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**Article**

## Nonrenewable Resources – the Gateway Towards a Solar Era

CES Working Papers

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*Suggested Citation:* Constantin, Alexandra Mihaela (2011) : Nonrenewable Resources – the Gateway Towards a Solar Era, CES Working Papers, ISSN 2067-7693, Alexandru Ioan Cuza University of Iasi, Centre for European Studies, Iasi, Vol. 3, Iss. 1, pp. 22-30

This Version is available at:

<https://hdl.handle.net/10419/198103>

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# NONRENEWABLE RESOURCES – THE GATEWAY TOWARDS A SOLAR ERA

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**Abstract:** *The end of the 20th century was preserving and handing down the concept of economic growth as the main goal of most of the governments and economic advisers, even if the world was integrating in a mondialist system. This economic model lasted for a long time, but it will not survive the 21<sup>st</sup> century, when the development of nations will depend increasingly on the security of natural resources. Progress now depends on a much more profound economic transformation than it has been possible so far, especially since countries around the world rely on the availability of renewable and nonrenewable resources to meet their rising needs and expectations. The transition from the traditional economic paradigm to that based on the sustainable or ecological economy takes years of changes at all levels – from theory to practice. The aim of this paper is to introduce the progressive visions of some outstanding specialists who have looked for solutions to make a sustainable economy possible. The transition to a world sustainable economy implies admitting the fact that human economy is just a part of the global ecosystem which encompasses it.*

**Key words:** nonrenewable resources, renewable resources, solar technologies, sustainable development.

**JEL classification:** Q01, Q32, Q42.

## 1. OVERVIEW OF THE CURRENT STATE OF NONRENEWABLE RESOURCES

Natural resources have always underlain the development of society, but for a long time economists understood and assimilated their importance only from the perspective of gaining. The ecological crisis that mankind is experiencing at the moment, heightened by the outbreak of the energy and raw materials crisis in the '70s, has led to an increase in the economists' level of

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<sup>1</sup> 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].

awareness regarding the danger of irrationally exploiting natural resources. Thus, at present, the depletion of resources leaves its mark on the activities in every field, their rational use converting into a unanimous aspiration.

Along the years people started to talk more and more about *eco-development* as being a complex relationship between economic development and the environment, and this has happened because the society became aware of the fact that the irrational exploitation of nature and its indiscriminate use can have, besides beneficial results on welfare in general, unfavourable consequences on the ecological equilibrium.

However, the vast majority of economists (neoclassicals, marxists, keynesians or post-keynesians) have ignored the ecological aspect, the environmental impact. They have often been inclined to dissociate economy from the ecological framework, to which it is fundamentally, interdependently related, and most of their basic concepts were no longer appropriate for describing economic activities.

The situation is worsened by the fact that most economists avoid to explicitly admit the value system their models are based on, and tacitly accept the set of strongly unbalanced values which dominate human culture and are embodied in its social institutions. These values have led to an excessive focus on technology, on huge consumption and the accelerated exploitation of natural resources, all this being motivated by the persistent obsession regarding growth. Undifferentiated economic, technological and institutional growth is still regarded by most economists as the sign of a “sound” economy, although it now causes ecological disasters, widely spread corporate crime, social disintegration and a higher probability of nuclear war. (Capra, p.505)

What is paradoxical is that economists seem to not be able to adopt a dynamic view, despite their obsession regarding growth. Their tendency is to arbitrarily freeze the economy in its current institutional structure, instead of seeing it as a constantly changing and evolving system, dependent on the alteration of the ecological and social systems which encompass it.

## 2. POSSIBLE SOLUTIONS

In the context described above, the adequate presentation of economy in its social and ecological aspects requires that the basic concepts and the variables of economic theories are correlated with the ones used to describe the social and ecological systems. This involves a multidisciplinary approach to the economic system, developed by numerous scientists over time.

Outstanding people, such as Nicholas Georgescu Roegen, Fridjof Capra and Lester R. Brown – whose vision finds perfect fulfilment nowadays – have written about restoring balance and

flexibility in economy and about social institutions, which require a thorough change of values. According to them, growth has to be rational and maintain a dynamic balance between growth and decline, so that the system as a whole remains flexible and open to change.

