2

Ecological Economics: Sustainability, Markets, and Global Change*

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Introduction

Ecological economics, as is practised today, often marks a paradigm shift from the ways neoclassical environmental economics was initially conceived. Yet, the embedment of the present day ecological economics in the traditional and critical developmental issues cannot be ignored. The origin of the development discourse traces back to the notions of economic growth defined in the form of expansion of the social basket of goods and services, and has eventually reached a stage where governments and academics are more concerned with more holistic notions of development than merely talking of reductionist growth. Though growth-fetishism persists in large parts of policy thinking in the developing world, sustainable development, eventually, has become a very important notion of the day and provides a more comprehensive definition of development, linking ecosystem services and quality of life with economic growth. Such a paradigm shift in less than a century is no less than a revolution. Expectedly, this shift has been marked by cognitive dissonance, bitter debates, and scholastic antagonism.

The Days of Classical Political Economy

With political economy evolving out of the writings of Adam Smith and David Ricardo, the scope of economics as a discipline got defined in the confinements to find and explain the "nature and causes" of economic development. The scenario is neither simple nor comfortable for modern economists of the post-Keynesian era; it has always been considered a maverick field, lurking somewhere in the background but not really thought of as real economics, rather as an amalgam of sociology, anthropology, history, politics, and all-too-often is based on ideological constructs of political thoughts and normative principles from ethics.

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* Modified version of the presidential address delivered at the Seventh Biennial Conference of the Indian Society for Ecological Economics, Tezpur University, Tezpur, Assam, 5–8 December 2013.

Though it has often been claimed that economic development as a branch of economic science emerged only in the 1950s, there is no doubt that the notion of development existed even in the classical economic thought processes, albeit by a different name. The recognition of development economics as a sub-discipline over the past 50 years earmarked the changes in human understanding of development. The wealth of experiments so far has revealed that there are clearly no sure-fire formulas for success; if there were, there would have been many more successes than there are today. Economic theory has, in fact, evolved to account for both successes and failures.

Nonetheless, few of the greatest economists actually ignored it outright. Those belonging to Classical School, starting with Adam Smith, were undoubtedly concerned with "economic development." However, their notion of economic development was quite different from what is defined as development today by development theorists. This difference gets reinforced in Smith's *Wealth of Nations* (1776), and Ricardo's *Principles of Taxation* (1817), and goes on till Schumpeter's classic *Theory of Economic Development* (1911). The German Historical School—and its English and American counterparts—could very well be deemed as part of "development economics," though it was thoroughly geared towards the theory of economic growth, as was known then.

However, the primary focus of economic research remained confined to developed nations till the 1930s. It was Colin Clark's quantitative study in 1940 that made economists realize that most of humankind did not live in the advanced capitalist economic systems. Yet the early concern was still Europe, namely, post-war European reconstruction and the industrialization of its eastern fringes as exemplified by the pioneering article by Paul Rosenstein-Rodan (1943) and Kurt Mandelbaum's book in 1947. It was only sometime after the war that economists really began to show their concerns for Asia, Africa, and Latin America.

To this end, decolonization was an important catalyst. Faced with a plethora of new nations whose standards of living and institutions were so different from the European way of life, modern development theory—by which we mean the analysis of not only growth but also of institutions that could induce, sustain, and accelerate growth—began in earnest to change its focus and rearrange its referential. After the Second World War, academes began to think of ways and means of effectively dealing with poverty and destitution that heavily weighed upon two-thirds of the human race (Pakdaman 1994).

The post-war formation of the United Nations and its attendant agencies, such as the World Bank, the IMF, the ILO, and various regional commissions, provided an impetus to the shift in focus and perceptions. The commissioning of numerous studies by these institutions led to the emergence of a non-academic strand of development theory.

Post-war Period: Stage Theory of Growth and Capital Formation

Post-war development was primarily looked at from the viewpoint of growth and capital formation. Even before that developing nations looked at development primarily as a process of industrialization. This resulted in the concept of a Third World consisting of Latin American, Asian, and African countries, which were to be mostly viewed as "underdeveloped" countries. It was believed that they were in the early stages of development; and with time, they would be able to transcend the various stages of underdevelopment and move up the ladder. This was contingent upon the way in which capital was being formed, industrialization was taking place, and GDP growth occurred.

This thought culminated in the "stage" theory of development, made famous by Gerschenkron (1962) and Rostow (1960). The stage theory assumes certain linearity in the development patterns of economies and argues that "underdevelopment in some of the economies will be converted to development over time."

A few of the Asian, African, and Latin American countries lagged behind the developed nations in terms of the time taken for development. Interestingly, to view development, capital formation, and technological change as linear functions of time is an assumption that is reductionist and that does not incorporate social and political variables that might result in differential and varying growth trajectories.

