

ROOTS OF ECOSYSTEM SERVICES FROM ECONOMICS

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ABSTRACT

The consequence of human action on environmental resources was noticed by ancient thinkers like Plato. Modern concern for natural resources started with the publication of Marsh's book *Man and Nature* in 1864 where he pointed out that natural resources are not infinite. Nature always remained at a core position in economic analysis. During pre-classical period, physiocrats believed that nature was the primary source of value. Classical economists like Ricardo, Malthus, Mill, put nature as an important determinant in their theories. But classical economists concentrated only to the use values, neglecting their exchange values. The writings of Marx are also rich in ecological hints. Rise of neoclassical economists brought about a change in economic analysis. Emphasis was shifted from use value to exchange value. By 1930s scope of economic analysis was restricted to the factors that command price. Gradually, natural resources completely disappeared from economic production function. Economists started to believe that natural resources can substituted for manufactured capital. During that period, non-marketed ecosystem services were kept outside the scope of economic analysis. The advent of environmentalists during the second half of 20th century opened the door for non-marketed services to be incorporated in economic analysis. For this purpose, they devised various tools like market value approaches, revealed preference approaches and stated preference approaches. Present paper will give an account of the trend of environmental concern in economic analysis.

Keywords: Ecosystems, Natural Resources, Use Value, Exchange Value.

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INTRODUCTION

The history of ecosystem services can be stretched back to late 1970s. During that time, its utilitarian framing concentrated on beneficial functions of the ecosystem to generate public interest on biodiversity conservation (Ehrlich & Ehrlich, 1981; De Groot, 1987). Since 1990s the concept gained much interest among the researchers and various methods were devised to estimate their economic value (Costanza, et al., 1997). Millennium Ecosystem Assessment (2003) has played an important role to put ecosystem services concept on a firm base in the management decisions and policy implementations. At present ecosystem services has been factored into economic decisions in the way of various market based methods, such as, payment for ecosystem services and market for ecosystem services. With the main streaming of the concept, its application widened, which resulted in the divergence from the original concept for which it was devised (Gomez-Baggethun *et al.*, 2010). In this connection, Peterson *et al.*, (2010) observed that the ecosystem services concept has slipped from its original agenda of creating public interest for biodiversity conservation to monetisation of ecosystem services as commodities. The trend of commodification of ecosystem services has been criticised on the ground that it may be counterproductive for conservation in the long run (Martinez-Alier, 2002; Soma, 2006; Kosoy & Corbera, 2010).

Man is the only creature on this earth that can curb the nature for its own sake. Human interventions disrupt the provision of nature's benefits. Contribution of natural resources on human welfare was noticed even by ancient thinkers. In 400 BCE Plato described the effect of deforestation on soil erosion and drying of springs (Daily, 1997; pp.5-6). During the 1st century CE Pliny the Elder recognised the interrelation between deforestation and rainfall. Modern Economics starts with the publication of the book *Wealth of Nations* by Adam Smith in 1776. Economists considered natural resources as an important input. As Mooney and Ehrlich (1997) noticed that modern concern for ecosystem services starts with publication of the book *Man and Nature* by Marsh in 1864. But, the term 'ecosystem' was not used at that time. The term 'ecosystem' was first used by A.G. Tansley in 1935. Modern Economics can be classified into different schools of thought. Those schools considered natural resources in their analysis in different ways. The paper traces how the position of environment in economic analysis has changed in the hands of different economists and schools of thought.

OBJECTIVE

To show that nature has always occupied an important position in economic analysis and how the views of the economists changed on natural resources overtime in economic analysis.

CLASSICAL ECONOMICS: THE ERA OF USE VALUES

The Classical economists considered natural resources as worthy of being a separate analytical factor since they offer free services (Crocker, 1999). They considered land (and later capital also) as a distinct factor of production. Consideration of land as non-substitutable production input explains to some extent the proposition put forward by some classical economists on physical constraints to growth. This thought can be traced in Ricardo's law of diminishing returns on land, Malthus' concern for population growth and Mill's statement that the economy will reach to a steady state (Costanza and Daly, 1992; Turner *et al.*, 1994).

Natural capital in the form of land occupied a core position in the classical economic thinking. In spite of this, to what extent the Classical economists recognised nature's intangible benefits, was not clear. In this respect Crocker (1999, p. 33) commented that "Other than Mill's brief remarks, no economists of stature deliberated upon the life support and the amenity services that natural environments offer". Here, it should be kept in mind that the concept of ecosystems did not develop at that time. Still, some Classical economists recognised the services rendered by natural agents. However, they took into account their use value only and generally denied any role played by the nature in the conformation of (exchange) value as they considered those resources as free gifts of nature.

