SUSTAINABLE NATURAL RESOURCE UTILISATION IN OUR FUTURE

Robert Magda*
Dhanashree Katekhaye**
Norbert Bozsik***

PURPOSE
THE purpose of this study is to develop and generalize technologies with low carbon intensity throughout their total life cycle, in order to reduce the pollution and effect on climate change. The dissemination of renewable energy sources is inevitable in the long term. In order to secure our future, it is imperative to initiate honest exploration to resolve the potential problems of pollution. The "green economy" can boost job creation and the local energy production methods can serve as the basis of sustainability of natural resources. Energy import may be reduced through sub-regional and autonomous local energy production and supply solutions based on renewable sources through the promotion and implementation of a more energy conscious lifestyle.

Design/Methodology/Approach: *The methodological approach is mainly descriptive. The analysis is based on relevant statistical data from secondary sources from national and international literature.*

Findings: *The analysis unequivocally demonstrate that the state of the environment has continued to deteriorate and natural resources are wasted unnecessarily. In the future, the process is expected to continue to worsen as the population, in parallel with it consumption, grows exponentially. Green growth can be measured with already developed indicators and it helps to realistically assess the situation. The biggest challenges are: climate change, reduction of biological diversity, on-sustainable management of water resources, and pollution and health effects of hazardous chemicals. It can be declared that for the sake of development and sustainability the economic model based on conventional (fossil) energy sources must be replaced by an alternative economic model which is basically built on green technologies and utilises renewable energy sources on a large scale.*

Research Limitations: *The study is descriptive in nature. The accuracy of the analysis is dependent upon the accuracy of the data reported by secondary sources.*

Practical Implications: *The significance of this study lies in addressing the issues and problems of sustainable natural resource utilization in our future.*

Originality/Value: *This paper describes an independent, self-carried analysis of sustainable natural resources by the researcher. The findings are own independent assessment of the researcher.*

Key Words: Sustainability, Renewable Sources, Green Economy, Pollution.

* *Associate Professor, Faculty of Economics and Social Sciences, Faculty of Economics and Social Sciences, Gödöllo.*

** *Ph.D. Student, Szent István University, Gödöllo.*

*** *Professor, Eszterházy Karoly University.*

Robert Magda, Dhanashree Katekhaye, and Norbert Bozsik

Introduction

The new idea that builds on the recognition that Earth is a finite world, the resources are not endless, and thus, the vision of continuous growth cannot be sustained, can be traced back to the 1960s. Global problems had already occurred by then, and trends calculated from the data indicated a rapid disaster for the future. Global problems include population growth, pollution, rapid depletion of resources, the global growth of poverty, loss of biodiversity, and climate change. The population explosion in recent decades, the vagaries of industrial and technological development, and the explosive growth of consumption has upset the harmony between people and nature and human activity is a direct mortal threat to our planet's wildlife. The climate change that threatens the entire human race, has been proven to accelerate due to human activities which require quick action. Greenhouse gases must be reduced and we have to prepare for weather anomalies associated with climate change. This paper deals with usage and diversity of energy at macro-level. Changes and trends in energy consumption are presented and analysed. Increasing energy efficiency and the use of environmentally sound technologies are important issues of cost-effectiveness in the economy. The policy makers should aim to develop and generalize technologies with low carbon intensity in order to reduce the effects of pollution and climate change.

Data and Methods

In the following sessions, the paper focuses on sustainable development, which means different opportunities, production, consumption of the fossil, and renewable energy sources, however, the motivation and the future goals have become the same for the entire World.

The methodological approach is mainly descriptive. The analysis will be based on relevant statistical data from secondary sources from national and international literature.