However, the role of capital formation as a crucial component that accelerates development was not only recognized by Gerschenkron and Rostow but also by Nurkse (1953) and Lewis (1955). Early Keynesians, such as Kaldor (1940 and 1961) and Robinson (1953), attempted to call attention to income distribution as a determinant of savings and growth. Even modern Marxists like Maurice Dobb (1951 and 1960) focused on the formation of savings. And even orthodox Marxists have had no conflict on this issue. Lewis and even Keynesians have argued that savings can be manipulated through government intervention (Myrdal 1957; Singer 1950). Thus, government involvement—whether by planning, socio-economic engineering, or effective demand management—was regarded as a critical tool of economic development.

Post-war Marxist Thinking

A number of emigrant economists in Britain, influenced by their personal experience of late industrialization in Central and Eastern Europe, developed plans for the post-war transformation of underdeveloped regions. The contributions of Michael Kalecki, Kurt Mandelbaum, Joseph Steindl of Oxford University, and Paul Rosenstein-Rodan of the Royal Institute of International Affairs laid the basis of development economics as a formal sub-discipline. These Central European economists were more familiar with Marx than with Keynes, and the success of the Soviet five-year plans played a significant role in their approaches to developmental planning. It is well known that Kalecki's (1955, 1956) model of an economy with underutilized resources of labour and capital was similar to Keynes' but presented in Marxist rather than the more familiar Anglo-Saxon analytical categories. In fact, Kalecki's contribution to planning for economic development deserves to be widely acknowledged.

Newly formed economies like India also followed the planning processes, as was done in the USSR, and their initial growth models were based on the USSR–Soviet experience. It was generally accepted that the State must play a central role in economic transformation because the private sector was either dominated by landed and commercial oligarchies with vested interest in the status quo or was simply too weak and disorganized. The degree of State involvement in the economy varied across countries, but basic public infrastructure and its financing was universally undertaken by the State, which was accompanied by some form of long-term economic planning. In the first three post-war decades, countries were able to privilege domestic agriculture and industry by discretionary access to credit and foreign exchange, subsidies, and a variety of protective commercial policies. The principle of sovereignty regarding natural resources, and more generally the sovereign right of nations to formulate fiscal, monetary, commercial, and all other aspects of government policy, was not questioned, although in practice it was often violated (Pakdaman 1994). Homer-Dixon (1991, 1994), Ghosh and Bandyopadhyay (2009), and many others have presented cases of such violations and conflicts in the context of various developing nations.

This was the time (at the end of first three post-war decades) when the new orthodoxy emerged around the notion of balanced growth with the works of Lewis and Nurkse. However, it never took much time for an antithesis to emerge in the notions of unbalanced growth with the works of Hirschman (1963, 1981) and Streeten (1959). They were of the view that balanced growth is not possible as the theory assumes that a modern sector would be superimposed on an old and traditional one. In the process, the balanced growth theory lost its focus from the processes of change, which, in fact, should have been the real focus of development theory.

Neoclassical Growth Theory

Neoclassical development theorists have emphasized the important role that international trade plays as a substitute for low domestic aggregate demand. They argue that governments should act as facilitators to promote international trade between economies. In the process of positioning the economy on an autonomous, sustained growth path, the government has to remove barriers to international trade in commodities. Comparative advantage, combined with the Hecksher–Ohlin theorem, can then take care of the rest. Subsequent amendments to this position require the removal of price distortions in domestic factor and commodity markets ("getting prices right"); this is in addition to the list of government actions that are required to induce suitable movements of factors of production across sectors, encourage the adoption of appropriate technology, and increase capital accumulation. In this view, domestic and international liberalization programmes suffice to bring about sustained economic growth and structural change.

Many economies have revealed considerable faith in this framework and have relied extensively on export-oriented growth. This has been the main characteristic of Southeast Asian economies and the present-day China. To a certain extent, even developing economies such as India and Brazil have also subscribed to this thought process. Interestingly, export facilitation in many of the Southeast Asian economies resulted in pegged exchange rate regimes and free international mobility of capital. Although phenomenal economic growth has been achieved, yet there have often been problems of capital flight caused by the lowering of interest rates as currencies were devalued to promote exports. Hence, in developing economies like India, where full capital account convertibility has been discussed and debated for long, words of caution have always been forwarded to go slow at this front.

From Economic Growth to Economic Development

Capital formation remained an important component of growth for centuries, and even today, its importance remains undiminished. However, over time, its connotation has changed. T.W. Schultz (1963, 1971) was the first to recognize the need for human capital formation as an important appendage to physical capital formation. This led to an emphasis on education and training as prerequisites of growth and the identification of the problem of "brain drain" from the Third World to the First.

