Chapter 6

How to Make IAs More Substantive

6.1 HIGHLIGHTS

This chapter is concerned with designing and managing regulatory and applied IA processes to better integrate environmental perspectives, values, and knowledge.

- The analysis begins with two applied anecdotes. The stories describe applied experiences associated with efforts to make IA practice more substantive.
- The analysis in Section 6.3 then defines the problem. The general problem is a shortfall between IA environmental aspirations and achievements. The more specific problem is the role that the IA process assumes in widening or narrowing that gap. We describe how to make the IA process more conducive to integrating environmental perspectives, values, and knowledge and to furthering environmental objectives.
- In Section 6.4 we provide an overview of a range of ecological, social, and sustainability concepts. Attributes pertinent to IA process management are highlighted. Methods that could facilitate the integration process are also briefly described.
- In Section 6.5 we detail how an environmentally substantive IA process could be implemented at the regulatory and applied levels. We address implications and future directions, and identify generic regulatory approaches for integrating IA and substance. We then demonstrate how an environmentally substantive IA process might be expressed at the applied level. We provide good practice examples at the SEA and project EIA levels and for SAs, EcIAs, SIAs, and HIAs.
- In Section 6.6 we address the contemporary challenge of horizontal integration. We consider if and how to better integrate various substantive environmental (e.g., ecological, social, economic) concerns into IA requirements and processes.
- In Section 6.7 we highlight the major insights and lessons derived from the analysis.

6.2 INSIGHTS FROM PRACTICE

6.2.1 Assessing Significant Socioeconomic Impacts in EIAs for the Decommissioning of UK Nuclear Power Stations

The 1997 amendments to the EC EIA Directive included, among other things, the addition of the decommissioning of nuclear power stations and other nuclear reactors for mandatory EIA. This was the first specific identification of the need for assessment for the decommissioning of major projects. The United Kingdom has over 20 nuclear reactors, many commissioned in the 1960s/early 1970s and coming to the end of their operational life. Decommissioning operations are now underway for many power stations, mainly with Magnox reactors of approximately 400 MW. The operations include three main stages stretching over 100 years.

The EIAs have been largely coordinated by Magnox Electric and often involve a number of consultancies with particular specialist expertise. The Impact Assessment Unit (IAU) at Oxford Brookes University has undertaken the socioeconomic assessment input for many of the decommissioning project EIAs. The requirements of the EC Directive have produced a range of guidance and standards, with a particular focus on the biophysical, including safety issues associated with the management of radioactive waste and facilities, but guidance is much more limited for socioeconomic issues. Yet, perhaps surprisingly, socioeconomic impacts have emerged as particularly high ranking impacts in the assessments. This is a reflection of how, in decommissioning, many of the impact effects of development are reversed. Thus, decommissioning will lead to landscape and visual improvements, and to ecology, water quality, and air quality benefits. But, for socioeconomic benefits, there are important employment changes, with the pool of well-paid and previously very stable jobs falling by initially an order of 50–70%, then almost by 100%—before rebounding substantially, but alas not for 100 years! These losses have knock-on effects on the associated local and regional manufacturing jobs, demography, and economic and social services.

Impact Assessment: Practical Solutions to Recurrent Problems and Contemporary Challenges, Second Edition. David P. Lawrence.

The focus on socioeconomic impacts also raises interesting issues with regard to the criteria for assessing impact significance. There are no easily applicable "state of local society" standards against which the predicted impacts of a development can be assessed. While an increase in local unemployment may be regarded as negative, and a decrease in local crime as positive, there are no absolute standards. Thus, views on the significance of economic impacts, such as the proportion and types of local employment on a project, are often political and arbitrary. Nevertheless, it is sometimes possible to identify what might be termed threshold or step changes in the socioeconomic profile of an area. For example, it may be possible to identify predicted impacts, which threaten to either swamp or badly deplete local labor demand. It is valuable if the practitioner can identify possible criteria used in the analysis for a range of levels of impacts, which at least provides the basis for informed debate. The insert below provides an example from one of our IAU decommissioning studies. While this is an imprecise exercise, it can also provide a very useful basis for impact discussion.

Assessing the Local Impact Magnitude of Socioeconomic Impacts: Extracts from a UK Nuclear Power Station Decommissioning Project

Type of Impact	Local Context	Negligible Impact	Minor Impact	Moderate Impact	Major Impact
		Demographic Impacts			
Change in local population level of more than 2%	Population growth (2001–2009)	Change in local population of less than + or −0.25%	Change in local population of + or −0.25%	Change in local population of + or −1 to 2%	Change in population of more than 2%
		Direct and Indirect Employment Impacts			
Change in employment levels in local economy	Employment growth (ABI estimate 2001–2007)	Change of less than + or −0.25% on employment levels in the local economy	Change of + or −0.1% on baseline employment levels in the local economy	Change of + or −1 to 2% on baseline employment levels in the local economy	Change of more than + or −2% on baseline levels in local economy
Change in unemployment level in the local economy	Claimant % unemployment rates (June 2010)	Change of less than + or −2% in claimant unemployment	Change of + or −2.5% in claimant unemployment	Change of + or −5 to 10% in claimant unemployment	Change of + or −10% in claimant unemployment level
		Accommodation Pressures and Development			
Change in stock of local housing	Housing stock growth (2001–2008)	Change of less than + or −0.25% on baseline housing stock	Change of + or −0.25 to 1% on baseline housing stock	Change of + or −1 to 2% on baseline housing stock	Change of + or −2% on baseline housing stock

In the assessment of significance, the analyst must be aware of the importance of triangulation of information. Multiple perspectives on significance can be gained from many sources, including key local opinion formers (especially local councilors and officials), the local population (via surveys, focus groups, etc.), and the local press, which can be very powerful as an opinion former. All can help to assess the significance, perceived and actual, of the various socioeconomic impacts.

JOHN GLASSON

Department of Planning, Faculty of Technology, Design and Environment, Oxford Brookes University, Oxford, UK

6.2.2 Applying a Sustainability Test to a Hydrocarbon Megaproject

The ambition and innovative potential of environmental assessment regimes vary greatly. In jurisdictions where assessment has not advanced far beyond regulatory licensing, the focus of assessment is mostly limited to mitigating the adverse biophysical effects of the already designed and proposed undertakings. More demanding regimes take a broader approach. They define "environment" to include interactions among social, economic, and cultural as well as biophysical effects; encourage careful attention to these effects from the outset of the planning process; and provide for public engagement in critical review of purposes and comparative evaluation of alternatives. But even these regimes are mostly concerned about avoiding negative effects, rather than demanding lasting gains.

The leading edge exceptions are assessment processes that aim to ensure positive contributions to sustainability. These require proponents to establish that their project (or strategic undertaking) will provide overall benefits and leave the relevant communities and ecologies in a better shape. In Canada, since the mid-1990s, five major project assessment review panels have contributed to sustainability test. Three involved mines, one was about a major hydropower dam and one, the most advanced case example, centered on a natural gas development and transportation proposal.

The Mackenzie Gas Project was an industry consortium's proposal for a multicomponent venture estimated to cost about 16.3 billion Canadian dollars. The proposal, as filed for assessment review, included development of three gas fields and associated gas gathering infrastructure in the Mackenzie Delta area of the Northwest Territories, in addition to a 1200 km gas pipeline south through the Mackenzie Valley to connect with the existing continental pipeline network, and a natural gas liquids pipeline about halfway along the same route to an existing liquids pipeline. The area to be affected was huge, sparsely populated (a few dozen mostly small communities), and in some ways, both ecologically fragile and socioeconomically stressed.

Anticipating the proposal, the relevant federal, territorial, and aboriginal authorities agreed to a process merging their three separate assessment regimes. In 2004, they appointed a seven-person Joint Review Panel to evaluate the project in light of public hearings centered on the proponents' Environmental Impact Statement. The panel's terms of reference explicitly established "contribution to sustainability" as a fundamental principle for the assessment, along with respect for traditional knowledge, land claims and treaties, diversity, and the precautionary approach (IGC et al., 2004, p. 4).

The project represented not only welcome economic opportunities but also significant challenges. As a nonrenewable resource undertaking, it could not itself be sustainable. Any positive legacy would depend not only on avoidance of lasting damage, but also on planning for implementation and revenue use to build the foundations for sustainable livelihoods after the resource was depleted. Also, the proposal filed for panel review was only part of the story. The proponents designed the gas pipeline for potential throughput expansion to more than twice the flow expected from the three fields in the proposal. Some scenarios presented to the panel anticipated another doubling of throughput. While no one was in a position to know how much more development would be induced, everyone expected additional exploration, extraction, and transportation that would bring higher revenues, further opportunities, and more stresses on ecological, social, and administrative capacities. The big issues consequently involved cumulative effects and legacies. And the options before the panel went beyond whether or not to recommend approval of the project as filed. They also included what pace and scale of development would bring the greatest benefits and the least risk. In effect, the case was a strategic assessment of choices for regional futures in the guise of a project assessment review.

Near the outset, the panel set out its contribution to sustainability test, explaining that it would "evaluate the specific and overall sustainability effects of the proposed project and whether the proposed project will bring lasting net gains and whether the trade-offs made to ensure these gains are acceptable in the circumstances" (Mackenzie Panel, 2005).

After holding public hearings in 26 communities, the panel prepared a detailed final report. It applied an analytical framework based on 36 key issues in five core categories that were meant to cover the full suite of requirements for progress toward sustainability (Mackenzie Panel, 2009, especially Chapters 5 and 19):

- cumulative impacts on the biophysical environment;
- cumulative impacts on the human environment;
- equity impacts (fair distribution of benefits and risks);
- legacy and bridging impacts;
- cumulative impacts management and preparedness (capacities for managing the risks and opportunities).

The report's final chapter summarized the panel's evaluation, comparing impacts in each issue area for the null option (no project), the basic project as filed, and the range of project expansion and induced development scenarios distinguished by the volume of gas pipeline throughput (Mackenzie Panel, 2009, Chapter 19). The panel also determined, for the full range of options, how the likely impacts would be affected if the panel's recommendations were implemented effectively, and the potential interactions between the effects and the nature of the remaining trade-offs.

The panel concluded that the project, with some expansion beyond the immediately proposed activities, would contribute to regional sustainability, if accompanied by effective implementation of 176 recommendations (Mackenzie Panel, 2009, pp. 613–615). Some of the recommendations were conventionally focused on the conditions to be written into licenses and permits. But the most innovative recommendations called for steps by the federal and territorial governments to mitigate adverse cumulative effects and enhance lasting benefits. Most controversially, the panel urged active management of the pace and scale of development and use of nonrenewable resource development revenues and other opportunities to foster transition to "a more diverse, flexible and lasting basis for livelihoods in the region" (Mackenzie Panel, 2009, p. 602).

The panel's legacy was mixed. The breadth, rigor, and transparency of its sustainability-based analysis set an exemplary standard for future applications. But the panel lost credibility and good will by taking 2 years to write its report. The receiving governments formally rejected the panel's most important recommendations, including those about managing the pace, scale, and cumulative effects of development (Canada and the Northwest Territories, 2010). Nonetheless, on some matters, other jurisdictions have acted on rejected recommendations. The territorial government has, for example, initiated the establishment of a heritage fund to build a positive legacy from nonrenewable resource income. The proposed project received government approvals, but due to falling natural gas prices, it is not now economically viable and may not be resurrected for many years.

In the larger context, the Canadian federal government has passed a new assessment law that eliminates or narrows most of the federal involvement in environmental assessments, relying instead on a patchwork of provincial and territorial assessment regimes. The official rationale is that current economic imperatives justify the removal of impediments to resource exploitation projects. These changes reverse decades of environmental assessment evolution and will weaken the near term prospects for sustainability assessment in Canada. Eventually, however, the effects are likely to reveal again the underlying wisdom of decision making that seeks to deliver both stewardship and lasting well being.

ROBERT B. GIBSON

Environment and Resource Studies, University of Waterloo, Waterloo, Ontario, Canada

6.3 DEFINING THE PROBLEM AND DECIDING ON A DIRECTION

The preceding stories demonstrate that IA processes, to be effective, must be substantive. Specific substantive concerns, as illustrated in the SIA story, need to be incorporated into explicit, consistently applied, and appropriately adapted (to suit the decision-making context) significance criteria and judgments. A general commitment to sustainability is of little value in terms of making IA practice more substantive. As demonstrated in the SA story, the derivation and successful application of a sustainability test requires a sustainability-based regulatory framework coupled with clearly defined and locally adapted definitions, criteria, thresholds, and trade-off rules. These mutually supportive sustainability elements must collectively and explicitly mitigate cumulative effects and facilitate the realization of lasting benefits.

The relationships between the process and substance in IA practice, as illustrated in Figure 6.1, can be approached from many perspectives. The position can and has been taken that IA is a negative force in the environmental movement. Some label it as a deceitful procedure that legitimizes, without excluding or appreciably altering, environmental unsound projects, actions, and practices. IA is considered as an empty and a wasteful paper-processing exercise. Resources devoted to IA should, it is argued, be redirected to redefining agency missions and to tangible initiatives that directly advance the cause of environmental quality and sustainability. Alternative environmental management approaches (such as the ecosystem approach and adaptive environmental management) are sometimes suggested as tools that could replace IA. The point occasionally made is that IA presumes a degree of predictability and control that is so inconsistent with the knowledge base and the institutional structure that it is doomed to fail as an effective environmental management instrument. At best, it is concluded, IA is a procedural instrument with no substantive content. A fundamental reorientation away from process and procedure and toward substantive purposes is needed (Cashmore, 2004). Substance is added only when and if IA is linked to and placed within the context of substantive environmental management frameworks and tools.

The argument that IA is invariably either a negative force or that it serves no substantive purpose is not made now as often as it was in the early days of IA practice—at least not by those having knowledge of IA practice. Nevertheless, the arguments are useful because IA can and too often does reinforce the status quo and waste resources. It also can be of limited value if knowledge and control limitations are not recognized and addressed, if IA requirements are watered down and made so discretionary that they constitute little more than the illusion of action, and if the relationship between IA and other environmental management instruments is not considered. The substantive role of IA is shared with numerous other environmental management forms. Thus, making the IA process more substantive requires complementary roles among instruments and within broader frameworks.

It is difficult to reach firm conclusions concerning the IA process—substance problem because of uncertainties surrounding both the knowledge base for IA and the consequences from IA. IA has been advanced as an effective mechanism for integrating social and environmental values and perspectives into institutional practice. Although there is ample favorable (and unfavorable) anecdotal evidence, it is an overstatement to conclude that IA has either been highly effective or ineffective in bringing about such a transformation when proponents tend to view IA requirements as a hurdle rather than a useful planning and decision-making mechanism (Bartlett, 1989; Eales and Sheate, 2011). The tendency under most IA systems is to work through a process rather than toward a substantive objective such as sustainability (Galbraith et al., 2007). It is also unclear if the results without IA would have been substantially different. The gap between aspirations and outcomes, in terms of global environmental and sustainability concerns, is especially wide (Gibson et al., 2005).

A similar aura of uncertainty surrounds whether IA appreciably reduces adverse environmental impacts and whether it greatly enhances natural and social environmental conditions and benefits. Some benefits in terms of the enhanced consideration of environment in decision making (as compared with past neglect and failure) are evident (Cashmore, 2004). What is much less clear is the extent to which IA has contributed to substantive environmental goals such as sustainability. These uncertainties stem in part from a spotty, albeit improving, record of monitoring environmental impacts, and mitigation effectiveness (Clark, 1997). They also result from a mixed record in furthering IA environmental aspirations. Even when applied, the procedural orientation of IA means that there is no obligation to select less environmentally damaging alternatives or to avoid or minimize negative environmental effects, much less to realize net environmental benefits (Pölönen, 2006;

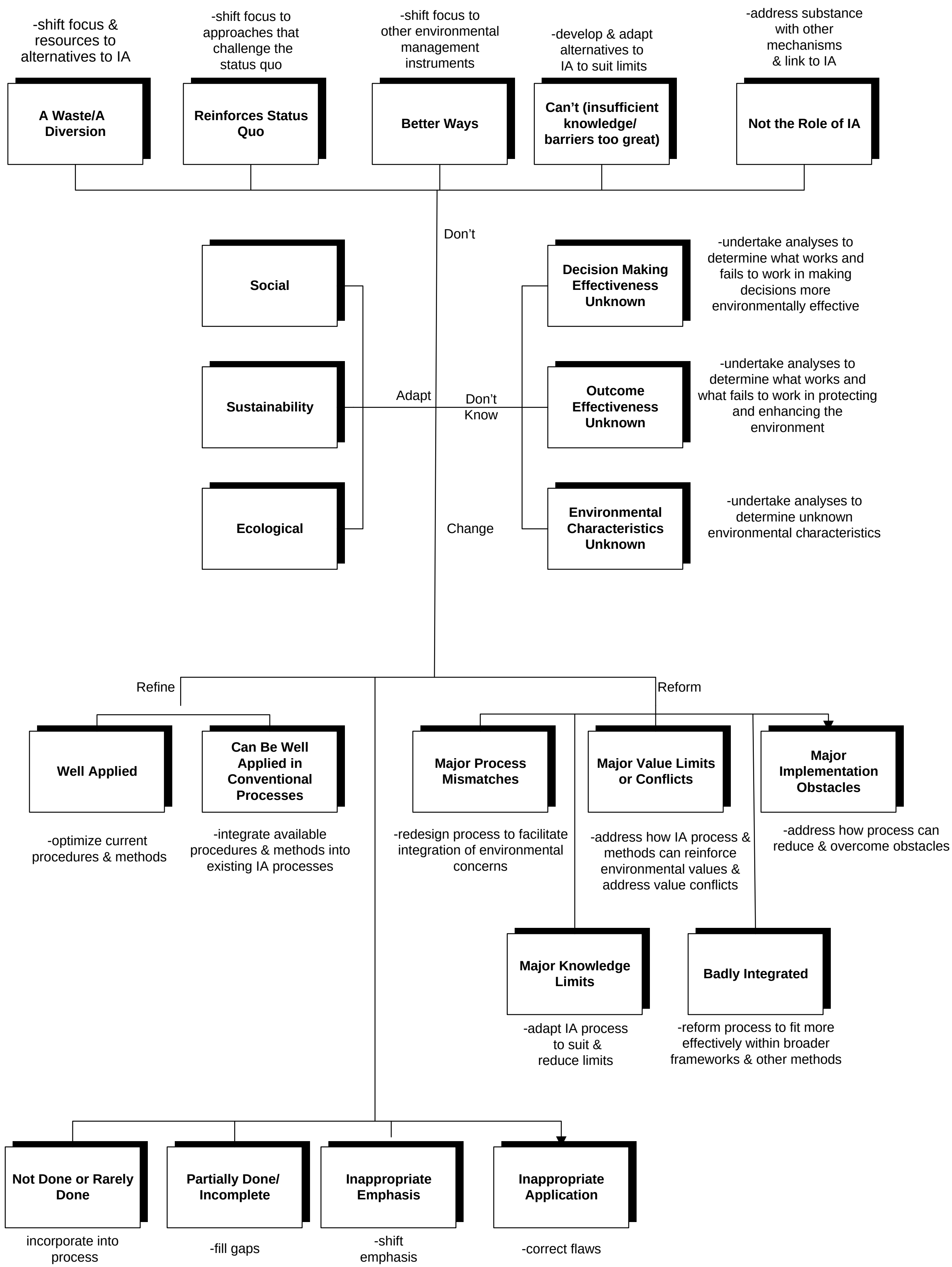

Figure 6.1 Perspectives on substance in the IA process.

