The Need for Renewable Energy Resources and the Reasons Why the United States and Russia Lag Behind

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Our dependency on the burning of fossil fuels has led to a number of serious problems that are being felt around the world, including global warming and the greenhouse effect. As a result, it is more important than ever before to fully develop and utilize renewable energy resources. In this article, the authors discuss the need for renewable energy resources while also offering a number of reasons why the nations of the United States and Russia lag behind in the development of renewable forms of energy.

Keywords: carrying capacity, climate change, ecosystem, power elite, renewable energy sources, sustainable source energy

INTRODUCTION

There is ample evidence of a compromised global environment. Protecting the various ecosystems that make up the totality of the earth's environment is the primary goal of environmentalists and environmental social movements. The term "ecosystem" was coined by British botanist Arthur Tansley in his 1935 article "The Use and Abuse of Vegetational Concepts and Terms" (1935). He stressed that one should not focus solely upon organisms, but rather upon the interactions between organisms and their environments. Ever since Tansley's work appeared, the role of ecologists has been to examine the structures and functions of ecosystems, especially with regard to the various ways in which life forms interact and rely upon each other. Every ecosystem housed on our planet is potentially affected by many external and internal variables that either help to sustain life or compromise it. Among the most critical variables to affect an ecosystem is climate. Our planet possesses a very diverse biosphere, one that is capable of creating a wide range of climatic conditions that affects living organisms. "The biosphere is the biological component of the earth systems, which also include the lithosphere, hydrosphere, atmosphere and other 'spheres' (e.g., cryosphere, anthrosphere, etc.)" (Ellis 2020). The diversity of the biosphere is the result of climate, and climate, in turn, determines the biome of an ecosystem. The biome refers to a large community of plants and animals that occupies specific areas. Climate dictates whether some regions will result in grasslands, tundra, deserts, rainforests, and so on (Delaney and Madigan 2014).

Throughout the history of our planet, dramatic climate change has compromised the earth's ecosystems beyond the point of reconciliation and has led to such extreme dire consequences as mass extinctions. A mass extinction (ME) occurs when the planet loses more than three-quarters of its species

in a geologically short interval of time, usually during a few hundred thousand to a couple of million years (Barnosky et al 2011). The planet Earth has already endured five mass extinctions in the past 540 million years and most scientists agree that we are currently in the sixth ME period. This is, of course, the first ME to involve humans and, ironically, the mass extinction process has been sped because of a number of human actions with the reliance on fossil fuels as the top activity.

THE HARMFUL EFFECTS OF A RELIANCE ON FOSSIL FUELS

It is human activity that places the highest demands on the environment. Humans also represent the greatest threat to the various ecosystems. It is important to note that the Earth has a limited "carrying capacity" to support life. *Carrying capacity* refers to the maximum feasible load, just short of the level that would end the environment's ability to support life (Catton 1980). The carrying capacity then, is tied to the number of organisms that can be supported in a given area (ecosystem) based on the natural resources available without compromising present and future generations. What is the earth's maximum carrying capacity? Scientists seem to agree that when we speak of humans specifically, that number would be between 9 and 10 billion people. The eminent professor Edward O. Wilson, author of two Pulitzer Prize-winning books, is one such scientist that puts forth the notion that the earth's maximum feasible load is connected to the number of people (as well as other organisms) and in his 2002 book *The Future of Life*, he uses this 9- to 10-million mark (Wilson 2002). At the start of 2020, the world population had already exceeded 7.7 billion. The human population is projected to reach the 9 billion mark by 2040 and reach the 10 billion mark shortly after 2050 (Worldometers 2020).