Literature Review

Humanity and Energy

Nowadays, population growth seems to be unstoppable as the number of the world population exceeded 7 billion in 2012. Since 1960, the population of Africa almost quadrupled, that of Latin America tripled, while the number of people in Asia has grown by two and a half times. According to the estimates by IEA-WEO (2012) (International Energy Association-World Energy Outlook), by 2035 the population of the world will exceed 8.5 billion. Around 2025, the population of India will be larger (1.5 billion) than that of China. Over the past two centuries, in Western countries the so-called modern demographic cycle went through all the phases. Europe's population increased fourfold, the number of births per woman fell from 5 to under two, the birth and death rate dropped from 35-40 per cent to 10%. Life expectancy increased from 30 years to 75-80 years. This change is called the "demographic transition". Bacci (1997) suggested that, countries with high birth-rates will have to go through similar phases so as to stabilise their population, but, this will only happen in the distant future. Africa and India should implement the transition in a much shorter time, because the longer the transition, the more unfavourable the consequences of the rapid population growth will be, considering the conditions for development. Population growth is associated with an increase in energy demand. Changes in energy policy are inevitable, but even so, the demand for energy is expected to increase by 1.2% a year and between 2010 and 2035 it is likely to reach a 30% growth. About 90% of energy demand growth is generated outside OECD countries, and fossil energy sources will diminish in the future. It is expected that by 2035, their rate will decline from the current 85% to 71%, while the proportion of renewables will grow slowly from 13% to 18%. The IEA-WEO (2012) data reveals a slow decrease in coal production and an increase in the consumption of natural gas as shown in table no.1 .

Table No. 1: World Energy Demand Growth (in Mt. oil-equivalent units)

Particulars	1990	2010	2015	2020	2030	2035	Average growth rate for the total period from 2010-2035
Coal	2,231	3,474	3,945	4,082	4,180	4,218	0.8%
Crude oil	3,230	4,113	4,352	4,457	4,578	4,656	0.5%
Natural gas	1,668	2,740	2,993	3,266	3,820	4,106	1.6%
Nuclear	526	719	751	898	1,073	1,138	1.9%
Water	184	295	340	388	458	488	2.0%
Biomass and waste	903	1,277	1,408	1,532	1,755	1,881	1.6%
Other renewable	36	112	200	299	554	710	7.7%
Total	8,779	12,730	13,989	14,922	16,417	17,917	1.2%

Source: IEA-WEO (2012). (Mt. = Million tonnes)

It can be stated that, the concept adopted by OECD biomass will replace fossil energy. Biotechnology (DNA transformation of plants) and synthetic biology (production of new varieties) will be able to produce oil substitutes. The idea may be fruitful in the long run, but without the moderation of growth it has no reality. The new economic system is organised by giant corporations according to the principles of the free market, which raises many doubts from an environmental point of view. The system which is already in operation in Argentina, Brazil, and Indonesia for cultivation of sugarcane, GM soya, and palm oil cause significant environmental damage.

In addition to fossil fuels (78.70%), the use of renewable sources is also increasing (18.30%), especially, in the traditional biomass energy supply as shown in figure no. 1.

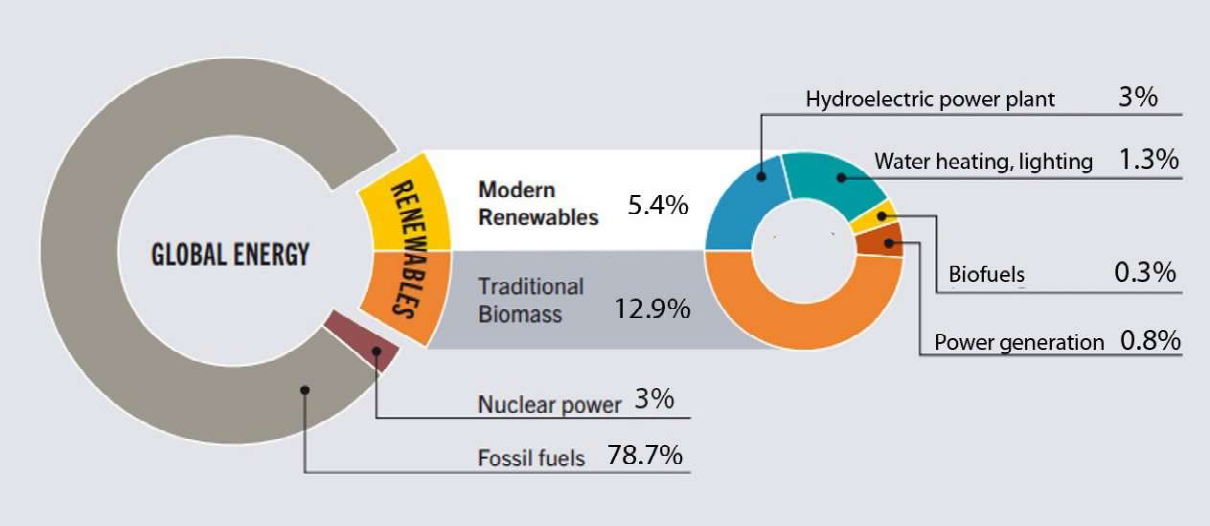

Figure No. 1: The Global Distribution of Energy Consumption by Energy Source

Source: Ren21 (2013)

The traditional fossil fuel extraction yield peaks are not distant. In respect of Oil, extraction yield peak is expected in between 2010-2020, with respect to Coal, it is expected to be 100 to 150 years from now, with respect to Natural gas, it is expected to be 120 to 150 years from now, and with respect to Uranium 235, it is expected to be 100 to 120 years from now.