Lewis (1965) and Singer (1965) also subscribed to Schultz's thesis. Their argument was focused towards social development as a whole, which could be brought about by education, health, fertility, etc. Improvement in human capital thus began to be considered as a necessary pre-requisite for economic growth. In this view, industrialization, if it came at the cost of social development, could never be self-sustaining.

According to Singer (1965, 5), "Development is growth plus change, and… change is not only economic but also social and cultural." He pointed out that growth had not resolved the problem of poverty, and suggested "poverty-biased policies" to affect the lives of the poorest. Till this time, all arguments, even those in favour of development, were growth-centric.

The growth obsession of development theory received a huge jolt when Seers (1969) published a seminal essay where development was construed as a social phenomenon rather than merely being defined in the reductionist mode of per capita income growth. Development, in Seers' opinion, involved the movement towards the social goals of poverty reduction, employment, and equality.

Myrdal (1968) also supported Seers' views. In his presidential address at the 11th Conference of Society for International Development at New Delhi, Seers (1969, 2) presented a more succinct statement of development with distinction: "[i]t is very slipshod for us to confuse development with economic development, and economic development with economic growth." Haq (1971, 6) was galvanized by Seers' call to redefine economic development, when he stated, "[w]e were taught to take care of our GNP as this… [would] take care of poverty. Let us reverse this and take care of poverty as this will take care of GNP."

Thus, structural issues, such as dualism, population growth, inequality, urbanization, agricultural transformation, education, health, and unemployment, began to be reviewed on their own merits, and not merely as appendages to an underlying growth thesis. Eventually, there was an emerging debate on the very desirability of growth, which was led by the extremely provocative publication by Schumacher (1973) where he argued against the desirability of industrialization and inscribed the merits of handicrafts economies.

The social positions of development became even more prominent with the adoption of Human Development Index (HDI) as a somewhat rough measure of development by academics and multilaterals in the 1990s. The HDI measures life expectancy, literacy, education, and standard of living for countries worldwide. This provides an indicative measure of the impact of economic policies on the quality of life. The index was developed in 1990 by Amartya Sen and Mahbub ul Haq with help from Gustav Ranis of Yale University and Meghnad Desai of the London School of Economics. Ever since its development, the United Nations Development Programme (UNDP) uses it as a standard measure for categorizing development of a nation in its annual *Human Development Reports*. Though a "vulgar measure," as described by Sen because of its limitations, it nonetheless brings forth the broader aspects of development than the per capita income measure it supplanted and provides a pathway for researchers to delve into the wide variety of detailed measures contained in the *Human Development Reports*. Even other multilateral agencies like the World Bank have started focusing their attention on social attributes like poverty. As a result, whether in policymaking or in academic research, social variables began to be factored in and became an integral part of development economics.

Yet the debate between growth and development continued and took a new twist in the late 1980s and became more prominent in the 1990s when the very sustainability of economic development was being questioned by environmentalists because of grave concerns about the growing environmental crisis. Environmental pollution was seen as an externality of mindless developmental policies. The questions that loomed large were: Growth? At what cost?

Sustainable Development

Around three and a half decades ago, a group of academics known as the Club of Rome put forth the "limits to growth" theory, predicting disaster for humankind unless natural resources depleting economic and technological progress were abandoned. Such pessimistic calls were, indeed, extreme in nature. However, the global recognition of the linkage between environment and development came as late as 1980 when the International Union for the Conservation of Nature (IUCN) published the *World Conservation Strategy* and used the term "sustainable development."

The concept came into general use following the publication of the 1987 report of the Brundtland Commission—formally the World Commission on Environment and Development (WCED). Set up by the United Nations General Assembly, the Brundtland Commission coined what was to become the oft-quoted definition of sustainable development: "Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (WCED 1987). This definition, despite being lauded as the first formal attempt to delineate sustainable development, has met with a lot of resistance and cognitive dissonance.

However, there is a misconception that sustainable development is all about environment and ecology. There cannot be anything more disastrous than conceiving such a reductionist scope of this notion. Rather than focusing solely on environmental issues, sustainable development policies broadly encompass three areas: economic, environment, and social. In support of this, several United Nations texts, most recently the 2005 World Summit Outcome Document, refer to the interdependent and mutually reinforcing pillars of sustainable development as economic development, social development, and environmental protection.

Among many subsequent definitions, the sustainable development triangle in Figure 2.1 shows one of the widely accepted explanations proposed by Munasinghe (1992) at the 1992 Earth Summit in Rio de Janeiro.

