

THE ROLE OF ENERGY IN ECOLOGICAL SUSTAINABILITY

Maria-Floriana Popescu

Faculty of International Business, Bucharest University of Economic Studies, Bucharest, Romania

mariafpopescu@yahoo.com

Abstract: *The rapid population growth leads to greater daily demand for energy, causing nations to diversify their portfolios and seek new sources of energy, including renewable to provide more energy. In a universe with seriously exhausted natural resources, severe urbanization, climate change and conflicts that go beyond borders, the issue of overpopulation unquestionably causes worldwide debates and can generate a snowball effect for the global economy or human society. Population's increase in the nearby future will have a central role in challenges such as: global warming, air and water contamination, increase in the level of poverty, food scarcity, deforestation, desertification, health problems and resource shortages. The transformation into a sustainable environmental model, situated in a post-carbon economy, will imply setting barriers to industrial progress (will have to be sustainable and environmental friendly) and also to population growth (will have to follow a normal pace). But, the level on vulnerability and uncertainty in the evolution of energy has been threatened lately by major events that took place all around the world. Security of supply, new geopolitical perspectives and ecological and sustainability issues are yet again on the bleeding line. Therefore, the goal of this theoretical article is to give an overview of the current situation concerning the role of energy in ecological sustainability. It expresses routes in which humans and enterprises can act in order to contribute to ecologically sustainable development. The subject of how we live on a congested planet represents the most critical sustainability of all. We are witnessing our current risks and we can also envision our possible, and particularly desirable, future: a steady human population, living and protecting the nature and planet, having finite needs of goods, services, or energy, and maintaining a healthy Earth for us and the animals that also depend on it. This is not a fantasy but an obligation for all of us. Consequently, we have to engage ourselves in building up this better future, with sustainability and prudent actions.*

Keywords: Energy, Consumerism, Fossil Fuels, Renewable energy, Sustainability.

JEL classification: O13; P46; Q46; Q56.

1. Introduction

Over the last two centuries the mankind have witnessed an untold growth and wealth mainly due to the industrial development. Unfortunately, this complex evolution has led to damaging the surrounding environment. Therefore, the earth is facing many environmental problems, such as global warming, oil spills, coastal contamination, ozone depletion, deforestation and desertification, loss of biodiversity, acid rain, industrial accidents, and toxic waste dumping (Pryde, 1991: 276; Smil, 1993; Shrivastava, 1995; Worldwatch Institute, 2013).

In 1991, there was a belief that the world population will double from 5.5 billion to 11 billion by 2030 (Ehrlich and Wilson, 1991). But, current studies show that world's population is likely to grow from 7.3 billion now to 9.6 billion in 2050 and to 10.9 billion in 2100 (Gerland,

et al., 2014). To fulfil people's needs, an increase in the number of population means also increasing the production of goods and energy. Therefore, Food and Agriculture Department of the United States (FAO) projects that global agricultural production in 2050 will be 60 percent higher than in 2005/2007 (Alexandratos and Bruinsma, 2012). Moreover, we can expect global energy demand to grow by 36% between 2011 and 2030 (British Petroleum, 2012) and the total energy consumption is projected to grow by as much as 55% by 2030 as the combined effect of population growth and the improvement of living standards (Royston, 2010). Using the current technologies, having the same social organization, and pursuing the same production practices, these increases in production and consumption will generate more environmental degradation (Meadows, et al., 1972; Frosch and Gallopoulos, 1989; Commoner, 1990).

The issue of whether the human advancement trading off on its current direction without compromising the future prosperity remains the key centre of the current ecological debates around on the planet.

The world is vast, yet people are numerous, and our utilization of the planet's air, outside layer, woods, fisheries, waters, and assets is currently a power like that of nature. Then again, we are brilliant and versatile, and that is the reason which maybe aides clarifying why such a large number of vital financial and ecological patterns appear to be going in clashing and even inverse ways. Are things turning upward or downward?