As opposed to the physiocrat belief that "land is the primary source of all values" the Classical economists emphasised the role played by labour in production process. This is reflected in the introduction of "Wealth of Nations" by Adam Smith (1776). There he pointed out that the wealth of a particular society is the result of the amount of labour embodied. But he considered that values do not generate from the nature itself, rather from the rent derived from its appropriation. Another Classical economist, J.B. Say, posed the services of nature as free gifts of nature in following terms "the winds which turns our mills, and even the heat of the sun, work for us; but happily no one has yet been able to say, the wind and the sun are mine, and

the services which they render must be paid for” (Say, 1829; p. 250 in Gomez-Baggethun *et al.*, 2010). Say also denied nature’s contribution in the creation of exchange value.

The works by Marx are rich in ecological hints. Marx considered that value is the result of combined effort of labour and nature, “Labour is not the source of all wealth, nature is just as much the source of use values (and it is surely of such that material consists) as labour, which itself is only the manifestation of a force of nature” (Marx, 1891, 1970, p-7). But, again, he stated that the capacity to produce exchange value rests with labour only (Marx, 1867, 188). And consequently, he opined that it was a waste of time in the “dull and tedious quarrel over the part played by nature in the formation of exchange value. Since exchange value is a definite social manner of expressing the amount of labour bestowed upon an object, nature has no more to do with it, than it has in fixing the course of exchange” (Marx, 1867, 1887, p-40).

In the 19th century, industrial growth, technological progress and capital accumulation are three remarkable guiding factors that led to changes in economic thinking. Since then nature started to lose its earlier position in economic analysis. A move was observed from ‘land and labour’ to ‘labour and capital’. Another remarkable change was the movement from physical to monetary measures. But the most important change was a move in focus from ‘use values’ to ‘exchange values’. Naredo referred to these slow but ground-breaking change as ‘post-physiocratic epistemological break’ (Naredo, 2003, pp.149 & 248). This paradigm shift in Classical economic thinking prepared the ground for later analytical treatment on which Neoclassical economists put forward their proposition of substitutability of natural capital with man-made capital. Thus, the fall of the Classical economics era (during 1870s) was marked by “temporary emancipation from land” (Mayumi, 1991).

NEOCLASSICAL ECONOMICS: NATURE’S SERVICES AS EXCHANGE VALUES

The Neoclassical economists introduced marginalist analysis in economics. Marginalist approach was introduced in the 1870s in the hands of the writers like Menger, Walras and Jevons, had a deep impact on the subsequent analysis of nature (Schumpeter, 1954). During this period some economists paid attention to the availability of resources in physical terms.

As for example, Stanley Jevons, in his book “The Coal Question” (1865), raised concern about depletion of coal stock. With the advent of marginalist revolution, Neoclassical economists restricted their analysis to the sphere of exchange values. In this respect Pigou wrote “The one obvious instrument of measurement available in social life is money. Hence, the range of our inquiry becomes restricted to that part of social welfare that can be put directly or indirectly into relation with the measuring rod of money.” (Pigou (1920) 2006, p. 11). Within a short span of time monetary analysis expanded beyond limits of markets as a tool to tackle externalities.

By 1930s, some economists like Gray, Ramsey and Hotelling elaborated possible effect of resource depletion on future generations. After that, natural resources gradually became insignificant in economic analysis. Scope of economic analysis was restricted to those goods and services that command a price, leaving outside those goods and services that are not valued in monetary terms (Gomez-Baggethun *et al.*, 2010). Thus, non-marketed ecosystem services were not considered for economic analysis. During the same period, some Neoclassical economists postulated that technological innovations will allow for increased substitutability between the factors of production, such as, between land and capital. In this regard Hubacek and van der Bergh stated that “By the second half of the 20th century land and more generally environmental resources, completely disappeared from the production function and the shift from land and other natural inputs to capital and labour alone, and from physical to monetary and more aggregated measures of capital, was completed” (Hubacek and van der Bergh, 2006: p.15).

The land was completely removed from the ‘growth model of Solow’ (1956) under the assumption that natural inputs could be substituted by manufactured capital. Solow relied on the self-regulatory capacity of the market. His argument was that when a resource becomes scarce, its rising prices lead consumers to shift to some alternative consumption goods which are cheaper (Solow, 1973). As Solow supported substitutability between factors, he did not think that natural resource depletion would be a hindrance to economic growth. Assuming zero extraction cost of non-renewable resources and constant capital stock, Solow (1974) showed that sustainable growth is possible when factors of production are perfectly substitutable and the saving rate is sufficiently high (Choudhury 2016: p.243).

ENVIRONMENTAL ECONOMICS: VALUATION OF NON-MARKETED SERVICES

In the second half of the 20th century, the environmentalists started to point out the weaknesses of conventional economic thinking in analysing environmental problems. They extended the scope of analysis of Neoclassical Economics by incorporating economic impacts of environment in decision making. Cost-benefit analysis was used for this purpose. The new branch of Economics came to be known as 'Environmental and Resource Economics'. The environmentalists argued that, in neoclassical approach undervaluation of ecological dimension in decision making process was obvious. Here, services of natural capital were not sufficiently quantified in terms comparable with economic services and manufactured capital (Costanza *et al.*, 1997). For this reason, ecosystem services were viewed as positive externalities. If those services were quantified in monetary terms, they could have been incorporated in economic decision making. In order to rectify the problem of market failure that was inherent in neoclassical approach, environmental economics literature developed a range of methods to value the ecosystem goods and services that are not bought and sold in the market.

