Natural Non-Renewable Resources in Economic Theory

Constantin Alexandra Mihaela
Alexandru Ioan Cuza University - Faculty of Economics and Business Administration
alexandra_c88@yahoo.com

Abstract

Non-renewable resources can doubtlessly be regarded as the backbone of our modern society. However, most of economists have ignored the impact of non-renewable resources on the environment by dissociating the economy from the ecological network it is fundamentally linked to. The aim of this paper is, therefore, to highlight a literature overview of the most important opinions regarding non-renewable natural resources.

Key words: renewable/non-renewable resources, technical and scientific progress, market mechanism.

J.E.L. Classifications: Q01, Q32.

1. Introduction

Natural resources have always played an important role in the development of society, but for a long time economists understood and assimilated their importance only from the perspective of the revenues they could provide. Nonetheless, the ecological crisis that mankind is currently faced with, together with the energy crisis and the raw materials crisis in the 70s, has led to increased awareness from the economists regarding the danger of irrational exploitation of natural resources.

By their nature, natural resources are renewable through natural or artificial processes (solar and wind power, tidal power and that of agricultural fields and forests), while others are non-renewable (ores and fossil fuels). Although for the time being geological exploitations are able to replenish the stocks for a given resource, in time we may not be able to enjoy such generosity from our environment. Thus, because of the problematic present situation and the uncertain future, many „sensitive” questions were raised regarding the universe of natural resources [1]:
• for how long and under what conditions can life go on on Earth with diminishing resources, with a population that consumes too much and limited natural resources?
• another major problem refers to the location (accessibility of exploitation) of the known stocks. The oil stocks are huge and new oil fields are discovered every year, but these resources are not located in the main oil-consuming countries in the Western hemisphere;
• another problem refers to our increasing dependence on resource stocks that are getting more and more low quality. In other words, the quality of the stocks of ore and fossil fuels used today is way below that of the stocks exploited in the past;
• or the role given to the market mechanism in determining the way resources are managed in the future, and this because throughout the years the market played an important role in determining the degree of exploitation and the rates of consumption.

2. Different opinions on non-renewable resources

Non-renewable resources can doubtlessly be regarded as the backbone of our modern society, only that in the time of the early economists, there was no concern over the deficit of natural resources, which was directly reflected in the planning of the economies.

Classical British economists. According to Adam Smith, in „The Wealth of Nations”, the “impersonal” market mechanism will look after society best, “if allowed to function unhindered, so that the laws of evolution lead society to its promised reward”. Therefore, the “invisible
Looking at the times highlighted by the 18th century, we notice that other classical economists were not so pessimistic. For example, John Stuart Mill (1862) emphasised the fact that, while the limited amounts of natural resources could be a hindrance in the way of increased productivity, this limitation has not yet been reached, and will not be reached by a country for a considerable time to come. Mill based his theory on the future development in the field of agriculture and on the fact that the social institutions and the increase of economic welfare could slow down the increase of population. An interesting characteristic of the thinking of John Stuart Mill is the argument according to which the quality of the environment is an important aspect of economic welfare. According to Mill, a world in which the environment is used only for industrial and agricultural purposes is not an ideal world.

These pessimistic or realistic opinions prevailed in the thinking of 19th century economists, albeit not without heated debate, until in time many of them were regarded as outdated, as the economic environment moved towards different values and tendencies.

The studies of Hotelling (1931) and Barnett & Morse (1963). Partly as a reaction to the Conservation movement – according to which economic growth has clear physical limitations, which cannot be avoided through technological progress - economist Harold Hotelling published a study called „The Economics of Exhaustible Resources”, in 1931. In this study he built a theoretical model which targeted the maximisation of social welfare, by examining the possibilities of optimal extraction of non-renewable resources. Hence the conclusion – of belief in an everlasting exponential growth – widely accepted among economists, is rather problematic, as competition and the economic market will always lead to a maximisation of revenues on the short run and the quick exhaustion of non-renewable resources.

Thirty years later, there were empirical data available to study the problem of the deficit of natural resources. Thus, two economists from the USA- Harold J. Barnett and Chandler Morse, in the study „Scarcity and Growth” (1963), studied the implications of the scarcity of natural resources on the extraction costs, as well as on

Unlike his successors - Thomas Malthus and David Ricardo - Adam Smith was not overly preoccupied with the effects of the consumption of natural resources as a limit to the wealth of nations. His main message being that wealth could increase indefinitely due to the division of labour and the accumulation of capital, which are regulated by the „invisible hand” of the market and free commerce and fueled by specific interests. However, this "bright optimism” [2] was toned down by future considerations regarding the provision of foods and the increase of population.

In 1798, Thomas Malthus, leading representative of classical liberalism, adopting a different point of view regarding the analysis of the economical and social reality of the time, published the work „An essay on the principle of population”, which produced a real shock to those who held optimistic views on the future. Malthus was the first „apocalyptical voice” [3], who noticed the limitations of our world, represented at that time by the ability of the arable land to feed an ever growing population, honestly believing that humanity will eventually reach a low point in its existence from which it will not be possible to escape. What intrigues the mind is that, despite the controversial ideas, currently, Malthus is seen as „the most accurate thinker of the 21st century” [4] if we are to look at the rate the population increases in China and India.

A contemporary of Malthus, David Ricardo, also had a pessimistic view on natural resources, believing that a balanced state between natural resources and the tendencies of the environment cannot last for too long [4]. In his model, Ricardo looks at economic growth as directly linked to the scarcity of natural resources, outlining a precise manner the tendency of economic growth which will decrease with the reduction of the availability of fertile (rich) fields.
the prices on the global market of natural resources, by first looking at the period between 1870 and 1957, and then drafting an extensive analysis for another 13 years. Their purpose was to test the hypothesis according to which the increase of the deficit of non-renewable resources has real support.