As far as the improvement in this area is concerned, the world has already achieved one of the targets of the Millennium Development Goals (Goal 7: Ensure Environmental Stability) which was aiming to halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation, this percentage being decreased by fifty percent until 2010 (compared to the 1990 levels) (Worldwatch Institute, 2013). Therefore, it can be contended that monetary thriving is on the ascent and essential needs in many parts of the world are progressively being met (UNICEF and World Health Organization, 2012; Kharas and Rogerson, 2012).

A controversial matter is the environment, and as far as this is concerned, the advancement in this field comprises various actions. Lately, there was a rising public awareness of issues related to environmental change, rainforest casualty, and a decline in biological diversity. Many governments are involving in different tasks meant to lessen their nations' gas emissions or, if this is not possible, to prevent further growths of these discharges. The renewables are becoming more used and faster than the fossil fuels (but not with the same amount of resources). Such patterns do not lead specifically in any quantifiable approach to genuine sustainability (the use of fossil fuels is growing in emerging world powers such as India or China). Nevertheless, they help in building the groundwork for environment's sustainability. One essential pattern, nonetheless, is both quantifiable and reasonable by its strict definition (in Article 9): a 1987 global treaty stresses that the worldwide utilization of ozone-draining substances has declined to the point where the atmosphere's sun-screening ozone layer is viewed as prone to repair itself, after years of human-created damage (United Nations, 1987).

It is not clear, notwithstanding, that any of these improvements and natural patterns show that really sustainable advancement is happening. Safe water is becoming available to more individuals, but conceivably to the detriment of keeping up stable supplies of renewable freshwater in streams or underground aquifers for future generations. Diminishing the extent of individuals in destitution is promising, but what if this is only a scenario where the instruments of advancement, as the use of fossil fuels to support and enhance development, contribute essentially to expanding the proportion of individuals in scarcity in the future.

Additionally, financial improvement is facing special requirements in different nations, as population and consumption are increasing the interest for natural resources, food and

energy past what it is supplied. The cost of resources, such as food, fossil fuels, minerals and other primary commodities that depend on non-renewable assets has moved upwards in the recent years, and all the shocks created in the market have led to rebellions, such as the African ones from 2007-2008 (Berazneva and Lee, 2013) or the 2012 Indian blackouts that affected over 300 million people (Bernstein, et al., 2012). Even if there are some nations that are not in this state, the growing number of humans is translated in eating more food, using more energy, damaging more landscapes and using more commodities that ever before. Therefore, integrated and worldwide available solutions for these issues have to be found for a tolerable future for everyone.

2. The Role of Efficiency

In the nearby future, the energy demand is expected to grow by 37% to 2040 on planned policies, with an average rate of growth of 1.1% (International Energy Agency, 2014). Given the speeding up rate in the use of renewables that is required to address energy needs without using fossil fuels, energy efficiency measures are fundamental to guarantee that new renewables counterbalance the fossil fuel power generation (Renewable Energy Policy Network for the 21st Century, 2014). Energy preservation is particularly imperative in the setting of sustainability requirements, as even renewable sources can have huge effects on the environment and resources.

Economic policies are more important when it comes to accessibility or about efficiency/inefficiency of energy weight distribution on the long term. For example, low prices kept artificially in Egypt have failed to maintain demand at a sustainable level, which led to blackouts (generated by power plants fuelled by gas). Energy efficiency measures work synergistically with renewable energy systems such as wind, solar, hydro, tidal and wave, that are designed to use the natural flows of energy or sunlight into power, and do not require inefficient and polluting processes such as the ones used to extract energy from fossil fuels and nuclear power-plants.

The efficiency of using renewable resources has to take into account the ecological, economic and social requirements. While availability of resources and natural requirements represent an issue towards creating particular renewable energy frameworks in particular areas, these restrictions can be overcome through proper planning, responsible ecological administration and the usage of clean and broadly accessible substitute innovations.

Therefore, it is required for sustainable renewable based energy planning a proper coordination as an efficient and solid power grid to connect numerous generation and distribution electricity sources over wide geographic areas, empowering the coordination between renewable facilities. For instance, the energy produced by wind farms may differ depending on time of day, as some of them can produce more in the morning and others in the afternoon; similarly, their power may depend on the time of the year. Therefore, wind and solar based power generators can be merged as they reach a climax not in the same time. Integrating these correlative assets can go far to finding a solution to renewable's discontinuity in generation and can produce a more integrated and reliable grid for energy supply based on renewables. Combining the renewables with conventional energy sources is similarly imperative in the process of producing efficient energy.

