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Towards an operational sustainability criterion

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ABSTRACT

This paper examines the concept of sustainability and its implications for environmental policy analysis. It builds on the premise that present society holds a moral obligation to pass on a world of undiminished life opportunities to members of future generations. Maintaining life opportunities, in turn, can be achieved by maintaining or improving a diverse set of resources and capabilities that support a person's freedom to define and pursue her own conception of the good life. On an operational level, this framework points to the following guideline for environmental policy: Protecting the rights of future generations requires either the conservation of environmental resources or compensatory measures (including the provision of substitute technologies) that ensure the fair and proportionate sharing of net benefits over intergenerational time scales. In this framework, resource depletion is permissible only if (with reasonable certainty) it would generate a Pareto improvement relative to a baseline scenario involving strict resource conservation.

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1. Introduction

The concept of sustainability has deep foundations in the history of political and economic thought. In a 1789 letter to James Madison, for example, the American statesman Thomas Jefferson wrote that “the earth belongs in usufruct to the living” (see Ball, 2000). Although Jefferson's immediate concern was with the regulation of the public debt, his line of reasoning ran parallel to the Public Trust Doctrine, an ancient principle of Roman and Anglo-Saxon law in which certain types of natural resources are construed as the joint property of each member of society (Bader, 1992). Taken at face value, Jefferson's premise implies that members of contemporary society hold: (a) a common right to derive economic benefit from environmental resources; and (b) a correlative duty to maintain and preserve the resource base for the enjoyment of future generations. These points flow directly from the definition of the term *usufruct* — “the right of temporary possession, use, or enjoyment of the advantages of property belonging to another, so far as may be had without causing damage or prejudice to this” (Oxford English Dictionary, 2d edition, 1989).

A closely similar perspective is developed in the writings of Gifford Pinchot, a German-trained forester who founded the Yale School of Forestry and served as the first Chief of the U.S. Forest Service. In *The Fight for Conservation*, Pinchot (1910, p. 80) set forth an approach to resource management that:

“recognizes fully the right of the present generation to use what it needs and all it needs of the natural resources now available, but [also] recognizes equally our obligation so to use what we need that our descendents shall not be deprived of what they need.”

Although Pinchot is sometimes labeled a “utilitarian” because he emphasized the instrumental or extractive benefits provided by natural resources, his approach unambiguously embraces a rights-based conception of intergenerational fairness. Pinchot's framework is important because it has guided the management of U.S. forest, land, and fishery resources since the early 20th century. Although Pinchot can be criticized for his oversight of the important non-use values provided by ecosystems, accounting for such values does not

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alter the judgment that future generations have a right to inherit an undiminished natural environment.

In this essay, I shall explore how the resource management principles set forth by Jefferson and Pinchot anticipate the more recent literature on the concept of “sustainability” and its implications for environmental policy analysis. The salience of this task is highlighted by Section 101 of the U.S. National Environmental Policy Act of 1969, which explicitly recognizes the government's duty to “fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.” Discussions of sustainability often begin with the Brundtland Commission's definition of “sustainable development” as development that “meets present needs without compromising the ability of future generations to meet their own needs” (*World Commission on Environment and Development (WCED)*, 1987, p. 43). It is noteworthy how closely this definition matches the framework described by Pinchot a full 77 years earlier. While the Brundtland Commission highlighted the environmental challenges facing developing countries and the emerging global economy, its core concept of sustainability is intimately tied to a long-standing tradition.

My analysis will proceed by successively addressing three distinct and yet interrelated questions:

1. Do future generations have well-defined rights that place restraints on short-term social, political, and economic decisions?
2. Can questions of sustainability be reduced to maintaining the utility or well-being of a typical member of society?
3. Under what circumstances do the rights of future generations entail a specific duty to conserve and protect the environment?