To put the current population in perspective, consider that at the dawn of agriculture (circa 8000 BCE), the world's population was approximately 5 million. Over the 8,000-year period up to 1 CE the population grew to approximately 200 million, although some estimates are higher. By 1750, a date just prior to industrialization, there were approximately 750 million people. It took all of human history to reach the one billion mark in 1804, the second billion mark was reached 123 years later (1927) and the population has exploded ever since, especially in the past century and projected through this century. The dramatic increase in the world's population since the time of industrialization has led to a high dependency on natural resources and a corresponding burden on the Earth's carrying capacity. The demand for natural resources coupled with the clamor for easily accessible heating and cooling options for homes and businesses along with a need for transportation fuel are among the primary causes for a stretched carrying capacity and a number of threats to the environment. These threats include, but are not limited to, human dependency on fossil fuels, urban sprawl, the spread of deserts, the destruction of forests by acid rain, deforestation, the stripping of large tracts of land for fuel, radiation fallout, and the many areas where the population is exceeding the carrying capacity of local agriculture (Delaney and Madigan 2014). Once the environment is sullied, the carrying capacity shrinks, thus negatively altering its ability to sustain life.

It is our dependency on fossil fuels—which includes oil, coal and natural gas—that is most relevant to our discussion as present-day humanity is highly dependent upon this finite source of energy. For more than a century, humans have become increasingly dependent on fossil fuels, especially for transportation and heating. The estimates on the world's dependency on fossil fuels vary somewhat depending upon the source cited. For example, the World Bank (2019) estimates that nearly 80 percent of the world's total energy consumption comes from fossil fuels; this is down from the record high 95 percent in 1970. The World Bank (2019) estimates that 92 percent of Russia's and 82 percent of the United States' energy sources come from fossil fuels. The U.S. Energy Information Administration (EIA) estimates that 80 percent of energy used comes from fossil fuels (EIA 2019a).

The harmful effects of a reliance on burning fossil fuels are numerous. Let's begin with the fact that the burning of fossil fuels has compromised the quality of the air we breathe and has compromised the ozone layer. The ozone layer is the earth's upper atmosphere, which screens out a great deal of the sun's harmful ultraviolet rays. The depletion of the ozone layer; ice cap and glacier thawing; climate change

and the rising CO2 levels; and the greenhouse effect, are among the primary concerns with our reliance on burning fossil fuels.

Climate change is what most people think of when discussing a reliance on burning fossil fuels. *Climate change* refers to a long-term change in the earth's climate, especially due to shifts in average atmospheric temperatures. There should be no debate as to whether or not humans are contributing to climate change; the only question is, "to what extent?" One of the most important measurements of climate change is the amount carbon dioxide (measured in terms of parts per million, or ppm) in existence. Carbon dioxide (CO2) is an important heat-trapping (greenhouse) gas, which is released through human activities such as burning fossil fuels and deforestation, along with natural processes such as respiration and volcanic eruptions (National Aeronautics and Space Administration 2020). Scientists warn that the atmospheric CO2 count needs to be at 350 ppm (maximum) in order to halt global warming and avoid catastrophic weather patterns that could spell the demise of human civilization. Scientists also calculate that the global level of CO2 before the Industrial Revolution was about 280 ppm (Porter 2013). According to NOAA (2019a), the atmospheric carbon dioxide level was 411.77 ppm in July 2019; it was at 408.71 just one year earlier. Record heat (July 2019 was the highest global temperature reading in Earth's history), rising global water levels, flood deluges, an increase in wildfires are just a few natural by-products of the rise in CO2. NASA (2020) reported in January 2020 that the CO2 level reached 412.43 ppm. The upward trend in the CO2 levels is an ominous warning that should be heeded.

The increased output of CO2 not only gives way to global warming, it also contributes to ocean acidification. The ocean absorbs about a quarter of the CO2 into the atmosphere every year. As the overall CO2 level increases, so too does the amount of carbon emissions in our oceans increase making the oceans more acidic and as a result poses a serious threat to biodiversity and marine life. With these notions in mind, *ocean acidification*, or OA for short, is the term given to the chemical changes in the ocean as a result of carbon dioxide emissions (NOAA 2019b). If left unchecked, ocean acidification could destroy all our coral reefs by as early as 2050. It also has the potential to disturb other ocean ecosystems, fisheries, habitats, and entire food chains (Ocean Acidification 2012).

This brief review of the harmful effects of burning fossil fuels represents just the beginning of the vast amounts of literature on the subject. One of the most effective ways of countering our dependency on oil, natural gas and coal is to increase our use of renewable energy sources.