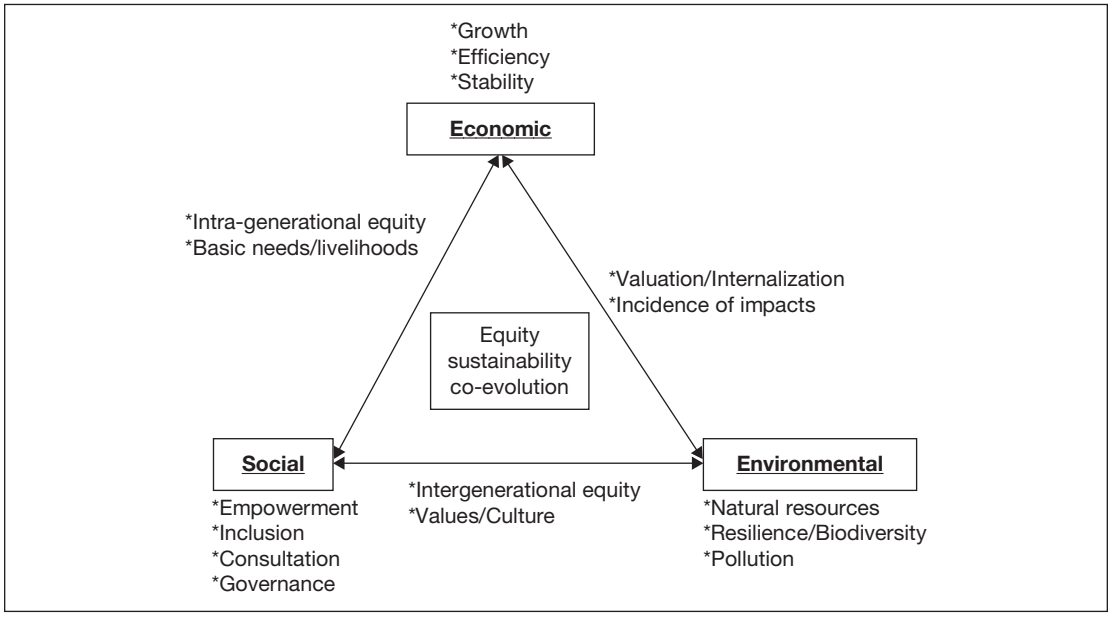
All the available documents on sustainable development acknowledge the interlinkages between the three domains and have argued that environmental changes (e.g., in ecosystem services like food production and water purification) not only influence economic growth in the short and the long run but also institutions and culture (Munasinghe 1992, Munasinghe and Reid 2005). Changes in social values and behaviour influence economic development and environmental management. And critically, economic growth and distribution of wealth and welfare influence both social and ecological attributes.

Sustainable development, eventually, led to the recognition that life-support systems that are crucial to human development are given by nature and can be finite, diminishing, yet replenishable at times. In the context of non-replenishability, there is an utmost need to look for alternative sources so that the exploitation of such resources is diminished. It also gave recognition to the fact that a given stock, composition, and productivity of society's capital—natural, man-made, and human—can contribute towards meeting basic human needs in a sustained manner over time, but only up to a maximum limit (Sengupta and Sinha 2003).

Yet the debate still rages. Despite various attempts to define "sustainable development," in terms of pathways, values, indicators, goals, practice, etc., a clear, fixed, and immutable definition remains elusive (Kates, Parris, and Leiserowitz 2005). It has also led some to infer that sustainable development is an oxymoron: "development" and "sustainability" cannot be reconciled. Verily, Kates et al. (2005, 20) state,

> Sustainable development draws much of its resonance, power, and creativity from its very ambiguity…its malleability allows it to remain an open, dynamic, and evolving idea that can be adopted to fit these very different situations and contexts across space and time. Likewise, its openness to interpretation enables participants at multiple levels, from local to global, within and across activity sectors, and in institutions of governance, business, and civil society to redefine and reinterpret its meaning to fit their own situation…. Despite this creative ambiguity and

Figure 2.1
Elements of sustainable development



Source: Munasinghe and Reid (2005).

openness to interpretation, sustainable development has evolved a core set of guiding principles and values, based on Brundtland Commission's standard definition to meet the needs, now and in the future, for human, economic, and social development within the restraints of life-support systems of the planet.

Hence, no ambiguity can deter one from concluding that sustainable development is probably one of the most powerful and holistic thought process that has enriched the development discourse, by challenging the reconciliation of what apparently seems to be the irreconcilable trinity of economic growth, social development, and environmental sustenance, thereby providing opportunities for a healthier and sustainable future.

Is Sustainable Development Opposed to Economic Growth?

Sustainable development has sometimes been treated as a notion emerging from the communistic thought processes, and sometimes as a tool used by antagonistic ecological and environmental activists. Both of these are widespread misconceptions about the notion. Rather, the notion is much more objective than being treated as inclined towards a particular tradition. The concrete challenges of sustainable development are at least as heterogeneous and complex as the diversity of human societies and natural ecosystems around the world. Unfortunately, both socialistic thought processes and ecological antagonism have used this notion as a powerful tool to talk against economic growth, and this has even deterred many market-oriented thinkers from adopting this notion. It needs to be remembered that sustainable development is not opposed to economic growth or development; rather, it talks of sustaining the process of growth and development over generations.