The main thrust of this essay parallels arguments I set forth in an earlier paper (*Howarth*, 1997). Important details of the argument, however, have been restructured and refined. Perhaps most importantly, the present paper builds new connections between the theory of “sustainability,” “sustainable development,” and *Amartya Sen's* (1999) notion of “development as freedom.” As we shall see, Sen's framework plays a key role in motivating my analysis and anchoring its conclusions.

In brief, I shall argue that today's society holds a moral duty to ensure that human life opportunities are equitably distributed between contemporaries and maintained or enhanced from generation to generation (see *Page*, 1983). In principle, duties to future generations might be fulfilled if steps were taken to maintain per capita utility or the joint productive potential of economic and environmental systems (*Pezzey*, 1992; *Solow*, 1993). Gauging future welfare, however, raises difficult problems of forecasting and foresight, while economic theory casts doubt on attempts to measure the sustainability of a given society based on observations of current data alone (*Brekke*, 1997). As a result, maintaining the life opportunities open to future generations requires either: (a) the conservation and protection of natural resources; or (b) policies that ensure that future generations share fairly and proportionately in the net benefits that accrue when resource stocks are depleted or degraded.

Following the lead of authors such as *Page* (1983), *Bromley* (1989), and *Norton* (2005), I shall argue that the depletion of natural resources stocks is morally legitimate only when particular and well-characterized steps are taken to compensate members of future generations for invasions of their just entitlements. This approach is related to the concept of “strong sustainability” described by *Daly* (1994) and to the stewardship ethic elaborated by *Brown* (1997; see also *Barnes*, 2001). It combines a rights-based conception of intergenerational fairness with a complementary focus on the importance of intertemporal efficiency as judged using the techniques of cost-benefit analysis. It rejects, however, the view that (in certain cases) cost-benefit analysis provides justification for imposing uncompensated costs on members of future generations.

2. Duties to posterity

The notion that future generations have rights that impose correlative duties on present decision-makers has been questioned on several grounds. A first argument holds that issues of the moral good must ultimately be decided through appeals to a social welfare function that balances the respective interests of each member of society (*Beckerman*, 1994). This point of view, which traces its origins to the classical utilitarianism of *Jeremy Bentham* (1823), is relatively common amongst economists. This argument is contestable, however, since utilitarianism is in deep tension with the rights-based ethical framework that supports both democratic governance and the pursuit of self-interest in markets (*Rawls*, 1971; *Buchanan*, 1977). Following the logic developed in *Locke's* (1690) *Two Treatises of Government*, for example, the U.S. Constitution aims to “secure the Blessings of Liberty to ourselves and our Posterity.” In a similar vein, *Sen* (1999) presents a theory of development in which extending freedoms rather than maximizing welfare is the fundamental objective.

A second argument begins with the premise that moral duties are defined by norms of mutual forbearance between individuals having the reciprocal power to confer benefits or inflict harms on one another. Since the actions of unborn persons in future generations can in no sense affect the welfare or freedoms enjoyed in today's society, this premise seems to entail that unborn generations have no moral claims that impose binding duties on the present (*Heilbroner*, 1974). This is not to say that present decision-makers might not voluntarily choose to engage in self-sacrifice so that members of future generations could enjoy a better quality of life (*Passmore*, 1974). Such sacrifices, however, would flow from motives such as love or altruism rather than the cold dictates of moral obligation.

This argument, like the first, is frankly implausible. To see this, note that the supporting premise seems to imply that it is morally permissible to inflict gratuitous harms on (say) young children or infirm people who are fundamentally unable to either aid or hurt us. Yet this inference cuts strongly against both moral intuition and widely-accepted religious teachings such as the Golden Rule or the Non-Harming Principle from Buddhism. More technically, philosophers such as Adam

Smith (1759) and Immanuel Kant (1963) ground moral duties on appeals to the idea of an “impartial spectator” or the categorical imperative. Though these approaches differ in the details, they share in common the view that right action entails the protection of the powerless from the powerful. In short, people have a duty to refrain from imposing harms on others that they would reject as unjust if the roles were reversed.

