

Is there a Connection between Renewable Energy and Geopolitics? A Review

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ABSTRACT

This article attempts to capture the link between geopolitics and renewable energy by reviewing the literature. This topic has been carefully covered since 2010, although the 1970s marked the beginning of writing about the geopolitics of renewable energy. From the literature there can be extracted the following conclusions: the use of renewable energy has both possible advantages and disadvantages: on one hand, it leads to the abandonment of fossil fuels, so that the environment is protected and divergences between states are reduced; on the other hand, the need to use certain materials to achieve technologies that allow the transition to renewable energy gives rise to various scenarios. Moreover, among the countries of the world, winners and losers can be identified in relation to renewable energy, but there are ways to change the situation in the future for some countries. There are 6 forces that favor the transition to the circular economy, with a different impact for each country, but that can influence relations between states in the future when fossil fuels will no longer be preferred in the energy production process.

KEYWORDS: *renewable energy, energy transition, geopolitics*

JEL CLASSIFICATION: *Q20, Q27*

1. INTRODUCTION

Global warming is a phenomenon prevalent in recent decades and involves rising average atmospheric temperatures. According to Jacobsen et al. (2020), the increased use of the renewable energy is the key in hindering global warming from rising above 1,5 degree Celsius, and the entire world should reach 100% zero-emissions energy by 2050.

Taking this information into account, a lot of scientists are wondering what are the implications of the conversion to renewable energy from a geopolitical point of view. The renewable energy adoption will bring about a tremendous improvement in the world security? Can renewable electricity to be used by energy leaders similar to how oil and gas resources are used in the present times? A short example regarding the global warming is the growing openness for trade, fishing, mining, drilling of Arctic countries, which accentuates the conflicts between neighboring states (Norway vs. Russia) (Osthagen, 2018).

The history of the widespread use of fossil fuels begins in 1914, with the First World War, when the British navy switched power supplies from coal to oil. Since then, oil has been a key element in relations between states. It has been widely used in various activities, which has increased dependence on imports from the Middle East. In addition to this aspect, an important role was played by the states that had access to the straits (Suez Canal, Hormuz Strait, Panama Canal), their power being high in international relations.

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All these elements that have unfolded over the course of about 100 years can now change with the adoption of renewable energy. For this reason, the goal of this article is to show up the existing literature regarding the geopolitical changes of the conversion to renewable energy. There has been analyzed literature regarding the consequences of the growing use of renewable energy, consequences related to the power of states, energy security, international conflicts.

2. LITERATURE REVIEW

Taking into account the fact that the paper is realized on the base of two important terms (renewable energy and geopolitics), it is right to proceed defining the terms.

According to International Energy Agency (2004), the renewable energy is “energy that is derived from natural processes that are replenished constantly (such as) solar, wind, biomass, geothermal, hydropower, ocean resources (tidal and wave), and biofuels, electricity and hydrogen derived from those renewable resources”. Taking this definition into account, we can observe that each energy which is derived from non-renewable resources cannot be considered renewable energy.

The „geopolitics” is a term still debated in the literature, whose meaning evolved from one period to another. At the beginning the „geopolitics” was defined as a relationship between permanent rivalry, territorial expansion and military strategies of imperial powers determined by geography and international relations between states (Tuathail, 1998; Overland, 2019). Over the period, geopolitics began to focus on geography more and more, a major importance in the current time being granted to natural resources from a region and transportation routes (Vakulchuk et al., 2020).

The end of the last decade of the 20th century was marked by a growing concern for critical geopolitics (Agnew, 1998). From that moment, there was a division between classical and critical geopolitics (Dodds, 2017). If critical geopolitics considers the change of power points according to technological, economic and political evolutions, conventional geopolitics means the power that an entity has in relation to strategic locations and natural resources (Amineh, 2003; Overland, 2015).

According to specialists, the focus of research on solar and wind installations began in 2006, and the geopolitics behind renewable energy has received attention since 2010 (Vakulchuk et al., 2020). Although the topic of the geopolitical implications of renewable energy has been debated in the past (in 1972 The National Science Foundation - NSF and National Aeronautics and Space Administration - NASA stated that solar energy can be considered of strategic importance in the United States of America and that it is imperative that environmental effects or the social benefits of using solar energy deserve to be researched and understood), a lot of research in the field has highlighted the novelty of this concept (NSF/NASA, 1972). The implications of producing and using renewable energy have been widely debated in the last decades of the 20th century. As with the findings of current studies show, Williams (1974) stated that crises associated with fossil fuel consumption can be avoided by using solar energy at the large scale. It can be debated what Williams tried to express using “crisis” word: it can refer at the limited nature of fossil fuels or the negative effects on the environment generated by the extreme use of fossil fuels.

