizable standards of rigour and validation is born of multiple, complex, often contradictory motivations. The hegemony of scientific rationality, the convenient intersections between scientific and economic rationalities which a focus on numerical representations promotes, and the sidelining of other ways of knowing about the world are all real, and dangerous, phenomena. The call for universalizable validation standards serves the interests of a wide range of powerful actors that seek to govern society at a distance while dissimulating those governance technologies. However, it is also a response to calls for greater accountability of powerful, often obscure decision makers; greater transparency of decision-making processes; and, more generally, more possibilities for democratic control of science-based policy.[118]

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[115] G. Teubner, 'The Two Faces of Janus: Rethinking Legal Pluralism' (1991) 13 *Cardozo Law Review*, pp. 1443–62.

[116] S. Beck, 'Moving beyond the Linear Model of Expertise? IPCC and the Test of Adaptation' (2011) 11(2) *Regional Environmental Change*, pp. 297–306; J. Van der Sluijs et al., 'Anchoring Devices in Science for Policy: The Case of Consensus around Climate Sensitivity' (1998) 28(2) *Social Studies of Science*, pp. 291–323; M. Hulme, 'Lessons from the IPCC: Do Scientific Assessments Need To Be Consensual To Be Authoritative?', in *Future Directions for Scientific Advice in Whitehall* (Centre for Science and Policy, 2013). Another cautionary tale is the highly unproductive misunderstanding of the Bradford Hill guidelines for epidemiological research as strict guidelines which courts may employ as checklists to determine the probative value of epidemiological evidence: C.F. Cranor, *Toxic Torts: Science, Law, and the Possibility of Justice* (Cambridge University Press, 2006), pp. 101ff.

[117] K.J. Mach et al., 'Unleashing Expert Judgment in Assessment' (2017) 44 *Global Environmental Change*, pp. 1–14.

[118] T.M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton University Press, 2001); S. Engle Merry & J.M. Conley, 'Measuring the World: Indicators, Human Rights, and Global Governance' (2011) 52(3) *Current Anthropology*, pp. S83–S95.

The various ways in which the reliability of scientific knowledge could be assessed range over a spectrum from reliance on the community of scientists themselves to reliance on standards created and monitored in the public sphere. It is highly unlikely that, at any given time, there will be one standard operating that attracts a high degree of consensus, even within the scientific community or among observers such as philosophers of science or architects of governance institutions. However, the further one moves from the producers of scientific knowledge, the more one must rely on means such as replication or peer review, statistical standards for the measurement of error, bias, and significance, or approved methodologies and research designs. Such measures can provide important insights into the production of scientific knowledge, and they have the great advantage of being accessible beyond the community of scientists actively working on a project and possessing deep knowledge about its design and the nature of its results. Yet, they obviously do not measure the quality of scientific knowledge directly; they are highly mediated, operating as proxies for reliability, as do indicators of ecological and societal well-being. As valuable as such proxies can be as the basis for judgment in the public sphere about the quality of scientific knowledge, any attempt at standardization risks placing constraints on the production of scientific knowledge as well as the further marginalization of unconventional or minority viewpoints. The study of complex systems depends on the consideration of a range of types of evidence and insight which, taken one by one, are inadequate to lead to conclusions in which scientists would have confidence.[119]

6. CONCLUDING REMARKS: A PLACE FOR INDICATORS?

Goals and indicators currently take up a good deal of space in sustainability governance, as law did around the turn of the century. As disillusionment with law seems to have set in, there was hope that the marshalling of a high degree of scientific consensus could generate both the informational base necessary to design policy solutions and the political will to put those solutions into motion. The turn to indicators suggests awareness that the accessible presentation of scientific information is not adequate. This information needs first to be translated into policy-relevant terms, which, too often, is understood to mean that arrays of choices must be made commensurable – which tends to mean that they must be monetized. Throughout this trajectory there is a tendency to seek to save sustainability governance from politics, which has generally meant a turn to technocracy. Yet, it is a mistake to hold expert knowledge and discourse to blame for these trends. The problem lies not so much in the turn to goals and indicators itself, but in the tendency to push goals and indicators to the centre of international environmental regimes, in the hope that scientific information can be readily transcribed as indicators that operate more or less directly on incentive structures. The problem lies, in other words, in the assumption that expert discourse can replace *voluntas* at the heart of international law and politics.

[119] Hulme, n. 116 above.

As Star and Griesemer argue, the construction and deployment of boundary objects is profoundly challenging work. Promoting ecosystem services and indicators as boundary objects is rendered more difficult by the understandable suspicion that these concepts and techniques are neoliberal Trojan horses; but they can also be understood as efforts on the part of scientists and economists to make their knowledge relevant to the broader society and to place it at our disposal. The reinvigoration of law and politics in sustainability governance cannot itself guarantee that voices will not be drowned out or poorly attended to, but it could prevent a situation in which sustainability is understood by decision makers to be largely technical, its normative dimensions appearing only at the margins. Such a reinvigoration could be promoted through efforts at engagement on the part of those working within those systems across the boundaries with science. When approaching wicked problems such as those gathered under the label of sustainable development, feedback loops will be required as political and legal authorities proceed under conditions of irreducible uncertainty. It will not be enough for political and legal authorities to view their responsibilities as discharged when legislation is adopted and high rates of compliance are obtained. It is difficult to strike a delicate balance of giving scientific insights into the non-human world greater resonance within politics and law, while at the same time not simply transforming those systems into stations that relay signals to the economic sphere. Yet, there may be ways to reimagine the roles of calculative practices along the lines of such a project.