On the contrary, the relationship between economic growth and indicators of air and water quality indicates that growth does not always contribute to environmental degradation. The connection is highly dependent on income levels: there seems to be a U-shaped relationship between income and environmental quality. This statement in favour of reconciliation of growth and ecological sustainability is best reflected in the Environmental Kuznets' Curve (EKC).[1] The EKC presents a relation between various indicators of environmental degradation and income per capita. In the early stages of economic growth, degradation and pollution increase, but beyond a threshold level of per capita income the trend reverses, so that at high-income levels economic growth leads to environmental improvement.

The EKC concept emerged in the early 1990s with Grossman and Krueger's (1993) path-breaking study of the potential impacts of NAFTA, and Shafik and Bandyopadhyay's (1992) background study for the 1992 *World Development Report*. However, the idea that economic growth is necessary for environmental quality to be maintained or improved is an essential part of the sustainable development argument promulgated by the WCED (1987). However, the EKC is an empirical phenomenon, despite research papers on the topic being inflicted by weak econometrics.

In the context of the EKC, it is easy to interpret that the levels of suspended solids and toxic metals in air and water increase rapidly as incomes approach middle-income levels, but thereafter they decrease. The link between income and pollution arises because the composition of output changes with growth in favour of newer, cleaner technologies. The EKC also presents a powerful statement on the political dimension of the economy–ecology linkage. Because of better education and awareness, citizens in higher income economies articulate their demands for a cleaner environment in a more effective manner than those in lower income nations. Hence, it is the concern of "environment" as a "good" being featured in the "utility bundle" of the consumer that acts as a prime driver in the scheme of things.

On the other hand, the convincing statements made by Munasinghe (1992, 2005) and the recently published Millennium Ecosystem Assessment (2005a) and TEEB (2010) on ecosystem services affecting economic behaviour reveal that ecological services and economic development cannot be dissociated or disintegrated, and that the causality flows from both directions.

Developing countries have often perceived pollution abatement as being opposed to their development aspirations. An implausibly high level of technical progress in energy use would be needed if these were to result in the stabilization of emissions. Incidentally, in consonance with the EKC phenomenon, most developing countries are still well below the peaks of their pollution so that global environmental damage is likely to increase substantially before it declines. Does that imply that growth needs to be sacrificed for this? Rather, sacrificing on growth would aggravate the problem, accelerating population growth, slowing the adoption of cleaner technologies, and frustrating the development of democratic institutions. Pollution tends to be related to population, and population growth is inversely related to income growth. Higher average income and output levels are only good for the environment when associated with policies that lessen demographic pressures by reducing personal risk and the need for large families. Improvements in the security of employment, education and training, pension policies, social security, and the employment of women are especially important.

Measurement of environmental costs and benefits is a key first step to the development of appropriate policies. The failure of current estimates of the net national product to account for the depreciation of environmental resources amounts to imputing this depreciation to be zero, biasing investments and technological choices. If full account were taken of environmental depreciation, profits and national output would be lower. In Costa Rica, for example, it is estimated that the depreciation of forests amount to around 10 per cent of GDP and over a third of gross capital accumulation (Salzman 2005). Biases like these have severe consequences everywhere, but are particularly pernicious in poor countries where small fluctuations in income or growth levels can spell the difference between famine and survival. Small changes in techniques of measurement, production, and lifestyle are likely to prove sufficient to preserve the options for future generations. Investments in environmental maintenance are likely to lead to barely significant declines in income growth (under 1 per cent) in the short term; in longer term, they should facilitate more rapid and globally equitable development (Salzman 2005). Policies which facilitate growth and lead to the appropriate pricing of natural resources provide the basis for enhanced environmental management. The establishment of a pricing structure for natural resources which reflects their true value will also be invaluable. The failure to price natural resources, such as water, at their economic cost means that degradation of natural resources by the present generations may undermine the basis for future economic growth.

Trade liberalization offers a particularly powerful impetus to growth and is entirely compatible with sustainable development. Indeed, trade distortions are a primary explanation for environmental degradation, as shown by the high dependence on subsidized dirty fuels in China and Eastern Europe. To the extent that trade policies may have an adverse effect on the environment, it is up to governments to initiate policy changes. Improved minimum standards and global cooperation for environmental management are a vital step to ensure that the benefits of economic growth may more quickly and effectively be reflected in an enhanced environment. Not only is growth sustainable, but it is a necessary condition for improved environmental management.