A third argument against the notion that future generations have clearly defined moral rights is advanced by authors such as Schwartz (1978) and Parfit (1983). The Schwartz–Parfit argument proceeds from the observation that the actions taken by present decision-makers will affect not just the welfare but also the *identities* of future human beings. Suppose, for example, that automobiles were phased out in favor of train and bus transport to reduce the potential threats posed by climate change. While this might enhance the quality of life enjoyed in future society, it would also lead to subtle but systematic changes in lifestyles and behavior that would in turn affect which pairs of gametes came together to define the genetic endowments and identities of future people. From this Schwartz and Parfit reason that members of future generations have only limited moral claims on the decisions undertaken by their predecessors. As long as they have lives that are minimally worth living, they should thank us for bringing them into existence rather than some other set of potential people who (conceivably) might have enjoyed better and happier lives.

Although the Schwartz–Parfit argument is philosophically elegant, it too runs into a counter-argument that reduces its practical force. In particular, it overlooks the fact that the adults living in contemporary society have undeniable obligations to the flesh-and-blood children who currently populate today's world (Howarth, 1992).

What exactly is it that we owe to our (now-living) children, grandchildren, and even great grandchildren? Suppose that we begin from the plausible premise that all members of society should enjoy a similar set of fundamental freedoms. This principle is deeply rooted in both political theory and in the structures and traditions of liberal democracies and is consistent with Sen's (1999) concept of “development as freedom.” In a formal defense of this view, Rawls' (1971) *Theory of Justice* builds on the premise that democracy entails the consent of the governed to the legitimacy of prevailing institutions (see also Habermas, 1992). Since a rational person would not freely consent to a set of arrangements that arbitrarily placed her at a comparative disadvantage, equality of rights or opportunity emerges as a central norm in democratic societies.

From this starting point it is straightforward to see that each successive generation holds a moral duty to pass on a set of undiminished life opportunities to its children and grandchildren (Howarth, 1997). This duty is social and political in origin and is distinct from the private obligations that particular parents owe to their particular offspring. It is certainly true that the adults in a given society have the shared power to deplete natural resources, draw down stocks of manufactured capital, and otherwise engage in profligate activities that would deliver short-term benefits while diminishing the opportunities and effective freedoms available to

their successors. But to exploit such power would in effect deny the full moral standing and personhood of the young people of today, thereby undermining the very notions of freedom and democratic governance. Since each generation in turn holds a duty to pass on a set of undiminished life opportunities to its own children, a “chain of obligation” exists that connects the present with the long-run distant future (Howarth, 1992).

3. Sustainability as nondeclining utility

The foregoing discussion points to a framework in which a society is considered “sustainable” if it maintains the quality of human life opportunities from each generation to the next. Given this premise, our next task is to consider methods for evaluating life opportunities to arrive an operational sustainability criterion.

Economists such as Pezzey (1989) and Solow (1993) argue that sustainability can be defined in terms of maintaining the utility or welfare of a typical member of society. In a liberal society in which people make well-informed, rational decisions, the utility achieved by a given person reveals the effective quality of the life opportunities she was afforded. Although utility is a measure of attained outcomes while opportunities are characterized in terms of a person's effective freedoms as determined by her available choice set, the Pezzey–Solow approach to the economics of sustainability has an important degree of intuitive appeal.

As Solow (1974) has observed, maintaining per capita utility over intergenerational time scales need not entail the conservation of specific natural resources. If the social costs of resource depletion were offset by compensating investments in manufactured capital and/or the development of new technologies, then a constant or increasing level of well-being could be sustained (Dasgupta and Heal, 1979). This view assumes that produced goods can effectively substitute for reductions in the services rendered by natural capital. Indeed, Solow (1993) has argued that the criterion of economic efficiency suggests that both present and future generations often benefit from the judicious use and depletion of environmental resources. Solow quips that “I doubt that I would feel myself better off if I had found the world exactly as the Iroquois left it” (p. 180), alluding to the benefits that arose for European immigrants when large portions of the American landscape were transformed from forests and grasslands into agricultural settlements and (later) urban environments. In this perspective, it is the total productive capacity of the economy, not natural resources *per se*, that must be conserved.