RENEWABLE ENERGY SOURCES

Renewable energy refers to "energy from sources that are naturally replenishing but flow-limited; renewable resources are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time" (EIA 2019b). In the past, renewable energy sources were described as "clean energy." For example, a decade ago, researchers at NASA (2010) described conducting "cutting-edge" research in the development of clean energy technologies for NASA mission needs and then went on to link the concept of "clean energy" to renewable energy. NASA hoped to reduce its dependency on petroleum-based fuels. The World Atlas (2019) states that "renewable energy is considered clean energy as it does not cause adverse environmental pollution."

There are many reasons why we should switch to renewable sources of energy. We can begin with the most obvious reason, and that is, to counter all the harmful effects of relying on fossil fuels mentioned previously. That is to say, we can reduce the depletion of the ozone layer; halt ice cap and glacier thawing; reduce the CO2 levels and the greenhouse effect; and, save our oceans and coral reefs. Other benefits of using renewable energy include:

- Creation of jobs in the renewable energy fields
- Diversify of our energy supply
- Improve public health
- Provide a degree of energy independence from Big Oil (once the initial cost of construction and setup of a renewable power source is covered, it can quickly pay for itself)

- Energy security (especially critical in areas where fossil fuels are costly and in short supply)
- Renewable energy is, essentially, unlimited
- Universal access to energy
- Secure energy needs for future generations
- Help to save the planet

Renewable energy is important for the future because it is reusable. Bearing in mind that some forms of renewable energy sources have a continuous flow limitation, we can use it as much as needed and still have energy for the future. It is much cleaner and therefore healthier for all living creatures—plants, ocean life and life on land. As any rational person can attest, it is a much smarter choice than relying on fossil fuels.

What are renewable energy sources? The most obvious examples come from nature itself and include: wind (via windmills which help to generate electricity); solar (the sun's radiation is a significant source of heat); water flow (e.g., hydropower energy); geothermal energy (energy from the heat within the earth); natural and human-made biomass (e.g., wood and wood waste; municipal solid waste; landfill gas and biogas; ethanol; and biodiesel); and tidal (energy obtained from tides). In the U.S., 11 percent of its total energy comes from renewable energy sources including wind, solar, biofuels, geothermal, biomass waste, wood and hydroelectric (EIA 2019b). Some U.S. states, such as New York, Maine and California are taking significant steps toward embracing renewable energy sources. In New York, for example, legislators want 70 percent of the state's energy to come from renewable sources by 2050; Maine has a much loftier goal—the newly-elected governor has pledged to move to 100 percent renewable energy by 2050; and, in California, the governor has pledged that all of its electricity will come from renewable energy sources by 2045. Many states are working toward diversifying their energy resources and have enacted policies that have driven the nation's $64 billion market for wind, solar and other renewable energy sources (National Conference of State Legislatures 2020). A growing number of states have established Renewable Portfolio Standards (RPS) in an attempt to promote a diversified resource mix and encourage deployment of certain energy technologies such as offshore wind or rooftop solar (NCSL 2020).

The US Department of Defense (DoD) is increasingly looking at renewable energy sources in order to more efficiently feed the enormous U.S. military. Reports indicate that the US military consumes over 100mn barrels of oil per year; without this fuel the troops are potentially exposed to enemy attacks, the vulnerability of oil prices and a potential rise in global oil demand (Berdikeeva 2017). As Berdikeeva (2017) explains, "The Pentagon relies on renewables both for military installations at home and in combat zones. In compliance with the Energy Independence and Security Act of 2007 [Public Law 110-140] and National Defense Authorization Act of 2010 [Public Law 111-84], military installations and facilities in the US are required to be energy efficient and produce or buy 25% of their total facility energy use from renewable sources by 2025." Subsequent legislation has maintained a commitment to increase renewable energy sources for the military.

Such action on the part of the DoD and many American states represents a sampling of the glimmer of hope in the United States that it is lessening its fossil fuel dependency.