The Role of Markets

From the discussion so far, it is clear that from the viewpoint of policymaking, a development path that is sustainable should also take into consideration institutions that will be conducive to greater participation of citizens at various levels. One of the critical elements that have been implicitly pointed out in this debate is the crucial role of market mechanism. Markets have traditionally been one of the mechanisms of social adaptation to scarcity. There are others as well. To understand the determinants of social adaptation to scarcity, Homer-Dixon (1995) defines "ingenuity" as society's ability to supply enough ideas.

Unfortunately, the role of market in sustainable development has not received much attention, and rather, in many cases, the same has been criticized by communist groups. Therefore, it is only pertinent here to talk of a few market phenomena that have emerged and might prove conducive to sustainable development.

Trading in Ecosystem Services: A Market for Nature

It has often been argued that ecosystems services should be viewed as a natural capital, investment in which can prove more effective than that in the built capital to deliver key services. As an example, consider the case of flood control. One can address floodwaters through built capital, such as engineered works (e.g., construction and maintenance of dikes and levees) or through natural capital, such as landscape management (e.g., restoration of wetlands in flood plains). In some instances, perhaps many, landscape management may prove a better public and private investment strategy for providing flood control, once one accounts for the positive externalities of improved water quality, wildlife habitat, and recreational amenities (Salzman 2005). Many solutions have been proposed to halt environmental degradation and reverse the downward trend in ecosystem services. Some have been successful, while others have failed. An assessment of response strategies undertaken by the Millennium Ecosystem Assessment (2005b) highlighted the potential of market-based strategies to mitigate the degradation of ecosystem services.

At one point in time, it was thought that nature is endowed with resources in abundance. Anything that is supplied in abundance eventually has no value, and no market. However, over time, with human intervention in the working of the environment, there has been degradation and depletion of the resources. With the decline in their *supply*, a traditional response has been to turn to governments for continued supply of ecosystem services, through regulations, cost sharing, and other related mechanisms. This is what has been done for public goods and utilities so far. The status of the ecosystem is really a cause for more serious concern than that of public goods and utilities. The Hardin-initiated parable of "The Tragedy of the Commons" demonstrates how free access and unrestricted demand for an open-access natural resource doom the resource through overexploitation (Hardin 1968). This happens as none of the beneficiaries from the resource are willing to take up the responsibility of restoration and maintenance, because the individual cost of doing so is perceived to be much higher than the benefits that accrue. According to the Millennium Ecosystem Assessment (2005a), if the current trends continue, ecosystem services that are freely available today will cease to be available or become more costly in the near future. The higher costs that primary users may face will be passed downstream to secondary and tertiary industries and will transform the operating environment of all businesses.

Since monitoring and regulation of the ecosystem services is difficult and expensive for the government, the need for creating markets and market values assumes importance. Ecosystem services affect the well-being of individuals and the performance of firms. Yet this is rarely reflected in the financial incentives that ecosystem participants get. Typically, those who reduce ecosystem services do not bear all the costs they impose on others, nor those who supply such services are rewarded for the benefits they provide to others. In the absence of non-existent markets, allowing participants to act in their own private interest can result in fewer ecosystem services than is optimal for the society as a whole. Markets work well at providing rewards, and hence, markets are a way of encouraging resource managers to properly manage natural resources by offering them incentives.

When one looks at the value chain of any marketed commodity, one realizes that goods extracted from ecosystems have long been traded in markets (i.e., can be bought and sold at established prices). The services provided by ecosystems have been used for just as long, but have remained beyond markets and largely unpriced. The problem of open access hinges on the fact that property rights over certain resources (including forests, water, or grasslands) are either poorly defined or undefined. Hence, if their use is not regulated, they can be accessed by all and used until exhaustion. But just as in any market, an emerging scarcity can make them tradable.

There have been establishments of markets for ecosystem services, and as argued by many, payments for ecosystem services can help in rural poverty alleviation and the process of conservation simultaneously (Uddhammar and Ghosh 2006, Ghosh 2007, Ghosh and Uddhammar 2013). Economists have also been instrumental in devising tools like environmental valuation to assess the value of the benefits accrued to human civilization by the environment (e.g., Chopra and Adhikari 2004; Costanza et al. 1997). This has

often helped in devising rules of compensation for environmental damages that cause economic losses to backward communities (e.g., Ghosh and Shylajan 2005).