Although defining sustainability in terms of nondeclining utility is theoretically coherent and fits nicely within the general framework of welfare economics, this approach faces a range of conceptual and practical challenges. The approach could be operationalized by forecasting the future development of a cardinally comparable utility index that was valid over time scales of decades and centuries. Economists, however, are with good reason skeptical about the construction of cardinal utility metrics that can be used for the

purposes of interpersonal comparisons. A related issue is that the preferences of future generations cannot be fully known from the perspective of present decision-makers. It is clear that values and preferences shift over time with the evolution of technologies, institutions, and cultures (Pezzey, 1992). This implies that predicting the welfare of future generations is an uncertain and potentially speculative undertaking.

A potential solution to this set of challenges is suggested by the literature on natural resource accounting that was pioneered by John Hartwick (1977). Although Hartwick's initial analysis focused narrowly on the substitution of manufactured capital for a nonrenewable resource, the subsequent literature has established that the following *net investment rule* is valid for a broad class of neoclassical growth models in which natural resources contribute to the production of market goods and/or the provisioning of environmental amenities (see Neumayer, 1999; Hartwick, 2000; Pezzey, 2004):

The *Net Investment Rule* — A dynamic economy will maintain a constant or increasing level of per capita utility only if investments in manufactured capital exceed the monetary value of natural resource depletion on an economy-wide basis.

In this setting, the value of resource depletion is calculated by multiplying the year-to-year change in the stock of each resource by a corresponding shadow price that represents society's marginal willingness to pay for the resource in question. The intuition is that one dollar of manufactured capital can provide services that fully replace those extinguished by one dollar of resource depletion.

Since Repetto et al.'s (1989) seminal analysis of the economics of oil, timber, and soil resource depletion in Indonesia, a wide range of studies have sought to gauge the sustainability of real-world societies through the empirical application of this net investment rule (see Atkinson et al., 1997; World Bank, 1997). Unfortunately, however, this approach has core characteristics that reduce its salience in practical applications. In particular, the net investment rule holds true only in economies that satisfy the following general assumptions:

1. Population, technology, and preferences must all be held constant.
2. The economy must be closed or else terms of trade must be constant.
3. Resources must be allocated in a perfectly efficient manner under conditions of perfect foresight.

It is readily apparent that these conditions are generally inconsistent with observed economic reality (see Pezzey, 2004). Most societies, for example, have positive rates of population growth, which *ceteris paribus* implies that the net investment rule understates the rate of capital investment that is required to achieve a constant level of per capita utility. Technological change, in contrast, reduces the required rate of investment since it augments the level of welfare that can be sustained from a given sets of inputs.

As noted above, it may be unreasonable to assume that preferences are fixed over multigenerational timescales. Pezzey (1992), for example, hypothesizes that habit formation and habituation effects may lead to a “hedonic treadmill” in which economic growth alters preferences so that increasing consumption levels are required to sustain a constant level of well-being. This hypothesis seems consistent with survey data from the United States, Europe, and Japan suggesting that, since World War II, large increases in material prosperity have been matched by only small improvements in people's life satisfaction (Easterlin, 1974; Oswald, 1997; Kahneman et al., 1999). Of course, the assumption of no international trade is violated for all national economies. Changes in the relative prices of imports and exports can either raise or lower the level of investment required to sustain a given level of well-being.

As Brekke (1997) describes in detail, departures from the assumptions that support Hartwick's net investment rule have far-reaching implications in determining the level of investment that is required to achieve a non-declining level of utility over time. In particular, the “sustainable” investment minimum – i.e., the rate of investment in manufactured capital required to maintain a constant level of well-being – must be calculated in a forward-looking model that accounts for anticipated changes in future population, technology, preferences, and terms of trade. This implies that, in principle, it is logically impossible to gauge the sustainability of real-world societies based on accounting measures that are constructed based on the observation of current data alone. Instead, one must forecast the course of the economy's future development over a long – in principle infinite – time horizon. Although this point is generally underappreciated, the upshot is that standard resource accounting methods are generally not sufficient to determine whether or not an economy is sustainable.