If in the 20th century researchers in the United States tried to describe the geopolitical implications of renewable energy, in the 2000s researchers in northern Europe began to dominate the field. The Nordic countries were the first to see advantages in the transition to

solar and wind energy. In these countries ministries of foreign affairs played an important role in funding research in the field. For a long time The German Federal Foreign Office and the Ministry of Foreign Affairs of Norway joined forces with the International Renewable Energy Agency (IRENA) in order to support international initiatives between 2016 and 2017 (O'Sullivan et al., 2017). Moving forward, all this relationship led to the formation of the Global Commission on the Geopolitics of Energy Transformation under IRENA in 2018 (Vakulchuk et al., 2020).

3. THE FORCES OF CHANGE

On a large scale, there are multiple forces that favor the transition to the renewable energy.

a) *Declining costs* - the cost of technologies that produce renewable energy have decreased from one period to another, which has allowed the development of numerous business plans in this regard. According to Motyka et al. (2018), solar and wind energy have come to outpace the costs of conventional technologies in much of the world's markets, even without subsidies, so they can now extend beyond niche markets.

According to IRENA (2020), costs for electricity from utility-scale solar photovoltaics fell 82 % between 2010 and 2019, while from onshore wind fell 39% in the same period. Due to the fact that from one year to another the cost of electricity produced from solar and wind sources is lower and the cost of lithium-ion batteries has also fallen, there is a lot of room for investments in these types of objectives which contribute to the growing of the competitiveness and also of the profits.

b) *Pollution and climate change* – all the stakeholders (investors, businesses, governments and the population) are all agree that there is a need to decarbonize the global economy due to the air pollution and climate change. A lot of cities from the entire world are negatively affected by air pollution, caused by the burning of fossil fuels. For this reason, in order to meet the Paris Agreement Targets and to hold the increase in the global average temperature, all the stakeholders agree that the renewable energy combined with improved energy efficiency could be the key to reduce humanity's impact on the environment.

c) *Renewable energy targets* - due to the negative effects of burning fuels on the environment, many states have accelerated the process of transition to renewable energy. According to REN21 (2018), at the world's level, there are 57 countries that have developed plans in order to use only renewable resources for their electricity needs, while 179 countries have set energy targets. Moreover, because of the lack of fossil fuels reserves (oil & gas), many countries are trying to shift to renewables and in this way to reduce the dependency on energy imports. It is the case of India which has to make the conversion to renewable energy if it does not want to increase its dependence on costly energy imports. (IEA, 2018; IRENA, 2019).

d) *Technological innovation* - taller wind turbines as well as increasing the efficiency of solar photovoltaics have played an important role in the transition to adopting renewable resources for electricity production. According to IRENA (2019), there has been a higher level of innovation in the field of clean energy technologies than in the field of traditional technologies that operate on the basis of nuclear energy or fossil fuels. Moreover, in the current times we are also talking about storage for wind and solar energy. There is a lot of innovation regarding batteries, which is expected to become an important storage technology – taking all of this into consideration, it can be concluded that the attention is moved from fossil fuels to renewable resources, and the whole world is aware of the importance of the conversion.

e) *Corporate and investor action* – the corporations actions can also contribute to the desired change. At the climate conference hold in Poland in December 2018 a group of 415 investors, representing over 32 trillion US dollars, reaffirmed their full support for the Paris Agreement. Moving forward, we can observe also that a lot of companies and institutions such as World Bank, Allianz and AXA announced that they are no longer financing coal investments. At the same time, there are also companies that are trying to obtain the needed electricity from renewable sources. Apple, Microsoft, IKEA, Tata Motors and Walmart have announced that their facilities are powered by renewable energy and also renewed their commitment to use renewables for more than 90 % of their electricity consumption (IRENA, 2018; IRENA, 2019).

f) *Public opinion* – the effect of society is also an important source of change. In the public opinion we can talk about leaders from different activity sectors, but also NGO's. Pope Francisc is a religious leader who talk about moral arguments for acting on climate change (IRENA, 2019). Moreover, in numerous cities from all around the world, there were a lot of demonstrations against air pollution. In addition to civic actions, a court in the Hague ordered he Dutch government to reduce the countries gas emissions by al least 25% by 2020 compared to 1990 level.

The list of these forces that favor change can be completed with other factors. What is certain is that the mentioned forces contribute to the energy transition worldwide, with a direct impact on environmental protection, which brings economic and social benefits.

4. CAN RENEWABLE ENERGY BRING MORE PEACE?

In the literature there are 2 different currents that deal with the implications of adopting renewable energy worldwide. One of the groups, called "renewed conflict", believes that the energy transition will not lead to conflict reduction, while the second group, called "reduced conflict", believes that ensuring a sufficient amount of energy will reduce conflicts between nations.

Specialists in the first camp who wrote on the subject (Rothkopf, 2009; Raman, 2013; Laird, 2013; Capellan-Perez et al., 2017) say that the conversion of traditional energy systems into systems that use renewable resources will lead to the same types of conflicts as in the past, or new conflicts, as severe as those caused by fossil fuels. Capellan-Perez et al. (2017) argued that even that energy consumption remains high during the transition to renewable sources, this can lead to negative events such as interrupted energy supply or instability in producing countries. Freeman (2018) mentioned that renewable energy is seen as an element that can end petrolium conflicts, but at the same time, it is a potential source of strong international trade conflicts. The general statement of the "renewed conflict" group is that there will be new types of conflicts in the future, no matter the type of the energy systems: there will be a lot of controversies which can develop in a massive conflict. One of the controversies is about rare earth materials, which are limited and very important in order to develop the systems that enable the conversion of traditional energy systems to renewable energy on the base of new technologies.