Keys et al., 2011). IA effectiveness ratings concerning decision-making benefits, reduced social and ecological impacts, and contributions to sustainability, all leave considerable room for improvement (Sadler, 1996). It is difficult to reach firm conclusions regarding IA benefits because of the myriad of uncertainties surrounding the analysis, prediction, and management of ecological, social, and administrative systems (Dearden and Mitchell, 1998). These uncertainties are compounded when social and ecological systems are linked to assess cumulative and sustainability effects.

IA is often credited with contributing to a greater sensitivity to and accountability for environmental consequences by agencies (Andrews, 1997; Caldwell, 1997). It also is viewed as helping keep environmental issues before the public (Moore, 1992). Although there is a sense of overall progress, there is considerable variability in how well the environmental concerns are integrated into decision making and regarding the extent to which environmental quality is enhanced (Dennis, 1997; Gibson, 2011; Eales and Sheate, 2011). Decision-making influence has tended to be limited in part because of institutional and political resistance, and in part because of the failure to proactively demonstrate the merits of environmentally substantive planning and decision making (Gibson, 2011). Oftentimes, a holistic perspective or even a passing knowledge of sustainability is lacking among specialized line agencies (Kirkpatrick and George, 2006). The lack of a holistic perspective on the environment is especially evident in the latter stages of IA processes (e.g., impact management) (Kørnøv et al., 2005). Most IA texts assume that disciplinary and interdisciplinary knowledge and methods can be readily incorporated into conventional IA process activities and stages (Canter, 1996; Morgan, 1998; Petts, 1999). The point is commonly made that "tiering" (fitting project-level EIA within a SEA framework) greatly expedites the process (Morris and Thérivel, 1995; Vanclay and Bronstein, 1995).

Many commentators suggest that the marriage of process and substance will necessitate both procedural and substantive adjustments. Some argue that IAs commonly lack an ecosystem perspective; remain a weak tool for integrating biodiversity, cultural heritage, cumulative effects, and climate change concerns; and fail to explore how social impacts are socially constructed (Beanlands and Duinker, 1983; Bond et al., 2004; Brooke, 1998; Burdge, 2002; Greer-Wooten, 1997; Sadler and Jurkeviciute, 2011; Weiland, 2010). They point out that the link between the environment and sustainability is often poorly defined (Thérivel, 2010). They suggest the need for a greater effort to include ecological principles; to fully address biodiversity impacts; to more effectively integrate social concerns and knowledge; to apply nonpositivist social science approaches and perspectives; to consider the benefits of conservation; and to devote more attention to global warming, cumulative effects, and other sustainability-related concerns (Andrews, 1997; Burdge, 2002; Byron and Treweek, 2005; Clark, 1997; Kaufman, 1997; Lockie, 2001; Moore, 1992; Treweek, 1999). They emphasize the need to devote more attention to capacity building, to ameliorating technical and logistical constraints, and to overcoming institutional and political resistance (Hanusch and Fischer, 2011). They point to the need to implement IA policy goals, to monitor social and ecological effects, to employ more than a weak conception of sustainability, and to ensure bureaucratic accountability (Bronfman, 1991; Dearden and Mitchell, 1998, Eales and Sheate, 2011; Kaufman, 1997; Treweek, 1999). They stress the need for IA to more effectively address resource-related impacts, most notably agriculture, forestry, and fisheries (Duffy, 2006).

IA processes and practices should, various commentators stress, be more interdisciplinary, place-based, and adaptive (Dearden and Mitchell, 1998; US CEQ, 1997a). The robust monitoring of trade-offs among environmental components is considered critical (Burdett, 2008a). They point out that interconnections among social, economic, and ecological systems and impacts continue to receive scant attention (Franz and Kirkpatrick, 2007; IEEP, 2004). They highlight such methodological shortcomings as inadequate study designs, inappropriate temporal and spatial boundaries, inadequate data, inappropriate statistical techniques, critical impacts not predicted, and an insufficient decision-making basis (Alberti and Parker, 1991; Beanlands and Duinker, 1983; Freudenburg, 1986). Many methodological limitations are traced to a poor understanding of social and natural systems and of available social and ecological scientific concepts, models, and methods (Beanlands and Duinker, 1983; Burdge, 2002; Craig, 1990; Treweek and Hankard, 1998). These shortcomings imply an iterative IA process–substance relationship, with cycles of adjustments in an ongoing effort to match procedural and substantive characteristics.

Some commentators maintain that it is premature to reorient IA requirements and practices to meet substantive environmental ends. They argue that fundamental value shifts are a prerequisite to an IA process driven by ecological, social, and sustainability ethical principles (Euston, 1997; Kaufman, 1997). IA can play a supporting role in advancing such values and in addressing basic value conflicts, but not through conventional procedures (Benson, 2003). Much ecological and social knowledge, upon which IA depends, is fraught with uncertainties, especially when cause–effect relationships must be discerned and future environmental effects must be predicted (Dearden and Mitchell, 1998). Additional complexity is added when cumulative ecological and social system effects must be determined and conclusions reached regarding sustainability implications. The substantive effectiveness of IA is further severely inhibited by "balkanized" government environmental and resource responsibilities (Weiner, 1997). Effective partnerships must be established and maintained among agencies, with nongovernment organizations, and with the public (Dennis, 1997; IEMTF, 1995). These substantive value, knowledge, implementation, and institutional obstacles and challenges necessitate, it is argued, fundamental reforms to the IA process.

The problem is not the same for ecological, social, and sustainability concerns, although IA effectiveness reviews suggest that there is substantial room for improvement in all three areas (Denq and Altenhofel, 1997; Freudenburg, 1986; Sadler, 1996). Effectiveness ratings tend to be lower for treating social concerns and lower still for treating sustainability concerns. The nature of the concerns naturally varies. An IA process conducive to addressing ecological concerns will not necessarily be appropriate for incorporating social or sustainability concerns. Adaptations will be necessary for each type of concern as well as for interactions among concerns. An often intensive debate continues to surround the question of whether IA should be limited to ecological concerns or also cover social and economic impacts (Thérivel, 2010) (See Section 6.6).

There is no simple answer to the question—Which of these perspectives is valid or the most valid? A greater understanding of environmental conditions and of decision making and outcome effectiveness is required. Pending such knowledge, it must be assumed that all problem perspectives and solutions, depending on the circumstances and to varying degrees, are valid. Sometimes IA is more trouble than it is worth. Sometimes the substance–process relationship needs refinement, sometimes modification, and sometimes reform. Sometimes the issues and solutions vary depending on whether ecological, social, or sustainability concerns are being addressed. The direction then is to explore how IA process management can better address this constellation of interrelated problems and solutions.

6.4 SELECTING THE MOST APPROPRIATE ROUTE

This overview of substantive environmental concepts establishes the foundation for enhanced IA process management. The analysis is necessarily abbreviated and selective. Only ecological, social, and sustainability concepts are considered. IA effectiveness ratings for treating such concerns tend to be low. The choice of concepts is admittedly arbitrary. Only concept characteristics directly relevant to IA process management are identified. Key concept attributes are first described. Then IA process management implications are explored.

6.4.1 Ecological Concepts

Ecology is a branch of the biological sciences concerned with the relationships between organisms and their environments, including relationships with other organisms. EcIA is a formal process of identifying, quantifying, and evaluating the potential impacts of defined actions on ecosystems (Treweek, 1999).

Table 6.1 identifies and briefly describes several ecological concepts potentially relevant to IA process management. The recurrent themes exhibited in the concepts imply an IA process distinctly different from the conventional process assumed in most IA texts. All the concepts begin with an ecological systems perspective. They see planning and management as shaped by ecological visions, goals, and principles. Disciplinary boundaries are spanned and transcended. Less emphasis is placed on comprehensive disciplinary analyses and single function institutions. More stress is placed on selective, transdisciplinary synthesis and place-based coalitions of agencies and stakeholders. Temporal and spatial boundaries are extended to match natural patterns and rhythms. Multiple spatial and temporal horizons and boundaries are employed. Natural systems are seen as dynamic, self-organizing, complex, evolving, and uncertain. Planning processes, to match such characteristics, are viewed as necessarily open, adaptive, creative, collaborative, iterative, selective, and action-oriented. A life cycle analysis of the ecological footprint of proposed actions is undertaken (Hansen and Wolff, 2011).

Action-induced stresses can result in ecological thresholds being exceeded, notwithstanding resiliency. Severe prediction and control limits are noted. Thresholds are difficult to discern and often change. Major implementation barriers and obstacles are identified. The value of scientific and rational knowledge and methods is recognized. But the need to integrate extra-rational perspectives, values, and interests is also acknowledged. The distinction between natural and human (e.g., social, political, and economic) environments is seen as forced and inhibiting. Distinctions among environmental management instruments, of which IA is only one, are also seen as artificial. Preapproval analysis is no longer the preoccupation. Instead, continuous management approaches are advocated that extend through implementation and that rely heavily upon monitoring and adaptive management.

The scientific and rational IA processes (described in Chapters 4 and 5) display few of these characteristics. They can assume a valuable supportive role. However, they appear poorly suited to integrating ecological substance and the IA process. The assumption that process and substance are independent cannot be supported. A substantive IA process will be conducive to integrating ecological perspectives, knowledge, and methods only if it is designed and managed with a sound appreciation of the procedural implications of substantive characteristics. Judging from the characteristics of the concepts presented in Table 6.1, it will be almost impossible to imbue an ecological perspective into a comprehensive, rigid, closed, top-down, and lineal IA process that assumes implementation and a high degree of predictability and control.

Biodiversity IA and ecological IA have expanded dramatically in recent years, both at a conceptual and at an applied level. Concepts, such as the ecosystem approach and adaptive management, have been refined. An extensive array of good practice guidance is available (IAIA, 2005). Nevertheless, application in practice has been, at best, mixed. IA

Table 6.1 Examples of Potentially Relevant Ecological Concepts

Applied ecology (also ecosystem sciences)	Requires an ecological perspective, adherence to basic ecological concepts, and an appropriate interdisciplinary conceptual framework Ecological systems—self-controlled within constraints, evolving and complex; ecosystems part of a larger sociobiophysical system (human cultures and environments part of system) Importance of temporal and spatial boundaries, which reflect ecological processes Seeks to better understand self-organizing structures and processes (management challenge to protect self-organizing capacities—ecosystem integrity) Recognizes highly dynamic systems, extreme variation, and major predictive and management constraints; strong interest in scale, patterns, rhythms, and thresholds in biophysical systems Focuses on key variables, key processes, and ecosystem tolerance; importance of habitat and biological diversity Focuses on questions relevant to decision-making choices
Ecological impact assessment	Identifies, quantifies, and evaluates the potential impacts of defined actions on ecosystems and their components Tends to fit within major IA stages; scoping, focusing, and ecological monitoring critical Links ecological evaluation and EIA and SEA Objectives—maintenance of natural areas and their biological diversity and maintenance of social functions provided by natural areas Focuses on interactions between ecological stressors and receptors; a systems perspective Addresses the well-being of ecosystem services beneficiaries, ecosystem services, and direct and indirect drivers of ecosystem change Concerned with the state of the environment (e.g., biodiversity loss); addresses impacts on ecosystems and their components (valued ecosystem components) Use of applied ecological concepts, principles, and methods (e.g., surveys, taxonomic classification, GIS, modeling, statistical analysis, ecological evaluation, monitoring, landscape planning, ecological footprint analysis, carrying capacity analysis) Takes into account barriers, limits, and uncertainties (institutional, knowledge, methodological, natural variation) Closely linked to socioeconomic impacts, risk assessment, pollution control, and land use and resource planning
Environmental indicators	Methods and measures to monitor environmental status (trends and conditions) Important for framing problems and for determining solutions Physical, chemical, and biological variables used to construct environmental change indicators; incorporated into environmental statistics (state-of-environment); a decision-making input Example indicator categories—response indicators (overall biological conditions), exposure or habitat indicators (ecosystem exposure to pollutants and habitat degradation), and stressor indicators (human and natural processes that change exposure and habitat conditions) Can help monitor environmental problems; responses also depend on social and political considerations
Biodiversity-inclusive IA	The array of interacting, genetically distinct populations, and species in a region, the communities they comprise, and the variety of ecosystems of which they are functioning parts (composition, structure, and processes); relationships and interactions are critical Management objectives—the conservation of biological diversity, the sustainable use of components, the fair and equitable sharing of benefits from genetic resources, and the ecosystem approach Identifies and applies principles (e.g., no net loss, net conservation benefit, precautionary principle, use of local, traditional, and indigenous knowledge, public participation, equitable sharing, sustainable use) Importance of inventorying the present state of biological resources Undertakes biodiversity screening (e.g., biodiversity threats, potential impacts on protected areas and species) and scoping Seeks biodiversity friendly alternatives; maps and evaluates biodiversity conservation differences Particular concern with habitat loss and fragmentation. Components—regional ecosystem diversity, local ecosystem diversity, and genetic diversity Utilizes factors contributing to biodiversity decline—physical alteration, pollution, over harvesting, introduction of exotic species, natural processes, and global climate change Identifies direct and indirect drivers that cause biological change and conceptual links; lists ecosystem services provided (e.g., fish, timber, regulating as in water purification, biological control, cultural services) Applies biodiversity principles (e.g., big picture or landscape perspective, protect communities, and ecosystems; minimize fragmentation; promote native species; protect unique or sensitive environments; maintain or mimic natural ecosystems processes; maintain structural diversity and genetic diversity; restore ecosystems, communities, and species) Ensures multispecies emphasis; seeks to protect broader habitats and ecosystems that support biodiversity Stresses need to think in terms of comprehensive multiscale ecological networks and to adopt nested hierarchical conservation strategies

(*continued*)

Table 6.1 (*Continued*)

	Assesses the extent of biodiversity loss and reduction or loss of biodiversity function (use of biodiversity indicators)
	Potential role of GIS-based ecological models; importance of assessing indirect, secondary, and cumulative biodiversity impacts
	Estimates uncertainty factors affecting impact evaluation and effect on results
	Value of people-centered approaches to integrating biodiversity into the broader livelihoods sustainability context
Ecosystem approach (also ecosystem management)	Place-driven environmental protection strategy; uses of natural boundaries and ecological indicators
	Whole system and broad regional and temporal perspectives (multiple scales and time horizons); appreciates the dynamic nature of ecosystems
	Sets long-term ecosystem management objectives; conserves ecosystem function and structure; maintenance of ecosystem services a priority
	Based on ecosystem integrity and sustainability principles and values; incorporates such concepts as carrying capacity, resilience, self-organization, community diversity, and stability; and the precautionary principle
	Seeks to restore and sustain health, productivity, and biological diversity of ecosystems and quality of life (the humans part of environment); manage within functioning limits
	Stresses the need for dynamic, transdisciplinary, visionary (explicit ecosystem goals), proactive, adaptive, and participatory planning process
	Internalizes ecosystem costs and benefits
	Recognizes the importance of institutional arrangements (especially coordination and communications) and of integration with social and economic goals and context; provides incentives to promote biodiversity conservation and sustainable use
Environmental planning and management (also resource planning and management)	Largely rational planning process adapted to integrate environmental knowledge and methods; methods have roots in ecological and social sciences
	Encourages inclusion of ecological perspectives
	Stresses the need to reach consensus on environmental issues
	Multi to interdisciplinary; stress the needs for comprehensive approach
	Usually advisory and participatory
	Increasing recognition of the need to address environmental justice and equity issues
Integrated environmental and resource management and assessment	Advocates need for a more effective, integrated, and coordinated approach
	Holistic, regional, and ecosystem-based perspective; stresses the preservation of natural systems integrity
	Interconnective, goal-oriented, and strategic; involves both human and natural resources in ecosystem
	Devotes greater attention to social, political, economic, and institutional factors operating in an ecosystem (including opportunities and barriers stemming from institutional arrangements) and to links to sustainability
	Supported by integrated management systems (e.g., database management, GIS, expert systems)
	Recognizes the importance of stakeholder collaboration and that of conflict management
	Recognizes the importance of context and links to urban and regional planning
Adaptive environmental assessment and management	Iterative decision-making process; mimics the dynamic, cyclic, and surprise-ridden state of nature; decisions and assumptions revisited; long-term research, monitoring and management critical; seeks more resilient policy
	Generally involves a series of workshops facilitated by a core groups of experts; focuses on building and testing (usually computer) models as tools for generating and testing options; ongoing data acquisition
	Combines scientific information with a forum for interested and affected parties; a minimum regrets planning tool
	Emphasizes interdisciplinary communications and collaboration; integrates societal and ecosystem goals and values
	Carries IA into ongoing management; highlights the importance of monitoring and that of adaptive management in the face of uncertainty and complexity; an open and continuous learning processes—learning by doing
Traditional knowledge	A way of knowing and thinking about relationships of living beings (including humans) with one another and with the environment (a way of life)
	A cumulative body of knowledge and beliefs, handed down through generations by cultural transmission
	Relies on observation and knowledge of indigenous people
	Holistic—a form of environmental knowledge that integrates the social, ethical, cultural, technical, scientific, historic, ecological, and spiritual; emphasizes interrelationships; avoids scientific reduction
	Includes interrelationships among physical, biological, and human; humans as participants in environment rather than only as observers
	Fluid and flexible; importance of understanding how it operates in indigenous contexts; often misunderstood and misapplied

Sources: Alberti and Parker (1991), Armitage (1995), Bagri et al. (1998), Barrow (1997), Beanlands and Duinker (1983), Beatley (2000), Berkes (1993), CEAA (1996a,b), Coleman (1996), Dearden and Mitchell (1998), Geneletti (2002, 2003), Geneletti et al. (2003), Genter et al. (2008), Hansen and Wolff (2011), Gontier et al. (2006), Hanusch and Fischer (2011), Hegmann and Yarranton (1995), Hollick (1993), Holling (1978), Hooper et al. (1999), IAIA (2005), IEEM (2006), IEMTF (1995), Khera and Kumar (2010), Kozlowski (1990), Landsberg et al. (2011), Letsela et al. (2010), Lou and Rykiel (1992), Margerum (1997), Sallenave (1994), Sheate (2011), Shepherd (2008), Sherrington (2005), Slocombe (1993), Slootweg (2005), Smith (1993), Slootweg and Kolhoff (2003), Slootweg et al. (2006), Treweek, (1995, 1999), Treweek et al. (2011), US CEQ (1993), Wackernagel and Rees (1996), Wegner et al. (2005), Wieringa and Morton (1996), Wiles et al. (1999).

ecological and biodiversity institutional arrangements and analyses have often been limited and of poor quality (Mandelik et al., 2005; Manou and Papathanasiou, 2009). In common with scientific and rational IA processes, ecological IA tends to be expert-centered. It continues to be hampered by data limitations. Procedures for overcoming institutional and implementation barriers; for integrating ecological and biodiversity considerations into decision making; for managing uncertainty; and for facilitating adaptation, creativity, and collaboration are far from fully developed (Fischer, 2011; Hooper et al., 1999). The concepts encompass such a wide range of aspirations (several of which are pursued in other chapters) that they run the risk of becoming either overly general or overly complex. While appreciating and addressing these potential limitations and obstacles, these concepts demonstrably help make IA processes more substantive.

