

3 Ecosystems and Human Well-being

EXECUTIVE SUMMARY

- Human well-being has several key components: the basic material needs for a good life, freedom and choice, health, good social relations, and personal security. Well-being exists on a continuum with poverty, which has been defined as “pronounced deprivation in well-being.”
- How well-being and ill-being, or poverty, are expressed and experienced is context- and situation-dependent, reflecting local social and personal factors such as geography, ecology, age, gender, and culture. These concepts are complex and value-laden.
- Ecosystems are essential for human well-being through their provisioning, regulating, cultural, and supporting services. Evidence in recent decades of escalating human impacts on ecological systems worldwide raises concerns about the consequences of ecosystem changes for human well-being.
- Human well-being can be enhanced through sustainable human interaction with ecosystems with the support of appropriate instruments, institutions, organizations, and technology. Creation of these through participation and transparency may contribute to people’s freedoms and choices and to increased economic, social, and ecological security.
- Some believe that the problems from the depletion and degradation of ecological capital can be largely overcome by the substitution of physical and human capital. Others believe that there are more significant limits to such substitutions. The scope for substitutions varies by socioeconomic status.
- We identify direct and indirect pathways between ecosystem change and human well-being, whether it be positive or negative. Indirect effects are characterized by more complex webs of causation, involving social, economic, and political threads. Threshold points exist, beyond which rapid changes to human well-being can occur.
- Indigent, poorly resourced, and otherwise disadvantaged communities are generally the most vulnerable to adverse ecosystem change. Spirals, both positive and negative, can occur for any population, but the poor are more vulnerable.

- Functioning institutions are vital to enable equitable access to ecosystem services. Institutions sometimes fail or remain undeveloped because of powerful individuals or groups. Bodies that mediate the distribution of goods and services may also be appropriated for the benefit of powerful minorities.
- For poor people, the greatest gains in well-being will occur through more equitable and secure access to ecosystem services. In the long run, the rich can contribute greatly to human well-being by reducing their substantial impacts on ecosystems and by facilitating greater access to ecosystem services by the poor.
- We argue ecological security warrants recognition as a sixth freedom of equal weight with participative freedom, economic facilities, social opportunities, transparency guarantees, and protective security.

Introduction

As noted in earlier chapters, the impacts of human activities on ecosystems have increased rapidly in the last few decades. While the majority of these can be considered beneficial to human well-being, there is growing evidence of adverse effects. Clear analysis of these undesirable impacts and their consequences for people has been difficult because of the numerous other causes of ecosystem change that operate and interact at different social, geographical, and temporal scales. For some people, especially those buffered by relative affluence, the problem is scarcely visible—or at least accorded low priority. Yet millions of others experience every day the detrimental consequences of ecosystem changes.

Consideration of purely local and overt environmental deficiencies, such as visible pollution, is no longer a sufficient framework to assess the relationship between the environment and human well-being. The recently evident larger-scale changes to the world's ecosystems must also be looked at closely (McMichael 2001).

The dependence of humans on ecosystem services reflects directly the profound co-evolutionary processes that underlie the origins of Earth's biosphere. The biosphere and its ecosystems provide life support to all species, as described in Chapter 2. Further, the biosphere is itself the product of life on Earth. The composition of the atmosphere and soil, the cycling of nutrients through waterways, and many other ecological assets are all the result of living processes—and all are maintained and replenished by living ecosystems.

The effects of adverse ecosystem changes on human well-being can be classed as direct and indirect. Direct effects occur with some immediacy,

through locally identifiable biological or ecological pathways. For example, impairment of the water-cleansing capacity of wetlands may adversely affect those who drink that water. Building dams can increase mosquito-breeding and thus the transmission of malaria. The deforestation of hill-sides can expose downstream communities to the hazards of flooding.

