

## PART III

# Methodological Aspects

Arthur Lyon Dahl

Many of the challenges in assessing sustainability are methodological. How do we turn the concept of sustainability into a framework or model and then identify indicators that describe its essential properties in a way that is easily understandable? Although this part raises a number of critical issues, it emphasizes an underlying theme of the need for more integrating indicators of system sustainability.

The first two chapters distill the experience of the European Environment Agency (EEA), which has become a leader in indicator development. Chapter 8 describes its evolving use of frameworks for environmental assessments and indicators, from simple arrangements of indicators to more cross-cutting frameworks based on scenarios and models. Starting with the traditional driving force, pressure, state, impact, and response framework, with its static list of indicators, and its adaptation by the World Health Organization to incorporate multicausal effects of exposures, the EEA has moved toward a more sophisticated typology of indicators in the policy life cycle, using indicators to define problems, measure performance and efficiency, monitor policy effectiveness, and assess total welfare. The authors propose six steps toward a common indicator development process, aiming for more consistency and reliability in indicators.

In Chapter 9, Stanners et al. look critically at frameworks to achieve environmental policy integration in other sectors of government. Models of sustainable development in common use, such as the three-pillar economic, social, and environmental framework, are misleading because it is not possible just to add together different sets of policy objectives. There is an unjustified assumption of independence and commutability and a tendency to overlook interlinkages between the pillars. Such frameworks are too simple to guide indicator selection. The authors call for new impact assessment methods and indicators for the synergistic interlinkages and overlaps between economic, social, and environmental policies. A more holistic reporting on sustainable development, acknowledging the interdependence of the socioeconomic system and the environment, would show sustainability as an emergent property of the whole system. As a

step in this direction, the EEA has identified eight key features of sustainable development that can be used as a checklist or guideline to test the relevance of indicators in the context of environmental assessment. They are also developing methods for evaluating complex scientific evidence to bridge science and policy (e.g., in application of the precautionary principle).

In Chapter 10, Dahl reviews the use of indicators in integrated assessments at the international level. After suggesting a scientific approach to the definition of sustainability, he compares the many assessments that simply use indicators as illustrations and a more statistical approach where data sets are compiled and analyzed to generate part or all of the assessment. The latter approach raises particular challenges of data adequacy, the selection of indicators, and their weighting, which leave them open to criticism. Methodologically, none of the present assessment processes has succeeded in addressing the challenges of integration or the definition of indicators of whole system sustainability. Nor have they adequately considered their susceptibility to underlying assumptions, values, or worldviews, although there is some progress in this direction. Other challenges concern policy relevance and legitimacy, with the difficulty of bridging the short-term perspective of policymakers and the long-term requirements for sustainability. In addition, people have a strong preference for indicators that reflect their own values and perspectives rather than those that are most objective. Dahl identifies a number of research needs, including linkage indicators, new data sets from global observing systems, indicators of less tangible dimensions such as governance, science, culture, values, and spirituality, and measures of intergenerational sustainability.

Finally, in response to the issues raised in the preceding chapters, in Chapter 11 Grosskurth and Rotmans propose a concept for an indicator of the sustainability of systems. Given the difficulty in understanding the complex dynamics of a whole human–environment system, this indicator would focus on the whole system structure rather than its parts. It would start with a conceptual model of the real-world system to be assessed, arranging stocks, flows, and actors in an influence diagram and defining the first-order influences as positive or negative. Because the model must include normative choices as to what is desirable, these should be made through a consultative stakeholder process. The model makes it possible to identify inconsistencies or conflicts, where progress in one area would undermine the system elsewhere. A qualitative system sustainability index can then be calculated based on the proportion of total flows containing inconsistencies. To improve sustainability, some inconsistencies could be corrected by changing the structure of the system, but ultimately it would be necessary to choose between inconsistencies, giving up some goals to achieve others. The indicator thus would be able to define realistic policy options.