6.4.2 Social Concepts

SIA is the process of managing the social issues, consequences (intended and unintended, positive and negative), and invoked social change processes associated with planned interventions (Esteves et al., 2012; Vanclay, 2003). Social, as applied in impact assessment, is a broad and therefore a difficult-to-define term or concept. It is also defined and applied in different ways (Burdge, 2002). It has been described as a field of research, a discourse, a paradigm, an interdisciplinary and/or transdisciplinary social science, and a subdiscipline (Esteves et al., 2012). It encompasses the evaluation of all impacts on humans and the ways in which people and communities interact with their sociocultural, economic, and biophysical surroundings (IAIA, 2003; Jones and Slinn, 2008). As such, it is strongly linked to and arguably subsumes such fields as aesthetic, heritage, archaeological, cultural, community, demographic, development, economic, fiscal, gender, health, institutional, infrastructural, indigenous rights, political, poverty, psychological, resource, and social and human capital impact analyses (IAIA, 2003). SIA can refer to the distinguishing characteristics of people, communities, and society (e.g., demographic, cultural, institutions, customs, traditions, political systems). It can involve multiple levels of human aggregation (e.g., families, groups, organizations, communities, society). It can include perceptions, attitudes, norms, values, aspirations, and beliefs. It can pertain to patterns of association, interactions, and interdependencies. It can refer to health and social well-being, quality of life and living environment, economic and material well-being, cultural values and integrity, personal and property rights, and gender relations. It encompasses the changes in people's way of life, their culture, their community, their political system, their environment, their health and well-being, their rights, and their fears and aspirations (Vanclay, 2003; Youngkin et al., 2003).

Depending on the definition, SIA can apply theories, concepts, and methods from such disciplines as economics, anthropology, political science, psychology, history, philosophy, and archaeology, and such professions as land use planning, social planning, landscape analysis, health planning, risk management, resource management, public involvement, and environmental management. It is highly interactive with the physical (both natural and built), resources, and the ecological. It is both a field of study (e.g., social sciences) and a field of application (e.g., SIA). It is an evolving field that embraces a diversity of distinct, partially overlapping and partially conflicting concepts, models, theories, perspectives, and frameworks. There are numerous frameworks available for structuring social criteria.

IA texts generally treat social impacts as a distinct discipline, but, for the most part, as a subset of SEA or project-based EIA. Sometimes social and economic impacts are considered separately. Sometimes they are combined under the umbrella of socioeconomic impacts. Occasionally, health impacts and cultural, historical, and archaeological impacts are addressed separately. The track record of integrating SIA into agency decision making and into the assessment process has been, at best, mixed (Bronfman, 1991; Burdge, 2004). Social concerns tend to be a secondary consideration in IA requirements (Burdge, 2004). Too often, SIA has assumed a marginal decision-making role (Burdge, 2002; Lockie, 2001).

The major stages in the SIA process largely parallel those of the IA process. Sometimes SIA processes commence with public involvement. They often include a separate stage for predicting public responses to impacts (Finsterbusch, 1995; Interorganizational Committee, 1994). Social impacts are not the same as ecological impacts (Barrow, 1997). People react in anticipation of and adapt to change, oftentimes based on perceptions and attitudes (Edelstein, 2003; Égré and Senécal, 2003; Peterlin et al., 2008; Wlodarczyk and Tennyson, 2003). Human reactions vary greatly among individuals and groups and over time. Social phenomena are difficult to predict (Finsterbusch, 1995). Social units are not fixed structures. Social phenomena involve adaptive interactions. SIA involves both social change processes (intervening variables that may lead to impacts) and social impacts (intended and unintended consequences on the human environment from planned interventions) (Vanclay, 2002). The IA process can influence how people anticipate and adapt to change.

Table 6.2 identifies and briefly describes several social concepts potentially relevant to IA process management. In considering these concepts the dangers of preconceptions and implicit assumptions about the conduct of the process, about the choice and application of methods, about the perspectives of potentially interested and affected parties, and about the potential social impacts are immediately apparent. The analysis and interpretation of social impacts should be approached with caution. Assumptions should be carefully scrutinized. Ongoing adaptations would be required. The world and proposed actions should be seen

Table 6.2 Examples of Potentially Relevant Social Concepts

Technical/scientific SIA	Relies heavily on natural and social sciences Seeks to maximize net social welfare (utilitarianism) Employs an adapted rational planning process Addresses change with and without proposal against control study Sees SIA as a technical component of the planning and decision-making process Uses a reductionist and objective research mode (scientist as neutral observer) Particularly helpful in structuring monitoring
Political SIA (also social conflict)	Conflict over resources and interests central to social life An interest-based approach; decision-oriented, value laden, and political Social life is diverse; social order is based on manipulation and control by dominant forces Tends to be issue-oriented; emphasizes openness, rectifying inequities and empowerment Seeks to understand basis for conflicts and how conflicts escalate Seeks to manage or contain conflict sufficient to identify mutually acceptable actions Stresses the need to strengthen the local institutional base (i.e., capacity building and community development) May be a realistic approach when positions are polarized and "worldviews" conflict
Participative/community-based SIA	In the tradition of collaboration and mutual learning of researcher and community, leading to social action Knowledge and experiences of individuals most affected by proposed change as the basis for impact prediction Roles of SIA practitioner—facilitator of knowledge sharing, interpretation, and impact reporting Process value laden and political Focused on community concerns Often employs techniques such as interactive community forums and frameworks such as community response (social viability, economic viability, political efficacy) and community organization models Emphasizes building social capital, capacity building, good governance, community engagement, and social inclusion Seeks to turn the impacted people into beneficiaries
Positivistic social science	Modeled after natural sciences; hypotheses tested by carefully analyzing the "numbers" Researcher as detached, neutral, and objective Stresses the value of an experimental, objective research approach, which seeks to logically explain cause–effect relationships Although flawed in its assumption of objectivity, is still instructive in terms of systematic and explicit research procedures; helpful in detecting methodological bias but contains own, often implicit, assumptions Social sciences can be difficult to apply in SIA because of inconsistencies in units of analysis, theoretical models, and language; social scientific traditions tend to be critical and discursive rather than predictive and explanatory (lack of a reliable set of theories for predicting social impacts) Weak on anticipating changes in the unquantifiable
Functional, ecological, and systems theory	Assumes shared norms and values in society Assumes a stable, cohesive, consensus based, and orderly social system; based on reciprocity, cooperation, and recognition of authority Assumes that system units are functionally related; change seen as an outside disturbance to an otherwise harmonious system; change accommodated by subtle shifts in system parts Reflected in most rational and participatory IA processes
Interpretative social science	Adopts a practical approach; not value free; common sense a vital information source Seeks to understand how people manage their everyday lives and construct meaning in natural settings Recognizes that people experience social reality in different ways Sees the unique features of specific contexts as essential to an understanding of social meaning May be helpful in addressing community-level impacts
Critical social science	Sees social science as critical and action-oriented; a political, moral activity Research conducted to critique and transform social relations Focuses on identifying and rectifying distortions and inequities Argues that social reality has multiple layers (illusions, myths, distortions, false consciousness) Potentially useful for addressing community empowerment issues

Table 6.2 (*Continued*)

Exchange theory	Assumes that human behavior reflects peoples' attempts to maximize rewards (utility) for involvement Expects that people will only become involved (and will continue to be involved) if they will benefit (or are rewarded) for their involvement; interaction seen as an exchange of rewards Requires a careful analysis of rewards (e.g., monetary, prestige, power, appreciation) that a setting is offering and how the rewards and patterns of exchange will be affected by a given change Sometimes basis for expectation that level of community acceptance will increase with the level of local benefits and compensation offered; of dubious validity and can be ethically problematic Has been incorporated into some siting approaches and explains some behavior
Symbolic meaning	Focuses on the inferred meaning attached to actions rather than to actions themselves People learn meanings and symbols in social interactions; can also alter meanings through introspection (their own interpretations of situations) and through interactions Conflicts may be exacerbated by definitions of situations Definitions of the situation by groups and individuals highly relevant to IA practice
Social learning	An approach for linking social concerns and public participation Includes both cognitive enhancement (e.g., learning about problem, learning about the values and interests of others) and moral development (e.g., developing a sense of self-respect and respect for others, developing moral reasoning skills) A potentially useful procedure for integrating social and moral considerations into participatory planning approaches
Phenomenological sociology	Focuses on describing and studying one's own and others' experiences without preconceptions Importance of avoiding preconceptions about external causes and consequences Opposed to objectivism, positivism, the acceptance of unobservable matters, and unsupported speculative thinking Seeks to analyze and describe everyday life; assumes that people create the world rather than being formed by social forces Although highly theoretical, underscores the need to begin with as few preconceptions as practical and to start from public and other stakeholder experiences and perspectives

Sources: Becker et al. (2003, 2004), Burdge (1995, 2004), Craib (1984), Craig (1990), Halstead et al. (1984), Harris et al. (2003), IAIA (2003), ICPGSIA (2003), Lane et al. (2003), Lee (2000), Manring et al. (1990), Newman (1997), Puschchak and Farrugia-Uhalde (2009), Ritzer (1996), Ross and McGee (2006), Rossou and Makan (2007), Schirmer (2011), Storey and Noble (2005), Vanclay (2003, 2006), Webler et al. (1995).

through the eyes of and as experienced by potentially affected parties. If social impacts are, in part, socially constructed, this suggests a socially constructed IA process (i.e., collaboratively designed and managed with interested and affected parties). Perspectives, norms, perceptions, beliefs, and values will change over time and can vary greatly depending on individual and group characteristics and depending on the level of social aggregation. This suggests iteratively exploring social impacts from multiple perspectives and at multiple levels. The magnitude and nature of social impacts are partly dependent on the process. The process is both an end (e.g., to provide a sound decision-making basis) and a means (e.g., a way of facilitating community empowerment, of avoiding and ameliorating adverse social impacts, of contributing to social viability, and of generating and enhancing social benefits) (Ross and McGee, 2006; Vanclay, 2003). This implies a process that is sensitive to public perceptions and perspectives, that actively seeks to manage positive and negative impacts from the outset (i.e., impact management as a continuous function), and that facilitates the achievement of community objectives.

Meaning and value are socially determined and are adjusted through social interactions. Dialogue is central to social interactions. Distortions in dialogue can exacerbate social impacts. The IA process is a form of social interaction. Dialogue and community/indigenous knowledge are central attributes of the process (IAIA, undated, a). This suggests designing and managing the process to facilitate dialogue, to contribute to co-learning, and to minimize communications distortions (Lockie, 2001). It also points to the need to understand how the IA process, as a form of social interaction, fits within and potentially affects existing social interaction patterns. Social interactions and impacts are both political and ethical. This suggests an IA process consistent with procedural and ethical principles and standards (e.g., equity, enhancement of marginal groups, gender equity) (see Chapter 10), conducive to the realization of social aspirations (e.g., reduced dependency, capacity building, building of social and human capital), and facilitative of the attainment of political objectives (e.g., empowerment, subsidiarity, strengthen democracy) (see Chapter 8) (Sharma, 2010; Vanclay, 2003). It also can entail community or indigenous control of the SIA (O'Faircheallaigh, 2009).

A reorientation of the SIA process, consistent with the view that SIA is primarily a mechanism for facilitating constructive social and political interaction and change, could result in less emphasis on impact prediction; more stress on co-learning and impact management; and a process contingent on the free, prior, and informed consent of proposal-affected people, formalized through an impact and benefits agreement (Esteves et al., 2012; Lockie, 2001). A taxonomic IA approach (which assumes minimal interactions among impact categories) is highly inappropriate given the dynamic nature of social interactions and impacts. What is required instead is an IA process built around conceptual models, frameworks, and stories that explore and trace through patterns of interaction and available choices from multiple perspectives (Vanclay, 2002). SIA is particularly concerned with the differential distribution of impacts among different groups in society, especially the most vulnerable (Vanclay, 2003). The most effective SIA processes draw upon and effectively integrate elements from technical, participatory, and political SIA models and methods (Ahmadvand and Karami, 2009; Becker et al., 2004; Lane et al., 2003).

The social sciences can make an important contribution to designing and applying an IA/SIA process. SIA encompasses such core social concepts as culture, community, power, human rights, gender, justice, place, resilience, sustainability livelihoods, capital, and participation (Esteves et al., 2012). But it is not a simple case of directly applying social science methods and models. There are multiple, overlapping, and conflicting social scientific models and methods available. Social science theories, models, and concepts can be quite effective in characterizing social change processes and impacts (Lima and Marques, 2005). They tend to be less effective in predicting the direction and magnitude of social changes and impacts. They are especially problematic regarding qualitative but significant aspects of the social environment (Puschchak and Farrugia-Uhalde, 2009). There are numerous interpretations of the appropriate purposes for and conduct of applied social research. Moving from the theoretical and the explanatory to the prescriptive and the practical can be very difficult. Contextual adjustments are essential. A clearly articulated theoretical framework is essential for effective social impact monitoring (Rossou and Makan, 2007). It is also important to identify and appreciate the implications of knowledge, resource, and control constraints and obstacles.

Notwithstanding the strong consensus on good SIA practice, the often-marginal role of social considerations in IA processes suggests the need for SIA practitioners to proactively advocate and extend the role of SIA within and among organizations (Bronfman, 1991; Esteves et al., 2012). The impartial analyst role is insufficient. It also implies the need for clearer definitions, enhanced methods, more follow-up research, a concerted effort to enlarge the SIA knowledge base, and a reconsideration of the nature of the SIA process (Burdge, 2002; Lockie, 2001).

The social concepts, in common with the ecological concepts, can shape and can be influenced by the IA process. Process and substance are intertwined. It is becoming increasingly possible to identify performance standards, albeit with contextual adjustments, for a socially substantive and sustainable IA process (ICPGSIA, 2003; Vanclay, 2003). General procedural characteristics, more and less conducive to combining substance and process in the IA process, can also be identified. SIA practice (e.g., locally appropriate mitigation, community benefits, equitable distribution of benefits) can be further enhanced with a greater emphasis on social follow-up, especially when it is structured, simple and workable, broadly available, empowers local residents, and facilitates social sustainability (Brown et al., 2003; Burdge, 2003b; Esteves and Vanclay, 2009; Lavallée and André, 2005; Lima and Marques, 2005; Petäjäjärvi, 2005; Rossou and Makan, 2007; Storey and Jones, 2003; Storey and Noble, 2005).

6.4.3 Sustainability Concepts

The roots of sustainability or sustainable development, as a concept, have been traced well back into the nineteenth century and beyond. The definition most commonly used as a point of departure is that of the World Commission on Environment and Development (WCED)—"development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987, p. 8). There is a continuing, albeit diminishing, debate surrounding how broadly sustainable development or sustainability (sustainability is used here for the sake of brevity and to avoid the impression that sustainability is only associated with development) should be defined. It is increasingly accepted that sustainability should encompass such considerations as intrageneration inequities, spatial inequities, human aspirations, other species needs, public participation in decision making, ecological limits, and relationships among sustainability forms and sustainability instruments. Common to most definitions is a desire to maintain, over an indefinite future, necessary and desired attributes of the sociopolitical system and of the natural environment (i.e., what society and communities want to sustain) (Deakin et al., 2002; Hanna, 2009a; Robinson et al., 1990).

Most recent characterizations view sustainability as holistic, ambiguous, adaptable, normative (i.e., objective-driven), and integrative rather than reductionist, deterministic, rigid, baseline-driven, and value-free (Bond, 2010; Gibson, 2006a; Pope, 2006; Pope et al., 2005). Sustainability also tends to be characterized as a continuous process of improvement (providing sustainability outcomes also are delivered); as more than just a global environmental perspective (also encompassing local, organizational, and societal perspectives); as necessarily democratic, open, inclusive, and equitable; as principles based rather than pillar-based, and as both universal and context-dependent (Binder et al., 2010; Bond, 2010; Craik, 2008; Dalal-Clayton and Sadler, 2004; Faber et al., 2010; Gasparatos et al., 2007; Gibson, 2006a; Grinde and Khare, 2008; Pope et al., 2004; Pope, 2006; Pope and Dalal-Clayton, 2011).

Some key interrelationships among sustainability elements are highlighted in Figure 6.2. Definitions, thresholds,

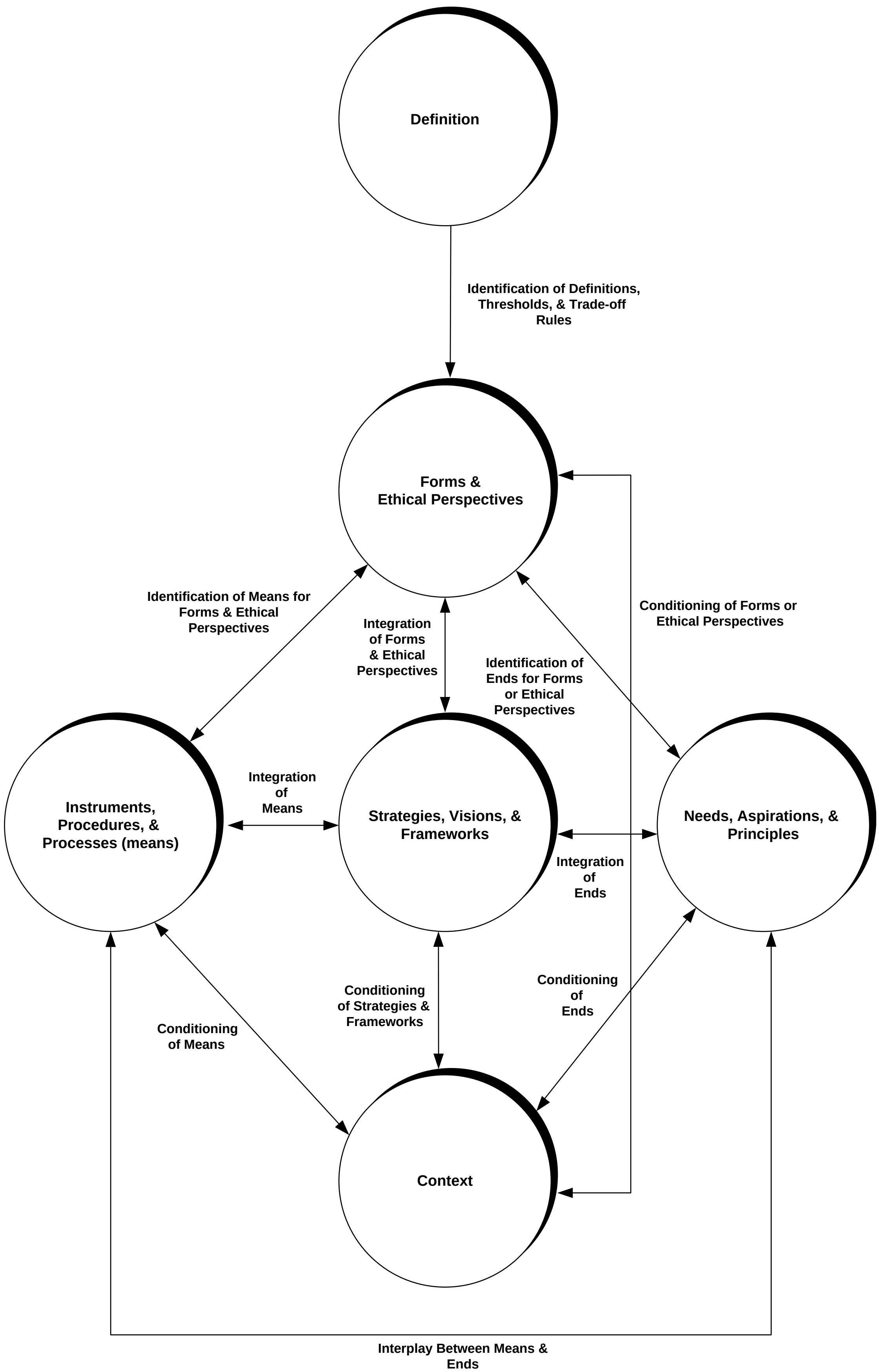

Figure 6.2 Sustainability elements. Adapted from Lawrence (1997b).

and trade-off rules are refined through sustainability forms and ethical perspectives. Sustainability forms concern overlapping and interdependent value systems (e.g., ecological, social, economic) (Franz and Kirkpatrick, 2007; Sadler, 1996). There is much debate concerning where the greatest emphasis should be placed and regarding how to best address interactions and interdependencies. Underlying these debates is a multiplicity of institutional, ideological, and academic sustainability perspectives and worldviews (Mebratu, 1998). These perspective differences are reflected in varying positions regarding such matters as the treatment of growth, weak versus strong sustainability (the latter is increasingly favored), the role of government and the market, and the importance of ecological limits and social justice (Bond, 2010; Constanza, 2000; Eales and Sheate, 2011). The net result is multiple versions of sustainability and multiple approaches to undertaking SA (e.g., minimizing negative vs. objectives-led vs. thresholds-driven, top-down vs. inside out vs. bottom-up, principle-based vs. triple bottom line or pillar-based, sustainability appraisal vs. sustainability IA vs. integrated IA, internal vs. external) (Binder et al., 2010; Fischer, 2007b; Henriques and Richardson, 2004; Pope et al., 2004; Pope, 2006; Robinson et al., 1990). Notwithstanding such differences, there are broad principles and imperatives common to many sustainability perspectives.