Indirect effects take a toll on well-being through more complex webs of causation, including through social, economic, and political routes. Some may take decades to have an impact. For example, where farmlands under irrigation become saline, crop yields are reduced; this in turn may affect human nutritional security, child growth and development, and susceptibility to infectious diseases. Beyond threshold points, limited or degraded supplies of fresh water may exacerbate political tensions, impair local economic activity (and livelihoods)—including industry—and reduce aesthetic amenity. These dynamic, interacting processes jeopardize various aspects of human well-being.

The impacts of adverse ecosystem change do not fall evenly on human populations. Indigent, poorly resourced, and otherwise disadvantaged communities are generally the most vulnerable. Further, many poor rural populations rely disproportionately on the integrity and functions of local ecosystems and are likely to lack the means to import ecosystem services. Impoverishment as a result of adverse ecosystem change may sometimes lead to a downwards spiral for such people. In all instances, the ability to achieve well-being is reduced by the diminished availability of ecosystem services.

Key Components of Human Well-being

There have been many formulations and definitions of human well-being (Alkire 2002). Most commentators would agree that it includes basic material needs for a good life, the experience of freedom, health, personal security, and good social relations. Together, these provide the conditions for physical, social, psychological, and spiritual fulfillment.

A distinction is sometimes made between the determinants of or means to well-being and its constituents—that is, well-being as an end (Dasgupta 2001). In other words, well-being is experiential, what people value being and doing. The determinants are sometimes expressed as commodity inputs, many of which are provided by ecosystem services. They include food, fiber, fuel, clean water, materials for shelter, marketed crops, livestock, forest products, and minerals. Enabling physical, environmental, and social conditions and access—for example, to resources and space—

are also relevant as determinants of or means to well-being. Viewed within this frame, some key elements of well-being can be both determinants and constituents. For example, education and health can be both ends in themselves and the means to experience well-being.

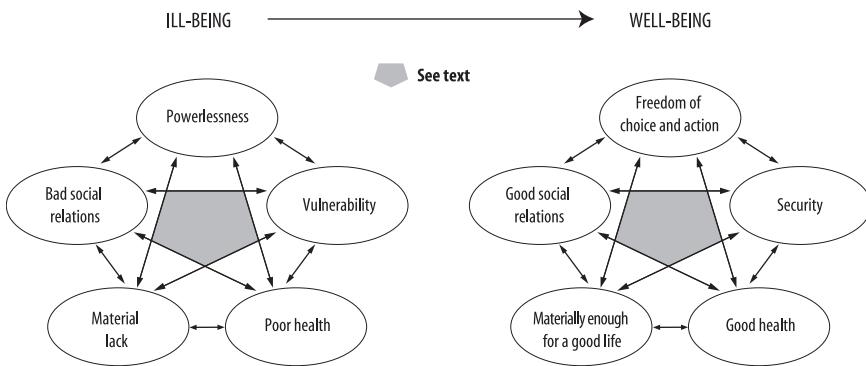
There is widespread agreement that well-being and poverty are the two extremes of a multidimensional continuum. In fact, the *World Development Report 2000/01* defined poverty as “the pronounced deprivation of well-being” (World Bank 2001).

How well-being and ill-being, or poverty, are expressed and experienced is context- and situation-dependent, reflecting local social and personal factors such as geography, ecology, age, gender, and culture (Prescott-Allen 2001). Although these concepts are recognized as complex and value-laden, some elements are nevertheless widespread—if not universal. This was evident in the “voices of the poor” research (Narayan et al. 1999; 2000), in which poor people in 23 countries were asked to reflect, analyze, and express their ideas of the bad and the good life. The respondents stressed many aspects, including the importance of secure and adequate livelihoods, cultural and spiritual activities, and the ability to provide for their children. Repeatedly, they indicated five linked components (see Figure 3.1):

- the necessary material for a good life (including secure and adequate livelihoods, income and assets, enough food at all times, shelter, furniture, clothing, and access to goods);
- health (including being strong, feeling well, and having a healthy physical environment);
- good social relations (including social cohesion, mutual respect, good gender and family relations, and the ability to help others and provide for children);
- security (including secure access to natural and other resources, safety of person and possessions, and living in a predictable and controllable environment with security from natural and human-made disasters); and
- freedom and choice (including having control over what happens and being able to achieve what a person values doing or being).