The non-conventionally exploited oil and gas reserves allow further use of fossil fuels which are relatively inexpensive. In the U.S., Shale Gas production decreased the price of gas by one third, by which U.S. could become an exporter. This offers new opportunities and capital investments for the energy intensive industries in the U.S. (chemical, aluminium, steel, and fertilizer production, etc.). The Liquefied Natural Gas (LNG) can be exported so there could be a unified gas market. The world's gas production is growing continuously and so, are the unconventional production methods. Shale Gas exploration in many cases leads to significant methane emissions, which will further fortify climate change. Another disadvantage is the considerable consumption of water and chemicals, which may cause environmental pollution. Falling energy prices in the U.S. may create the illusion that fossil fuels will not run out and there is no need to save and find alternative solutions. Enright & McKernan (2010) studied the growth opportunities under environmental regulation limits. György & Sándor (2010) stated that the reduction of the load on environment is one of the most important challenges for the economy. A study conducted by Pintova (2011) states the issue of environmental migration caused by floods, which in Slovakia and many other countries is a living topic over the years.

The changes are expected to slow down energy consumption generated from renewable energy sources as fossil energy will be competitive for a long time. Nevertheless, the fact is that the changes are inevitable owing to the climate change. The use of nuclear energy is a sensitive issue, and opinions on its usage differ worldwide. However, the development of nuclear energy seems to be constant and the sources of Uranium will last for a long time. Considering the current use of Uranium, resources are sufficient for about 100 to 120 years. Instead of the current 439 nuclear reactors, there may be as many as 1400 in operation in the year 2050, according to the International Atomic Energy Agency (2013). Each year, about 30 power plants are built around the world, but the growing energy needs may increase this rate. Nuclear power production does not cause CO_2 emissions, so in principle, with the higher number of reactors in 2050, it is possible to meet the UN expectations of reducing CO_2 emission by 14 million tonnes. Uranium is available in politically stable countries so unexpected events cannot cause a crisis in the energy market. It is expected that the proportion of nuclear power will increase quickly (Minisztérium, 2012).

Energy & Environmental Policy, and International Agreements

It became obvious in the 1970s and 80s that, human activity causes global environmental impacts. From then on, the monitoring of the state of the environment became conventional. At that time it was SO_2 emissions related "acid rain" which caused the main problem. After a while it became clear that, one of the major causes of anthropogenic climate change is the growing atmospheric concentrations of greenhouse gases resulting from the consumption of fossil fuels. Due to the global effects, the problems cannot be handled by individual nations thus, international cooperation is needed. The rapid deterioration of the human environment led to the development of the first global program, which took place in Stockholm in 1972. The UN Environment Programme (UNEP - United Nations Environmental Programme) was established to coordinate and manage international cooperation.

During the 1979 World Climate Conference at Geneva, a decision was made to implement the World Climate Research Programme (WCRP). In 1984, the UN General Assembly established the World Commission on Environment and Development, wherein a report titled as "Our Common Future" was released, which first formulated the ideas of sustainable development. It was declared that, the economy can grow only if the environment is preserved. In 1988, the Intergovernmental Panel on Climate

Change (IPCC) was established. So far, it has released four evaluating reports in the years 1990, 1996, 2001, and 2007, the fifth report is being published currently. The EU Sustainable Development Strategy was adopted during the Gothenburg European Council in the year 2001.

In 1992, the United Nations organized the World Conference on Environment and Development in Rio de Janeiro, which relied on the report "Our Common Future". Important documents on sustainable development were adopted during conference such as, the "Tasks of the XXI Century" (Agenda 21) document, which provides a comprehensive program of sustainable development, the Rio Declaration which includes the principles of sustainability and the principles of sustainable forest management. The Convention on Biological Diversity and the Framework Convention on Climate Change, which are also referred to as the "Rio Conventions", were opened to be signed.