Sustainability forms and perspectives provide a basis for identifying sustainability ends (needs, aspirations, and principles) and sustainability means (instruments, procedures, thresholds, trade-off rules, and processes). Sustainability ends are both procedural (e.g., openness, fairness, participation) and substantive (e.g., ecosystem integrity, protection of biological diversity, enhanced quality of life, satisfaction of basic human needs, social justice). Sustainability ends can assume different forms (e.g., goals, principles), can represent both aspirations and thresholds that define unsustainability, and can operate at varying levels of detail (e.g., broad goals, specific objectives, priorities, criteria or indicators) (Hacking and Guthrie, 2006; Moles et al., 2008). Sustainability means are the mechanisms by which stakeholders work separately and together to move toward sustainability ends (e.g., green planning, legal instruments, indicators, thresholds and trade-off rules, financial incentives and penalties, institutional reforms, direct citizen mobilization, applied research, consumption and lifestyle choices, forums for joint planning and cooperation). Sustainability forms, ends, and means are brought together in sustainability strategies, visions, models, and frameworks. It is through such integrative mechanisms that core sustainability principles, themes, limits, decision rules, approaches, and methods are identified and applied (Brooke, 1998; Devuyst, 1999; Gibson, 2001, 2010). Part of application involves adapting ends, means, and strategies for different situations (i.e., sustainability as a situated concept) and clearly defined responsibilities (Binder et al., 2010; Kobus, 2005; Lawrence, 2009; Shearman, 1990). This, in turn, necessitates a regional/territorial understanding and definitions for sustainability (Péti, 2012).

The general interrelationships between sustainability and IA are illustrated in Figure 6.3. IA should be a proactive instrument for promoting sustainability (Sadler and Jurkeviciute, 2011). Sustainability and IA can be integrated at three levels—the conceptual level (theory and research), the regulatory level (sustainability-related IA requirements embedded within an overall sustainability governance regime), and the applied level (integrating sustainability concerns into IA practice) (Gibson, 2010; Gibson et al., 2005). Both IA and sustainability are concerned with maintaining and enhancing ecological, economic, and social environments. They reform, manage, and apply science and technology, institutional arrangements, and human environmental interventions (Pope and Grace, 2006). Both address interrelationships within and between environments and human activities. Sustainability can and should provide a means for redefining IA. IA can and should be an instrument for facilitating sustainability.

IA texts initially tended to assume that sustainability is an input to and an output from the conventional IA process. The essential features of the process remain unchanged. The relationships between sustainability and the IA process, however, are more complex, as illustrated in Figure 6.4 (Note: the numbers in Figure 6.4 are explained in the text). Sustainability offers the potential to extend and redefine the IA process within a fundamentally restructured institutional and societal setting (Pope and Grace, 2006). Project-level EIA and SEA, for example, identify, predict, and manage direct, indirect, and cumulative effects (1). Cumulative effects tend to be addressed incrementally (e.g., project effects in combination with the effects of related activities). Effects are projected into the future, usually assuming current trends persist. Sustainability, in contrast, starts with holistic images (often both desirable and undesirable) of the future and a systems perspective (Grinde and Khare, 2008) (7). It challenges conventional thinking and practice (Gibson et al., 2005). It begins from the whole and moves to the parts. It focuses on links and interdependencies. It adopts a long- and short-term perspective (Gibson et al., 2005). It does not assume that there is a single potential future or that trends define the future. It is embedded in complexity and surprise, understands the irreducibility of uncertainties and risks, adopts a precautionary approach, recognizes the importance of systems resilience and its determinants, proactively seeks creative innovation opportunities, and utilizes adaptive management and governance approaches (Gibson et al., 2005; Govender et al., 2006). It both extends from the present and traces connections back to the future. It pursues multiple, reinforcing gains (Gibson, 2010). It seeks a lasting sustainability legacy from planned, proposed, and potential change (Gibson, 2011). It meaningfully engages the broader community. It integrates IA types and decision making (horizontally across agencies and vertically among governments—both up and down) (Pope and Grace, 2006).

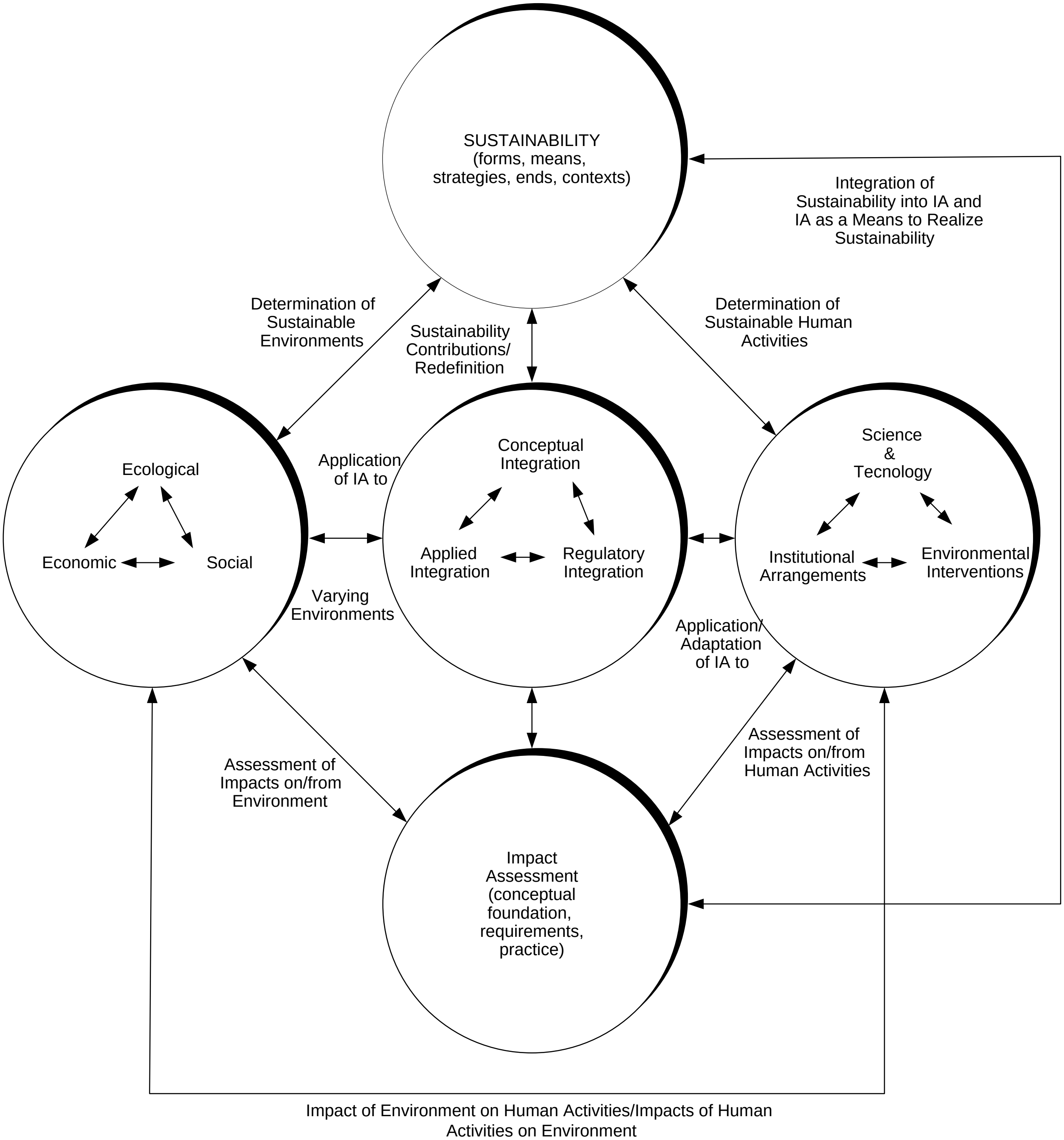

Figure 6.3 Integrating IA and sustainability. Adapted from Lawrence (1997b).

It is both shaped by (e.g., understanding of issues) and proactively strives to influence and reform policy and institutional contexts (Pope and Grace, 2006).

Conventional EIA and SEA approaches usually address significance in terms of the importance of individual environmental components, effects, or interactions (Hanna, 2005). Relationships between significance determinations and context are often poorly defined. Limited attention is given to systemic complexity and uncertainty. Sustainability visions (both ultimate state and milestones) and limits provide a context and a touchstone for significance interpretations and impact management actions (2) (Hacking and Guthrie, 2006; Sadler, 1996). Options, proposed actions, and effects can be assessed in terms of whether they respect inviolable limits (e.g., environmental or social carrying capacities or thresholds) (4) and in terms of their relative

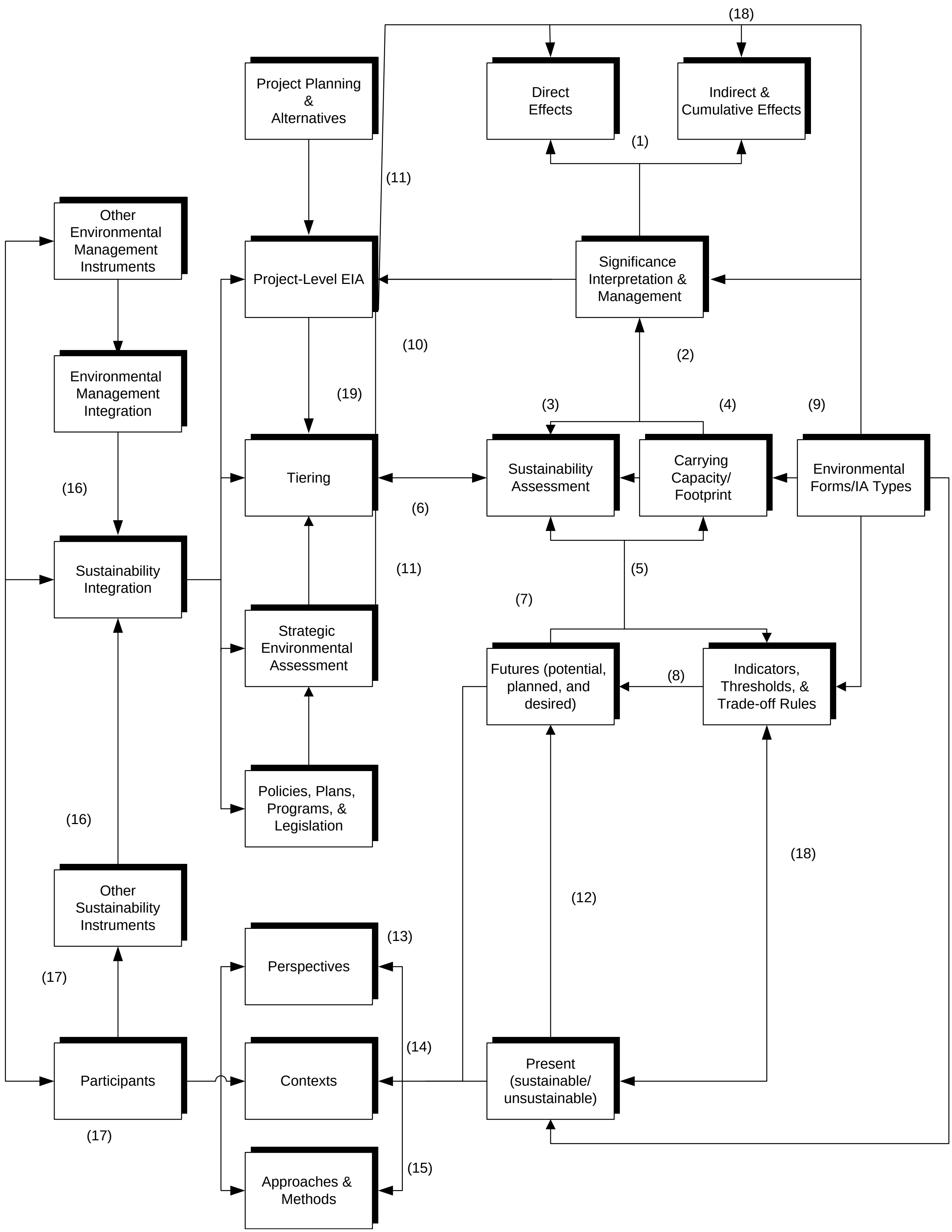

Figure 6.4 Sustainability in IA process.

contribution to sustainability visions, goals, targets, criteria, and principles (3) (Gibson et al., 2005; Noorbakhsh and Ranjan, 1999; Sadler, 1996). Sustainability analyses can be supported by qualitative and quantitative decision aid systems, models, and frameworks (Bruner and Starkl, 2004; Hassan, 2008; Hodge, 2004; Kain and Söderberg, 2008; Moles et al., 2008). Proposed actions or alternatives can be a catalyst for sustainability. A higher test is established for approvals (e.g., enhancements, net gains for sustainability) (Hanna, 2005).

Sustainability assessment could be considered the highest "rung" in the assessment ladder (6) (George and Kirkpatrick, 2008; Rotmans, 2006). It provides a context for SEA and links local actions to global concerns (Berke, 2002). Trade and other international agreements and broad strategies, which seek to integrate individual SEAs, could be subjected to a sustainability assessment (Elkin and Voiturez, 2009). Sustainability analyses could incorporate global and transboundary effects and priorities into integrative strategies, into lower order SEAs, and into project-level EIAs. Ultimately, SAs can represent a mechanism for integrating all IA forms and environmental management tools, both among (e.g., IA as a contribution to international governance) and within jurisdictions (Burdett, 2008b; George and Kirkpatrick, 2008). The database for EIA and SEA often has gaps and inconsistencies, especially as scales are broadened (e.g., to address cumulative effects) and as time horizons are extended. Sustainability criteria and indicators, which combine and supplement environmental, social, and economic indicators and which systematically cross and transcend pillar (social, economic, ecological) issues, can address these gaps (Gibson et al., 2005) (8). Ends and means are intertwined (Gibson et al., 2005). Sustainability principles, criteria, indicators, and trade-off rules, supported by participatory IA, also help determine whether ecological and social thresholds are being approached and whether progress is being made toward sustainability targets (18) (Fahy and Cinnéide, 2007; Hermans and Knippenberg, 2006; Jepson, 2001).

Conventional project-level EIA and SEA commonly treat social, economic, and ecological effects separately. Critical links among such effects are usually considered when addressing cumulative effects. Sustainability, in common with integrated assessment, recognizes that social, economic, and ecological systems are highly interdependent (Rotmans, 2006) (9). It uses holistic visions and integrative frameworks to address interdependencies from the outset (Bond and Morrison-Saunders, 2011). Sustainability decision rules often focus on interdependencies (e.g., economic growth within ecological carrying capacity). Sustainability can help focus project-level EIAs and SEAs (i.e., contributing to or undermining of sustainability) (10). EIAs and SEAs can be guided by sustainability visions, goals, and precisely defined principles, thresholds, criteria, and trade-off rules (Benson, 2003; Gibson et al., 2005). They can broaden spatial and temporal boundaries to address global and intergenerational impacts (Hacking and Guthrie, 2008). They can characterize baseline conditions in terms of sustainable and unsustainable activities and environments. The generation and evaluation of alternatives can focus on precautionary choices that are likely to be conducive to sustainability, offer the greatest overall benefit, and avoid undesirable trade-offs (Gibson et al., 2005) (11). Procedural and substantive ethical principles (e.g., inter- and intragenerational equity) can be prominently featured (Bond and Morrison-Saunders, 2011).

Proposed actions, rather than being viewed only as environmental intrusions (to be ameliorated to acceptable levels), can be treated instead, as potential sustainability opportunities or catalysts. Unsustainable alternatives can be screened from consideration (e.g., threat to carrying capacity). The remaining alternatives can be evaluated using sustainability decision rules (e.g., maintenance of natural capital, waste generation within assimilative capacity, renewable resources within regeneration rate, nonrenewable resources equal to substitution rate) (Gibson, 2006a; Goodland, 1993; Noorbakhsh and Ranjan, 1999; Sadler, 1996). Mitigation, compensation, and local benefits measures can maintain and enhance sustainability (e.g., in kind compensation for natural capital loss, fair distribution of benefits and risks) (Gibson, 2011). Before and after comparisons can be undertaken to determine sustainability-related changes (Thérivel and Minas, 2002).

The overall IA process can continually reflect back to the original vision and objectives (Bond and Morrison-Saunders, 2011). It can be supported by sustainability science, guided by sustainability procedural (e.g., keep options open, precautionary principle, a fair, accessible, efficient, and effective process) and substantive principles, informed by sustainability advisors, and supported by integrative frameworks, networks, models, and methods (Beatley, 1995; Gibson, 2001; Gibson et al., 2005; Hacking and Guthrie, 2008; Kates, 2000; Sadler, 1996; Scanlon and Davis, 2011; Slocombe, 1993). The process is open, transparent, iterative, inclusive, and learning oriented (Gibson et al., 2005; Singh et al., 2009; Täbara and Pahl-Wostl, 2007; Tuinstra et al., 2008). Proposed decisions must operate within key sustainability constraints, thresholds, and limits. They also must minimize the negative, optimize the positive, compensate for the loss of valuable features and benefits, and adhere to predefined trade-off rules (e.g., net overall and mutually beneficial, social, economic, and ecological gains, burden of proof on proponent, protection of the future) (Gibson, 2006a; Thérivel, 2010). SA can be broadened to subsume other IA forms, provide the institutional context for formulating and implementing SA good practice norms, make sustainability operational in an organizational setting, and contribute to international governance (Craik, 2008; George and Kirkpatrick, 2008; Kiewiet and Vos, 2007).