In order to capture more comprehensive picture of the value of the environmental services several environmental factors, which were neglected in conventional economic analysis, were identified. Application of cost-benefit analysis on dams, as shown by Krutilla, put a high economic present value to the loss of landscape amenities, an intangible service of the nature (Krutilla, 1967). Krutilla's concept paved the way of dividing environmental values into use values and non-use values, which were further divided into several value concepts. These values were added up to give Total Economic Value (TEV), a comprehensive measurement of the ecosystem services. For estimation of these different value types, a range of monetary valuation techniques were devised and those are continually modified and revised. Valuation techniques of environmental services relied upon related goods and services that were exchanged for in the market. These valuation techniques used marketed goods and services as proxies, such as, in the case of hedonic pricing method. In some cases, the techniques are based on observed behaviour (revealed preferences), such as, in the case of travel cost method. In their absence, valuation studies have relied on expected consumer behaviour in hypothetical

market situations through surveys which are included in stated preference methods. This approach has been used in contingent valuation method. Sometimes, values of an original valuation site have been applied to some other similar site by so called 'benefit transfer method'. A benefit of using contingent valuation method is that it is capable of estimating non-use values which revealed preference methods cannot.

ECOLOGICAL ECONOMICS: SUBSTITUTABILITY CONTROVERSY

By late 1980s, a group of systems ecologists and heterodox economists, concerned with human-nature interaction, split from the field of Environmental and Resource Economics and formalised the foundation of 'Ecological Economics' (Gomez-Baggethun *et al.*, 2010). How Environmental Economics differs from Ecological Economics is a controversial issue (Turner, 1999). They use similar techniques to measure sustainability, to evaluate policies or to make decisions. However, the two approaches differ significantly in the qualitative framework within which they operate (Costanza, 1991; Gowdy and Erickson, 2005). Environmental Economics operates mainly within the axiomatic framework of Neoclassic Economics, such as, consumer behaviour, perfect information and marginal productivity theory of distribution. Ecological Economics challenges some of the assumptions and develops the economic system as an open subsystem of the ecosphere where the social and ecological systems exchange energy, materials and waste flows.

In relation to the issue of the importance of nature in economics, there remained two main points of controversy. The first one is related to the 'strong versus weak sustainability debate'. In other words, the controversy relates to the substitutability of the natural capital. According to the Brundtland Report sustainability is sharing of resources between generations. But the report remained silent about how it could be maintained. After the oil shock of 1970s, Hartwick (1977) and Solow (1986) suggested that sustainability can only be achieved by maintaining a non-declining capital stock. They opined that 'a non-declining capital stock' can be maintained by investing all the rent derived from non-renewable natural resources in manufactured capital. This is 'weak sustainability' that assumes substitutability between natural resources and manufactured capital. This proposition was supported by the Neoclassical Economists. As against this, Ecological Economists advocated 'strong sustainability' which states that natural

capital and manufactured capital are complementary in nature (Costanza and Daly, 1992). The strong sustainability proposition challenged the growth models that ignored natural resources on the ground that manufactured capital cannot be reproduced without using natural resources (Georgescu-Roegen, 1986).

The second area of controversy is related to environmental services values. Some Ecological Economists hold the view that the application of cost-benefit analysis in environmental decision making is not justified as many services cannot be measured in monetary terms (Martinez-Alier, 2002). Incommensurability of different types of values relies on the philosophical foundation of weak compatibility of values (Martinez-Alier *et al.*, 1998). Thus the application of extended cost-benefit analysis to reduce different ecosystem-services values to single metric, tend to be critically appraises and emphasis was given on deliberative and multi-criteria based decision process.

CONCLUSION

The pattern of historic development of conceptualisation of ecosystem services suggests that there is a trend of monetisation and commoditisation of ecosystem services. To some extent, it was due to a shift from original economic conception of environmental benefits as use values in the hands of Classical economists to their conceptualisation in terms of exchange values by the Neoclassical economic analysis. The direction of ecosystem services research suggests that Neoclassical Economics approach to the environment continued even after 1990s. This is reflected by the increased efforts for refinement of monetary valuation methods and researches on how to monetise ecosystem services on potential markets. These researches were operating within the limits of exchange value framework which was established after marginalist revolution by the Neoclassical Economics. Increased emphasis on monetary valuation methods and market-based policy design attracted political support for conservation of environmental resources.

Monetisation of ecosystem services and development of market-based policy designs helped mainstreaming of the concept and gained political support for conservation. Prolific growth of research in the field of environmental valuation since 1990s resulted in commodification of a

large number of ecosystems which tried to solve environmental problems through market-based mechanism. This method helped in generating common peoples' awareness towards conservation. Despite the criticisms levelled against monetary valuation methods, growing popularity of the method indicates the fact "a value is better than no value" (Perni *et al.*, 2021).

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