At the end of August 2002, the World Summit on Sustainable Development was held in Johannesburg, South Africa. The conference's ideas were only partially successful. Instead of the "Declaration of the Earth" a much "softer" document was adopted ("Rio Declaration"), which contained only principles. However, the Climate Change Framework Convention and the Convention on Biological Diversity were signed by the majority of the participating countries. Mandatory standards were not adopted for the protection of forests, merely a recommendation was formulated.

The Kyoto Protocol, signed in 1997, is an international agreement which brought together developed countries in which the participating industrialized countries pledged to cut their carbon dioxide emissions to 5.2% below the 1990 level within one decade. By December 2006, 169 states joined the Convention; these countries were responsible for 61.6% of global CO_2 emissions.

The USA and Australia did not join. Although India and China did join, but due to special treatment it was not mandatory for them to reduce their CO_2 emissions.

Commitments under the Kyoto Protocol are not enough to stop climate change, but because of conflicts of interest, no agreements were signed in the following conferences: Copenhagen 2009, Cancun 2010, and Durban 2011. In 2012 at Doha, in the United Nations Framework Convention on Climate Change (UNFCCC) conference, it was agreed that the validity of the Kyoto Protocol had to be extended until 2020.

Role of Different Renewable Energy Sources

There are plenty of renewable energy resources available and it would be possible to satisfy our total energy needs from these sources provided that they are used in a sensible way. However, we are a long way away from this as only 18% of the energy we consume originates from renewable sources. The global energy need is growing continuously due to countries like China, India, and other developing countries.

The Earth's energy supply can be considered inexhaustible as the solar energy we receive is 1,524,000 EWh (1 EWh = 10^{12} kwh). The current world energy consumption is only 100 EWH. The next renewable energy source is the wind (30,800 EWH), followed by wave energy and sea water (7620 EWH), biomass has less potential (1520 EWH), and finally hydropower (46 EWH) must also be mentioned. These figures represent global values.

"Technical potential refers to (from the technical point of view, realistically exploitable within structural constraints), the volume that can be achieved with current technology, which is still greater than the economic potential (which refers to the economically exploitable potential). Compared to the economic potential the actually (realistically) exploitable so called **sustainable potential** (i.e., the potential that can be utilised in harmony with social ecological factors*)* is even smaller, more restricted**."** (Magda & Onalan, 2018)

Table no. 2 summarises the global technical potentials of renewable energy sources.

Table No. 2: Global Technical Potentials of Renewable Energy Sources

Energy Source	Global Technical Potential (EJ)
Solar energy	1,575 – 49,837
Geothermal energy (electricity)	118 – 1 109
Wind energy	85 – 580
Biomass	50 – 500
Geothermal energy (heat)	10 – 312
Energy from the oceans	7 – 331
Hydro energy	50 – 52

Source: IPCC (2011)

The amount of the potentially usable renewables could satisfy the current total energy demand of mankind more than twenty times. The UN Intergovernmental Panel on Climate Change (IPCC) concluded that, within four decades 80% of the total energy needs of mankind could be met using solely renewable energy. To do this, governments should create public policies on green energy. The technology of green energy production is still more expensive than the utilisation of oil, coal or natural gas. To prevent global warming, the production of renewable energy should be multiplied twenty times. This would require an investment of about 1% of the total global GDP (IPCC, 2011).

Solar Energy

The use of solar energy is currently next to minimal, but it is evolving rapidly. Its utilization can be passive when it comes to the design and construction of buildings in order to make use of solar energy, and it can also be active when heat or electricity production is carried out. The solar thermal systems convert the sun's energy into heat, while the solar panels produce electricity from solar radiation.

The utilisation of wind and water energy can be traced back to the sun's energy, and biomass energy also generates energy from plants which are involved in energy production and use after conversion through photosynthesis.

Table No. 3 : Potential Annual Solar Energy Production

Region	Potential energy production (EJ)
Western Europe	25 – 914
Central and Eastern Europe	4–154
Former Soviet Union	199 – 8,655
North America	181 – 7,410
Central and South America	113 – 3,385
Middle-East and North Africa	412 – 11,060
Africa (Sub Saharan)	372 – 9,528
Asia	196 – 6,469
Total	**1,502 – 47,574**

Source: Arvizu et al. (2011)

Wind Energy

Today, wind energy has become competitive compared to many traditional energy sources. This resource under certain wind-related barriers is competitive and should be preferred because, it does not trigger climate change (Blaskovics, 2008). The aggregate wind power capacity at the end of 2011 represented a nominal capacity of 238 GW. The distribution between countries is shown in table no. 4.