In Russia, the percentage of current total energy from renewable energy sources is much lower than in the U.S. with about 3 percent of its energy coming from wind, water, solar biofuel and waste. However, the Russian Federation has set out to increase and diversify its use of renewables, particularly for power generation. "Under current plans and policies, renewables would reach nearly 5% of total final energy consumption by 2030. Accelerated deployment, however, could boost Russia's renewable energy share to more than 11% in the same timeframe (International Renewable Energy Agency 2019). In particular, the potential is particularly large for wind, biomass, small hydro, geothermal and solar, depending on the geographic regions. Energy experts stress that Russia has abundant resources for all types of renewable energy and thus, as IRENA (2019) states, Russia is a potential "green giant." Nonetheless, the development of renewable energy sources other than hydropower and bioenergy has progressed slowly in

Russia as its national energy balance is still dominated by the traditional sources of coal, oil, and natural gas.

Given its large biomass resource availability, Russia has great renewables production potential in pellet fuel. Today, Russia has become the fifth largest biomass pellet producer in the world and the third largest exporter of pellets to the EU. (Note: Pellets are biofuels made from compressed organic matter or biomass—coming from any one of five general categories of biomass: industrial waste and co-products, food waste, agricultural residues, energy crops, and virgin lumber.)

The Russian government is becoming involved in the adoption of renewable energy sources in Russia. The Russian Government Decree of 28 May 2013 (the Mechanism for the Promotion of Renewable Energy on the Wholesale Electricity and Capacity Market) obliged renewable energy project investors to use equipment in each installation which is at least partly produced or assembled in Russia (so-called "local content requirements"). The purpose of these measures is to stimulate economic activity in the field of renewable energy and to create jobs in this developing sector. It aims to ensure the financial viability of investments in renewable energy by adding a "premium" to the wholesale electricity price. Moreover, it requires consumers to purchase a certain amount of their electricity needs from renewable energy installations. Furthermore, it provides that producers will be compensated by the state for the connection costs of renewable energy installations with an installed capacity of not more than 25 megawatts (MW).

An additional source of energy other than fossil fuels is nuclear energy. Some consider nuclear energy as renewable as it has low carbon emission but, it is more accurately described as *sustainable source energy*. Nuclear energy is not renewable as its primary fuel source is uranium and it is not unlimited; although using breeder and fusion reactors makes it possible to produce other fissionable elements. In this regard, nuclear energy becomes a sustainable source of energy. In the U.S., 8 percent of its energy sources come from nuclear power. Globally, nuclear energy accounts for 13.3 percent of the total energy needs, up from less than 3 percent of the total in 1960 (The World Bank 2019). Russia is moving steadily forward with plans for an expansion in nuclear energy, including the development of new reactor technology (World Nuclear Association 2020). Nuclear energy, however, comes with its own set of potential deadly and catastrophic consequences both to humanity and the environment. For example, the threat of core reactor meltdown and human operating errors (i.e., the Chernobyl accident), concerns over how to safely transport and store nuclear radioactive waste, toxic exposure and the threat of nuclear weapons.

According to the World Atlas (2019) the nations least dependent of fossil fuels for energy are (the percentage provided refers to the percent of energy that comes from alternative and nuclear energy sources): Iceland (89.0 percent), Tajikistan (64.1 percent), Sweden (48.5 percent), France (47.0 percent), Switzerland (39.5), Costa Rica (38.7 percent), Norway (34 percent), El Salvador (33.8 percent), New Zealand (31.5 percent), and Kyrgyzstan (29.5 percent). The United States and Russia lag behind these world leaders in lessening their dependency on fossil fuels.

WHY THE U.S. IS LAGGING BEHIND IN RENEWABLE ENERGY

While there has been some progress in the United States in the attempt to lessen its dependency on fossil fuels, there remain many obstacles. There are many reasons why the US is lagging behind some other countries in their attempt to become less-dependent upon fossil fuels. Described below are four key reasons.

An Abundance of Fossil Fuels

While supplies of fossil fuels are finite, advanced technology has revealed numerous large reserves of crude oil, coal and natural gas. The EIA estimates that less than half the world's total conventional oil reserves will have been exhausted by 2030.

The United States is partially dependent on foreign oil. In 2015, 24 percent of the oil consumed in the U.S. was imported from foreign countries (Canada, Saudi Arabia, Venezuela, Mexico, Columbia and

Russia) (Institute for Energy Research 2019). Despite this relatively low dependence on foreign oil, the glut in oil reserves globally has helped to keep the cost of consumer oil products (e.g., gasoline for motor vehicles and home heating) relatively low.