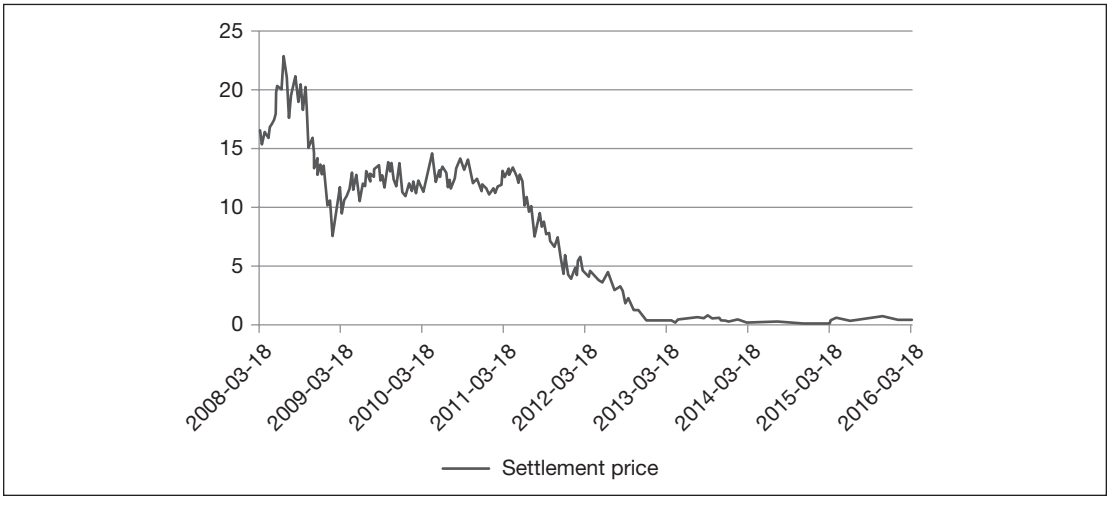
There was a consequent expansion of markets for other environmental services that suggested that they may rapidly become a central point of sustainable development financing, representing tens of billions of dollars annually within the next 10–15 years. All these moves towards markets have been triggered by two major drivers that include conscious national environmental policy movements towards market-based instruments, and rising demand for environmental goods and services from public authorities, private entities, and consumers. On the one hand, there are new public regulations along with the establishment of market-based instruments, and on the other, it has become quite lucrative and fashionable for private players to show initiatives towards efforts of biodiversity protection. Consumer demand for derivatives of healthy ecosystems in the form of organic foods, fair trade products, and ecotourism has also increased over time. Its positive incidence on human health and overall welfare is also being steadily documented.

The Failure of Markets

Lately, however, the failure of environmental markets point out to a different perspective on markets. The failure is more visible in the context of crash of the markets on carbon trading, especially the Certified Emission Reduction (CER) markets after the financial market crash of end 2008 and the consequent global slowdown. The same is prevalent in Figure 2.2.

As one may see in Figure 2.2, the CER futures prices dropped from USD 23 during 2008 to USD 0.4 during 2016. This market crash brings us to a different perspective on markets. Let us go into the fundamentals of the markets to explain this. Essentially, with the assumption of the efficient market hypothesis, the price of CER (or its derivatives) is supposed to reflect on the value loss due to a ton of carbon emission. When viewed from another angle, the price will also reflect the shadow value generated by the forest through a ton of carbon sequestration. This is an important regulating service of the forest. Now, the situation is

Figure 2.2
Settlement price of CER futures at international exchange (USD)



Source: www.theice.com

such that due to decline in demand for carbon credits by industries and related sectors, mostly because of the global slowdown, the CER prices have dropped to abysmal levels. Does that imply that the value of the forest ecosystem services in the form of carbon sequestration declines during the times of slump, as compared to the times of economic boom? Of course, this is the age-old paradox of economic theory that views all values through the prism of the markets, and there is no denying of the fact that markets are inefficient. As this example clearly shows, the markets have failed to acknowledge the true value of the underlying ecosystem services. Possible imperfections also exist in the derivatives markets, where it has essentially turned out to be a market of speculation.

Emerging Markets and Sustainability

Even with its inherent imperfections, markets are important. They need to be regulated to be put to right use. One may not deny the fact that market institutions make the common man understand the value of the services that the ecosystem provides to the economy as a whole, the incidence of economic activity on the ecosystem, and finally, its possible repercussions on the quality of life. This dictates the supply-side phenomenon of an economy, including human health, welfare, and eventually, labour markets. At the same time, trade in ecosystem services has the potential to become the new growth industry. Areas and projects where such trade is possible are likely to generate significant secondary benefits, such as ecotourism, with multiplier effect on incomes and employment. The potential for synergies among various initiatives, therefore, is plenty. Not only can an economy fulfil its obligations under the various environmental conventions to combat desertification, biodiversity degradation, and global climate change, but the possibility also exists to engage various rural communities in formal market transactions, reducing thereby the extent and magnitude of poverty.