Table No. 4: Cumulative Wind Power Capacity

Country	MW	Capacity %
China	62,364	26.2
USA	46,919	19.7
Germany	29,060	12.2
Spain	21,574	9.1
India	16,084	6.8
France	6,800	2.9
Italy	6,737	2.8
UK	6,540	2.7
Canada	5,265	2.2
Portugal	4,083	1.7
Rest of the world	32,143	13.5
Total Top 10	205,526	86.5
World Total	**237,669**	**100.0**

Source: Harmann (2012)

Looking at the world market, China and India are increasing their capacities at a rapid rate and the two countries had more than 50% of wind power market in the world, in 2011. The distribution of installed wind power capacity in 2011 was 40.56 MW.

The amount of utilised wind power in the world tripled between 2008 and 2012 (GWEC, 2013). The globally generated wind power exceeded 282,000 MW at the end of 2012.

Hydro Energy

During the utilisation of hydro energy, the potential energy of water is exploited in such a way that electricity is generated in hydroelectric power stations. As a result of solar radiation, water is in continuous circulation thus, its energy resources are constantly renewed, which makes it a never exhausting "renewable energy source". After the oil price shock of the 1970s, hydroelectric dams became increasingly competitive and became an instrument for the dissolution of fossil fuel dependency. Flowing waters have kinetic energy while, the still waters have potential and pressure energy. Hydro energy comprises of all these energies. The world's technically recoverable hydro-power capacity (according to estimates) is about 20,000 TWH, while the total global hydropower production is about 2,000 TWh, which is only 10% of the technically recoverable energy as shown in table no. 5.

Today more than 160 countries around the world generate electricity using hydro power and the total capacity of approximately 11,000 hydro power plants worldwide is 874 GW. Half of the

Table No. 5 : World's Hydropower Potential

Continent	Theoretical Hydropower potential TWH	Technically Utilisable TWH	Total Electricity Generation TWH	Hydro-energy Generation TWh	% of Hydro-energy	Utilised Technical Hydropower Potential %
Europe	4,360	1,430	2,599	453	18	32
North America	6,150	3,120	3,202	642	20	21
Latin America	5,670	3,780	370	281	76	7
Africa	10,120	3,140	234	49	21	2
Asia	20,430	7,530	3,475	564	16	7
Oceania	1,500	390	161	39	24	10
Total	**18,230**	**19,390**	**9,962**	**2,028**	**20**	**11**

Source: Juhász et al. (2009)

technically recoverable hydro energy can be found in 5 countries, namely: China, USA, Russia, Brazil, and Canada. (IEA, 2010).

Geothermal Energy

Geothermal energy is the internal energy of the earth's crust, which can be utilized for energy purposes. It can be considered as a source of clean and renewable energy as the heat from the interior of the Earth is virtually unlimited. The energy is accessible at any time of the year, unlike wind and solar energy. The constantly flowing heat from inside the Earth represents 42 million MW of power so, its utilisation is justified.

The capacity of geothermal power plants in 2012 exceeded 11 GW. The rate of capacity expansion is dynamic. The main types of utilization of geothermal energy and their distribution is as follows: heating of buildings (63%), baths, balneology (25%), horticultural greenhouses and soil heating (5%), industrial heat consumption and agricultural drying (3%), aquaculture and fish farming (3%), and snow-melting (1%) (Lund, Freeston, & Boyd, 2010). The main heat utilising countries are shown in table no. 6.

Biomass

Biomass is potentially the largest source of renewable energy, the annual primary production reaches 4,500 EJ, of which 2,900 EJ can potentially be used as bioenergy. The extraction of about 10 percent of the total amount is sustainable in the long-term (Hall & Calle, 1999).

Almost 10% of the annual global energy consumption (approximately 500 EJ) originates from biomass-based energy production and biomass provides a significant part, varying from country to country of renewable energy. Due to its limitations (industrial production, fertilizer use, changes resulting from land use) it does not necessarily guarantee the upkeep of CO_2 balance (Bauen, Berndes, Junginger, Londo, & Vuille, 2009).

Biomass energy can be grouped according to generation level, mode of energy conversion, final product, and storing possibilities.