In general, the authors strongly question many of the basic premises of the conservation movement, as well as the pessimistic point of view of Malthus. Upholding the same comforting ideas such as those of Barnett&Morse are the studies done by N. Potter and F.T. Christy (1962), W.D. Nordhaus and J. Tobin (1972), whose results stated that natural resources will not become a severe hindrance in the way of economic growth. However, there were still questions among the specialists of the time which referred to the neofactors of production, such as the technological developments, the substitution technologies, studying their positive influence on the offer of resources.

Many researchers, as well as governmental officials, were concerned about drafting the estimates of resource stocks on data that was as reliable as possible. Thus, a realistic estimation should include not only known stocks, but also a „probable estimation” of the quantities that are not fully known at present but will probably be discovered in the future [4]. Some analysts, such as J. Zwatendyk (1972), thought that we will never run out of natural resources, because the stocks are much greater than the known technological and economical limitations.

The report „Limits to Growth” for The Club of Rome. For many analysts, The Club of Rome is seen as neo-malthusian in its views, because of the conclusions launched in its first report „Limits to Growth” (1972), presenting the warning signals that the world was becoming ever more poor in the resources that are necessary to support our lifestyle. The study presented a new model, whose purpose was to anticipate the evolution of the following five global variables: population, agricultural production, non-renewable natural resources, industrial production and pollution. The predictions of the study were extremely pessimistic: the future level of world population, of agricultural production and industry will grow exponentially at first, and during the next century will collapse. The collapse will follow because the economic world will reach its physical limits regarding the use of non-renewable resources, agricultural production and excessive pollution. Likewise, the study predicted the depletion of eleven vital ores before the end of the 20th century, among which there were copper, mercury, natural gas, oil, tin and zinc. Under these circumstances, the authors suggested promoting deliberate restrictions on the processes of demographic and economic growth, and thus achieving a gradual and slow transition from growth to complete balance [4].

However, these scenarios did not come true, and many researchers around the world criticised them. The main academical criticism came from the economists, who claimed that the study did not take into consideration the mechanism of prices, and from the scientists, who pointed out that they had neglected the ability of science and technology to solve the problems of the world.

With regard to the problem of the depletion of non-renewable resources, the Report of the Club of Rome played an essential role in generating a vigorous debate regarding the availability of these resources in the future, debate that is still valid today.

Economic researches on „durability”. One year after the publication of the report „Limits to Growth”, the price of oil almost tripled in a very short period of time, which led to the first energy crisis. Few people questioned the vision according to which the future of the world is that in which the deficit of energy and of natural resources is increasing. Maybe the most known work at the time was the model of non-renewable resources and of economic growth suggested by Dasgupta Partha and Greffrey Heal [5]. These economists were wondering whether an economy can maintain a positive level of consumption for an indefinite period of time in the absence of technological development, and in which the production of goods is possible only by using the limited non-renewable resources such as oil. This thing clearly reflects a matter of durability. According to their analysis, maintaining a positive level of consumption
indefinitely is possible only if the capital can be replaced by non-renewable resources without technical difficulties. If the substitution possibilities are limited, the future consumption per capita should eventually decrease to zero. Many environmental economists (eco-economists) believe that only the second case fits the laws of physics. In this respect, it is considered that not even permanent technical innovation (which does not violate the laws of physics) couldn’t change this pessimistic scenario [6].

From the study of Dasgupta and Heal, as well as other similar studies regarding the scarcity of natural resources - R.M. Solow (1974) [7], J. E. Stiglitz (1974) [8], the research in this field has evolved in several directions. One direction of research seriously considered the possibility that the market economies might not lead to durable results, even if this thing were technologically possible. Another direction of research includes renewable resources such as solar and wind power in models of long-term economic growth. This is meant to change the above-mentioned pessimistic result. At the beginning the economy uses its non-renewable resources and simultaneously invests in some revolutionary technologies which lower the costs of using renewable energy [9]. Thus, non-renewable resources are used up to a point, after which there is a transition to using renewable sources of energy.

A third direction of research continues to study the deficit of natural resources in a pragmatic way. Now that the first and second energy crisis have ended, it has become clear that they weren’t dealing with the long-term deficit of natural resources. When the oil prices went up, the companies were willing to take the risk of exploring new regions. Thus, new deposits were found in the North Sea, Mexico and Venezuela.

It thus appears that the efficiency of the market mechanism is one of the reasons why non-renewable resources were not completely depleted, to this being added the opinion of many geologists who believe that the physical exhaustion of the resources is impossible, as long as the decrease of the availability of resources will always trigger their substitution.

3. Conclusions

In conclusion, the points of view regarding the problem of non-renewable natural resources can be divided into two categories: a pessimist one, according to which the stocks of resources are finite, and the future is somber; and an optimistic one which is confident in the unlimited abilities of the human being to always find new solutions, in which the great „thinkers” are the product of the schools and the environment they were raised in.

In an era of extremes, we believe that the middle way is the best way and at the same time the most feasible way to deal with such a problem. Thus, the rational use of natural resources is the main way to efficiently increase production, which can be obtained by decreasing the production factors in the process of extracting and processing them. In this respect, technological and economical progress (the informational resource) and the use of the human potential (the only plentiful resource) become the main instruments in solving the contradictions between the increasing demand for resources and the limited possibilities offered by the environment.

Acknowledgements: This work was supported by the European Social Fund in Romania, under the responsibility of the Managing Authority for the Sectoral Operational Programme for Human Resources Development 2007-2013 [grant POSDRU/88/1.5/S/47646].

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