The implementation of renewable energy based systems should take place especially at a local level. The energy projects developed around this type of energy must be completely incorporated with regional features that guarantee the protection of the environment, consider specific administrations in that area, and completely take into account the privileges of individuals living near those terrains (Boucher, et al., 2011; World Commission on Dams, 2000). Renewable energy projects that would truly harm the

encompassing environment or undermine nearby people ought to be forgo or relocated.

All the developments done in the field of renewable energy have also to take into account the needs for sustainable water utilization and to safeguard the usage of rare assets meant for human consumption. Water shortage has now effects on every continent as around 1.2 billion individuals worldwide are affected and more than 500 million humans are at danger (UN-Water, 2007; United Nations, 2013). In areas where water is rare, alternative technologies ought to be utilized to minimize water utilization.

Additionally, apart from taking into consideration regional and local peculiarities, sustainable renewable energy projects should be also worldwide-centred. This is surely valid for the climate crisis, which can be solved only if all nations diminish their greenhouse gases emissions (Sawin and Moomaw, 2009). Also, there is a need for strict regulations in the energy field as extraction of rare resources is incrementing around the globe in the run for renewable energy, power grid and storage innovations. There has to be taken actions in order to mitigate further soil erosion, surface and groundwater contamination, avalanches, and fauna and flora damages. Reusing materials ought to be reinforced for supportable energy improvement. These incorporate mass materials, such as concrete, copper, and steel, and also rarer or dangerous materials, as neodymium and cadmium.

The economic, financial, technological and asset-oriented difficulties to switching to a completely practical worldwide energy framework are colossal, yet they can be completely tended to with arrangements that exist today (British Petroleum, 2014). There is a chance for a new era of genuinely manageable and feasible energy power grids.

3. Getting to Sustainability

In spite of scattered endeavours to ascribe advance on environmental change to the United Nations summit in Rio de Janeiro in June 2012, the agreement continues that it created intense debates but with no noteworthy activity. Environmental change is just the most conspicuous ecological pattern that threatens sustainability.

The consumer society is the one that governs the world today. Consumerism has ended up undermining both human prosperity and the planet's life-sustainability capacities (Assadourian, 2010). At the same time, it is a wilfully designed method for living, consolidated by colossal amounts of money spent yearly on broadcasting, sponsorships, tax reductions, and advertising. Therefore, we have to replace this culture of consumerism with a society of sustainability.

Numerous social choices may qualify as practical. However, certain qualities appear to be discriminating. Therefore, various researchers have devoted their studies on these issues, and the economy is perceived as being focused on human prosperity instead of on monetary development as an end in itself (Costanza, et al., 1997). Additionally, another solution encountered in scholarly articles is represented by changes of companies responsible for more than 60 percent of global gross domestic products and which are also producing trillions of dollars of externalities and sometimes apply a malevolent influence on national strategies (Sukhdev, 2012). Another solution is represented by transforming externality exposure into routine corporate reporting (Hohensee, 2013).

Energy is maybe the most overwhelming test before us. In a genuine sense, using fossil fuels to generate power is the creator of present day civilization threatened to be obliterated by its own architect. One of the arrangements proposed to mitigate this risk is to take a genuine prudent approach and leave fossil fuels in the ground by diminishing their power (Princen, et al., 2013), the transition to renewables being a must. But, the flaws and qualities of renewables are many, such as the fact these are second-class

compared to fossil fuels (Murphy, 2013).

The energy problem is not the only one that should raise concerns in the sustainability area. Global agriculture is also at a defining moment. As presented in the beginning of this paper, billions of people are suffering from hunger or malnutrition, as in the same time, many individuals are overweight, while the system throws away enormous amounts of nourishment. Farming can help take care of different issues through diminishing food waste, finding ways to innovate the farming process and concentrating on producing nourishing rather than unhealthy food.