These five dimensions reinforce each other, whether positively or negatively. A change in one often brings about changes in the others. The shaded space in Figure 3.1 represents the experience of living and being—including stress, pain, and anxiety in the bad life and peace of mind and spiritual experience in the good life.

FIGURE 3.1 The Main Dimensions of Well-being and its Obverse, Ill-being



In this multidimensional formulation, there are negative and positive webs of interactions. On the side of ill-being and the bad life, the double-headed arrows represent negative directions of causality: for example, poor people are vulnerable to sickness, which in turn makes them poorer; bad social relations make people vulnerable to shocks, which in turn deepens material poverty and so on; and all of these contribute to powerlessness. On the side of well-being and the good life, having materially enough facilitates physical strength, enabling a better livelihood, while good social relations can provide security against stresses and shocks. In turn, security is likely to increase material well-being and so on. And all of these enhance freedom of choice and action.

Overall, development can thus be seen as the enhancement of well-being. It entails transitions for those who are deprived—from conditions of ill-being or the “bad life” to well-being or the “good life.”

One condition for personal well-being is the capability to adapt and achieve that which individuals value doing and being in situations of dynamic change. At the social level this may contribute to conflicts, necessitating trade-offs between the well-being of different individuals and groups. Trade-offs may occur when, for example, material capital is accumulated at a cost of environmental security or cultural or spiritual values. This also has a temporal dimension concerning the well-being of others in the future.

Addressing these issues leads into the sphere of values. This is a realm for decision-makers. The Millennium Ecosystem Assessment (MA) does not take a position, but we note that one proposed approach to these con-

flicts and trade-offs is a framework that combines concepts of equity, sustainability, livelihood, capability, and ecosystem stewardship. These are related to a value-based notion of well-being in which socially and ecologically responsible behavior plays a part (Chambers 1997a). This in turn relates to the negative and positive effects of individuals' lives, actions, and non-actions on ecosystems and on other people—both now and in the future. Negative effects manifest especially through the unsustainable consumption of resources, the degradation of ecosystems, and the many impacts of the behaviors of people who are richer and more powerful on those who are poorer and weaker. Positive effects include sustainable relationships between people and ecosystems, as well as the provision and enhancement of present and future livelihoods, capabilities, and human well-being.

Linkages between Ecosystem Services and Human Well-being

These formulations recognize that the relationship of ecosystem conditions and the flow of services to the well-being of groups of people as well as individuals is diverse and complex. Further, it changes over time. Many ecosystem changes are planned, but many are inadvertent consequences of other human activities. Human interventions in nature have had unexpected and surprising consequences, some of which have harmed and further impoverished those who are disadvantaged. Equitable and sustainable well-being depends heavily on links with ecosystem services and on who gains and who loses over time from their use. As noted in Chapter 2, the MA has identified four major categories of ecosystem services that bear directly on human well-being: provisioning, regulating, cultural, and supporting services.

The provisioning function of ecosystems supplies goods and other services that sustain various aspects of human well-being. By the same token, shortages of food, fiber, and other products have adverse effects on human well-being, via both direct and indirect pathways. Adverse impacts on livelihoods are of particular importance. In both social and environmental contexts, livelihood sustainability has three aspects:

- a livelihood is sustainable “when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future” (DFID 1999);
- a livelihood is sustainable in a social context when it enhances or does not diminish the livelihoods of others; and

- a livelihood is sustainable when it does not deplete or disrupt ecosystems to the prejudice of the livelihoods and well-being of others now or in the future.