In the United States, coal, the first fossil fuel to make its presence felt, remains as a major source of energy. However, instead of being used primarily to heat homes, it is used as fuel for power plants that generate electricity for residential and commercial customers. "In fact, it accounts for over 30 percent of US electricity generation" (IER 2019). Despite all the controversy surrounding coal (e.g., its production process wherein robots and automation are replacing human workers), American coal production is currently the second highest in the world (China is number one).

Today, the United States is the largest producer of natural gas (Russia is second), producing 27.1 trillion cubic feet in 2015 (IER 2019). The controversial hydraulic fracturing process has become an environmental nightmare but the abundance of natural gas is used as justification by Big Oil and consumers who want cheap energy supplies.

In brief, the U.S. is endowed with huge quantities of fossil fuels and this abundance is likely to keep the nation committed to it for its energy needs for decades to come.

It is important to note, however, that at our current rate of consumption of fossil fuels the CO2 levels will climb so high that most forms of life will be wiped out before we run out of coal, oil and natural gas.

A Disbelief in Science

True science does not bother itself with concerns of politicians or of people who fret over factual knowledge that undermines their beliefs. Nearly all scientists across the globe have concluded that climate change is real and that human activities, especially those connected with the promotion and continued reliance on burning fossil fuels as the primary source of energy, contribute to the severe threat of our planet. Ignorant people duped by certain politicians have allowed themselves to embarrassingly question the legitimacy of the harmful effects of climate change in general, and to naïvely accept the assertion that further dependency on fossil fuels is the best course of action.

As a proponent of the environmentally damaging fossil fuel energy industry, U.S. President Donald Trump has repeatedly bashed renewable energy sources as viable alternatives. His defense is often laughable, were it not for the seriousness of the issue. For example, on April 2, 2019, Trump stepped up his attacks against wind power, claiming that the structures decrease property values and that the noise they emit causes cancer. Delivering remarks at the National Congressional Committee's annual spring dinner, Trump said, "If you have a windmill anywhere near your house, congratulations, your house just went down 75 percent in value. And they say the noise causes cancer" (Burke 2019). He offered no evidence to support these claims. Trump also said that wind turbines are a "graveyard for birds" even though the Department of Energy has noted that bird deaths from the structures are rare. Just a month earlier, Trump said at a Michigan rally that wind power doesn't work because the wind doesn't always blow. Sounding like a simpleton to make his point, Trump said, "If it [wind] doesn't blow, you can forget about television for that night. 'Darling, I want to watch television.' 'I'm sorry! The wind isn't blowing.' I know a lot about wind'" (Burke 2019).

Disbelievers in the validity of science tend to be either too ignorant to understand how science works, realize that the truth will interfere with their socio-political agendas, or fear that factual, scientific information disproves their unenlightened and irrational thinking.

Social Movements Lacking an Impact

A social movement is a persistent and organized effort on the part of a relatively large number of people who share a common ideology and try to bring about or resist change. In the U.S., there was a strong social movement in the early 1970s among many of the younger generation to help save the environment. For example, the first Earth Day took place in 1970 and in the early 1970s a great deal of legislation (e.g., the Clean Air Act of 1970 and Clean Water Act of 1972) designed to protect the environment was passed as a result of the baby boomers; however, as they learned, the *power elites* managed to curtail all of their lofty goals.

The current younger generation is energized by such climate activists as Greta Thunberg, a Swedish teenager who first became known for her activism in August 2018 (then aged 15) when she first stood outside the Swedish parliament to protest climate change and calling for stronger action on global warming by holding up a sign that read: "School strike for the climate." Throughout 2019 she led a youth-spirited social movement in an attempt to halt the negative forces contributing to climate change. Thunberg's message has been so inspiring that *Time* magazine named the teenaged climate activist the 2019 "Person of the Year" (she is the youngest person to receive this prestigious honor).