Therefore, the sustainability issue questions the incentives for humans to accomplish all these changes. If the civilizational survival is not inspiration enough, unfortunately, some eco-disasters could be the force to drive the people to act. Moreover, all the changes will have to be connected with the political action aimed towards building up systems that offer solutions and activate nations.

The societies where humans live are characterised by cultures which follow certain standards, stories, ceremonies, values, symbols, and customs that direct almost the greatest part of our decisions, from what we eat and how we raise our kids to how we function, move, play, and celebrate. Shockingly, the consumerism is part of our culture as well, as it was supported in the last centuries by a nexus of business and governments around the world, turning into a prevailing ideal model in most societies. More individuals are characterizing themselves as a matter of first importance through how they consume and are endeavouring to possess or utilize constantly stuff, whether in style, food, travel, hardware, or innumerable different other items and services (Assadourian, 2010).

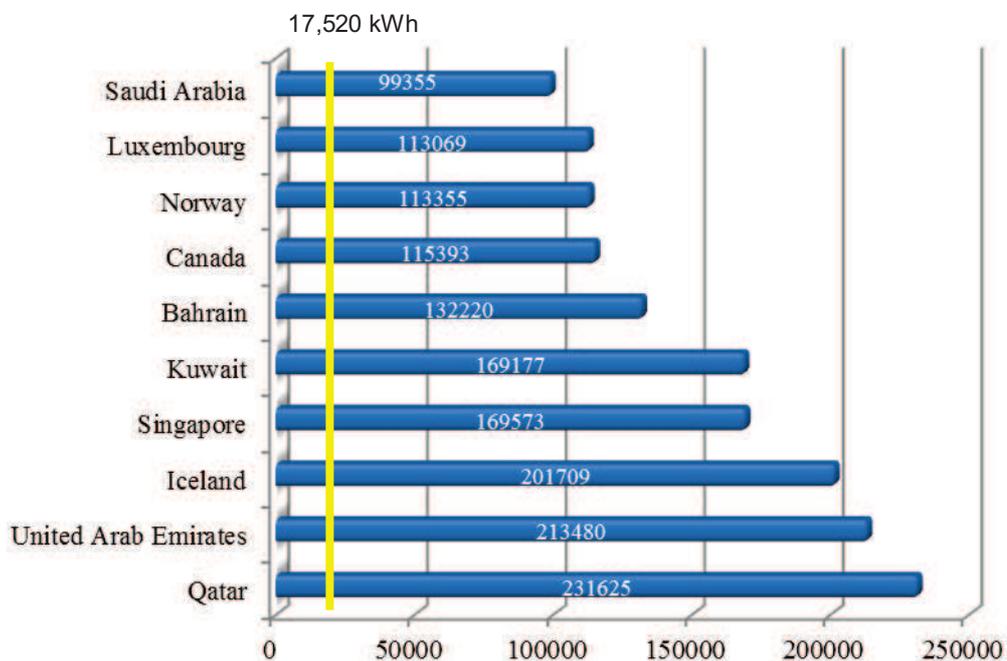
However, consumerism is not a suitable social ideal model on a planet whose frameworks are profoundly stressed and that is presently home to more than 7 billion individuals, let alone on a planet with 10.9 billion people as it was projected for 2100. Therefore, to build a sustainable human civilization that can support itself and the generations to come without affecting the planet, consumer-related societies will have to be redesigned into societies of sustainability, so that living reasonably feels as common as living as a consumer does today (United Nations, 2013).

4. A culture of Sustainability

Moving past consumerism can be difficult, and that is why opponents see this move as an involution, a return in the Stone Age, where the main source of food can be offered by hunting and raw agriculture. But, a proactive approach aimed to help the Earth and not bring it to exhaustion, can find solutions for mankind to keep up a respectable personal satisfaction for all at a much lower level of impact.

Based on an environmental vision, first introduced in 1998 by the Swiss Federal Institute of Technology in Zürich (ETHZ), the average world citizen should act in reducing his overall average continuous energy usage to no more than 2,000 watts (48 kilowatt-hours/day) by 2050, without lowering his current standard of living (Spreng and Semadeni, 2001). This idea was furthermore comprised in a research conducted in 2006, which estimated an equitable and sustainable level of consumption (Stulz and Lütolf, 2006). Their research subscribed to the vision introduced in 1998 that from an energy viewpoint, supporting the use of renewables as base towards sustainability, the average human could constantly utilize 2,000 watts of energy (or 17,520 kilowatt-hours every year) for the majority of his or her needs, including nutrition, transportation, water, administration and assets (Stulz and Lütolf, 2006). In Figure 1 in can be observed the top 10 countries in terms of Total primary energy consumption per capita in 2011 and the level suggested in the researches presented before.