Biodiversity is fundamental to many ecosystem services. For example, it provides sustainability and resilience vital for the livelihoods and coping strategies of many people, especially the rural poor. They often obtain ecosystem services, and thereby reduce their vulnerability, through diverse and complex mixes of activities over the seasons. For them, biodiversity has a stabilizing and buffering function. It provides multiple sources of ecosystem services, as well as fallback options for food and other resources when times are bad (Davies 1996; Chambers 1997b; Carney 1998; Ellis 1998; Koziell 1998; Scoones 1998; Neffjes 2000).

The regulating functions of ecosystems also affect human well-being in multiple ways. These include the purification of air, fresh water, reduced flooding or drought, stabilization of local and regional climate, and checks and balances that control the range and transmission of certain diseases, including some that are vector-borne. Without these regulatory functions, the varied populations of human and animal life are inconceivable. Thus changes to an ecosystem's regulatory function may have consequences for human health and other components of well-being.

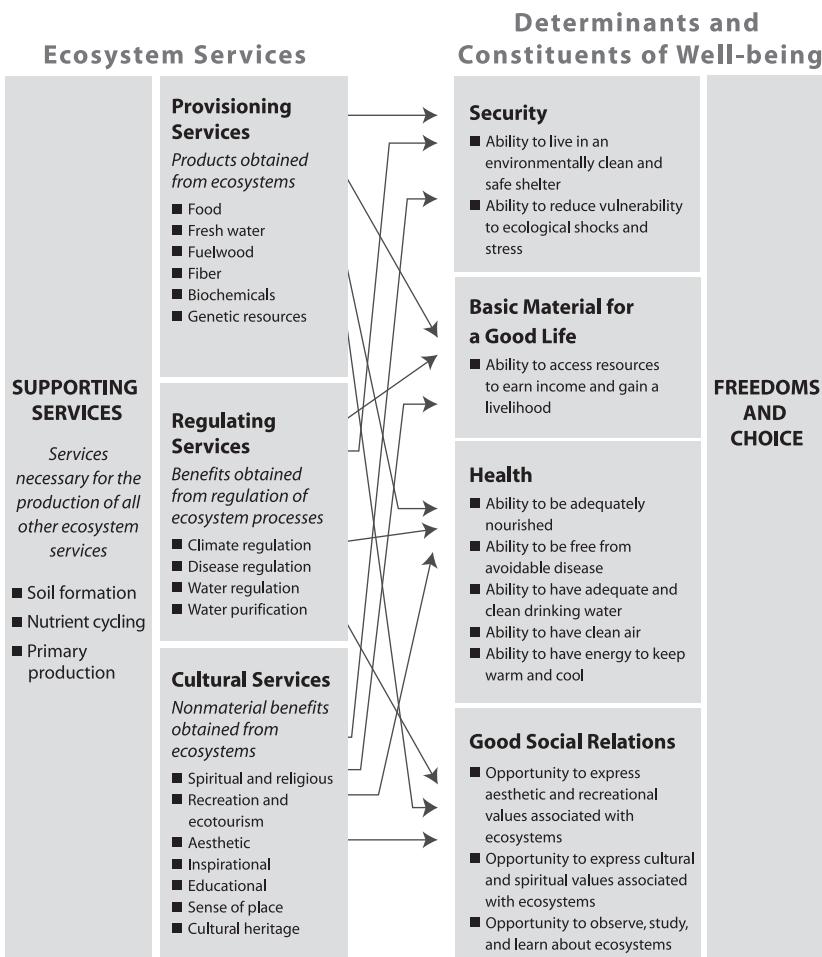
Ecosystems also have many consequences for human well-being through the cultural services they provide—through, for example, totemic species, sacred groves, trees, scenic landscapes, geological formations, or rivers and lakes. These attributes and functions of ecosystems influence the aesthetic, recreational, educational, cultural, and spiritual aspects of human experience. Many changes to these ecosystems, through processes of disruption, contamination, depletion, and extinction, therefore have negative impacts on cultural life and human experience.

Supporting services are essential for sustaining each of the other three ecosystem services. Thus the link between supporting services and human well-being occurs indirectly.