Sustainable Development

A lot of people misinterpret the definition. The reason is that they cannot distinguish between growth and development. It is important to declare that in economic terms sustainable development is not the

Table No. 6 : Direct Heat Utilisation in Different Countries (at the end of 2009)

Country	Capacity (MW)	Annual use (GWH/Year)
China	8,898	20,931.8
USA	12,611,46	15,710.1
Sweden	4,460	12,584.6
Turkey	2,084	10,246.9
Japan	2,099,53	7,138.9
Norway	3,300	7,000.6
Iceland	1,826	6,767.5
France	1,345	3,591.7
Germany	2,485,4	3,546.0
Holland	1,410,26	2,972.3
Italy	867	2,761.6
Hungary	654,6	2,713.3
New-Zealand	393,22	2,653.5

Source: Lund et al. (2010)

opposite of growth. The condition for responsible management is the assessment of the supply of private and public goods and measuring value of such services, taking into account the external costs and gains on a yield-oriented basis (Farkasné, 2004).

Costanza (1989) created a definition from an ecological point of view. In his opinion, a condition is sustainable when the minimum conditions are provided for ecosystems so that they are stable and resilient. Norton (1992, p. 25) argues that "sustainability is a relationship between dynamic human economic systems and larger, dynamic, but normally slower changing ecological systems, such that human life can continue indefinitely, human individuals can flourish, and human cultures can develop - but also a relationship in which the effects of human activities remain within bounds so as not to destroy the health and integrity of self-organizing systems that provide the environmental context for these activities." Another example of an eco-centric definition originates from the OECD, according to which Sustainable Development is a development that does not harm the health of populations and ecosystems, and satisfies the socio-economic needs in such a way that renewable resources are utilised slower than the amount of time needed for their regeneration, and non-renewables are used slower than the regeneration of renewable sources, that can be applied to substitute them (Csanády & Kovács, 2003; Kelemen, 2013).

Ecological economics brought about a paradigm shift in economic thought by exploring the complex relationship between nature and society. Thus, Earth, as a global ecological system, presents an absolute limit to society and the economy.

The principle of Sustainable Development, nowadays, has two interpretations (weak and strong). Weak sustainability means that social, economic, and environmental considerations are equally taken into consideration in the decision-making process. This is shown in figure no. 2.

The weak sustainability criterion states that the total value of natural capital, human capital, and that of man-made goods as capital cannot reduce over time. This idea assumes the unlimited mutual

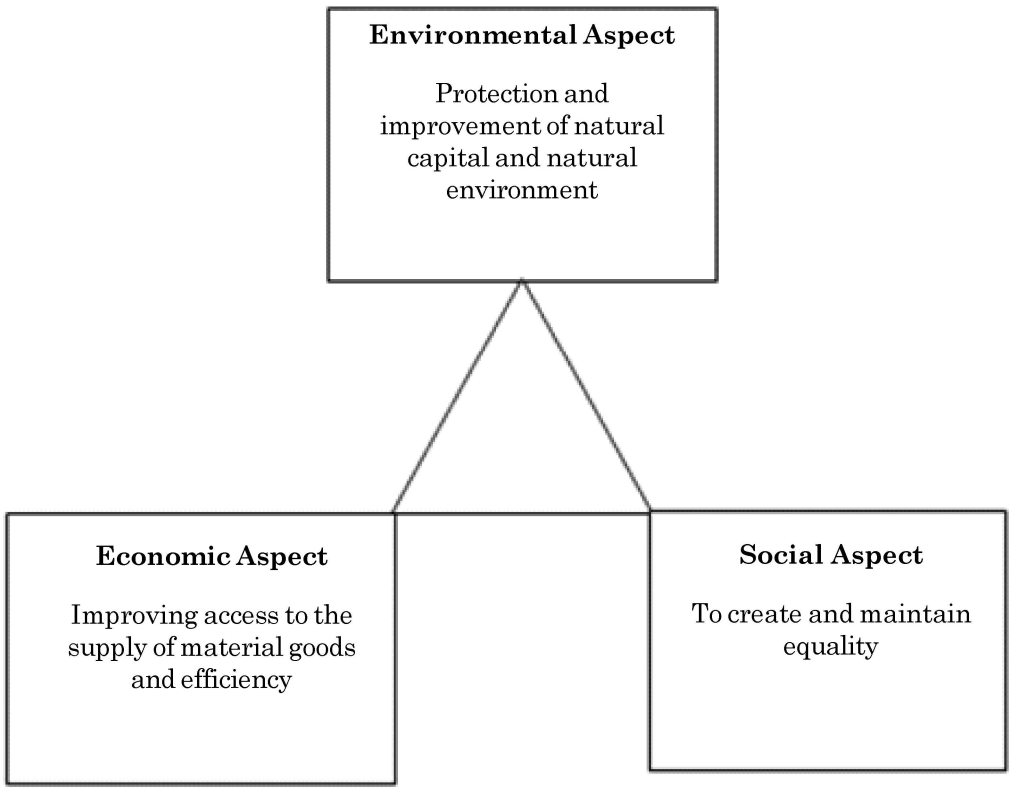

Figure No. 2: Aspects of Sustainability

Source: Zhou & Kuhl (2011)