Figure 1: Total Primary Energy Consumption per Capita in 2011 for selected countries (kWh/person)



Source: Authors' calculation based on the data provided by U.S. Energy Information Administration, 2015

Note: The data were provided in Million Btu per Person, and the transformation into kWh/person were done according to the conversions rate 1MMBtu=10⁶Btu and 1kWh=3,412.1414799Btu (Green, 2014: 29)

The research conducted in 2006 was analysed further, as people started to ask themselves what means living off with this amount of energy. Therefore, in 2009, an Australian specialist and innovator, Saul Griffith, broke down a 2,000-watt way of life at an individual level and observed that he would need to possess one tenth as much stuff as he had that day and make it work for ten times as long as before. Moreover, he would need to fly now and then, drive rarely (and generally in environmentally friendly vehicles completely stacked with travellers), and turn into a vegetarian (Griffith, 2009).

Basically, a 2,000-watt way of life resembles the path a significant part of the world lives today, or better, but without praised privileges of the high-income way of life: eating meat every day, about daily access to a private auto (regularly with only one traveller), cooled homes, family pets, and free access to flights that can travel around the world. These extravagances will never again be routinely available to most individuals in a genuinely sustainable society. However, they may be accessible as rarer pleasures, similar to the way these are perceived now by low-income families.

These lost consumer extravagances will be troublesome penances to acknowledge after a lifetime with free access to them. However, rarer utilization of these could transform them in more agreeable activities, such as getting away to a cool bistro on an extremely hot day or appreciating meat at special events. Balancing these lost customer extravagances will more likely enhance wellbeing of individuals, will offer more spare time to people, less stress, fortifying groups (as individuals depend on one another rather than on privatized

administration), and will stop the decay of major environments on which a steady human development rely on.

5. In conclusion

The fossil fuels are becoming the resources we must manage to live without them even if we cannot do without them. On one hand, coal, oil and gas are the soul of advances of industrial civilization. They have unleashed the bewildering advance in human productivity. On the other hand, sustaining their flame will roast the Earth to the point of being indistinguishable. The hydrocarbons that remain after the fossil fuels' processing, the Earth environment is overwhelmed and the atmosphere is polluted. Changing to renewable energy sources and different lifestyles is the test of our times.

The change is needed, the transition has to be made, but people have to believe in it and see beyond consumerism. Now, many people think that if they accept the next energy transition, it will be similar to the past moves, when the path towards providing energy went from human power to animal power, from animal to wood, from wood to coal, and from coal to oil (Smil, 2010: 17-20). This transition is seen as a way to have access to higher speeds, enhanced work profitability, and even more choices of goods and services that are ready to be consumed – this is the view resulted from observing the changes that happened during the evolution of energy (Princen, et al., 2013).

This is the time to pick a new perspective and a new future. It should be acknowledged the fact that Earth's resources of fossil fuels are limited and their exhaustion is close. The inquiry humankind faces at this crossroad is how to deal with the transition in order to avoid catastrophic climate and other ecological effects. Without a doubt, this is no simple assignment. It will and is being opposed by many parties that have an enormous stake in supporting the worldwide consumer-based society – from the fossil fuel industry and big players in the agribusiness sector, to food processors, auto producers, sponsors and many others. Yet, given that consumerism and the utilization of fossil fuels are not in harmony with the prospering of a sustainable planet, either we discover approaches to pry our social examples away from the grasp of those with a personal stake in keeping up consumerism or Earth's environment will decline and cut down the consumerism era in a much crueller way.

6. Acknowledgements

This work was cofinanced from the European Social Fund through Sectoral Operational Programme Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/134197 „Performance and excellence in doctoral and postdoctoral research in Romanian economics science domain”

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