The diverse links between ecosystem services and the determinants and constituents of human well-being are illustrated in Figure 3.2. The spatial and temporal forms of these links, as well as their complexity, vary greatly. Some relationships are immediate; others are lagged. For instance, impairment of food production causes hunger today and malnutrition before long, bringing lassitude, impaired ability to concentrate and learn, and increased vulnerability to infectious diseases. Examples of longer time-lags include the clearing of mangroves, which impairs the replenishment

FIGURE 3.2 Ecosystem Services and Their Links to Human Well-being

Ecosystem services are the benefits people obtain from ecosystems. These include provisioning, regulating, and cultural services, which directly affect people, and supporting services needed to maintain the other services. Changes in these services affect human well-being through impacts on security, the necessary material for a good life, health, and social and cultural relations. These constituents of well-being are in turn influenced by and have an influence on the freedoms and choices available to people. (See also Duraiappah 2002.)



Determinants and Constituents of Well-being

Security

- Ability to live in an environmentally clean and safe shelter
- Ability to reduce vulnerability to ecological shocks and stress

Basic Material for a Good Life

- Ability to access resources to earn income and gain a livelihood

Health

- Ability to be adequately nourished
- Ability to be free from avoidable disease
- Ability to have adequate and clean drinking water
- Ability to have clean air
- Ability to have energy to keep warm and cool

FREEDOMS AND CHOICE

Good Social Relations

- Opportunity to express aesthetic and recreational values associated with ecosystems
- Opportunity to express cultural and spiritual values associated with ecosystems
- Opportunity to observe, study, and learn about ecosystems

of fish stocks (Naylor et al. 2000), salinization created by badly managed shrimp aquaculture, depletion of groundwater for irrigation, and the impact of introduced species.

Some larger-scale environmental stresses heighten tensions, leading to possible conflict, and threaten well-being by causing health problems (Homer-Dixon 1994). For example, Ethiopia and the Sudan, which are both upstream of Egypt, increasingly need the Nile's water for their own crops. Worldwide, approximately 40 percent of the world's population, living in 80 countries, now faces some level of water shortage (Gleick 2000). The construction of large dams, though of benefit through irrigation and power generation, can create new stresses—particularly in developing countries—by leading to increased levels of schistosomiasis (Fenwick et al. 1981) or displacing people through flooding (Roy 1999; World Commission on Dams 2000).

The dual challenge for society is thus to retain and, indeed, sustain a sufficient level of ecosystem services in a way that contributes to the enhancement of human well-being and the reduction of poverty. Explicit recognition of these links (see Box 3.1) and of substitutability among the various forms of capital will help policy-makers and other stakeholders to make informed decisions. Those, in turn, may produce the most efficient and equitable outcome.

Substitutability and Well-being

Ecosystem services can be conceptualized as flows parallel to those from physical and human capital. Some of these services can also be partially replaced by using physical capital. For instance, limited amounts of clean air and water can be obtained by air-conditioning a space or by using water filters. In other words, partial substitutability exists for at least some ecosystem services. Some commentators believe that the problems from the depletion and degradation of ecological capital can be largely overcome by the accumulation of knowledge and of manufactured and human capital. There are limits to substitution possibilities, however, and the scope for substitutions varies by social, economic, and cultural conditions.

In fact, the substitution possibilities open to a community depend critically on economic status. A resource can be a luxury for others even while it is a necessity for some. Politically, commercial demand can easily outrank local needs, especially under nondemocratic regimes. If local biodiversity is lost, ecotourists can go somewhere else, where it still exists. International public opinion, not to mention pressure from a country's

**BOX 3.1 Environment, Population, Poverty, and Well-being:
A Complex Relationship**

The downward spiral that links environment, poverty, health, and well-being is complex. Both poverty and environmental degradation, via independent pathways, jeopardize well-being and health.

Some commentators maintain that an approximate inverted U-shaped relationship exists between income and environmental degradation. That is, as the average income of a population increases, many forms of environmental degradation initially increase before the availability of wealth, literacy, and regulatory institutions combine to reduce the problem (Grossman and Krueger 1995).