Sustainability recognizes that there are multiple perspectives concerning how the world is, how the world is likely to be, and how the world should be (13). These perspective differences result in many different pathways (i.e., an open-ended process) from the present to sustainable or unsustainable futures (Gibson et al., 2005) (12). Sustainability initiatives seek to identify the "overlapping consensus" among interested and affected parties that will provide a basis of action (17) (Rawls, 2001). A variety of approaches and methods can both define a sustainable future (e.g., assessment frameworks, visions, scenarios, models, participatory tools, indicator sets) and assess the contributions of individual proposals (e.g., apportionment techniques, sustainability indices, footprint analysis, multicriteria analysis) (14) (De Ridder et al., 2010; George, 1997; Jiliberto, 2004; Lee, 2006; Rotmans, 2006; Singh et al., 2009; Wackernagel and Rees, 1996; Wiek and Binder, 2005). Adjustments are also made for different settings and situations (e.g., a territorial/regional understanding of sustainability) (Kobus, 2005; Ng and Hui, 2007; Péti, 2012) (15). Multiple perspectives and methods are available for characterizing present and potential future conditions (i.e., methodological pluralism) (Gasparatos et al., 2007).

Project-level EIA and SEA operate largely independently from other sustainability instruments. Connections are made to other instruments but usually only after the process is well advanced, often during the review and approval stage. Sustainability initiatives recognize that many mutually supportive instruments are required (16). Efforts are made to ensure complementary visions, actions, and monitoring systems (12). The IA process could be modified to more effectively address the advantages and constraints associated with integrating sustainability concerns into both EIA and SEA (19). Ultimately, other IA forms should be transcended by and integrated within SA (Burdett, 2008b). These efforts could be broadened to embed, from the outset, SEA and EIA within the full network of sustainability instruments (16 and 19).

Many issues, obstacles, and dilemmas remain concerning how to best integrate sustainability and the IA process. The theoretical base for sustainability is still in need of refinement. Many questions are still being raised regarding how to best determine what is sustainable, over what area, and for how long (Briassoulis, 1999; Shearman, 1990). There are many debates concerning who integrates the various analyses and decides what is and what is not sustainable (Morrison-Saunders and Thérivel, 2006; Robinson et al., 1990). Apportionment procedures, how to consider uncertainties, and the treatment of compromises and trade-offs are difficult issues requiring further attention (Gibson, 2001, 2006). The inherent flexibility of sustainability can result in the adoption of alternatives that are "good enough," rather than sustainable (Bond and Morrison-Saunders, 2009). The fragmentation of disciplines, sectors, and institutions; weak vertical and horizontal integration; jurisdictional gaps; the fundamentally weak concept of sustainability most commonly applied; the lack of political and institutional will, understanding and SA competency; and the disconnect between attempts to govern the global environment and manage the global economy continue to hinder IA and sustainability integration efforts (Ayre and Calloway, 2005; Eales and Sheate, 2011; Kirkpatrick and George, 2006; Kobus, 2005; Tang, 2010). Sustainability challenges prevailing assumptions, institutions, and practices (Gibson et al., 2005) Accordingly, resistance to change and to the integration of SA into decision making tends to be the norm, with IA in any form (but especially SA) being viewed as an unwelcome hurdle rather than a useful planning mechanism (Eales and Sheate, 2011; George and Kirkpatrick, 2008; Voituriez et al., 2006). The causes of unsustainability are deeply embedded within prevailing institutions (Dovers, 2005). Reorienting and reforming the institutional and political context of IA is, at best, a long-term generational goal (Dovers, 2005).

Monitoring (especially of critical feedback loops and of decision quality), effective SA guidance, far greater emphasis on enhancement, and the robust auditing of SA experiences (which approaches and methods delivered and failed to deliver practical results, sustainability effectiveness) are critical to the advancement of the sustainability knowledge base (Burdett, 2008a; Grinde and Khare, 2008; Hacking and Guthrie, 2008; João et al., 2011; Morrison-Saunders and Hodgson, 2009; Pope and Klass, 2010; Thérivel et al., 2009). Care needs to be taken that more quantitative approaches to integrated IA and SA do not undervalue the qualitative, inhibit stakeholder involvement, and underestimate uncertainties (Duncan, 2008; Hodge, 2004). So far, effectiveness SA reviews range from discouraging to mildly positive (Thérivel et al., 2009; Wilson, 2010). Particular weaknesses include a failure to envision radically different futures; a reactive rather than a proactive approach to policy and option design; a tendency to rely on superficial check-list approaches (breadth over depth); and the less than holistic treatment of climate change, health, and gender impacts (Eales et al., 2005; Kessler and Abaza, 2006; Milner et al., 2005; Wilson, 2010). More attention needs to be devoted to capacity building, interagency coordination, and multi-stakeholder participation (Kessler and Abaza, 2006).

Some argue that sustainability is either not possible or is a "smokescreen" for "business as usual." Others suggest that more fundamental changes in values and behavior, coupled with fundamental institutional changes, are necessary before any discernible progress toward sustainability can be made (Connor and Dovers, 2004). On the bright side, the range of sustainability initiatives is enormous and the record of tangible improvements from these initiatives is considerable. Sufficient experience in undertaking sustainability assessments or appraisals has already been acquired and effectiveness factors (e.g., broad local involvement, early in the process, adequate resources) have been identified (Thérivel and Minas, 2002). An optimistic interpretation would be that IA practice can build on the successes while appreciating and addressing the constraints. It is an overstatement to suggest that IA has made more than a minor contribution to sustainability to this point. IA process reforms, along the lines described above, could increase that contribution.

6.4.4 Methods

Formulating and applying a substantive IA process requires numerous methods sensitive to ecological, social, and sustainability characteristics and objectives. The ecological, social, and sustainability concepts described in the previous subsections demonstrate the need to systematically address interrelationships. IA practice makes considerable use of network analysis, systems diagrams, and modeling to address interconnections and interdependencies. The systematic consideration of interrelationships finds its fullest expression in cumulative effects assessment (CEA). All four jurisdictions provide guidance for selecting and applying CEA methods. Methods for addressing interrelationships among disciplines are not as fully developed as those for considering interrelationships within disciplines.

IA is about decision making for the future. Substantive IA processes must consider long-term implications and explore pathways toward and back from sustainable futures. IA generally relies on projection and forecasting techniques when anticipating future conditions. Although helpful, such techniques provide only a partial picture of a potential future. They are also weak on social concerns, are lacking in vision, often underestimate uncertainties, and are prone to quantitative and conservative biases. Visioning, scenario writing, and story telling are better able to integrate qualitative, social, ecological, and political considerations. They can also provide multiple images of a desired future and that of varying routes to that future. Backcasting helps work back through decisions and actions from a desired future to the present.

The IA process should establish proximity to thresholds; assess progress toward ecological, social, and sustainability ends; and compare alternative courses of action. Ecological footprint analysis, carrying capacity analysis, and environmental indicators (see Table 6.1) can help assess status and choices. The process must adapt to and manage uncertainties and data gaps. Rapid rural appraisal, scenario writing, and adaptive environmental assessment (also see Chapter 11) are well suited to addressing uncertainties. A high level of community participation is essential for making IA processes more substantive. Visioning, story telling, participatory rural appraisal, the ecosystem approach, and social learning can all help in involving the interested and potentially affected parties.

6.5 INSTITUTING A SUBSTANTIVE IA PROCESS

6.5.1 Management at the Regulatory Level

All four jurisdictions (the United States, Canada, Europe, and Australia) explicitly combine procedural and substantive requirements, albeit in different ways and with varying degrees of success. Table 6.3 provides examples of how the four jurisdictions have sought to integrate procedural and substantive requirements. IA requirements can, for example, be made more substantive if IA legislation includes detailed environmental and sustainability policies, objectives, tests, and principles as a "touchstone" for generating and evaluating alternatives and as a framework for identifying, interpreting, and managing effects. The cause of more substantive IA requirements can be furthered by a broad definition of actions, proponents, alternatives, environment, and effects (including cumulative effects) by explicit and systematic links to related substantive environmental policies, plans, strategies, and requirements and through systematic tiering and horizontal integration institutional arrangements. It can also be facilitated by detailed substantive environmental guidance (e.g., biodiversity, human health, social heritage, climate change, significance determination factors); through triggers and special requirements for environmentally sensitive and significant areas; by means of detailed scoping, follow-up, and auditing requirements; and through applied environmental research and sponsoring initiatives. Care should be taken to ensure that environmental quality is not compromised by timing limits, IA substitution institutional arrangements, exemptions, and discretionary authority.

Arguably, the broad application of different forms of IA requirements to various classes of actions is consistent with the intent of IA to broadly integrate substantive environmental concerns into public and private decision making. The danger is that an all-encompassing set of requirements could consume a vast amount of resources, oftentimes in vacuous procedural requirements of minimal environmental benefit. A narrower range of proposed actions, it could be posited, with more tightly circumscribed requirements, could ensure that available resources are focused on those actions most likely to induce significant adverse effects. But such focused requirements ignore the intent of making decision making more environmentally substantive and often miss out on potentially significant environmental effects associated with vulnerable settings and cumulative effects potential. The middle ground between these two positions is more onerous IA requirements for major (with clear thresholds) actions and/or actions in highly sensitive/significant settings; simpler and less onerous requirements (e.g., screening procedures, class assessments) for routine decision making involving actions not likely to induce significant adverse effects; and a more discretionary, but transparent, procedure for actions that, depending on the circumstances (e.g., cumulative effects potential), could fall into either camp. This type of streaming approach to "IA triggering" is facilitated when there is an IA hierarchy such that higher level IAs requirements bind and shape lower level IAs.

On the surface, IA requirements that broadly define the environment (e.g., physical, ecological, social, economic, cultural, health, heritage, sustainability) and effects (e.g.,

Table 6.3 Positive and Negative Examples of Regulatory Level IA Examples Regarding Environmental Substance

United States	Canada	Europe	Australia
(±) National Environment Policy Act (NEPA) broadly outlines national environment policy (e.g., harmony between man and environment, health and welfare, balancing population and resource use, present and future generations); courts have ruled only a procedural duty (±) Broad range of actions (major actions funded, assisted, conducted, regulated, or approved by federal agencies); in practice, largely projects and, to a much lesser extent, plans and programs (±) Broad definition of environment and effects; positive and negative direct, indirect, and cumulative, ecological, social, economic, health, historic, archaeological, and health effects; social, health, and economic effects on own not an EIS trigger (+) References irreversible and irretrievable resource commitments and conservation potential (+) Context and intensity factors provided for significance determinations (+) Considerable substantive guidance (e.g., human health, biodiversity, protected areas, heritage resources, energy conservation, coastal zone management, floodplain management, forest health, environmental quality, pollution and waste prevention and control, cultural resources) (King, 2002) (+) Extensive array of executive orders (e.g., wetlands, invasive species, protected areas, migratory birds) (+) Applied research and coordination initiatives (e.g., ecosystem approach, adaptive management, coastal zone management)	(+) Broad purposes (e.g., promoting sustainable development, avoiding significant adverse environmental effects, cumulative effects) (+) Application broadened to include Crown Corporations, federally funded projects on reserve lands and national airport authorities (+) Factors include effects significance, accident and malfunction potential, and cumulative effects (+) Regulation triggers—selective project types in wildlife or migratory bird sanctuaries, offshore or in Yukon or Northwest Territories (+) Effects definition cross references specific environmental legislation (e.g., Fisheries Act, Species at Risk Act) (+) Treatment of substantive environmental concerns strengthened by mandatory and enhanced monitoring provisions (+) Recent panel decisions have applied a sustainability test and utilized the precautionary principle (+) Each federal agency required to prepare a sustainable development strategy and federal government has a green plan and a sustainability strategy (+) Oversight role by Commissioner of Environment and Sustainable Development (+) Physical and cultural heritage guidance (CEAA, 1998b) (+) Aboriginal Traditional Knowledge guidance (CEAA 2010a) (+) Sponsored research on sustainability-based EA (±) Makes provisions for regional studies but no trigger	(+) Proposed EIA Project Directive (PPD) addresses environmental issues such as resource efficiency, biodiversity, climate change, and disaster risks (+) PPD—linked to Soil Thematic Strategy and Roadmap to a Resource Efficient Europe, UN Convention on Biological Diversity, and Europe strategy for smart, sustainable, and inclusive growth (+) PPD—broad definition of effects (+) PPD—detailed requirements regarding environmental project characteristics, project location, and characteristics of potential impacts (+) PPD approach to substantive environmental concerns strengthened by mandatory scoping and monitoring (−) PPD—limited to major projects (−) PPD time limits could inhibit systematic consideration of environmental concerns (+) SEA Directive—seeks to provide a high level of environmental protection; sustainable development an objective (+) SEA Directive—requirement to identify existing environmental characteristics and problems; reference to value and vulnerability of area due to special natural characteristics or cultural heritage, exceeded environmental quality standards or limit values, and intensive land uses (±) SEA Directive—mandatory for plans/programs prepared for agriculture, forestry, fisheries, energy, transport, waste/water management, telecommunications, tourism, town, and country	(+) Aims of Environment Protection and Biodiversity Conservation (EPBC) Act—protecting environment, especially matters of national environmental significance, biodiversity conservation, protection of world and national heritage, and promotion of ecological sustainable development (+) Detailed conservation of biodiversity provisions, including principles of ecologically sustainable development (Australian Government, 2011a) (+) Specifies matters of national environmental significance; detailed requirements and guidance (+) Provisions for SEAs of policies, plans or programs (e.g., regional development pressures, high growth, multiple stakeholders, complex actions, cumulative effects) (+) SEA mandatory for fisheries and regional marine planning; applied to national environmental protection measures (+) Accepted reforms—greater use of regional environmental plans, strategic assessment, and conservation agreements (+) Environment—ecosystems and parts, including people and communities, natural and physical resources, qualities and characteristics of locations, places, and areas, and social, cultural, and economic aspects; includes indigenous heritage values (+) Direct and indirect impacts; references to short and long impacts and whether unknown, unpredictable, or irreversible significance; courts interpreted as including cumulative effects (+) In response to independent review, government agreed to include vulnerable ecological communities as a matter of

Table 6.3 (*Continued*)

United States	Canada	Europe	Australia
(±) NEPA goals consistent with sustainability; inhibited in practice by procedural orientation (+) Draft guidance document on climate change effects and greenhouse gas emissions (+) US EPA Center for Sustainability (+) NRC research report on incorporating sustainability into EPA principles and practices (+) Various initiatives to improve environmental, energy, and economic performance (+) Updated principles and guidelines for water and land-related implementation studies (+) Gulf coast ecosystem restoration (working group, road map for restoring ecosystem resilience and sustainability) (+) Review of mineral management service (MMS) NEPA procedures for managing natural gas, oil, and other mineral resources on the outer continental shelf (+) Federal sustainability initiative (+) Interagency Ocean Policy Task Force	(±) Focuses on significant adverse environmental effects (−) Narrow range of decision makers (only three), EA Agency, National Energy Board, (NEB) and Canadian Nuclear Safety Commission (CNSC) actions and designated projects only (from project list subject to screening and on a case-by-case basis) (±) Physical activity regulations—various physical projects in selected locations and/or on basis of scale thresholds and other project characteristics (−) Limited to major projects (−) Narrow definition of environment (biophysical only) and effects (areas of federal jurisdiction, broader for effects on aboriginal people; discretion to broaden) (Gibson, 2009, 2012) (−) Application constrained by exemption of infrastructure projects, initiation review period, time limits, and potentially by provincial substitution provisions (−) Removes the requirement of assessing the capability of natural resources to meet future needs (±) Biophysical definition of environment for cabinet submissions; SEA effects—positive and negative ecological, social, and economic effects	and land use planning; includes community-supported programs and plans; excludes national defense, minor, financial or civil emergency; not applied to policies (±) SEA Directive—broad range of environmental issues and effects (e.g., biodiversity, population, human health, fauna, flora, soil, water, air, climate, material assets, protected areas, vulnerability, cultural heritage, landscape, and interrelationships; does not require consideration of social and economic effects; only negative significant environmental effects; includes probability, duration, frequency, and reversibility, transboundary and cumulative effects, human health and environmental risks) (+) SEA Directive cross references sustainability action plans and strategies; required to identify environmental protection objectives (+) European Commission—sustainability assessment for all major policy proposals (sustainability assessment unit) and for trade agreements (+) Extensive substantive guidance and applied research (ECORYS Research and Consulting in Collaboration with IZA, 2010; EC, 2009b; IEEP, 2004; Teller and Bond, 2002; UNEP, 2002)	national environmental significance (+) Protection of matters of national environmental significance also addressed through conservation agreements, bilateral agreements and bioregional planning (+) Cross references to obligations under international environmental conventions and intergovernmental environmental agreements (+) National environmental strategies (e.g., biodiversity, forests, oceans, sustainable development, greenhouse gas emissions) (+) Australian government draft biodiversity policy and draft environmental offsets policy (+) Required to address links to related actions and to allow for federal or state policies, plans, or programs (−) Requirements and guidance regarding social, economic, and equity matters very general

direct, indirect and cumulative, positive and negative, short- and long-term effects) are more likely to provide a comprehensive and integrated assessment of the potential consequences of proposed actions and their alternatives. Such a comprehensive approach is also potentially more conducive to the determination of whether sustainability is being promoted or inhibited. However, as detailed in Section 6.6, there is a well-founded fear that under such an IA regime, socioeconomic benefits will overwhelm the assessment and biophysical concerns will receive much less attention and resources. Socioeconomic benefits, moreover, it is argued, already assume a dominant role in decision making outside the IA process (i.e., a form of double-counting). The counter to this argument is that a system that is limited to biophysical concerns will exclude entirely valid adverse social and economic effects; push IA even further to the periphery of decision making; result in an even less transparent and accessible decision-making process (outside IA requirements); and undermine any efforts to coherently address complex interactions among effect types, cumulative effects, and sustainability.

A somewhat less direct but still important way of integrating substantive environmental concerns into IA requirements is through explicit links to related environmental requirements and forms of environmental management. The linking and blending of these various instruments can, at least in theory, provide a systematic framework for integrating procedural and substantive requirements, vertically among governments and decision-making levels, horizontally across agencies, and among various environmental planning and management initiatives. This type of loosely connected network can, if connections and roles are clearly defined, be effective, efficient, and adaptable, while maintaining the independence of various environmental management and planning initiatives and requirements. The integration of requirements targeted to specific environmental components can help identify objectives and priorities, raise minimum standards, and establish coherent analysis and management approaches (Carter and Howe, 2006; Pritchard, 2005). The greatest danger is that any potential for a holistic perspective will be severely diminished. This is especially the case if IA requirements lack clear substantive objectives and selectively address environmental components and effects; if the links among instruments are not explicit with clearly defined roles; if higher level planning and decision making does not frame lower level planning and decision making; and if there are major substantive gaps, missing connections, unwarranted duplication, and contradictory objectives, roles, and requirements. In such cases, "the whole is decidedly less than the sum of the parts."