However, Thunberg and her peers are also learning first-hand of the resistance among conservatives and the power elite who wish to maintain the status quo. President Trump, for example, tweeted (upon learning that Thunberg received the *Time* honor), "So ridiculous. Greta must work on her Anger Management problem, then go to a good old fashion movie with a friend! Chill Greta, Chill!" This is the type of ignorance this current younger generation must overcome if they hope to be more successful than the previous generations.

Greed Among the Power Elites

Never underestimate the level of financial greed among the power elites as their motivations for greater amounts of wealth come at the expense of the masses and future generations. Sociologist C. Wright Mills (1956) describes the *power elite* as those persons who hold positions to make decisions that have major consequences over others. Mills argued that the power elites are a select few people who are at the top of major corporations, sometimes referred to as "captains of industry," influential government persons and top influencers of the military. Combined, big business, government and the military form what Mills described as the "tripartite elite" and warned that this triangle of power was an increasing threat to American democracy. (Delaney 2014). Mills has been shown to be quite prophetic as this triangle of power yields an increasing amount of control and influence in the United States. Their level of greed is immense.

Most relevant to our topic is the role of the "captains of industry" of "Big Oil," key military influencers (e.g., private military contractors and special interest groups that represent the needs of the power elite) and key politicians who have sold their souls to evil in their greedy pursuit of great power. To get an idea of the power of Big Oil and other proponents of fossil fuel dependency consider this unenlightened and irrational form of thinking: On May 28, 2019 the U.S. Department of Energy posted a press release about liquid natural gas exports by referring to the natural gas as "freedom gas" and as "molecules of U.S. freedom" (Wu 2019). The burning of fossil fuels causes many specific problems beginning with compromising the Earth's ozone layer, which extends about 10 to 30 miles above our planet and serves a shield protecting people and the environment from the Sun's harmful ultraviolet radiation. Without a healthy ozone the planet will suffer dramatic environmental change and life will not be the same as we know it. Many life forms, including humans will suffer tremendously. A compromised ozone will cause an increase in the number of people who will suffer from asthma, lung problems, chest pain, coughing, shortness of breath, and so on. A further deterioration of the ozone can cause catastrophic levels of death. And yet, humans compromise the ozone on a regular basis by emitting toxic chemicals into the air, the chief among them from used fossil fuels. These "freedom gases" are really just potential molecules of death.

WHY RUSSIA IS LAGGING BEHIND IN RENEWABLE ENERGY

Russia is making small strides toward embracing renewable energy sources but like the United States there remain a number of barriers. Consequently, Russia is lagging behind in lessening its dependency on fossil fuels. Three of the primary reasons are described below.

The Presence of Large Reserves of Fossil Fuels

Like the United States, Russia enjoys large reserves of fossil fuels. Russia is the world's largest producer of crude oil and gas exporter and, as previously mentioned, the second-largest producer of dry

natural gas. Russia also produces a significant amount of coal. As a major producer of hydrocarbons it is not surprising to learn that more than one-third of Russia's federal budget revenues come from the production of fossil fuels (EIA 2017). The presence of large reserves of fossil fuels makes Russia a major producer and exporter of oil and natural gas. "Russia's economic growth is driven by energy exports [which accounted] for 36% of Russia's federal budget revenues in 2016" (EIA 2017). *Forbes* reports that Russia derives 40% of its revenue from oil and gas sales, making it a "de-facto petro-state" (Cohen 2019).

More than one-third of crude oil imports to European countries in the Organization for Economic Cooperation and Development (OECD) in 2016 came from Russia, thus making the OECD quite dependent on Russia's large reserves (EIA 2017). In addition to the revenue that results in fossil fuel exports, Russia generates revenues from taxes on the domestic sales of such products as gasoline, taxes on minerals extraction, and collects dividends from oil and natural gas companies in which the state is a shareholder (EIA 2017). As an example of the dividends it collects, consider that the State owns 50% of Russia's largest energy company, Rosneft (other owners include BP, 19.75%; QIA-Qatar Investment Authority, 18.93%; and Glencore, 0.6%) (Enerdata Intelligence 2019).

With all the revenues associated with fossil fuel use, Russia will continue to promote its use for as long as possible.