The poor, however, derive their sustenance and livelihoods from healthy ecosystems such as grasslands, forests, and cropland. Why do they degrade the very assets that are the source of their own present and future incomes? Does their poverty make them barter the future for the present? Studies in the past decade from many parts of the developing world show that this usually happens when local social institutions that govern the use of “the commons” break down (Chopra et al. 1990; Chopra and Gulati 2001; Jodha 2001; Markandya 2001). This may be due to the operation of a combination of factors, including commercialization, population pressure, and bad governance. When appropriate sets of property rights are put in force, the process can be contained.

Most of the documented examples of an inverted U-shaped relationship refer to local pollution such as river or air pollution. In contrast, the indices for many of today’s larger-scale environmental problems (such as greenhouse gas emissions and the release of activated nitrogen) display a continuous increase (Vitousek et al. 1997; Butler 2000). These are problems of the “global commons” (Dasgupta 1996; Buck 1998) for which there is not yet clear feedback in terms of perceived consequences that influence the richer populations. Finding appropriate interventions for them will require the agency of global institutions.

elite, is often at best tepid. Local needs are frequently overridden by outsiders’ demands (Guard and Masaiganah 1997).

When wetlands, forests, and woodlands are converted (for agriculture, for example, or urban development), local communities may suffer. For them, and especially the poorest, there are few substitutes or choices. For privileged others, whose “ecological footprints” dwarf those of the poor and weak (Wackernagel and Rees 1995), there are often substitutes—something else, often somewhere else. Issues of common and conflicting interests and of reducing demands can be expected to surface. The question that may arise is whether long-term and secure well-being for the world’s relatively affluent people will lie in living more lightly on Earth while ensuring a better life and a fairer share of ecosystem services for those who

are poor and deprived. In any case, there are vital policy questions about how to achieve well-being for all, and especially for those who experience it least.

Balancing Priorities: Present Versus Future

The relationship between ecosystem change and human well-being has both current and future dimensions. The overexploitation of ecosystems may temporarily increase material well-being and alleviate poverty, yet it may prove unsustainable. That is, to solve today's pressing problems, society is often tempted to deplete tomorrow's ecological resource base. This can jeopardize future well-being and, in some cases, even survival.

The World Commission on Environment and Development first proposed a now widely accepted definition of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987:43). That is, each generation should bequeath to its successor at least as large a productive base as it inherited. Thus the concept of sustainable development incorporates not only intragenerational but also intergenerational equity.

In practice, can the present generation be expected to pursue sustainable development policies? After all, parents care about both the current and future well-being of their children. Since their children's well-being will depend upon the well-being of their grandchildren—and that of their grandchildren will in turn depend upon their great-grandchildren's, and so on—parents will tend to take at least some account of the interests of their distant descendants, even if they are directly interested only in their children.

Such individual concerns find a reflection in societal preferences only when prevailing property rights and other institutional structures take them into account. This is rarely the case. Instead, bad or weakly functioning institutions not only permit adverse consequences for human well-being from past and present actions but also hold no one to account. Often, the damage to ecosystems is the result of elite and powerful groups, both domestic and international, extracting short-term values for quick gains, thereby overriding the often longer-term interest of individuals and local communities (Jepson et al. 2001). If property rights to local ecosystems are ill defined or inadequately protected, such actions can have long-term adverse effects on ecosystem services that no one is responsible for.

Just as such actions can adversely affect contemporaries, they can have unintended consequences over time. For example, fish farms created by clearing mangroves can benefit economically the company that has created the farms, but the action will inflict future damage on those who would otherwise have depended on the mangroves for provisioning, regulating, supporting, and cultural services (Gilbert and Janssen 1998; Ong 2002).