Two further concerns about the measurement of sustainability using the net investment rule may be summarized as follows. First, authors such as Asheim (1994) have rigorously shown that the fact that investments in manufactured capital exceed the monetary value of natural resource depletion is necessary but not sufficient to ensure that an economy is sustainable even given the restrictive assumptions outlined above. The sufficient condition entails that investments in manufactured capital exceed the value of resource depletion *at all points in time* — a condition that (as in Brekke's analysis) can only be checked given a full-fledged, forward-looking model that accurately anticipates long-term economic trends.

Second, the assumption that resources are allocated efficiently under conditions of perfect foresight is neither straightforward nor innocuous. It is of course immanently reasonable to suppose that certain forms of resource depletion – say the exhaustion of conventional oil resources – could in principle be offset through investments in manufactured capital goods such as wind turbines, photovoltaic cells, or perhaps nuclear fusion power plants. The case of oil resources is instructive, however, since there are substantial uncertainties regarding the empirical magnitude of the remaining resource base and the prospects for achieving a smooth transition to a post-petroleum economy (see Goldemberg, 2000). Such considera-

tions are fundamental to debates over “sustainability” but are largely missing from the theoretical models that lie behind green accounting measures.

This discussion is not meant to deny the value of developing better metrics of human well-being for use in the design of economic and environmental policies. See [Brekke and Howarth \(2000, 2002\)](#) for an extended discussion of this topic that links recent research in fields such as economics, psychology, anthropology, and sociology. Nor am I arguing against the desirability of extending standard measures of output and investment to account for the value of natural resources. Still, the value of the nondeclining utility criterion in sustainability measurement depends on analysts' ability to accurately predict the future using models that fully integrate anticipated social, economic, and environmental trends. While such models provide important insights, applications to issues such as global climate change yield a wide range of sharply divergent yet nonetheless plausible scenarios regarding the long-term interplay between human and natural systems ([Intergovernmental Panel on Climate Change \(IPCC\), 2000, 2001](#)).

4. Sustaining opportunities

The foregoing discussion highlights the challenges involved in constructing comprehensive, forward-looking indicators of human well-being. In this sense, it suggests that operationalizing the concept of sustainability in terms of maintaining the experienced utility of a typical member of society is an elusive and possibly infeasible goal. This conclusion, however, by no means casts doubt on the importance of evaluating trends in experienced well-being over time (see [Kahneman et al., 1999](#)). Nor does it suggest that the concept of sustainability cannot be operationalized.

As I argued in Section 2, it is morally coherent to interpret the sustainability criterion in terms of maintaining human life opportunities from each generation to the next. This interpretation is closely linked to [Rawls' \(1971\)](#) theory of justice, which focuses on the fair provisioning of so-called “primary goods” — the underlying resources and capabilities that allow human beings to define and pursue their own conception of the good life. Contrary to the standard interpretation of Rawls' writings in the economics literature, Rawls did not believe that social, political, and economic institutions should be organized to maximize a particular social welfare function — e.g. the maximin social welfare function explored by [Solow \(1974\)](#) amongst others. Instead, Rawls' theory was concerned directly with rights and entitlements — in effect, the raw endowments that people start out with in the real-world equivalent of the Edgeworth Box (see [Bator, 1957](#)).