substitutability of capital goods and creates the necessity to financially assess nature which is reflected by applied tools (e.g. the internalization of externalities) (Kerekes, 2006). The shortcoming of this theory is that, it does not account for the possibility of the changes caused in the ecosystem (Málovics, 2007).

In case of strong sustainability the external environmental constraints must be abided which means that, the emissions must not exceed the environment's capacity to absorb, the use of renewable resources must not exceed the rate of formation, and the use of non-renewable resources must not exceed the rate at which sustainable and renewable substitution occurs.

Sustainable development strategy is a long-term program for humanity. However, beside the global level, implementation has national, local, and micro-regional programs as well. Local levels have a crucial role in realising the objectives.

From the point of view of efficiency, it is very important to distinguish the levels and areas of sustainability. Csete & Lang (2005) asserts that, global and long-term principles of Sustainable Development often unfold in the regional and local programs, which may be organized, regulated, and controlled by the authorities of a given level. It is possible at this level to mobilize, persuade, and teach people to be responsive to Sustainable Development.

Láng (2003) believes that Sustainable Development is based on three pillars. The Stockholm Conference created the natural environment pillar, the Rio Conference brought the economic pillar to the forefront, while the Johannesburg Conference emphasized the social pillar.

Green Economy and Green Growth

In the light of data and research results, we must realize that the growth paradigms used so far are unsustainable. The United Nations, the European Union, and the OECD play a pioneering role in the development of methodology and the measurement of "green growth". We must strive to accomplish a synergistic relationship between economic growth and environmental protection with lower energy consumption. As per Pomázi & Szabó (2013), three main objectives should be fulfilled:

– support for green growth,

– improving the quality of life of society,

– participation in the international fight against climate change

In order to solve the climate crisis, the net amount increase of greenhouse gases must be reduced by at least 80-90 percent. Currently it seems highly unlikely since, China and India use huge amounts of coal, natural gas, and oil in order to achieve fast development. It is worth studying the energy use of these continent-sized countries as for the future of our civilisation may depend on them. The relationship between the use of renewable energy and food production is an interesting study, since, land use must be carefully considered in order to avoid hunger strikes.

Findings and Discussions

Economic growth, employment, and future opportunities depend on the status of energy production and use. An alternative economic model is required which is characterized by energy saving, energy efficiency, and the use of renewable energy sources. The current energy structure is not exchangeable for a long time thus, we have to face anomalies associated with climate change. Due to the unstoppable population growth and the exponentially increasing energy consumption we have crossed the limits of the biological carrying capacity of the Earth. Currently humanity uses more than 1.5 times of the Earth's natural resources and natural amenities. 80% of energy use today is based on the use of fossil fuels whose peak production yields are not far away. Increasing emissions of greenhouse gases causes global warming. The main culprit is CO_2, the concentration of which increased in the atmosphere from the level of 320 ppm in 1960 to over 400 ppm by 2013. The Kyoto Protocol, signed in 1997, is not enough to stop climate change, a new agreement is required. If current trends continue, by 2060 the Earth's temperature will increase by 4°C, which can have devastating consequences. World energy demand and consumption continues to grow, especially because of China, India, and the developing countries. The answer could be the use of renewable energy sources whose potential amount could cover the full amount of potential energy needs of humanity up to twenty times. The potentials of solar energy are promising but, further research and development is required.

Wind energy combined with solar energy forming a hybrid system may become a significant factor in autonomous power supply. Hydro energy requires significant investment, but because of the long lifetime of power plants it pays off. The facilities may play a significant role in flood regulation and agricultural irrigation. Geothermal energy is a clean and renewable source of energy which is suitable for direct heat recovery and electrical power generation. The direct heat utilization is the norm, especially for heating buildings. Heat pumps used in low depth are suitable for heating or cooling. Biomass is potentially the largest renewable energy resource. Its energy recovery is versatile. Biofuels could substitute gasoline and diesel. In the EU, member states are expected to increase the share of renewable energy in transport to 10% by 2020.