Optimistically, a loose network of requirements, guidelines, and initiatives will gradually coalesce into a broad strategy or into a mutually consistent, but loosely affiliated series of strategies. This strategy or strategies will, in turn, lead to a more central role for environmental considerations in decision making and to tangible environmental improvements in the direction of sustainability. IA would assume a pivotal role in this effort. The IA process would be progressively reformed to be more fully conducive to realizing substantive environmental ends. The pessimistic interpretation is that the present "patchwork quilt" will remain largely unchanged or will be narrowed in scope and application. Major gaps and inconsistencies will continue. The EIA and SEA requirements will be too general to make an appreciable difference. Progress (or not) toward sustainable futures will be unclear. The implications for IA process management will remain largely unexplored. Only time will tell which interpretation is more accurate in which jurisdiction.

Figure 6.5 highlights several ways in which IA substance and process can be integrated, based on the experiences in the four jurisdictions. Procedural IA requirements, structured within an IA hierarchy, can integrate substantive IA types, be linked to related substantive environmental requirements, and be placed within the context of sustainability strategies and plans. Substantive requirements can be built directly into IA legislation and regulations. IA requirements can be formally merged with other environmental requirements and/or informally linked to strategic and regional planning and management efforts. Substantive requirements can be comprehensive (e.g., ecological, social, economic, sustainability). They can focus on specific priorities (e.g., ecological sustainability, environmental justice). Procedural and substantive requirements can be addressed through tiering (e.g., regulatory/sustainability assessment, SEA, project-level EIA). An effective blending of the procedural and the substantive will incorporate elements of each of these approaches. The four jurisdictions include aspects of each approach, albeit in different ways and to varying degrees. Distinguishing between effective and less effective combinations would require systematic effectiveness analyses, tempered by jurisdiction-specific adjustments. Still, at least on the surface, directly integrating substantive requirements into IA legislation, regulations, and guidelines, coupled with procedural guidance conducive to realizing substantive objectives and requirements, would seem the most direct route to more substantively effective IA practice.

6.5.2 Management at the Applied Level

Figure 6.6 illustrates an example of substantive IA process. The figure and the process description that follows draw upon the concepts and methods presented in Sections 6.3 and 6.4. IA process managers and participants can "pick and choose" the relevant and appropriate elements.

Start-Up IA, and by extension the IA process, is an instrument for realizing tangible ecological, social, and sustainability objectives. The process begins with an overview of pertinent environmental and sustainability plans, strategies, programs, and other public, private, and multistakeholder initiatives. These initiatives could influence the current and future environmental and community conditions in the geographic areas potentially affected by proposed actions. They provide a context. They could be undermined, complemented, or unaffected by any proposed actions. An analysis of need and opportunities is undertaken. Need and opportunities are addressed both in the conventional sense (e.g., market opportunities, public service needs) and in the sense of identified sustainability problems (i.e., shortfalls between sustainability objectives and expected future conditions). Parties potentially interested and affected by potential actions are identified. The perspectives, concerns, and positions of these parties are identified. Varying worldviews regarding current environmental conditions and desired future conditions are determined. Known sustainability constraints and opportunities are identified.

Study design and scoping are informed by these background analyses. They focus the process on major issues,

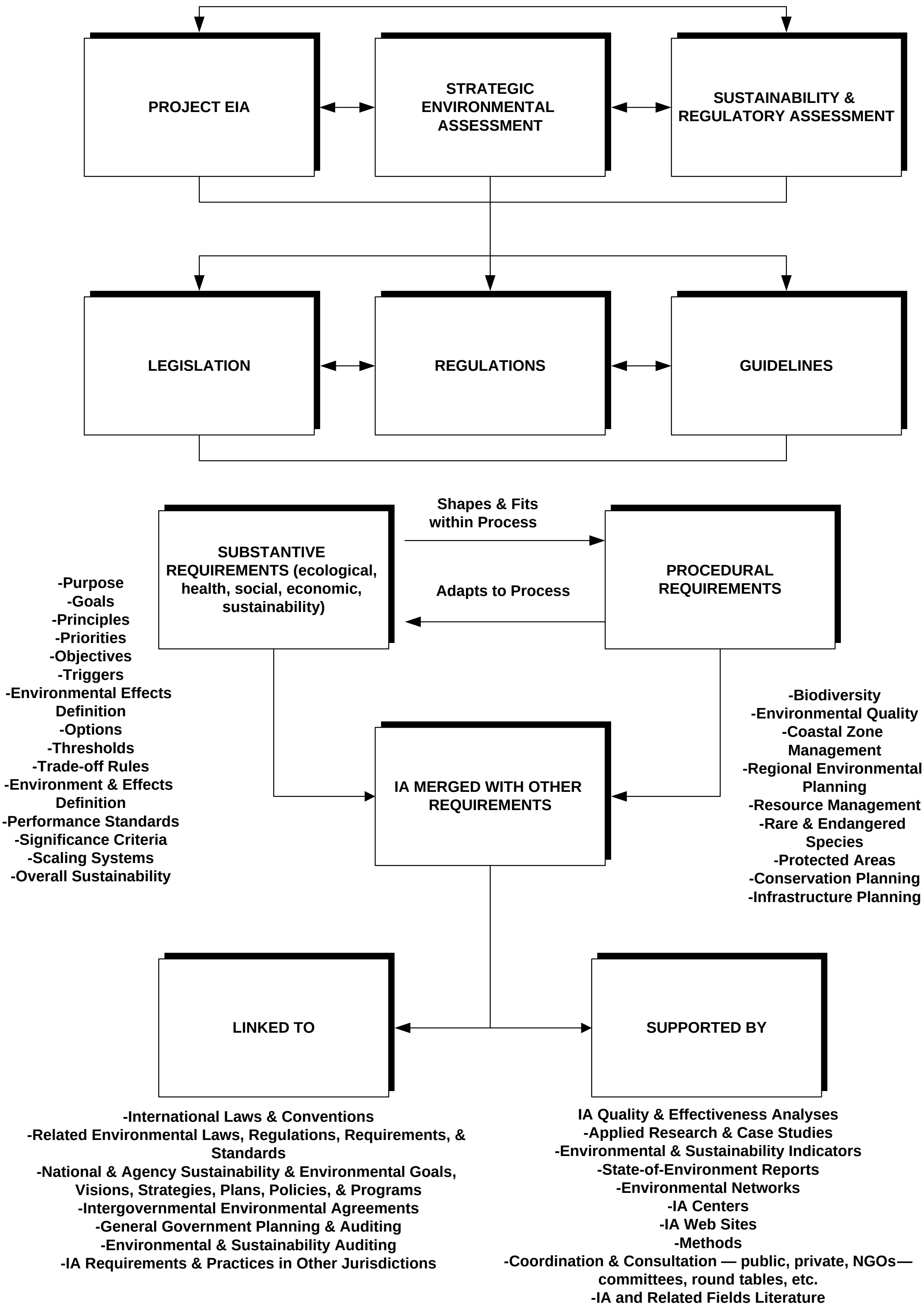

Figure 6.5 Examples of regulatory approaches to integrating IA and substance.

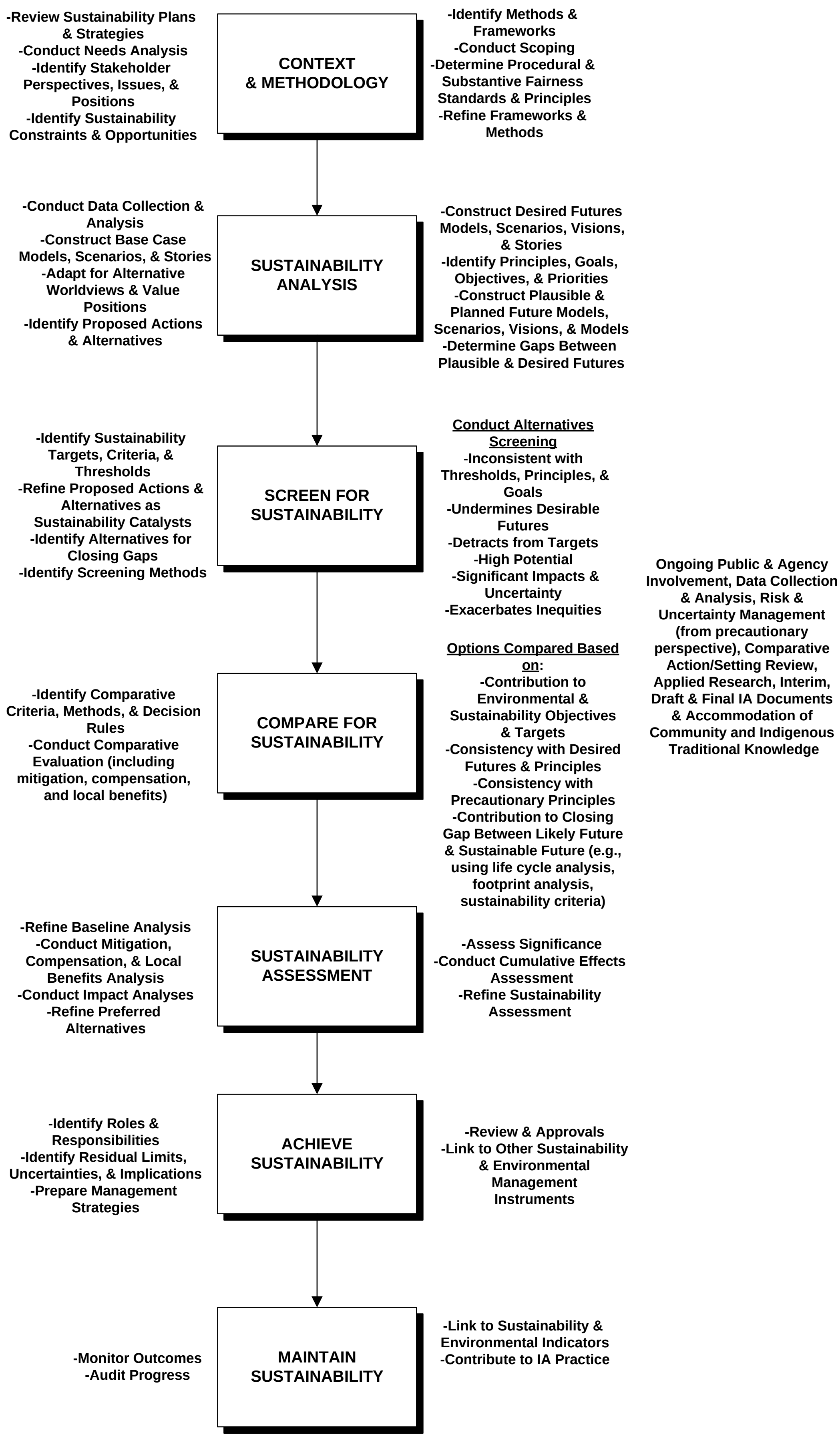

Figure 6.6 Example of a substantive IA process. Adapted from Lawrence (2005a).

needs, and participants within the context of relevant sustainability initiatives, constraints, opportunities, and perspectives. Frameworks for guiding the process and the types of methods likely to be applied in the IA process are identified. Procedural fairness standards and principles are jointly determined to facilitate the full and equal participation of interested and potentially affected parties.

Sustainability Analysis The sustainability analysis establishes the foundation for sustainability assessment. The sustainability analysis employs multiple qualitative and quantitative methods to characterize the present (sustainable and unsustainable activities and environments) and the future (plausible, planned, and desired)—all from multiple perspectives. Conventional IA processes tend to view proposed actions (and their alternatives) as intrusions upon social, economic, and ecological systems—the negative effects of which are to be minimized. In this case, the proposed actions and alternatives are envisioned as potential catalysts for a sustainable future. Methods and frameworks for undertaking the sustainability analysis are formulated and then progressively refined and adapted. A preliminary set of proposed actions and options are identified, refined, and adapted in an ongoing effort to meet the identified need while at the same time facilitating sustainability.

A series of base case (i.e., past and present conditions without proposed and possible actions or their alternatives) scenarios, models, and stories are first constructed. Conceptual and quantitative network diagrams and models explore spatial and temporal patterns of interrelationships between historical and current environmental conditions and activities. Alternative assumptions and inputs address uncertainties and explore varying interpretations. Scenarios and stories describe and explain how present conditions evolved from the past. These integrative tools are jointly formulated and applied with interested and affected parties. The analysis draws upon scientific and traditional data and knowledge. Different base case characterizations reflect alternative worldviews and value positions. Frameworks are constructed to explore overlaps and interconnections among disciplinary models and systems. Group consensus building and conflict resolution techniques identify common ground and residual areas of dispute among the characterizations. The analysis is undertaken at multiple levels (e.g., regional, community, local). It focuses on sensitive and significant environmental components and processes that could potentially be affected by proposed actions and alternatives. Activity patterns that appear sustainable and unsustainable, positive sustainability initiatives (that have and are making a difference), and sustainability constraints and opportunities (building on the start-up analysis) are identified. Multiple iterations are required to explore gaps, uncertainties, links, and varying interpretations. The outcome from these efforts is a small number of partially overlapping and partially interconnected base case characterizations. The core values and underlying assumptions of each are identified. Varying interpretations and perspectives are noted. Where practical, ecological, and social carrying capacities surpassed or in jeopardy are indicated. Major uncertainties and potential implications are highlighted.

The analysis next addresses future conditions, again in multiple ways and from multiple perspectives. Conventional forecasts identify trends in key conditions pertinent to sustainability, appreciating that trends are often a poor predictor of the future. Key attributes of the planned future, as envisioned in public policy and spatial planning documents, are highlighted. Plausible future conditions (pertinent to both sustainability and to proposed actions and their alternatives) are addressed using models, visions, scenarios, and stories. These plausible futures address how conditions (e.g., demographic, ecological, social, economic, political, institutional, technology) might evolve taking into account baseline conditions, forecasts (including those prepared by others), proposed activities in the area, sustainability instruments in operation, and the planned future. Visions, models, scenarios, network diagrams, backcasting, and stories also characterize desired, sustainable futures. The desired futures include both ends states (for various time horizons) and sequences of events (from the present to the future and back from the future to the present). The plausible and desired futures encompass multiple worldviews and value positions, alternative assumptions and interpretations, and varying perspectives regarding the nature and implications of uncertainties. Group processes are again used to search for common ground, to build consensus and to resolve disputes. A complete consensus does not emerge. Residual differences are highlighted for subsequent application in sensitivity analyses and in contingency measures. The analysis focuses on identifying and characterizing discrepancies between plausible, planned futures, and sustainable futures. Instances where plausible futures suggest that social or ecological thresholds could be surpassed are highlighted. The gaps and thresholds provide the basis for identifying sustainability principles, goals, objectives, and priorities. Major remaining uncertainties and potential implications are noted. The analysis is placed within the context of broader government and multistakeholder sustainability initiatives. It also builds on other efforts to characterize plausible and desired future conditions.

Sustainability Assessment Possible actions and their alternatives are reconsidered taking into account the gaps (including thresholds) between the plausible and the desired futures. Ways in which the gaps could be closed are assessed. The actions and the alternatives are modified, to the practical extent to assume the role of a catalyst for narrowing the gaps. The possibility of generating additional alternatives, which might better address the sustainability shortfalls, is also explored.

The sustainability principles, goals, objectives, and priorities are refined into more specific targets, criteria, and thresholds. Methods and exclusionary criteria for screening out unacceptable alternatives are formulated. Alternative screening criteria are formulated to reflect varying perspectives where a consensus cannot be reached among the interested and affected parties. Decision rules are formulated for addressing situations where the results from applying alternative screening criteria conflict. The screening criteria are applied to the proposed action and to the alternatives. Alternatives that are, for example, inconsistent with sustainability thresholds, principles, and objectives, undermine desirable futures, detract from targets, and result in major impacts and exacerbate inequities for socially disadvantaged groups are excluded from further consideration. A precautionary approach is adopted. Thus, marginal alternatives, characterized by major potential impacts and high levels of uncertainty, are also excluded.

Criteria, methods, and decision rules for comparing the remaining alternatives are formulated. The alternatives are compared for their contributions to environmental and sustainability objectives, for their consistency with desired futures and with sustainability principles and criteria, and for their potential contribution to closing the gaps between plausible and desired futures. The comparison of alternatives is supported by techniques such as life cycle and footprint analysis. Uncertainties and alternative interpretations are addressed with sensitivity analyses. A precautionary approach is applied. The implications of applying mitigation and enhancement measures are explored. Preferred alternatives are selected, supported by a clear rationale.

Baseline conditions, pertinent to the preferred alternatives, are characterized. Individual and cumulative impacts associated with the preferred alternatives are identified, predicted, and interpreted (in terms of significance). Mitigation and enhancement measures are introduced to prevent and offset adverse impacts and to enhance benefits. These activities largely mirror those associated with conventional IA processes. However, unlike conventional processes, the analysis focuses on using and refining the proposed and potential actions as sustainability instruments or catalysts. The impact analysis also builds toward an overall assessment of contribution to sustainability (e.g., contribution to or amelioration of global and transboundary problems, maintenance of ecological integrity, maintenance of natural capital, waste generation within assimilative capacity, reduced energy and material use, maintenance of environmental quality, biodiversity maintenance, amelioration of intergenerational and intragenerational inequities, pollution prevention, avoidance of risk to carrying capacity). Implementation, monitoring, and auditing roles and responsibilities are specified. Residual limits (e.g., knowledge, resource, institutional) and uncertainties, together with associated implications, are detailed from a precautionary perspective (e.g., minimum regrets).

Interested and affected parties are fully involved in all facets of the sustainability assessment.

Approvals and Postapprovals The process culminates in final conclusions regarding the acceptability, on sustainability grounds, of proposed and potential actions. A management strategy is included with links to other IA tiers and to other environmental management and sustainability instruments, networks, and strategies. Measures to ensure follow-up coordination, communications, cooperation, public involvement, and coalition/capacity building are instituted. Consideration is given to how to best overcome implementation barriers. The implementation measures could include institutional reform.

If proposed action(s) are acceptable, with or without approval conditions, environmental changes, impacts, and mitigation/enhancement are monitored. Monitoring results provide the basis for ongoing environmental and sustainability management. The environmental change monitoring results are incorporated into broader environmental and sustainability indicator systems. The IA process is audited. The lessons learned from the auditing analysis are broadly circulated as a contribution to IA practice.

Ongoing Activities The IA process is highly iterative, dynamic, and collaborative. It provides for both continuous (e.g., advisory committees) and periodic (e.g., workshops, forums, conferences, open houses) public and agency involvement opportunities. The workshops, conferences, and forums support generating, refining, and integrating visions, scenarios, models, and stories. They also contribute to generating and applying goals, objectives, criteria, principles, and decision rules. Surveys, interviews, meetings, and focus groups help identify perspectives, concerns, and initiatives. Periodic opportunities (e.g., open houses, meetings) are provided for broader public and government official (elected and nonelected) involvement. Provision is made for public and agency involvement during the postapprovals stage. Participant assistance is provided to ensure the effective involvement of all interested and affected parties. Specialists participating in the process are a part of and maintain contact with broader environmental management and sustainability networks.