[Sen's \(1999\)](#) *Development as Freedom* presents a rich and textured analysis of the view that public policies should aim to maintain and enhance people's effective life opportunities. Although Sen's emphasis is most explicitly on improving livelihoods in developing countries, his viewpoint is premised on principles that are central in the defense of liberal political and democratic institutions. According to Sen, life opportunities should be understood in terms of a broad set of factors

that support meaningful choice and the pursuit of the good life. These include:

- *Political freedoms* — people's ability to participate in and duly influence prevailing systems of governance.
- *Economic facilities* — especially the access to education that is so pivotal in shaping people's lifetime earning potential.
- *Social opportunities* — the integrity of basic social institutions as they contribute to the quality of life and the sustenance of well-being.
- *Transparency guarantees* — the openness and institutionalized honesty that are essential in forestalling corruption so that individuals can make truly free, uncoerced decisions.
- *Protective security* — access to adequate health care and social insurance programs.

Sen offers these categories as pragmatically defined, complementary domains that should each be improved and enhanced in societies that aim to achieve meaningful “development.” His underlying argument is that human welfare will improve if the conditions necessary to support well-being are adequately nurtured and cultivated. Importantly, each of the factors enumerated by Sen can be operationally measured using the theories and methods of the social sciences.

What are the implications of this framework for environmental conservation? Although Sen himself does not particularly emphasize environmental issues, the opening page of Sen's book *Development as Freedom* does identify “worsening threats to our environment and to the sustainability of our economic and social lives” as “deprivations” that negatively affect well-being in both industrialized and developing nations ([Sen, 1999](#), p. ix). By developing this line of reasoning, a sympathetic, ecologically inclined reader might extend Sen's framework in the following way ([Sneddon et al., 2006](#)). From an ecological perspective, access to natural resources and the benefits derived from a favorable environment are essential contributors to human life opportunities and well-being, especially in low-income societies in which livelihoods often depend directly on nature ([Millennium Ecosystem Assessment, 2005](#)). Without contradiction, we may therefore articulate the following principle that is consistent with Sen's general approach:

The Fair-Sharing Principle — *Ceteris paribus*, each member of present and future society is entitled to share fairly in the benefits derived from environmental resources. Specific stocks of environmental resources should not be depleted without rendering just compensation to members of future generations.

The basic logic of this approach is consistent with the writings of Thomas Jefferson (see [Ball, 2000](#)), [Gifford Pinchot \(1910\)](#), and the [World Commission on Environment and Development \(WCED\) \(1987\)](#) as discussed in the introduction of this paper. In effect, the Fair-Sharing Principle holds that natural resource stocks are the joint property or patrimony of present and future generations. As such, present society has no legitimate right to degrade the environment unless it takes steps to ensure that its successors receive their proportionate share of

the ensuing net benefits. In this formulation, compensation must be understood in terms of explicit payments for the opportunity costs imposed by resource depletion.

In practice, compensation might be rendered through either: (a) the provisioning of adequate replacement technologies (i.e. low-cost solar collectors in exchange for the depletion of low-cost petroleum resources); or (b) financial payments transmitted by means of durable institutions stretching over multigenerational timescales. Realistically, however, the creation of durable financial mechanisms that can withstand incentives to withdraw assets to provide short-term benefits might well prove unworkable (Lind, 1995). Hence the main emphasis should perhaps be placed on in-kind compensation schemes involving substitute resources and/or technologies.

The criterion elaborated in the Fair-Sharing Principle does not focus on maintaining average income levels or the overall value of manufactured and natural capital stocks from each generation to the next. Instead, the specific individuals harmed by resource depletion must be compensated for the specific infringements imposed on their just entitlements. Importantly, this setup achieves a merger and synthesis between principles of intra- and intergenerational fairness. Individual members of future generations hold rights that are commensurate with (and that indeed ultimately flow from) the goal of ensuring the just distribution of life opportunities between members of contemporary society.

Authors such as Page (1983), Bromley (1989), Howarth and Norgaard (1990), Daly (1994), and Norton (2005) have set forth arguments that closely mirror the line of reasoning advanced above. Indeed, the Fair-Sharing Principle is intimately related to the stewardship ethic described by Brown (1997; see also Barnes, 2001). The basic point is that the achievement of “sustainability” requires resource management regimes that effectively confer property rights on members of future generations.