Comparatively Low Energy Prices

As stated above, Russia owns large energy resources. Specifically, Russia's natural gas reserves are estimated at 50 322 billion cubic metres (bcm), which represents 24% of the world reserves; and oil reserves at 14.5 Gross tonnage (Gt) (as of 2018), which represents about 6% of world reserves (Enerdata Intelligence 2019). Primarily as a result of this large presence of fossil fuel reserves and a desire to assist the continued growth of business, the Russian government has kept energy prices relatively low for consumers and businesses. Electricity prices are much lower in Russia than in the European Union (as much as 60-80% lower) (Enerdata Intelligence 2019). In June 2019, the price of electricity in Russia was 0.068 U.S. Dollar per kWh for households and 0.092 U.S. Dollar for businesses which includes all components of the electricity bill such as the cost of power, distribution and taxes (Global Petrol Prices 2019). "For comparison, the average price of electricity in the world for that period is 0.14 U.S. Dollar per kWh for households and 0.12 U.S. Dollar for businesses" (Global Petrol Prices 2019). Tariffs on the electricity market vary from one region of Russia to another but overall, Russians appear to be thankful for the comparatively low energy prices as total energy consumption has been increasing rapidly since 2016, by almost 3.5% per year (Enerdata Intelligence 2019).

In addition to the low cost of electricity in Russia, Russians enjoy a comparatively low price for gasoline. Data compiled by Global Petrol Prices (2020) indicates that gasoline prices per liter, octane-95, in Russia from 11-Nov-2019 to 17-Feb-2020 was 45.79 Russia Ruble, while the average price of gasoline in the world for this period was 92.68 Russian Ruble.

The comparatively low energy prices results in no immediate significant motivation for investing into alternative energy sources.

The Lack of Sufficient Environmental Pressure on the State

The low energy prices in Russia also results in a corresponding lack of environmental pressure placed on the State by either businesses or consumers to promote renewable energy (with the exception of very remote regions where renewable energy can be considered as a solution to energy security). As a result, Russia has not fostered an extensive program for the development of renewable energy. The fact that the State generates a huge amount of its overall revenues from fossil fuels highlights why there is a lack of systematic federal funding in the development of renewable forms of energy.

Russian business has shown some interest in the development of renewable energy. But their activity should not be overestimated as the main players on the renewables market (i.e., Rusnano and RusHydro) are focused on lobbying and developing their own local projects with vested interest. Renewable energy investments are not on the top of the agenda for state corporations and they're reducing their investments

in this sphere. In fact, as stated earlier, Russia's renewable energy share of its total energy use is expected to only reach 5% by 2030.

Some Russian companies are, however, engaged in the international renewables. Hevel Solar and its subsidiaries provide a full range of services from conducting research in the field of solar energy to the production of solar modules and construction and operation of solar plants—of any size and type. Hevel is found in some Commonwealth of Independent States (CIS) (former Soviet States), the Middle East and Africa.

CONCLUSION

The earth's environment is no longer thriving, in fact, it can barely sustain itself. When enough global ecosystems become compromised the sixth mass extinction will wipe out most living species, including humans. As a result, it is more critical than ever before that humans take real action in order to secure the livelihoods of future generations.

One of the most important actions that humans must undertake is the reduction of our reliance on fossil fuels. The continued dependency on fossil fuels will compromise the earth's carrying capacity to the point where it can no longer sustain life. Among the chief concerns of burning fossil fuels are climate change and the dramatic increase in the levels of carbon dioxide.

The authors promote the idea that United States and Russia, two of the world's greatest superpowers, must decrease their dependency on fossil fuels and increase their use of renewable energy sources which include, wind, solar, water flow, geothermal energy, natural and human-made biomass, and tidal. It is important for these two nations to shift their reliance on fossil fuels to renewable energy sources for the betterment of the planet's ecosystems and the very survival of humanity.

Unfortunately, both the U.S. and Russia lag behind many other nations in their development and consumption of renewable energy sources. A number of explanations were provided for each respective nation as to why this is the case. It is up to such global powers as the United States and Russia to lead the way in renewable energy alternatives and shun its reliance on fossil fuels.

And, we better do this soon or the negative consequences of inaction will be dire.

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