



Where Is the World Heading? Social Crisis Created by Promotion of Biofuels and Nowadays Liberal Capitalism

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Introduction

The starting point for our discussion is the statement that rapid technical and technological development gave the modern man immense power, which enables him to transform the world virtually to an unlimited degree, including its destruction. Therefore, the reasons of escalating ecological (as well as social) crisis should be sought in the dominant socio-economic model [1–5].

Conferences organized since 2005 by Professor Tadeusz Piecuch (Annual Set The Environmental Protection 2005–2014) focus on environmental engineering, which creates technical devices for shaping and protecting the environment. I believe that the development of this science provides ever-improving tools for preventing the degradation of environment and undoing harm done by people. However, it turns out that modern man does not always take advantage of these abilities appropriately [6–10].

In Poland, the beginnings of environmental engineering in its present understanding can be traced back to the 1980s, while its predecessor – sanitary engineering – to the 19th century. Some actions associated with the modern environmental engineering can already be found in the ancient times. Sanskrit – scripture of ancient Hindu – prescribes filtration of water through gravel and heating in the Sun's rays in order to make it suitable for drinking. The Ancient Chinese added ash from dried leaves

to water and invented tea through experimentation. In our culture, a well-known description is found in the Book of Exodus (march from the Red Sea to Mt. Sinai). It recounts the story of Moses leading Jews through a desert, who encountered springs of undrinkable water on his way. Moses cut the branches of a shrub and tossed them into water, thus purifying it. Recently conducted research showed that on Sinai desert, there is a shrub containing oxalic acid. The acid from the sap of cut branches caused precipitation of calcium and magnesium ions, resulting in partial desalination of water. Hence, Moses was the first person to employ water desalination for the purpose of consumption.

By and large, up until the 15th century epidemic outbreaks ravaged Europe, e.g. plague, which broke out in the 14th century killed over 30% of population.

It is commonly assumed that the advances in health protection are due to the development in medicine. Few people realize that the greatest breakthrough in that field was made by sanitary engineers who introduced covered sanitary sewers and supplied clean drinking water.

Removal of pollutants and water supply is well-established from the technical point of view. Therefore, if so many people suffer from the shortage of clean water, it is not due to insufficient technical knowledge, but rather from the lack of adequate socio-economic solutions.

In his book, Professor T. Picuch, along with minister Gawłowski [11], showed that energy supply will be the main problem in the next several dozen years. On the one hand, modern world will not be able to function without sufficient supply of energy; on the other hand, all the major issues concerning both the natural and social environment occur during the gathering, processing and use of energy.

Energy versus climatic changes

One of the greatest dangers connected with the gathering and processing of primal energy sources is the CO₂ emission from the combustion of fossil fuels and its impact on the climatic changes. The greenhouse gases emitted to the atmosphere, mainly CO₂ and CH₄, as well as steam, retain heat radiated from the surface of Earth. This phenomenon is not negative on its own, as without it the average temperature on Earth would amount to -14.5 C° .

The problem is that the CO₂ emission caused by the combustion of fossil fuels is constantly on the rise since the times of Industrial Revolution. While the CO₂ concentration equaled 278 ± 5 ppm in 1759 m, it reached 390 ± 0.1 ppm in 2011 [12].

IPCC reports [11,12] unequivocally indicate CO₂ as the main factor of increasing temperature on Earth to the point of threatening the stability of planet's ecosystem. It is worth noting that Lindzen, an outstanding American climatologist [13] does not question the impact of CO₂ concentration on the temperature increase; however, he points out that this influence is an order of magnitude lower than assumed. This statement is important because the preventive measures employed in order to mitigate the greenhouse effect, especially in the European Union, are relatively expensive and may negatively impact the economy of member states, as they mainly focus on significant changes in energy policy.

It should be noted that the global anthropogenic CO₂ emission in 2013 amounted to 9.5 ± 0.8 billion tons of CO₂ per year [12], whereas the combined breathing emission of people, animals and plants was many times greater and equalled 119 ± 1 billion tons of CCO₂/year in 2013. These values are significantly higher and therefore, focusing solely on the energy policy seems to be irrational, especially as some of the actions recommended in that field raise concerns.