## 2.1 Nicholas Georgescu-Roegen

Along time, Nicholas Georgescu-Roegen has proved to be the first professional economist of Romanian origin, who addressed the issue of the human species' economy in a global ecological context in a thorough manner (he was the one who studied the determining role of entropy on economic life). In his fundamental paper – “*The Entropy Law and the Economic Process*”, he presents the criticism of the classical and neoclassical “standard” economic theory, which is blamed for its newtonian mechanism, that has developed great and real possibilities of autoregeneration. According to it, all we do is pursue a global economy whose functioning is based upon the second law of thermodynamics, which states that nothing is lost, nothing is created, everything is transformed. Starting from this principle, standard economists have presented the economic activity as the movement of a pendulum between supply and demand, where any disturbance can be overcome by a “correct price”, which can only be the price of the free market. However, Roegen draws attention to the fact that this entire demonstration was conducted in a purely ideatic, abstract environment, completely detached from the physical one, the possibility of natural resource depletion not representing a matter of interest standard economists.

Being unsatisfied with the solutions offered either by the classical theory, or, even more so, by the neoclassical one, Roegen tried to impose his own paradigm, asserting that “the economic process is, by its very nature, entropic and that the entropy law<sup>1</sup> governs both this process and its evolution”. According to the outstanding economist, once the resources of the globe have been exhausted, they become impossible to use in the future. In the classical economic theory, the needs of the future generations are not taken into consideration at all. The same applies to business, where nobody speaks about the ones who will live on this planet, those people who start their ever poorer living regarding energy supply. The only solution to protect future generations against the present-day loss of energy is our own re-training – *towards the responsibility based on care and love for the human being – our future associate. Love for your own species is the key to solving tomorrow's*

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<sup>1</sup> Entropy represents the constant alteration of energy in a system of the universe. From an economic point of view, entropy expresses the process of alteration of material and energy resources, a process which takes place both at the level of the economic life, determined by people's actions and control, and outside it. The entropy of any system characterises its degree of disorder. (Bran, P., *Economica valorii*, Editura ASE, București, 2002, p. 45).

*crisis*, N. Georgescu-Roegen prophetically writes. The present generation's monopoly on the future generation will be substantially diminished within the framework of an economy rightly called *bioeconomy*.

Taking these reality into account, Georgescu-Roegen conceptualises a few elements, which he includes in a *Minimal Bioeconomic Programme*, capable of providing a balanced and long-lasting standard of living for humankind, such as: avoiding the loss of any kind of energy or mass; freeing the today's man from his morbid tendencies to produce and consume all kinds of new products; the necessity for the producers of goods (commodities) to focus on product durability, on their ease of use and particularly on their maintenance and repair (Drăgan and Demetrescu, 1994).

However, N. Georgescu-Roegen did not make any illusions that his programme could be easily adopted, that his recommendations, expressed almost as aphorisms, could be followed, at least not in a foreseeable future, because, the great thinker concluded, maybe man's destiny is that of a short, yet intense, exciting and extravagant instead of a long, passive existence, lacking in events. Some live long, others live fast, here is a formula which can function just as well for people as for species. But even so, Roegen's opinion is that man does not have the right to act to the detriment of the other living species which populate the Earth.

## 2.2 Fridjof Capra

Another visionary of our times, Fridjof Capra – physicist and system theoretician, brings some additional valuable ideas to the formerly described perspective, and in one of his books “*The Turning Point: Science, Society and the Rising Culture*” he suggests a *systemic approach to economy*, in order to bring order into this conceptual chaos, providing the necessary environmental perspective. From a systemic viewpoint, economy is a living system, made up of human beings, social organisms (institutions) and the ecosystems which surround them, which are in continuous interdependence.

According to the systemic vision, the economy, regarded as a living system, is healthy if it is in a state of dynamic equilibrium, characterized by continuous fluctuations of its variables. To achieve and maintain such a healthy economic system, it is crucial to preserve the ecological flexibility of the natural environment and to create the social flexibility needed to adapt to environmental changes.

The fulfillment of this goal does not mean a return to the past, but the development of new forms of technology and social organization, because many of the conventional, resource-intensive, highly centralised technologies are now outdated.