Data and analysis, including traditional knowledge and reviews of comparable situations, are incorporated into each activity. Particular consideration is given to related sustainability experiences. Technical (e.g., model building, scenario generation) and procedural (e.g., consensus building, conflict resolution) advice and applied research are provided whenever needed. Impact and uncertainty management are continuous functions in the process. Numerous interim documents are generated as the process unfolds. The results of the process are consolidated into draft and final IA documents, which provide a complete decision-making basis. Documentation extends into postapprovals with the production and circulation of monitoring and auditing reports. The process is knit together by the central purpose and theme of facilitating substantive, sustainable environmental improvement.

Adaptations by IA Type Substantive IA processes vary by IA type and level. Table 6.4 outlines examples of good

Table 6.4 Substantive IA Practice by IA Type

Substantive SA Practice	Substantive SEA Practice	Substantive EIA Practice
Treats SA as a means of integrating all substantive IA types and levels	Places within substantive policy context	Identifies and evaluates ecological and social/health resources and features likely to be affected
Employs strong conception of sustainability; seeks sustainable outcomes milestones and ultimate state not just sustainability-oriented processes	Ensures SEA role in implementing substantive policies and requirements	Identifies changes likely to affect valued ecological and social components
Establishes a workable sustainability concept in decision context	Uses biodiversity, social and sustainability checklists	Ensures appropriate scoping (e.g., temporal and spatial scales, choice of measurable indicators)
Approaches sustainability from a systems perspective; principles/objectives rather than pillar-based	Identifies, constructs, and applies environmental objectives and indicator systems	Predicts, characterizes, mitigates/enhances, and assesses significance of impacts; monitors and manages (including use of direct and indirect environmental offsets and compensation)
Explicitly commits to sustainability objectives, criteria and trade-off rules	Identifies biodiversity social, health and sustainability friendly options	Emphasizes positive outcomes for biophysical and socioeconomic environment
Clearly identifies sustainability principles, purposes, issues, and indicators	Applies holistic approach	Utilizes participatory approaches (e.g., interactive community forum) to assess options and impacts
Applies no net loss principle; seeks positive sustainability contribution	Operates at multiple spatial levels and temporal horizons	Seeks a fair distribution of effects and risks; enhances distributional equity over space and generations
Avoids a reductionist approach; seeks to facilitate resilient socioecological systems	Considers cumulative threats	Emphasizes social/ecological enhancements
Emphasizes climate change	Expands the use of SA, SIA, HIA, and EcIA in SEA and integration of each into SEA	Seeks free, informed, and prior consent of affected publics
Monitors from a sustainability perspective; protects the future	Seeks an enhanced understanding of ecosystems and of society, and related processes	Strengthens local project governance (e.g., impact and benefits agreements)
Uses models to assess regional sustainability	Considers distribution of effects (ecological, intragenerational, intergenerational, vulnerable populations)	Seeks to balance best available science, competing societal objectives, and local political considerations
Uses conceptual frameworks and indicator systems to assess progress toward sustainability	Assesses micro- and macroecological and societal changes independent from and resulting from impacting events	Utilizes GIS and surveillance systems
Uses sustainability criteria in alternatives generation; seeks alternatives that offer greatest overall benefits and avoid undesirable trade-offs	Devotes more attention to ecological, social, economic, and health issues in predecision and follow-up stage	Assesses cumulative impacts on biophysical and human environment
Ensures preferred alternative designed for resilience and adaptability	Clearly explains models and assumptions if quantitative approach	Assesses equity and legacy implications (including pace and scale options); seeks lasting benefits; ensures active transition planning
Identifies critical decision windows that can influence sustainability outcomes	Enhances recognition of ecological, social, and health determinants	
	Institutes ecological, social, and health disparity policy initiatives	
	Institutes longitudinal surveillance systems	
	Uses SA to identify SEA shortcomings; need for SEA to more fully engage sustainability concept and apply sustainability science	
	Recognizes the irreducibility of risk and uncertainty	
Substantive EcIA Practice	Substantive SIA Practice	Substantive HIA Practice
Identifies biodiversity management objectives and principles (e.g., no net loss, net benefits—enhancement)	Integrates social concerns from the outset	Integrates health disciplines
Proactively considers biodiversity from the outset; includes ecosystem services, ecological connectivity, and landscape	Obtains a good understanding of the likely affected communities (profiling); identifies community needs and aspirations	Integrates and engages health professions
Ensures a clear understanding of environmental capacity thresholds	Ensures effective public participation, collaboration, and mutual learning	Seeks industry-wide HIA standards
Ensures consistency with international obligations (e.g., treaties, conventions) and national biodiversity policy	Integrates local knowledge	Devotes greater attention to health inequities and to health and cumulative effects determinants
Collaboratively involves ecologists	Assesses distributive and poverty effects (e.g., intra and intergenerational equity, gender equity, human rights and justice issues, perception changes, sociopsychological effects, cultural	Ensures that HIA is gender sensitive
		Assesses the effect of HIA on population health (e.g., retrospective evaluation)
		Addresses the need for better health information systems, knowledge of health impacts, and access to previous HIAs
		Ensures sufficient resources

Table 6.4 (*Continued*)

Substantive EcIA Practice	Substantive SIA Practice	Substantive HIA Practice
Determines ecosystem loss, compensates for biodiversity loss, and restores ecological processes (reverse harm) Takes an adaptive approach to building ecosystem resilience; integrates ecological mitigation and enhancement measures	heritage impacts, and cumulative effects on human environment) Applies social performance standards Ensures effective (structured, hypothesis-testing) social follow-up Emphasizes social sustainability Identifies social development needs	Broadly defines health determinants (e.g., gender) Facilitates HIA capacity building Broadly defines health alternatives (e.g., goals, knowledge, institutional)

Sources: Ahmadvand and Karami (2009), Athanas (2005), Australian Government (2011b,c), Becker et al. (2003), Benson (2003), Bond (2010), Bond and Morrison Saunders (2009, 2011), Bond and Pope (2012), Bond et al. (2004, 2012), Burdett (2008a,b), Burdge (2003b, 2004), Byron and Treweek (2005), CEAA (1996a,b), Croal et al. (2010), Dalal-Clayton and Sadler (2004), Dannenberg et al. (2006), Desmond (2007), Devuyst (2000), Donnelly et al. (2006, 2007), Donnelly and O'Mahoney (2011), Eales and Sheate (2011), Esteves and Vanclay (2009), Esteves et al. (2012), Slootweg et al. (2006), Fahy and Cinnéde (2007), Fischer (2003, 2011), Fischer et al. (2010), Franz and Kirkpatrick (2007), Gasparatos et al. (2007), Geneletti (2002, 2003), Geneletti et al. (2003), Genter et al. (2008), George (1999), Ghanimé et al. (2011), Gibson (2000, 2006a, 2009, 2011), Gibson et al. 2005; Gontier et al., 2006; Govender et al., 2006; Grinde and Khare 2008; Hacking and Guthrie 2006; Harris et al. (2003), Harris-Roxas et al. (2012), IAIA (2003, 2005), ICPGSIA (2003), IEEM (2006), Jiliberto (2004), João et al. (2011), Jones and Slinn (2008), Khera and Kumar (2010), Kobus (2005), Kolhoff and Slootweg (2005), Krieger et al. (2003), Kumagai et al. (2006), Landsberg et al. (2011), Letsela et al. (2010), Lord (2011), Mandelik et al., (2005), Morrison-Saunders and Arts (2005), Meynell (2005), Morgan (2003a), Noble and Bronson (2006), Péti (2012), Partidário (undated), Pischke and Cashmore (2006), Peterlin et al. (2008), Pope (2006), Pope and Grace (2006), Pope et al. (2004, 2005), Pritchard (2005), Quigley and Taylor (2003), Puschchak and Farrugia-Uhalde (2009), Rajvanshi et al. (2011), Rowan and Streather (2011), Sadler and Jurkeviciute (2011), Schirmer (2011), Sharma (2010), Sheate (2011), Slootweg and Kolhoff (2003), Söderman and Saarela (2010), Storey and Jones (2003), Storey and Noble (2005), Tetlow and Hanusch (2012), Thérivel (2010), Treweek et al. (2005, 2011), US CEQ (2010a), Utzinger et al. (2005), Villani (2011), Wale and Yalew (2010), Wegner et al. (2005).

practices for integrating substantive environmental concerns by IA level (SEA, project EIA) and by substantive IA type (EcIA, SIA, HIA, SA).

SA, EcIA, SIA, and HIA are inherently substantive. Key substantive issues with these IA types tend to pertain to which substantive concerns are especially critical, and how they can be most effectively introduced, linked, and integrated into a coherent whole.

Substantive EcIA practice proactively emphasizes biodiversity management principles and objectives, ecosystem services, and ecological connectivity and landscape issues from the outset. It stresses the importance of placing IA practice within the context of international and national policies and requirements, collaboratively involves ecologists, and focuses on environmental capacity issues. It seeks to determine, compensate for, and restore ecosystem loss; adopt an adaptive management approach to building ecosystem resilience; and integrate ecological mitigation and compensation measures.

Substantive SIA practice focuses on intergenerational and intragenerational equity, human rights and justice, perception changes, sociopsychological effects, cultural heritage effects, and cumulative human environmental effects. It emphasizes the importance of integrating social concerns from the outset. It stresses effective public participation, collaboration, and mutual learning. It seeks a sound understanding of the characteristics, needs, and aspirations of potentially affected communities and populations. It facilitates the integration of local knowledge. It concentrates on distributive and poverty effects. It strives to identify and meet social development needs. It applies social performance standards, ensures effective follow-up, and seeks to contribute to social sustainability.

Substantive HIA practice effectively engages and integrates contributions from the health disciplines and professions. It assesses population health, addresses an extensive range of health alternatives (e.g., alternative goals, forms of knowledge, institutional choices), and focuses on health inequities. It is gender sensitive. It broadly defines health determinants and cumulative effects. It facilitates capacity building, ensures sufficient resources, and seeks to establish and raise industry-wide HIA standards. It addresses the need for better health information systems, enhanced knowledge of health impacts, and access to previous HIAs.

Substantive SA practice represents a means of integrating substantive issues into all IA levels and types. It employs a strong sustainability conception, focuses on sustainability outcomes (not just sustainability-oriented processes), and approaches sustainability from a systems perspective. It concentrates on critical decision windows. It is appropriate to the decision context. It avoids a reductionist approach. It explicitly commits to and applies sustainability purposes, principles, issues, objectives, criteria, indicators, and trade-off rules (e. g., no net loss, positive sustainability contributions). It seeks to facilitate resilient socioecological systems. It emphasizes climate change issues. It monitors from a sustainability perspective (i.e., protect the future). It applies models, conceptual frameworks, indicator systems, criteria, and other methods to structure the integration of sustainability concerns to assess progress toward sustainability. It ensures that preferred alternatives are resilient and adaptable, avoid undesirable trade-offs, and provide the greatest overall benefit.

SEA and project-level EIA are, by definition, substantive in the sense that they seek to broaden decision making to encompass environmental concerns. Unfortunately, perhaps in part because of the vagueness of their substantive aspirations, they have tended to focus on procedures over outcomes. As a consequence, the contribution of SEA and EIA to the realization of substantive environmental ends has either been uncertain or less than hoped. The need to make SEA and EIA more environmentally substantive in terms of outcomes has become a recurrent theme in recent years in IA theory and practice.

Substantive SEA practice is framed by broader environmental policies and requirements. It emphasizes tangible, positive environmental outcomes. It employs a holistic understanding of ecosystems and society. It systematically integrates substantive IA types (e.g., SA, SIA, HIA, EcIA), issues, and methods from the outset and extending through follow-up (e.g., longitudinal surveillance). It formulates and applies specific objectives and indicators. It employs multiple scales and time horizons. It clearly explains methods and assumptions. It recognizes the irreducibility of risks and uncertainties. It focuses on biodiversity, social, health, and sustainability-friendly options. It thoroughly assesses micro- and macroecological and social change processes. It systematically assesses the determinants of effects, the distribution of effects, and the cumulative effects.

Substantive project-level EIA practice focuses on valued ecological and social components, features, resources, and processes. It ensures scoping is appropriate to the context. It makes effective use of geographic surveillance systems. It systematically identifies, mitigates/enhances, interprets the significance of, and manages a broad range of positive and negative, direct and indirect ecological, social, health and cumulative options and effects. It emphasizes positive substantive environmental outcomes and enhancements. It seeks a fair distribution of effects, risks, and lasting benefits. It employs participatory approaches to assess options and effects. It seeks the free informed and prior consent of the affected public. It strives to strengthen local project governance (including transitional planning). It seeks to balance the best available science, competing societal objectives, and local political considerations.

6.6 CONTEMPORARY CHALLENGE—HORIZONTAL IA INTEGRATION

Integration in IA is a "hot topic" and a recurrent theme in IA theory and practice. Integration can refer to the integration of IA and planning/decision making (addressed in Chapter 3), vertical integration (e.g., as in tiering among policies, plans, programs, and projects) (addressed in Chapter 8), and horizontal integration (among, e.g., ecological, social, health, and economic considerations) (Lee, 2006; Pope, 2006). This section focuses on horizontal integration.

Integration can occur at the regulatory (e.g., laws, regulations, guidelines, policies) and/or applied levels. It can encompass procedural arrangements, organizational/institutional arrangements, and methodology (Fischer, 2006; Milner et al., 2005; Pope, 2006). Horizontal integration is generally displayed as a continuum ranging from no integration (e.g., minimize biophysical only or separate IAs for each substantive area) to full integration (e.g., integrated IA, sustainability assessment). Examples of middle ground options include (a) minimizing biophysical, direct heritage, and indirect socioeconomic effects; (b) minimizing direct and indirect negative biophysical and socioeconomic effects; (c) positive and negative biophysical, social, and economic effects; (d) trading off biophysical, social, and economic effects; (e) triple bottom line—biophysical, social, and economic; (f) mutually reinforcing positive, net gains—weak sustainability (natural capital can be fully substituted by man-made capital); (g) net gains sustainability and social justice; (h) strong sustainability in the use of natural capital, permitted only if they are fully replaced; (i) strong sustainability and precautionary principle; and (j) combinations (Fischer, 2007b; Kirkpatrick and George, 2006; Morrison-Saunders and Thérivel, 2006; Pisani and Sandham, 2006). As demonstrated in Table 6.5, there are strong arguments for and against integration. There also is little consensus regarding how far along the continuum is appropriate and under what circumstances.

The case for no integration pertains largely to keeping true to the original intent of IA (e.g., focused on biophysical; higher profile for natural environment; more easily understood and coherent; greater decision making weight, profile, and resources; greater advocacy role). It also avoids various risks associated with integration (e.g., "watering down" of biophysical, being associated with processes with limited decision-making effectiveness, being force-fit into inappropriate frameworks, being dominated by other decision-making factors). The same case could be made for keeping SIA and HIA separate, although the likelihood of institutional arrangements that provide sufficient resources to support parallel "action-forcing" systems that somehow come together at the end in the political arena appears remote.

A more likely scenario, if no integration is the preferred system, is competing systems, where there are winners and losers (e.g., formal biophysical and selective indirect social effects, informal, ad hoc, and secondary status for social and health concerns assessment). This is largely the pattern in the four jurisdictions. Also, having a separate system, with, for example, a biophysical emphasis, does not assure the decision-making effectiveness of such factors or a more prominent political position. It could instead contribute to the marginalizing of natural environmental concerns with the "real" decision making occurring outside the IA process. Moreover, there is a considerable price to be paid for no integration (e.g., ignores interconnections among types of environmental and cumulative effects, lacks holistic perspective, prevents "win–win" solutions, impairs sustainability potential, excludes valid environmental impacts and public concerns and preferences, is politically polarizing).

The case for integration is largely based on potential, positive environmental and procedural outcomes from integrated IA and/or sustainability assessment. The benefits of

Table 6.5 The Challenge—Integration of Substantive IA Types

	Not Integrated (e.g., Separate IAs, Biophysical Only)	Full Integration (e.g., Integration IA, Sustainability Assessment)
Efficient use of resources	(+) Resources focused on biophysical (−) Wasted resources if HIA and SIA have to take on tasks more appropriate to EIA and SEA (−) Danger that individual fields will sink under their own weight if continue to operate separately (−) Resources dispersed among multiple IAs; duplication and overlap	(+) Reduced duplication of reports and double-counting (+) Can facilitate more efficient and effective resource allocation (focused on potentially significant impacts and interactions); benefits of shared information and of time and resource savings (+) Takes advantage of established procedures, practices, and decision-making recognition (+) Provides opportunities for streamlined appraisal process (−) Resources dispersed over multiple effect types (−) Integration of little value if minimal capacity to address (−) Danger that integrated approaches could become too unwieldy; could become a "catch-all" for every conceivable topic
Decision-making effectiveness	(+) Privileges environmental factors; environmental concerns not marginalized (+) SIA and HIA not well suited to EIA/SEA (e.g., litigious environment, emphasis on quantitative/technical) (+) More suited for informing decision making if standalone (+) Avoids the danger of working with process often criticized for low effectiveness and weak implementation (+) Avoids the issue of resistance by EIA and SEA professionals for consideration of health and social concerns (+) May raise the profile of certain issues and help ensure decision-making weight (−) Value of standalone IA types limited if not broad, system-wide support across government for each IA type (−) Separating makes it harder to integrate into decision making; competing with other IA types (−) Decisions could be made based on considerations separate from IA process (−) If separate, some IA types will lack "action-forcing" mandate (−) Partial appraisals, including EIA, have a strong regulatory base	(+) All environment related decision making addressed at once under a legal mandate; comprehensive decision-making basis; greater credibility (+) Lifts the consideration of health and social issues to policy and project level; might not occur without trigger; provides regulatory standing and helps promote awareness (+) Decision makers provided with full range of impacts and options (+) Will lead to greater awareness of social and health issues and impacts (+) Helps build constituency and ensures legitimacy of HIA, EcIA, and SIA (+) Political appeal of sustainability could extent IA influence (+) Growing receptiveness to integrating different forms of IA; growing acceptance of sustainability (+) Growing recognition of the role of integration in public and private decision making (−) Tendency for economic to dominate; biophysical, health, and social effects marginalized; undermines the goal of building environmental considerations into decision making (−) Social and economic already dominate decision making; simply reinforces (−) If poorly integrated, runs a risk of marginalizing all substantive concerns (−) If sustainability too vague, substance will be lost; quantity over quality (−) Won't work if agencies lack capacity and/or are not convinced of benefits (−) IA, if broadened, weak tradition of addressing social and health issues; runs the risk of lowering standing of health and social concerns in eyes of decision makers (−) Integrated appraisal does not enjoy strong regulatory support (−) Integrated approaches often used loosely and uncritically
Transparency and ease of understanding	(+) Focused on narrower scope of environment; more easily understood (+) If kept separate, no uncertainty regarding what is best for the environment (−) Connections to excluded impacts and benefits; decision-making role not transparent	(+) All effects and interconnections addressed at once (+) Can provide a comprehensive evidence base; illustrates planning and decision-making process (+) All human judgments explicit (−) When all effects addressed, IA process and documents can be very complex and difficult to understand (−) Danger environmental issues and role submerged and undervalued (−) Sometimes so inclusive, loses clarity
Completeness and coherence	(+) More in-depth analysis if biophysical only (+) More coherent if confined within well-established biophysical frameworks and models	(+) Complete and coherent analysis of fully array of direct and indirect, positive and negative effects; easier to integrate under the umbrella of contribution to sustainability (+) Raises standard—net environmental benefits, explicit thresholds and trade-off rules, enhancement opportunities, and preferred futures