Characteristic of energy sources

While the greenhouse effect is a commonly known phenomenon, fewer people realize that the main fossil fuels and non-renewable Earth resources are rapidly depleted, which constitutes greater danger for the existence of our civilization. A few examples include: with the current rate of consumption, the reserves of crude oil will suffice for 40–50 years, natural gas: for 60–70 years, coal: 140–150 years, uranium: probably for 140–150 years. While analyzing the supply of primal energy source materials it must be stated that in Poland, it is impossible to cease using coal in the nearest 20–30 years without major social consequences.

Nuclear power is an important source of primal energy in the world scale. With the current use of conventional reactors the known deposits of uranium will suffice for approximately 140 years. If the breeder reactors were used, availability of uranium for electric energy production would lengthen to hundreds of years. The problem is that

breeder reactors produce plutonium, which can easily be used in the construction of an atomic bomb. That is why breeder reactors are used nowadays only for military purposes.

High hopes are put into the travelling-wave reactor developed by an American company TerraPower. In this type of reactor, breeding nuclear reaction is initiated in the core, then the energy-generating fission-zone advances steadily through the core for as long as several dozen years. Such solution enables enclosing the fuel rods in a sealed reactor for the period of several dozen years, which significantly limits the availability of fission materials. TerraPower informed that the first reactor of this type, with the output of 100 MW will be launched in 2015. It seems that the developments in nuclear power may provide sufficient energy supply. A lot of attention is drawn into so called renewable energy sources, such as: solar energy (thermal, photovoltaic) [14,15], Earth internal energy (geothermal), falling water and tidal energy, energy from waste [16,16] and widely-advertised biomass energy. However, utilizing biomass as a source of energy becomes problematic due to environmental and social issues connected with its application.

Consequences of bio-fuel application

While discussing the environmental protection, we usually think about the natural environment and that is where the protective actions aim at. The human environment, with its important component – socio-economic conditions – is usually forgotten about. The afore-mentioned bio-fuel utilization is an example of overlooking the socio-economic conditions.

Focusing of energy policy only on counter-acting the CO₂ emission threatens the sustainable development of the world. One of the most essential sustainable development paradigms is the intra-generational justice, which prescribes equal access to basic resources, including food, to all people. Despite appeals, almost 1 billion people in the world still suffer from starvation. It turns out that the directive signed by European Union in 2009, which enforces 10% share of biofuels in transportation by 2020, might threaten the sustainable development paradigm of intra-generational justice without having a significant effect on mitigating CO₂ emission, as the production of biofuels both increases prices of food and lowers its production.

Competition with food production industry

The food demand will continue to increase for two reasons: growing human population and greater number of better-fed people. Meanwhile, 250 thousand people starve to death each day, while 780 million people in developing countries and 27 million people in developed countries are malnourished. With this status quo, devoting large areas of land for the biomass used in fuel production raises moral concerns. This is especially relevant in the context of biofuels from agriculture. According to the European Commission decision from 2009, as much as 10% of energy used in transportation should be obtained from biofuels made from food crops. In order to make biofuels a viable solution, European governments subsidize powerful industrial and agricultural lobbies. For instance, by 2020 each person in Great Britain will pay approximately £35 per year (£1-2 billion in total) for biofuel subsidies, while in Germany – roughly €30 (€1.4–2.2 billion in total).

Also in the United States, the production of ethanol (mainly from corn) which is used as fuel additive developed rapidly thanks to subsidies. In 2011, as much as 127 million tons of corn, i.e. 40% of annual production was devoted for bioethanol production. Allocating such a great amount of corn for ethanol production in 2007–2012 caused a 100% increase in the prices of corn. Large import of crops for biofuels by the European Union caused a dramatic 2.5-fold increase in the food price index. The increase in food prices is especially severely felt by poor people, who spend most of their income on this basic commodity.

In the light of the above-mentioned statements, utilizing biomass from agricultural crops as a source of energy endangers the implementation of sustainable development, as it violates the intra-generational justice paradigm by limiting the access to food for the poor.

Effect of biofuels on the greenhouse gases emission

The promotion of biofuels is based on an erroneous assumption that their combustion releases equal amount of CO₂ to the one absorbed earlier by plants. This oversimplification does not take into consideration the entire biofuel production cycle. The effects of land use and energy outlays for the cultivation and processing of biomass used in fuel production are omitted in the calculations.