Critics such as Solow (1993) worry that providing future generations with *ex ante* entitlements to natural resources runs the risk of “locking up” resources in a manner that would impair economic efficiency and forestall the improvement of living standards over time. Close scrutiny, however, suggests that the approach under discussion effectively addresses this concern. As Page (1983) and Howarth (1997) argue in detail, it is fully appropriate for policy-makers to pursue an intertemporally efficient allocation of natural resource stocks if doing so would serve to benefit both present and future generations. According to these authors, however, concerns about sustainability impose two major qualifications:

1. The costs and benefits that resource depletion would impose on future generations must be established with a reasonable degree of confidence.
2. Members of future generations must receive full compensation for the costs imposed by resource depletion.

Stated somewhat differently, the framework under discussion endorses the pursuit of intergenerational Pareto improvements relative to the baseline that would arise given the full and literal protection of future generations' *ex ante* right to enjoy the benefits of an undiminished natural environment (see Gerlagh and Keyzer, 2001; Howarth, 2001). But it insists that the invasion of entitlements must be accompanied by actual compensation.

In cases where either the preferences of future generations or the future impacts of environmental degradation cannot be pinned down with reasonable confidence, the costs that future resource depletion would impose on future generations are literally indeterminate. In this event, rights remain well-defined while net benefits are in an important sense not operationally defined. Under such circumstances, the fair treatment of future generations requires the strict protection of future entitlements, just as property rules are used in common law to forestall behaviors with uncertain consequences and the potential for uncompensable harms (Bromley, 1989). In this sense, the Fair-Sharing Principle is related to the concept of safe minimum standards in resource economics (Ciriacy-Wantrup, 1952; Bishop, 1978) and “strong sustainability” in ecological economics (Daly, 1994). The approach clearly favors resource conservation in the face of scientific uncertainty. On the other hand, the approach leaves ample room for considerations of economic efficiency and hence for the application of cost-benefit analysis in resource management — provided that costs and benefits are sufficiently well-defined and steps are taken to compensate individuals and groups who are specifically harmed by environmental degradation.

5. Conclusions

In this paper, I have explored an approach to defining the concept of “sustainability” and its potential operationalization in policy analysis. The main arguments of the paper may be summarized as follows. First, the members of future generations are morally entitled to enjoy life opportunities that are at least as good as those enjoyed today. This principle flows from and is fully consistent with the judgment that equal opportunities should be provided to each member of society. In this sense, the concept of sustainability is intimately tied to and grounded in a well-known conception of intragenerational fairness.

Second, life opportunities would be sustained if the utility of a typical member of society was maintained over intergenerational time scales. But gauging future utility runs up against theoretical and empirical barriers that are not easily resolved in the practice of policy analysis. Analysts may construct a range of plausible scenarios concerning the impacts of present decisions on future welfare, and good modeling work can – and should – be used to clarify the potential implications of alternative public options. Still, it is well-recognized that short- and medium-run forecasting models frequently fail to anticipate important developments in the economy and society. These issues are compounded in a long-run setting where technologies and preferences are endogenous and where environmental systems may be perturbed in ways that would give rise to unpredictable consequences. Despite their intuitive appeal, the techniques of resource accounting do not get around this problem.

Finally, maintaining life opportunities can be achieved by providing future generations with a “structured bequest package” (Norton and Toman, 1997) in which a variety of items – manufactured capital, technological capacity, envir-

onmental resources, and the integrity of political and social institutions – are maintained over time. This approach is consistent with the view that future generations hold a specific right to share in the benefits provided by natural systems. This approach does not require that specific natural resource stocks must be permanently conserved. It does, however, imply that resource depletion or environmental degradation entail a duty to compensate members of future generations for the invasion of their entitlements. This reasoning is distilled in what I have termed the “Fair-Sharing Principle,” which builds on the long-standing notion that certain types of environmental resources are the common property of each member of present and future society.

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