Institutions and Freedoms

Earlier sections demonstrated how many of the constituents or determinants of well-being were directly or indirectly provided by ecosystem services. It has also been shown that ecosystem services are not infinite and are subject to scarcity. Although there are potentials for substitutability with other forms of capital, thresholds exist beyond which substitutes are not possible. For example, while many pharmaceuticals can be produced synthetically, the therapeutic potential of extinct, undiscovered species can never be developed.

Scarcity and the chance to add value provide powerful incentives for individuals or groups to try to gain privileged access and rights-of-use to many ecosystems and their services. They do this by influencing the political, economic, and social institutions that govern their access, management, and use (Ostrom 1990; Acheson 1993; Alston et al. 1997; Ensminger 1997).

Institutions—formal and informal—mediate the link between ecosystem services and the constituents and determinants of human well-being. For example, institutions for community forest management in India have successfully facilitated access to forest products for local communities (Chopra and Dasgupta 2002).

In most cases, inequitable distribution of or access to ecosystems and their services occurs when formal or informal institutions break down (Binswager 1989; Jaganathan 1989; Duraiappah 1998). This happens either when institutions do not exist or when they are inefficient or ineffective. There are many reasons for institutional failure. Commonly, powerful individuals or groups prevent the establishment of institutions. Existing bodies that mediate the distribution of goods and services may also be appropriated for the benefit of powerful minorities. Agricultural subsidies in western industrial countries are an example of this.

Creating, revising, and modifying institutions is a social process. Certain preconditions, or “freedoms,” are necessary to ensure that this process

is equitable and fair. These freedoms, by permitting a fair and equitable social process, play a critical role in preventing or mitigating institutional failure. Five freedoms that have been identified are participative freedom, economic facilities, social opportunities, transparency guarantees, and protective security (Jordan 1996; Sen 1999; Chopra and Duraiappah *in press*). For example, access by the poor to credit at reasonable interest rates—the provision of an economic facility—has been facilitated by microcredit schemes, such as the Grameen Bank, a formal institution (Yunus 1998).

We have, in this chapter, added a sixth freedom to the five just listed—ecological security. We define this as the minimum level of ecological stock (an ecological safety net), defined by respective communities through an open and participatory process, that is required to provide the supporting services needed to ensure a sustainable flow of provisioning, regulating, and cultural ecosystem services. We stress that ecosystems and their services are not only instrumental for improving well-being, but are also constitutive elements of well-being. For example, microbiologically adequate water, needed for good health, may also be valued for aspects such as its purity and ease of access.

Contrary to the view that some of these freedoms are luxuries, deferable until some level of macroeconomic growth has been achieved, we argue that they are complementary, rather than substitutes. Social, political, economic, and ecological freedoms are essential if equity, fairness, justice, and choice are to be addressed. In order to take advantage of economic facilities, for instance, it is essential to have some social opportunities, such as health and education, available (Drèze and Sen 2002). In a similar fashion, it is necessary to have participative freedom and transparency guarantees if ecological security is to truly benefit local communities.

These six freedoms provide the space that allows individuals to define their rights—legal, political, social, ecological—and to create institutions to protect and oversee a fair and equitable distribution of these rights for all members of society. In this manner, individuals, especially the poor, are given the ability to make their own choices for self-determination. This process allows them to become agents of change.

Conclusion

The well-being of present and future human populations depends on ecologically sustainable and socially equitable ways of living in the world. In determining how to achieve these, value judgments have to be made concerning equity and ecosystem stewardship. These are the sphere of policy-

makers. Depending on context, decision-makers are faced with questions of who gains and who loses in rights, access, and the ability to enjoy ecosystem services.

Toward these ends, and toward the reduction of poverty, an essential step is fuller understanding of the myriad ways in which human activities and well-being are related to ecosystem changes and services. Such understandings will always be needed to inform and support responsible and farsighted governance. It is implicit in this chapter that enhancing those understandings will be an essential and permanent part of human endeavor. To achieve sustainable well-being for all will be a perennial challenge. And in the constant flux and interaction of ecosystems and people, no answers can ever be final.