A lot of pressure put on the usage of biofuel in transportation, exerted especially by the European Union policy, resulted in the deforestation of tropical forests and cultivation of biofuel plants – especially in the developing countries. According to the research conducted by Danielsen et al., the absorption of CO₂ by tropical forests is much greater than the one of plants grown in their place. Consequently, the biofuel production decreases CO₂ absorption on the lands of felled tropical forests. Transforming tropical forests and moors for the cultivation of biofuel plants leads to an additional emission of 55 Mg CO₂ annually per hectare for the period of 120 years. Therefore, the usage of agricultural biofuels usually does not mitigate CO₂ emission.

Moreover, in order to produce biofuel, e.g. corn bioethanol, it is necessary to provide power for the cultivation, fertilizer production, plant collection, as well as fuel processing through fermentation and distillation. By using the life cycle assessment technique, it was shown that the amount of the emitted CO₂ per unit of energy obtained from corn ethanol is 60% greater in relation to the CO₂ amount emitted in combustion of the equivalent petroleum-based fuels. Even in the case of sugar cane ethanol produced in Brazil, where the industry is most advanced and where the leftover biomass is entirely used, e.g. sugar cane stalks are burned for heat energy; it was not possible to decrease CO₂ to a lower level than the one of oil-based liquid fuels.

However, in the case of Brazil, the development in sugar cane ethanol helped to create approximately 700 thousand new jobs, which can be considered a positive effect increasing the social sustainability. It allowed Brazil to become independent from the liquid fuels import, and the price of ethanol is competitive to the one of petrol. In Brazil, it was possible to achieve sustainable access to liquid fuels in transportation; still, the emission of CO₂ did not decrease. However, this case is exceptional.

The full analysis of production cycle showed that cultivation of some plants for biofuel production, such as rape, requires application of large amount of fertilizers which increase the emission of another greenhouse gas; namely, nitrous oxide, thus contributing to the greenhouse effect. In the case of rape, the nitrous oxide may increase the greenhouse effect by as much as 70%.

Assessment of biofuels in the aspect energy efficiency

According to the research by Professor Piementel from Cornell University [18], the amount of energy consumed in bioethanol production is greater than the one obtained by combustion in car engines.

In the process of corn ethanol production, 29% more energy is consumed than obtained, in the case of grass ethanol – 45%, wood ethanol – 57%.

The situation is similar in the case of biodiesel, which is produced from soybeans. Here, 27% more energy is consumed than generated, and when biodiesel is produced from sunflower seeds, this value increases up to 118%. The data presented above shows that in the United States (and probably other developed countries as well), utilizing plants in liquid fuel production is not sustainable, because – conversely – it increases both the consumption of fossil fuels and CO₂ emission.

Impact of biofuels on the environment

The development of biofuel plant cultivation destroys habitats and biological diversity.

More than half of land animal species live in tropical forests. The forests in south-eastern Asia, which provide habitats for a plethora of various organisms, are the most endangered by the biofuel plant plantations. The tropical forests absorb roughly 46% of carbon dioxide found in the atmosphere. Their destruction may increase the carbon dioxide concentration by 25%.

Hence, there is an internal contradiction in devoting tropical forests for the cultivation of plants for so called low-carbon fuels. It is estimated that the number of species living in the area decreases fivefold when forests are cut and turned into biofuel plantations.

Production of liquid biofuels for the transportation also has a negative impact on the aquatic environment due to a high consumption of water both for watering plants and during processing to biofuels. Moreover, the processing involves production of large quantities of hazardous wastewater, e.g. production of 1 litre of ethanol is tantamount to 6–12 litres of highly contaminated sewage. Meanwhile, water shortage is already negatively influencing food production.

Generally, approximately 2500 litres of water are used in order to obtain 1 litre of biofuel. Such amount of water is enough to produce food for one person. In order to irrigate 30,000,000 hectares of land for biofuel cultivation, roughly 180km³ of fresh water will need to be used. One must bear in mind that due to the growth of population to 8.3 billion in 2030 (from 7.2 billion in 2012), food, water and energy demand will increase by 35%, 40% and 50%, respectively.

Large monocultures, which are usually employed in the case of biofuel plants, require wide application of herbicides and pesticides, which then infiltrate to ground waters – contaminating them. Soybean farming in Brazil is an example of a negative effect of pesticides. Along with herbicides, they are used on a large scale in the Pantanal wetland, which constitutes one of the most important habitats for hundreds of birds, mammals and reptiles. Another example includes 20,000 hectare sugar cane plantation, intended for ethanol production, which is located in the delta of Tana River in Kenia. With the planned water uptake of 1680 m³ water/min, which equals 30% of river flow rate, it seriously threatens the local ecosystem which is a habitat to 345 species of water and marsh birds.