Biofuel production generates ethical and environmental conflicts and it is expected that in 5-10 years from now, second generation fuel production, which does not threaten food production, will prevail.

The world leaders should realize that, the current level of energy consumption cannot be reduced, while

its increase cannot be considered. The dissemination of renewable energy sources requires investments and profitability is expected only in the long term.

Political leaders think in terms of election cycles and curbing energy use would decrease quality of life, which they do not want to risk.

The previously existing harmony between mankind and nature has ceased to exist, the Earth's resources are finite, exponential growth presents a deadly threat to our planet's wildlife. In countries with growing populations, the severe lack of water and food can lead to total destruction of the social order. The population of megalopolis has increased tenfold over the past forty years. In 2013, there were 23 cities whose population exceeded 10 million. The excessive consumption of freshwater and soil erosion make the possibility of a rapid increase in food production infeasible.

By the use of fossil fuels 90 million tons of pollutants are emitted daily into the thin layer of the planet's atmosphere, which acts as a heat trap and accelerates global warming. In order to be able to combat the climate crisis, humanity should take immediate, significant, and coordinated actions, but it has not happened yet. Should these processes remain unchanged, a significant extinction of species may occur, which would be solely triggered by human activities. If we do not want to ruin the future of our future generations, the new era of economic growth must be less energy intensive. A thrift life is the first step towards sustainability. In order to realize the goals, the environmental, social, and economic conditions must also be met.

According to the Millennium Ecosystem Assessment (2005), unprecedented changes in the ecosystem have occurred in the past 50 years. Demand for food, water, and energy has rapidly increased, which has accelerated the changes. Due to the acidification of sea water, most of the coral reefs have been destroyed or damaged, half of the mangrove forests have been destroyed, the frequency and intensity of floods and forest fires have increased significantly. More than 700 European species are threatened with extinction.

Practical Implications

Sustainable development is often found to be unfolding in the regional and local programs. People establishing close cooperation with nature must adapt to the environment by using a decreasing proportion of import resources. It is necessary to preserve the biological diversity and strive to exploit the opportunities offered by sustainable land use, agriculture, and natural industry. Changes in sustainability should be tracked by variable data analysis of natural environmental, economic, and social indicators.

Conclusions

With the expansion of globalization the use of resources and their unsustainable exploitation have accelerated. The analysis unequivocally demonstrates that the state of the environment has continued to deteriorate and natural resources are being wasted unnecessarily. In the future the process is expected to continue to worsen as the population and in parallel with it, the consumption grows exponentially.

Essential life-sustaining systems thought to be ever-existent have been damaged; the water cycle, atmospheric composition, natural assimilation of waste, the reutilisation of nutrients, plants pollination, the delicate balance of the coexistence of flora, and fauna have all been jeopardised.

According to some people, these ominous changes should be treated as a moral issue. Companies and leaders of industries prefer an economic system which can be characterized by ruthless competition, selfish accumulation of material goods, and excessive consumption. Our attitude needs to be fundamentally changed. The Earth is heading towards an economic collapse. Overshooting and collapse

may be our future unless we learn to cooperate rather than compete with each other for the sake of our future generations.

From the point of view of climate change, the reduction of air pollution is the most important issue. Energy efficiency must be improved and cleaner energy sources as well as less polluting technologies should be disseminated. Over the past 12 years the emission of harmful substances has increased significantly in Hungary in every respect, except for atmospheric particulate matter (PM 2.5). This improvement cannot be observed in the developing countries of the world thus, the risk of climate change increases.

High CO_2 levels (over 400 ppm) can be dangerous if methane is released from polar ice sheets and the Tundras, because of warming temperatures, which can cause further warming. We are now in unfamiliar territory. Recent studies have shown that the growth paradigms used so far are unsustainable. Even the international organizations promote "green" growth, which is necessary and economically feasible. The United Nations Environment Programme states that the concept of green economy has been formulated to increase the well-being of human beings. Green growth can be measured with already developed indicators and it helps to realistically assess the situation.

The biggest challenges in this respect include climate change, reduction of biological diversity, non-sustainable management of water resources, and pollution and health effects of hazardous chemicals.

It may be stated that for the sake of development and sustainability, the economic model based on conventional (fossil) energy sources must be replaced by an alternative economic model, which is basically built on green technologies and utilises renewable energy sources on a large scale.

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