In the new context, attention falls on alternative energies, many of which are already in place. Their advantages consist in the fact that they can be used on a small scale, in a decentralized manner, they can respond to local conditions and can be designed so as to increase the degree of autonomy, providing a maximum degree of flexibility. Thus, they are often called “soft technologies”, because their environmental impact is much more reduced by the use of renewable resources and the constant recycling of materials. Examples of such soft technologies are solar collectors, wind generators and organic agriculture (Capra, 2004, p. 508).

Moving from "hard" technologies to the "soft" ones is needed in areas related to energy production. The deepest roots of the current energy crisis can be found in irrational production and consumption patterns that have become characteristic for our society. In order to solve the crisis, there is no need of more energy, as it would enhance the existing problems, but of deep changes regarding values, attitudes and lifestyles. Nevertheless, while this long-term goal is being pursued, we must as well replace the use of nonrenewable resources for energy production with renewable resources and make the transition from “hard” to “soft” technologies, so as to achieve an ecological balance.

Currently, most energy policies of the industrialised countries reflect the intensive use of natural resources, energy being produced from nonrenewable resources - oil, natural gas, coal and uranium – through centralized, rigidly programmed technologies, which are wasteful and unhealthy. However, nuclear energy is by far the most dangerous element of using “hard” natural resources.

A healthy way of solving the energy crisis would be a "softer" approach of energy production, which would involve the following main aspects (Capra, 2004, p.510): energy conservation through more efficient consumption, intelligent use of nonrenewable resources as "bridge fuels" during the transition period and the rapid development of “soft” technologies for energy production out of renewable sources. Such a threefold approach would not only be favourable to the environment and ecologically balanced, but it would also be the cheapest and the most efficient energy policy. A Harvard Business School study showed that increasing efficiency and investments in new technologies represent the most economical sources of energy, providing a greater number of work places (Capra, 1979 in Stobaugh et al., 2004).

The reality is that on the long term, we need a renewable energy source, economically efficient and environmentally benign. *Solar energy* is the only type of energy that meets these criteria. The sun has been the main source of energy for our planet for billions of years, and life, in its countless forms, has resourcefully adapted to solar energy throughout the planetary evolution. All the energy we use, with the exception of nuclear power, represents a stored form of solar energy. (Capra, 2004, p.513).

One of the main arguments against solar energy is that it would not be economically competitive compared to conventional energy sources, but this is not true. Some forms of solar energy are already competitive; others can become so in a few years' time. "Many people still suppose that solar energy is something related to the future and wait for a technological discovery. This supposition represents an error, *as active and passive solar heating is present here and now as an alternative to the conventional sources of energy*", shows the Harvard Business School study (Capra, 1979 in Stobaugh et al., 2004).

Other technologies with tremendous potential are the photovoltaic and wind generators, which would bring about fundamental structural changes for the utilities industry. Today the major obstacle to rapid development of new technologies is represented by the utilities companies that are unwilling to give up their monopoly in the field of electricity production.

F. Capra states that the way towards a solar future is open and all that is necessary is accurate public information about the solar energy potential, together with appropriate social and economic policies, so as to facilitate the transition to the solar era. At the same time, the renowned theoretician offers the example of Barry Commoner, a man who designed a detailed scenario for replacing most of the unrenewable energy sources with solar energy on a 50-year timespan scale. (Capra, 1979 in Commoner, 2004). His proposal neither entails major technological innovations, nor does it depend on drastic measures of energy preservation. The key to the project is the *role of natural gas* as main bridge fuel. The underlying idea is the increase of production, the extension of the current natural gas distribution grid and, afterwards, the gradual replacing of natural gas with methane from solar sources. In order to do so, methane-generating devices have to be built wherever there is a sufficient amount of biomass available.

According to Commoner's scheme, which, of course, is only one of the numerous possible plans, the initial step of the transition would consist in putting up gas generators wherever it is possible and building more extensive gas distribution grids for their supply. At the same time, active and passive solar heating systems would expand and greater and greater amounts of solar methane made out of biomass would be added to natural gas in the distribution grid. The use of photovoltaic cells and wind generators would significantly increase in a few years' time and the total production of solar energy would gradually increase until reaching approximately 20% of the total energy budget in 25 years' time. At that stage, in the middle of the transition period, both solar energy and natural gas put together would make up a little bit more than half of the total energy budget of a state, which would make it possible to completely eliminate the reliance on nuclear energy. In the second half of the transition, oil and coal needs would progressively decrease down to zero and the natural gas production would fall to around half of the present-day



amount. At that moment, the system would be 90% solar energy based. In the following years, the 10% natural gas share could be cut out, but it would be important to maintain this source of energy as a backup, in order to compensate for the irregularities brought about by climate fluctuations (Capra, 2004, p. 520).