Socio-economic conditions of the present crisis

Advancements in the energy supply is commonly associated with the technical and technological development. Problems related with the utilization of biofuels indicate however that the increasing lack of balance in the development of the modern world is caused by the prevailing socioeconomic system which assumes unlimited domination of free market that degrades human and his needs to the level of mere tools for its development. According to this widely-held doctrine, it is human who should serve economy, not the other way around, thus making it some kind of supreme entity.

Evolution of socioeconomic environment in present times

From a practical point of view the quality of life is determined by the availability of basic goods necessary for life, the quality of the natural environment, and human relationships determined by the sociopolitical system. The problem is that, since the times of President Ronald Reagan,

there has been a gradual deterioration of socioeconomic relations, whilst the difference in living standards and incomes has risen sharply. Undoubtedly, the rise of capitalism caused an accelerated development of production. Initially, an enormous diversity in society was observed. Employees, particularly manual workers were deprived of any rights, even the right to a guaranteed minimum living wage. In response to this, movements arose, calling for a fairer distribution of wealth. The encyclical *Rerum Novarum*, issued by Pope Leo XIII was a notable voice, due to the importance of the institution. At the same time, socialist movements also arose calling for equality and social justice. Consequently, this led to the rise of trade unions in the first half of the nineteenth century which, with their increasing power, significantly influenced the transformation of the state's role in the direction of a national welfare state, towards the end of the first half of the twentieth century. These *changes* – because it is difficult to call them Reforms (as reforms have a positive connotation) – whose creators were President Ronald Reagan and Prime Minister Margaret Thatcher, reduced the role of traditional unions, which led to a recurrence of unjustified inequalities and to a direct rise in large groups of people thrown onto the side-line. As intra-generational justice is one of the basic paradigms of sustainable development, it is worth looking at modern civilization of liberal capitalism from this viewpoint. This issue has been repeatedly raised in the journal entitled *Problemy Ekorozwoju/Problems of Sustainable Development*.

The cause of this state of affairs was seen as the inadequate development of social sciences and humanities [13–21].

In my assessment, today's (rising inequalities) and future threats (the overexploitation of the rapidly depleting natural resources, progressive degradation of the environment) indicate that modern civilization is developing in an unsustainable way. In the next section I will attempt to point out the causes.

Causes of unsustainability

The paradigm of modern liberal capitalism is the immense greed of the elite financial to accumulate wealth at all cost, through the principle of *grow or die*. Capital can be accumulated by using the Earth's resources and human labour. I have already mentioned the trade unions which, by the mid twentieth century, led to a balance in society between capital and the

workers on the one hand, and also – through the strong role of the state – imposed the high standards of environmental protection on the other. This was possible because the power of the capital was offset by the power of the state where trade unions represented the workers [1–19].

The state began its withdrawal, from the time of Ronald Reagan and Margaret Thatcher, in line with the *less state* slogan, which was also propagated in Poland. The weakened trade unions were not able to oppose this trend in many countries. The withdrawal of the state and the rise of multinational corporations have meant the loss not only of the element protecting workers, but also of such issues as environmental protection, protection of working rights, the rationalised consumption of the Earth's non-renewable resources.

Basically, there is no sufficiently powerful partner who could play a regulatory role in relation to the international corporations, whose sole purpose is profit. That is why production is so easily transferred from countries with greater social and environmental safeguards to countries where these regulations are more liberal. Consequently, despite huge increases in productivity, poverty in the world has not been reduced, whilst the number of excluded people continues to grow. Thus, it follows that for a global economy there is also a need for a powerful transnational partner, who would have the instruments to control and enforce pro-social and pro-environmental behaviours in accordance with the principle of sustainable development. Deregulation of the financial markets and large-scale privatisation of banks, as initiated by Ronald Reagan and Margaret Thatcher, is an even worse evil. This allowed for financial speculation and its detachment from production, unprecedented in human history. In the recent years, it was mainly the financial markets which caused the appropriation of most of the revenues as a result of speculation – prof. Brunnhuber from Club of Rome showed that as much as 98% money transactions are pure speculations. Yet, these missing vast sums have been transferred somewhere. It is even more outrageous that as a result of these massive transfers, no added value has been created as opposed to production processes.