Ecological Economics and Global Change

Global change refers to planetary-scale changes in the earth system. The system consists of the land, oceans, atmosphere, poles, life, the planet's natural cycles, and deep Earth processes. These constituent parts influence one another. The earth system now includes human society, so global change also refers to large-scale changes in society. At Indian Society for Ecological Economics (INSEE), we debated on why we need to include global change as a theme of this conference. What is the relevance of global change in ecological economics? In terms of explicit scope delineation, ecological economics emerged over the last three decades, as a trans-disciplinary domain of academic research in an attempt to address the critical interface between the nature, economy, and society. In the process, ecological economics recognized the spatio-temporal co-evolutionary interactivity of the human economy and the natural ecosystem. Environmental economics, on the other hand, is explicitly recognized in the mainstream economic analysis as an embodiment of the neoclassical framework. Ecological economics saw the economy as embedded in, and supported by, natural systems, whereas environmental economics treated nature as a pool of resources that act as factors in the foundation of economic activity. Ecological economists sought to provide scientific arguments for preserving the natural world not only by integrating models from ecology and economics, but by also looking at the interplay of various other socio-ecological and institutional factors that governed an economic system (Ropke 2004; Sagoff 2011).

In a recently published article in the *Breakthrough Journal*, Sagoff (2011) postulates, "Ecological economics aimed to be revolutionary, but it is now ignored by the sciences it had hoped to transform. Both ecology and economics have changed, but not because of the rise of ecological economics." This position, however, is not true, as a large component of Sagoff's arguments are based on the contention that ecological economics has essentially attempted to place a price tag on the ecosystem services and functions. This position would

have been true if we indeed accepted ecological economics as another off-shoot of the traditional school of economics that deals with the issues of values and market prices. Neoclassicism, essentially, entailed a methodological breakthrough within the traditional school of economics that was obsessed with the working of various forms of markets, with varying powers of the stakeholders. Rarely, however, neoclassicism thought of evaluating institutions, and even if it did so, the traditional cost-benefit approaches with the present value of monetized net benefits were used for decision-making.

Sagoff (2011) was, however, right in pointing out the lack of advances made in this domain, as also the inherent reductionism that dominated the policy and academic spheres, because of the adherence to these measures. What Sagoff has completely missed out in his argument is the advancement of ecological economics in the other direction that is independent of cost-benefit analysis of ecosystem services and functions. This is where Ostrom opened a new horizon for ecological economics. With the institutional analysis and development framework, she showed how the working of institutions can be evaluated without really resorting to neoclassical methods of valuation. Moreover, Ostrom also took a departure from looking at ecosystems as merely providing services (provisioning, regulating, supporting, and cultural) to human society, as has been envisaged by the early works of many ecological economists. She has looked at the society as an integral component of the social–ecological system. This approach was missing from the body of ecological economics. Sagoff, unfortunately, in his criticism, has indeed failed to capture this emerging dimension in the study of ecological economics.

By studying "global change" and setting it as a theme in its seventh biennial conference, INSEE has essentially attempted to understand the broader linkage of the human society with the changes taking place in the global system. This encompasses a wide range of issues entailing population, climate, the economy, resource use, energy development, transport, communication, land use and land cover, urbanization, globalization, atmospheric circulation, ocean circulation, the carbon cycle, the nitrogen cycle, the water cycle and other cycles, sea ice loss, sea-level rise, food webs, biological diversity, pollution, health, over fishing, and more. One needs to appreciate here the circular causality between the various forces. In the context of ecological economics in South Asia, while it is important to initiate the causal thought process, it is also important to recognize the exogenous stimuli working on the dynamics of the various forces. This can render a better and more holistic understanding of the social–ecological systems.

Concluding Remarks

Sustainable development, by all means, is an all-encompassing notion involving parameters of human health, labour, education, industrialization, and demand-side factors along with the recognition of the contribution of nature to the economy. Such a paradigmatic shift to a holistic concept of development from a reductionist notion in less than a century is no less than a revolution.

The quality of life indicators (see Oswald 1997), rather than simply growth, have increasingly become important for governments and academics, as disciplines are being transcended. As the biophysical constraints of land, soil, and water put an upper limit on the carrying capacity of nature, there is the utmost need to develop institutions like markets to manage the limited resources efficiently, ensure equity in the distribution of these resources, allow substantial time for replenishment of the resources, and find alternatives to guarantee sustainability. This would simultaneously require a trans-disciplinary knowledge base,[2] public action, and design of appropriate macro and sectoral policies. More critically, the entire discourse of public policy needs to be viewed in the wider context of inclusive development, including those of future generations. Ecological economics is definitely the critical enabler of this process.

Notes

1. EKC is named after Simon Kuznets (1955), who hypothesized that income inequality initially rises with per capita GDP and then falls as economic development proceeds beyond a threshold level.
2. Sustainomics has been suggested by Munasinghe (1992) as a trans-disciplinary knowledge base emerging out of knowledge of economics, ecology, and society.

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