The main obstacles against the solar transition are not technical, but political. The transition from nonrenewable to renewable resources forces oil companies to give up their dominant role in the world economy and fundamentally alter their activities. One solution would be for most of the oil companies to invest in innovative businesses, as many of them have already started. Certainly, problems will arise in other industries, as solar transition generates conflicts between social and private interests. In F. Capra's view, the soft energy path would obviously serve the interest of all energy users, but a reasonable transition to the solar era would only be possible if we are able, as a society, to put long-term social advantages above short-term personal gains.

### **2.3. Lester R. Brown**

One of the best-known scientists in the world - Lester R. Brown - is the founder of the *Worldwatch Institute*, and founder and president of the *Earth Policy Institute*. *The Telegraph* of Calcutta refers to him as "the guru of the environmental movement", and the *Washington Post* called him "one of the world's most influential thinkers."

With the help of the institute set up by him, he published yearly reports called: Global Issues of Humankind – State of the World, translated into 35 languages and released at the same time in different countries around the world. Through papers such as the one published in 2003 "*Plan B, Rescuing a Planet under Stress and a Civilization in Trouble*", considered by many specialists to be of the same magnitude as the first Report to the Club of Rome in 1974, he warned the global community about the major dangers humankind and nature are facing. In order to avoid the destruction of the planet, Lester Brown comes up with the following proposals: setting up a budget for the recovery of the planet through the UNO and its financial programs; using current techniques for protecting and restoring the environment; promoting the recycling of raw materials, a process which takes place naturally in the environment; a short stage for the transition from the use of fossil fuels (oil, natural gas, coal) to the use of renewable resources (wind, biomass, hydrogen, photovoltaic devices, tides).

Thus, setting up a new global economic model has become the great challenge of the century, which has generated answers such as Brown's B Plans (taking into account the fact that the so-



called Plan A – which has been implemented so far, has been leading the world towards economic decline and, eventually, towards collapse).

Finally, a middle path which realistically integrates the requirements of a global economic model and the ecological aspirations of the future generations is represented by the “society of moderation” project. The essential problem is finding a balance between the existing natural capacities and the needs (present and future) of the society. The human ecological footprint has become so heavy that the planet is seriously affected. The rapacious character of the “consumer society” is strongly denounced.

Both the exaggerated individual consumption model and its collective expression and the western model which the societies of the emerging countries have drawn the conclusion they should follow in order to develop are thus challenged. Extremes can never constitute a viable solution. We can neither preach for a utopian economic de-growth, nor continue on the same path, believing that adaptation will occur owing to the force of circumstances. On the contrary, tools must be identified and promoted in order to allow a reduction in fossil energy consumption, in the material and resource flows. We do not need to become a society of privation, but a society of moderation, and in L. Brown’s opinion, we must do it quickly, as the world of tomorrow, whether we like it or not, will be radically different from that of today.

### 3. CONCLUSIONS

People have long lived under the impression that progress is linear, that every day will bring about a step forward. The only thing is that the current “market” logic fatally leads to the opposite direction. However, a new logic can progressively be substituted to it. But, in order for that to be possible, the foundations of the present society must be amended and the “philosophical stone”, which would allow the conciliation between the maintenance of economic and social growth and the good management of the environmental issues, must be found.

In an era of extremes, the middle path seems to be the most appropriate, as well as the most feasible in approaching such an issue. Thus, the rational use of natural resources is the main mean of achieving an efficient increase in production, which can be accomplished by saving the factors of production in the process of extracting and processing them. Thus, *technical and scientific progress (the informational resource)* and *the use of human potential (the only abundant resource)* become the main tools for solving the contradictions between the continuous increase of social needs and the limited possibilities that the environment provides.

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