The deregulation of financial markets, allowing for speculation of money on an unprecedented scale in the history of mankind, is the main cause of inequalities. A new class has emerged, managing corporations and financial institutions on an international scale, with exorbitant in-

comes, which through links with the political elite does not bear any responsibility. An example in Poland are the notorious pension funds (OFE), so eagerly introduced by the Jerzy Buzek's government, whose boards receive generous rewards regardless of the results. Insomuch, voices are being heard, calling for a return of the welfare state [19–22], all the more, as the Scandinavian countries were not submissive to the Reagan-Thatcherite ideology and function quite satisfactorily as countries with a developed social policy.

Is globalisation compatible with sustainable development?

The creators of modern liberal capitalism extol globalisation, pointing out the positives arising from the creation of an international (borderless) market economy. Meanwhile, as demonstrated by Fotopolous [23], the opening and liberalisation of the markets was carried out in the interests of the world's financial elite, who control the market economies. Its purpose was, and is, to minimize social control over the market, particularly of those who, like the trade unions, are trying to safeguard workers' interests and environmental protection. This in turn becomes an obstacle to increasing economic efficiency and increased profits. Free movement of capital and goods across borders required the liberalisation of all the markets in order to minimise the role of the states, which are capable of effective control, protecting workers and the environment on their territory. However, on an international scale, corporations do not have a sufficiently powerful controller.

Consequently, according to a report by the International Labour Organisation (ILO), globalisation repeatedly leads to fast growing inequalities, creating a superrich elite, and side-lining increasingly larger groups of people.

This phenomenon occurs particularly strongly after 1990. This way, socialist ideas created in the East, or the social democratic ideas created in the West (equality and social justice) are pushed out of the modern civilization.

Conclusions

Modern civilization is developing in an unbalanced way. Without proper control, free market and liberalisation associated with globalisa-

tion lead to a fast, if not an exponential, rise in inequality. This is facilitated by the lack of sufficiently strong employee representation on an international forum, thus causing a direct increase in poverty. Simultaneously, the lack of proper control of international corporations causes an irrationally rapid depletion of Earth's non-renewable resources and degradation of the environment.

The financial markets are a big threat to the world's stability, where speculation leads to acquiring vast sums of money without creating any added value. The slogan *less state* only serves big international capital, leaving most citizens without adequate safeguards. It is essential to work on replacing the gross national product with a newly defined indicator, as a measure of development, which will determine the quality of life, taking into account the sustainability of the socioeconomic system: permitting full compliance of environmental quality, and the degree of consumption of the Earth's resources on the one hand, and the welfare of all citizens on the other. Just as in the nineteenth century, the spectre of unemployment is beginning to appear. This requires studies to be performed on how to change the organisation of socioeconomic systems. An unemployment rate of 20–30% among young people is practically a humanitarian disaster. It acts degradingly on people affected by it, even more so than living in a degraded environment.

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Dokąd zmierza świat? Kryzys społeczny stworzony przez promocję biopaliw i współczesny liberalny kapitalizm

Streszczenie

Człowiek współczesny dzięki rozwojowi techniki i technologii jest zdolny praktycznie do dowolnego przekształcania świata, nie wyłączając jego zagłady. Jeśli zatem obserwuje się narastający kryzys ekologiczny to jego przyczyny należy doszukiwać się w dominującym obecnie modelu społeczno-ekonomicznym opartym na idei liberalnego kapitalizmu, w którym dominującą pozycję zajęły międzynarodowe korporacje. Osłabione przez Prezydenta R. Regana i premier M. Thatcher związki zawodowe nie są w stanie równoważyć siły tych korporacji. W konsekwencji w większości krajów lawinowo rosną nierówności. Zachodzące przemiany zostały zilustrowane na przykładzie zaopatrzenia w energię. Rozwój niekontrolowanego rynku biopaliw doprowadził do 2,5-krotnego wzrostu cen żywności w sytuacji kiedy ponad 1 mld ludzi głoduje. Zakładane wielkoobszarowe plantacje roślin przeznaczonych na biopaliwa, przyczyniają się do poważnych negatywnych zmian w środowisku w krajach rozwijających się. Co gorsze ich stosowanie w większości przypadków nie przyczynia się do redukcji emisji CO₂.

Słowa kluczowe:

zrównoważony rozwój, kryzys ekologiczny, kryzys społeczny, polityka energetyczna, efekt cieplarniany

Keywords:

sustainable development, ecological crisis, social crisis, energetical policy, greenhouse effect.