Table 6.5 (*Continued*)

	Not Integrated (e.g., Separate IAs, Biophysical Only)	Full Integration (e.g., Integration IA, Sustainability Assessment)
	(+) EcIA, HIA, and SIA will never reach full potential if subsumed under EIA and SEA; on own can develop methods and demonstrate value; if combined distorted and confined (−) When separate, tendency to be limited to mitigating negative (−) Many potential direct and indirect impacts excluded from the process (−) Interconnections between biophysical and socioeconomic not addressed and unclear (−) Inhibits ultimate integration of substantive environmental concerns	(+) When combined resources and mandates; facilitates sub-fields reaching full potential (+) Easier to trace cause effect chains (+) Facilitates integration of core values of SIA and HIA; human well-being fully addressed (+) Better cooperation and coordination (+) Sufficient good practice examples that full integration possible and practical (−) With effort dispersed across such a wide array of issues and effects, danger of superficial analysis (if any) of effects that should be addressed in detail (−) Danger that some impacts (e.g., social) will be "force-fit" into unsuitable frameworks (−) When terminology and objectives vague and unclear, inhibits the understanding and determination of positive outcomes (−) Regulatory agencies and practitioners lack social and health expertise and counter to entrenched practices
Bias and balance	(+) Eliminates potential for dominance of biophysical by socioeconomic; environmental dimension kept central (+) Maintains biophysical emphasis; easier to maintain integrity of methods (+) When separate, can focus on IA type (e.g., social, health) issues and not compromise values, frameworks, models, and methods (−) If separate, social and health issues not addressed or minimal consideration	(+) If properly scoped and managed, should be possible for all potentially significant effects and interactions to be adequately addressed (−) Tendency for secondary status for biophysical and social concerns—could "water down" treatment of such concerns; the illusion of balance (−) Risk of integrated appraisals being captured by dominant interests (−) Argument that SA overly promotes economic agenda and undermines environmental gains (−) Could result in reduction in the integrity of frameworks, models, and methods of individual IA types (−) Inhibited by professional bias of EIA/SEA practitioners (−) Tendency of quantitative, "comprehensive" approaches to bury uncertainty and undervalue qualitative (−) Can allow trade-offs between individual issues to be hidden
Natural environmental protection and enhancement	(+) Consistent with core reason for SEA and EIA (i.e., ecological rationality) (+) Focused on natural environment (+) Recognizes the ultimate goal—environmental regulation rather than integration per se (−) Other aspects of environment not considered or given secondary status (−) Could ultimately be detrimental to natural environment because lacks holistic perspective of natural/human environment interactions	(+) Emphasis on mutually beneficial solutions conducive to greater emphasis on environmental enhancement; more opportunities to identify WWW solutions (+) Possible to retain emphasis on natural environment by giving preeminent position to ecological sustainability (+) Comprehensive approach more conducive to effective environmental management (−) Dilution of IA focus could undermine the future of natural environment; breadth over depth (−) Danger that environmental quality and capability eroded under the guise of integrated IA (−) Danger that shifts emphasis from substantive to procedural (−) Danger of substance lost in sustainability rhetoric; malleable concept; perpetuates status quo (−) Danger of legitimizing (if three pillar approach) trade-off of environmental loss for economic gain and social benefits (−) Danger that environmental concerns undervalued if objectives set by proponents and decision makers (−) Not in best interests of the environment
Synergistic potential, cumulative effects, and sustainability	(+) Potential for synergies with individual IAs (+) Avoids the problem of environmental–socio–economic trade-off being submerged in documentation	(+) Provides a framework for systematic consideration of interactions and cumulative effects (everything connected, only way of ensuring all trade-offs addressed); all under the umbrella of sustainability assessment (+) Provides opportunity for multiple, mutually enforcing gains—greatest overall benefit and avoidance of undesirable trade-offs (+) Added value (e.g., environmental and social determinants of health)

(*continued*)

Table 6.5 (*Continued*)

	Not Integrated (e.g., Separate IAs, Biophysical Only)	Full Integration (e.g., Integration IA, Sustainability Assessment)
	(+) Better as standalone because of lack of progress in integration where has been undertaken (−) Limited potential for addressing synergies among separate IAs or between included and excluded aspects of environment (−) Only partial treatment of interconnections among effects, cumulative effects, and sustainability (e.g., ecological sustainability); even ecological sustainability difficult to address systematically because of limited consideration of interconnections to human environment	(+) HIA, EcIA, and SIA can benefit from each other and from literature and experiences of EIA and SEA (+) Makes it possible to fully explore potential "win–win–win" synergies and sustainability opportunities (+) Integration (the essence of sustainability) essential if all IA types have to be brought together under umbrella of sustainability (−) Analysis may be so wide ranging, vague, and superficial that synergistic opportunities and cumulative effects are addressed only superficially (−) Allows trade-offs among individual issues to be hidden (−) Sustainability may be so weakly defined that net negative effects or outcomes unclear (−) Argument that sustainability anthropocentric
Stakeholder and public involvement	(+) Stakeholder involvement focused on a small number of effects and issues; not "watered down" (−) Many public issues, stakeholders, and interconnections excluded from process; no public forum for addressing (−) Ignores needs and preferences of planners and policy-makers who need as much balanced and impartial information as can obtain (−) Inhibits mainstreaming of health, social, and gender interests (−) Public fatigue—asked to participate in too many IAs	(+) Possible to fully involve all interested and potentially affected parties; could facilitate stakeholder involvement (+) Broad definition of environment more conducive to public participation and collaboration; easier to identify and explore interrelationships among issues (−) With resources so widely dispersed, opportunities for "in-depth" involvement may be limited (−) Danger that overly complex IA analysis or overly superficial analysis (e.g., checklists) will inhibit involvement (−) Danger that public involvement procedures may be dominated by particular issues or stakeholders (−) Impossible to have public debates when everyone's opinion is equally considered ("smoothie model")
Democratic accountability	(+) Standalone IA can operate more effectively in terms of political advocacy (+) Political, value-based questions continue to be addressed in political arena (−) Danger that narrowly defined IA will be marginalized; reinforces role of decision-making factors outside the IA process (−) Excludes many valid public concerns from agenda (−) Danger that separate IAs will have to compete in political arena (−) Counter to interests of politicians who need more analytical and knowledge support (−) Separate treatment of substantive issues can be politically polarizing	(+) All factors affecting decisions within IA process; decision making accountable within IA process (+) Reflects breadth of public concerns (+) Helps institutionalize HIA and SIA (+) Reflects trend in central government departments and elsewhere (+) Helps raise awareness by decision makers of full array of potential consequences (+) Integrated assessment can help secure regulatory and social approval/acceptance (−) Decision makers and others may bypass the process regardless of how comprehensive the process is (−) Removes political/value-based questions (e.g., social vs. ecological) from democratically accountable decision making and instead addresses with technical/rational methods (−) Danger that expert-driven systems will undermine democracy (−) Weakens environmental advocacy role

Sources: Ahmed (2004), Azcarate and Balfors (2009), Bhatia (2007), Bina et al. (2011), Birley (2003), Bond et al. (2011), Burdett (2008a), Cole and Fielding (2007), Craik (2008), Dannenberg et al. (2006), Duncan (2008), Duncan and Hay (2007), Eales et al. (2005), Farley and Smith (2012), Fischer (2006, 2007b), Gibson (2006a), Gershberg (2002), Gibson (2010), Hacking and Guthrie (2011), Hacking and Guthrie (2008), Harris and Spickett (2011), Jackson and Illsley (2007), João et al. (2011), Kirkpatrick and George (2006), Lawrence (2009), Milner et al. (2005), Morgan (2011), Morrison-Saunders and Fischer (2010), Morrison-Saunders and Thérivel (2006), McCaig (2005), McCluskey and João (2011), Nilsson (2009), Orenstein et al. (2010), Ortolano (2008), Pisani and Sandham (2006), Pope (2006), Pope and Dalal-Clayton (2011), Pope et al. (2005), Scrase and Sheate (2002), Sadler (2011a), Sinclair et al. (2009), Thérivel (2010), Vanclay (2010), Wernham (2007), Wright et al. (2005).

integration have yet to be consistently demonstrated. Integrated forms of assessment may integrate all potentially significant environmental concerns (including their interrelationships) into decision making in a manner that facilitates and influences decision making and contributes to the realization of positive environmental outcomes. They may reflect a broad range of public concerns. They may effectively allocate resources. They may ensure transparency. They may avoid bias and imbalance, especially the domination of ecological, health, and social concerns by economic imperatives. They may protect and enhance the natural environment. They may systematically consider cumulative effects. They may facilitate stakeholder and public involvement. They may enhance the potential for sustainability (i.e., multiple mutually reinforcing gains, bad trade-off being avoided). They may contribute to democratic accountability. However, it is just as possible that integration, if improperly framed and conducted, can be wasteful, burdensome, unfocused, superficial, excessively procedural, vacuous, "captured" by narrow interests, incoherent, unsupportable in terms of institutional and resource capacity, excessively anthropocentric, reinforcing of the "status quo," of little value in protecting and enhancing the environment, and inhibiting of democracy.

In view of the above, the question then becomes—can such an integration (or some form of partial integration) be instituted, which can retain the positive features of no integration and realize the potential of integration, without suffering its' potential pitfalls—all within appropriate (designed to context) integrative regulatory and applied frameworks? The answer would seem to be a conditional yes. That is, integration is desirable but only if certain regulatory and applied preconditions are first satisfied (Azcarate and Balfors, 2009). There is no shortage of examples of such measures. They pertain to institutional, political, regulatory, and professional reforms, resources, and capacity building—measures that challenge the status quo (Biermann et al., 2012; Eales et al., 2005; Harris and Spickett, 2011; McCaig, 2005; Nilsson, 2009; Pisani and Sandham, 2006; Pope, 2006). They concern methodological integration research and testing, coordination and cooperation initiatives, and political awareness raising efforts (Ali et al., 2008; Bhatia, 2007; Birley, 2003; Dannenberg et al., 2006; Morgan, 2003b; Wright et al., 2005). They include environmental and risk/uncertainty thresholds and mitigation/enhancement objectives, measures, and positive outcomes that options and proposed actions must clearly satisfy (João et al., 2011; Mishra, 2009; Thérivel, 2010; Thérivel et al., 2009). They encompass transparency, public access, and public involvement requirements (Lawrence, 2009; Orenstein et al., 2010). They include clear, consistent, and broadly supported definitions for key terms and requirements, especially with regard to sustainability (Farley and Smith, 2012).

Particular thought needs to be given to questions such as (a) who integrates (e.g., not just proponents and their political supporters), (b) how to avoid turning political–social–ecological value-based choices into technical–rational choices, not always explicitly, by experts and expert methods, and (c) how integration is to take place (not just procedures but also roles and responsibilities) (Kirkpatrick and George, 2006; Lawrence, 2009; Morrison-Saunders and Thérivel, 2006; Pope et al., 2005)? Cumulative effects assessment and management is a further key concern that must be fully addressed in any exploratory integration initiatives (Fischer, 2011; Thérivel et al., 2009). It is essential that the measures adopted are mutually supportive, and designed, framed, and adapted to take full advantage of the potential of integration without succumbing to the pitfalls. Suites of good practice integration principles and criteria need to be identified and tested in varying settings, and from the perspectives of various stakeholders (Fischer, 2006; Orenstein et al., 2010). The product of these effectiveness reviews should be a clear set of priorities, leading to better regulation, guidance, and practice, and directly resulting in enhanced procedural and substantive outcomes (Morgan, 2011). In this way, the "added value" of integration can be demonstrated (Quigley and Taylor, 2003). With such initiatives, it is hoped that the debate can gradually shift from the relative merits of integration versus no integration to specifying conditions and perhaps milestones along the journey to satisfying those conditions.

6.7 SUMMING UP

This chapter is concerned with managing regulatory and applied IA processes to better integrate environmental perspectives, values, and knowledge. The two stories describe ways in which the IA process can become more substantive: (1) through the integration of substantive concerns into significance criteria and (2) through the systematic application of a sustainability test.

The general problem addressed is a shortfall between IA environmental aspirations and achievements. The more specific problem is the role that the IA process assumes in widening or narrowing that gap. Numerous ecological, social, and sustainability concepts and methods are presented. These concepts and methods provide the basis for characterizing how a substantive IA process might be applied at the regulatory and applied levels.

The relationship between IA process and substance has been approached from several perspectives. Some say that IA is an unnecessary diversion of resources. They argue that it reinforces the status quo or that it cannot be properly applied or that there are better ways to bring about environmental improvements. Others argue that the substantive benefits of the IA process are unknown because of knowledge gaps concerning decision-making effectiveness, outcome effectiveness, and environmental characteristics. Still others submit that the IA process can be conducive to environmental advancement but that refinements or modifications or major reforms are needed. Many acknowledge that issues and solutions vary depending on whether ecological, social, or sustainability concerns are being considered. This chapter explores how IA process management can better address this constellation of interrelated problems and solutions.

An overview of ecological, social, and sustainability concepts and methods provides the basis for the substantive IA process. The ecological concepts explored include—applied ecology, ecological impact assessment, environmental indicators, biodiversity—inclusive IA, the ecosystem approach, environmental planning and management, integrated environmental and resource management and assessment, adaptive environmental assessment and management, and traditional knowledge. Examples of recurrent themes displayed by these concepts include the need for an ecological systems perspective, to adopt a place-based approach, to employ sound ecological knowledge, to transcend disciplinary boundaries, to recognize ecological stresses and limits, to acknowledge knowledge and control limits, to continuously and adaptively manage impacts (both pre and post-approval), and for the process to be open, adaptive, creative, collaborative, iterative, selective, and action-oriented.

The social concepts considered include technical SIA, political SIA, participatory/community-based SIA, positivistic social science, functional, ecological, and systems theory, interpretative social science, critical social science, exchange theory, symbolic meaning, social learning, and phenomenological sociology. The overview analysis recognizes that people react in anticipation of and adapt to change and that social phenomena are very difficult to predict and influence in predictable ways. It demonstrates that there are multiple potentially applicable, but partially overlapping and conflicting social models, theories, perspectives, and frameworks. It points to the often-peripheral position of SIA in decision making. It describes the gulf between social sciences and applied fields such as SIA. It underscores the importance of being cautious regarding preconceptions and to design and adapt the process to fit the context. It emphasizes the need to see the world through the eyes of potentially affected parties. It acknowledges the value of a socially constructed IA process. It stresses the importance of exploring social impacts at multiple levels and from multiple perspectives. It demonstrates that the SIA/IA process can be beneficial or can exacerbate negative impacts. It illustrates how meaning and value are socially determined. It shows the central role of dialogue and social interactions in the process. It stresses that frameworks and methods should systematically address social interactions and choices, from multiple perspectives.

The overview of sustainability concepts describes the varying perceptions of the nature and purpose of sustainability. It illustrates how sustainability is refined through sustainability forms and ethical perspectives, directed by needs, aspirations, and principles; applied through instruments, procedures, and processes; integrated by strategies, visions, and frameworks; and adapted to contexts. It demonstrates that IA and sustainability are applied to varying environments and activities and can be integrated at conceptual, regulatory, and applied levels. It describes how sustainability extends and completes IA. Sustainability adds to the IA process a sound basis for interpreting significance and means for determining environmental limits; integrating measures of environmental change; interpreting present conditions; determining plausible, planned, and desirable conditions; integrating diverse perspectives and methods; adapting to context; and linking to other environmental management and sustainability instruments. Most importantly, sustainability helps make the IA process more effective in advancing substantive IA aspirations.

Several methods, potentially conducive to a more substantive IA process, are briefly described. The methods described include network analysis, systems diagrams, modeling, projection, forecasting, backcasting, visioning, scenario writing, storytelling, ecological footprint analysis, life cycle analysis, rapid rural appraisal, and participatory rural appraisal. Collectively, these methods effectively address interrelationships, interpret past and present conditions, identify ecological and social limits, portray plausible and desirable future conditions, determine how the gaps between plausible and desirable future conditions can be narrowed, manage uncertainties, and facilitate the involvement of interested and potentially affected parties.

Substantive IA requirements and guidelines in the four jurisdictions are briefly described. Each jurisdiction integrates process and substance in different ways, although there are many parallels. There are many positive and negative features and examples associated with how substantive environmental concerns are addressed in each jurisdiction. The appropriate mix of approaches will vary by jurisdiction. Additional effectiveness analyses are required. It seems advantageous for environmental substance to be directly integrated into IA requirements at the project, strategic, and regulatory levels. The selective merging of IA with other substantive environmental requirements can sometimes be beneficial. Further consideration should also be given to IA process adaptations that enhance the effectiveness of links to other environmental requirements and the potential for substantive environmental enhancements. Examples of regulatory approaches to integrating IA and substance are presented.

An example of substantive IA process is described. A context is established. Sustainability plans and strategies, sustainability constraints and opportunities, the need for action and stakeholder perspectives, and issues and positions are reviewed. The process is scoped. Potentially appropriate methods and frameworks are identified and refined. Procedural fairness standards and principles are determined.

Proposed actions and alternatives are identified. Base case models, scenarios, and stories are constructed and adapted to encompass alternative worldviews and value positions. Models, scenarios, visions, and stories are used to construct plausible and desired futures. Gaps between plausible and desired futures are determined. The gaps provide the basis for identifying sustainability principles, goals, objectives, and priorities. More specific sustainability targets, criteria, and thresholds are then formulated. Alternatives for closing the gaps are identified. Proposed actions and alternatives are refined and treated as potential sustainability catalysts.

The alternatives are screened and compared using sustainability thresholds, criteria, and decision rules. A sustainability assessment of the preferred alternatives is undertaken, extending from such conventional IA activities as baseline analysis, impact analysis, cumulative effects assessment, mitigation and enhancement analysis, and significance interpretations. Appropriate roles and responsibilities are determined. Residual limits, uncertainties, and implications are identified. Overall impact management strategies are prepared. Links to other sustainability and environmental management instruments are specified. These analyses provide the basis for proposal review and approval or disapproval.

Outcomes from the process are monitored and linked to sustainability and environmental indicators. The IA process is audited. The auditing results are widely circulated to help improve IA practice. The IA process is supported by such ongoing activities as public and agency involvement; comparable proposal review; data collection and analysis; applied research; the accommodation of traditional knowledge; and the preparation of interim, draft, and final documents.

A substantive IA process varies by IA level and type. Good practice examples for integrating substantive environmental concerns by IA level (SEA, project EIA) and by substantive IA type (EcIA, SIA, HIA, SA) are presented.

The contemporary challenge of horizontal integration (among, e.g., ecological, social, health, and economic considerations) is explored. Arguments for and against integration are summarized. The conclusion is reached that integration is possible and desirable subject to a range of conditions intended to retain the positive features of no integration, realize the potential of integration, and avoid potential integration pitfalls. Regulatory framing and contextual adaptation are both critical. These conditions need to be drawn together into complementary suites of measures and tested through effectiveness reviews assessed from multiple perspectives.