By contrast, there are specialists that sees geopolitical tensions reduced in a world which is functioning on the base of renewable sources (Peters, 2002; Verrastro et al., 2010; Lacher & Kumetat, 2011; Johansson, 2013; Hoggett, 2014). This group focuses its attention on internal

energy sources, not external ones, which contributes to reducing the reasons for conflicts between nations. Moreover, ensuring sufficient energy based on renewable energy, but also the reduced possibilities to manipulate prices compared to fossil fuels, are also reasons behind this orientation. An additional explanation is that, reducing imports, as well as reducing the interdependence between countries given that each nation can produce energy from renewable sources, geopolitical tensions can be minimized (Hoggett, 2014).

Because each camp is based on different ideas, it is difficult to find a compromise that will lead to reconciliation. At the same time, the most important thing that we can see from the literature is that the world will be changed after the conversion to renewable energy will be done, and for sure the geopolitics of renewables will be different from the geopolitics of fossil fuels. Due to the fact that the approach is at the beginning and there are many uncertain data, both camps limit their analyzes, being prudent in clearly predicting the events.

5. WHY RENEWABLES WILL CHANGE THE RELATIONSHIP BETWEEN STATES

The energy transition is mainly based on increasing the use of renewable resources (solar and wind) and reducing the use of fossil fuels (Cicea et al., 2019; Cicea et al., 2021).

Unlike fossil fuels, renewable energy can be available in many forms in many countries, so there will no longer be a concentration of resources only in certain locations (Pintilie et al., 2020; Pintilie, 2021). In this way, there is already a possible reduction in the importance of choke points (Suez Canal, Panama Canal), which are of major importance today.

A second argument in favor of renewable energy is its form. Renewable energy is in the form of flows, which makes it difficult to disrupt, while fossil fuels are stocks that can be stored, but which are used only once (IRENA, 2019).

Third, renewable energy allows decentralization in all forms (production and consumption), with direct effects on increasing liberalization. In the end, the marginal costs of renewable energy sources are close to zero, and in the case of solar and wind energy there is a 20% reduction in costs when capacity is doubled (DNV-GL, 2018).

According to IRENA (2019), the widespread use of renewable energy will change the existing customs and will redraw the main geopolitical problems of our times, taking into account the maps of world solar potential and world wind potential.

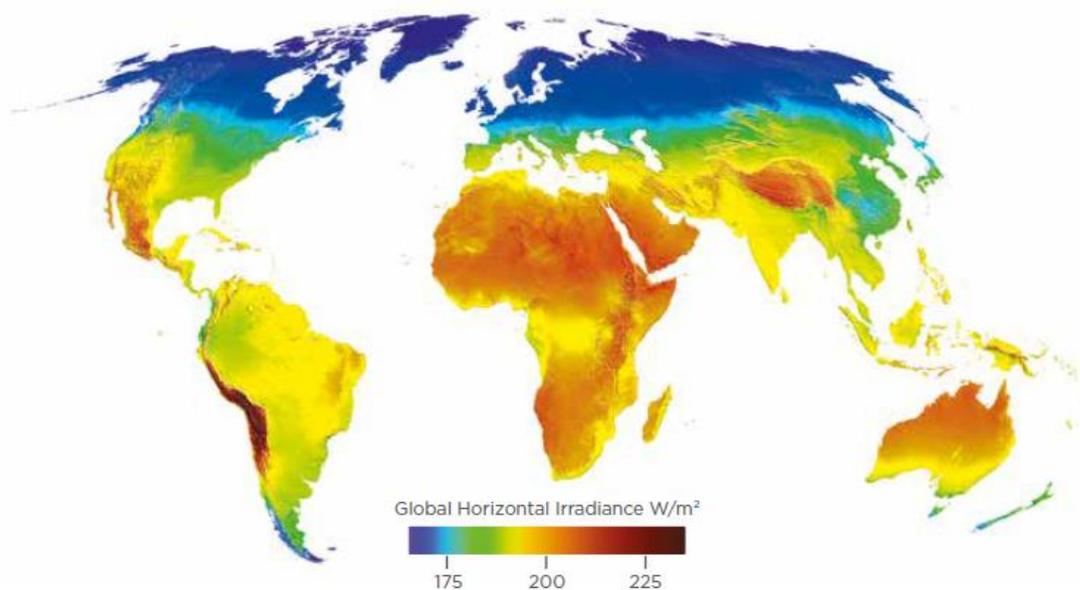


Figure 1. World solar potential
Source: adapted from IRENA (2019)

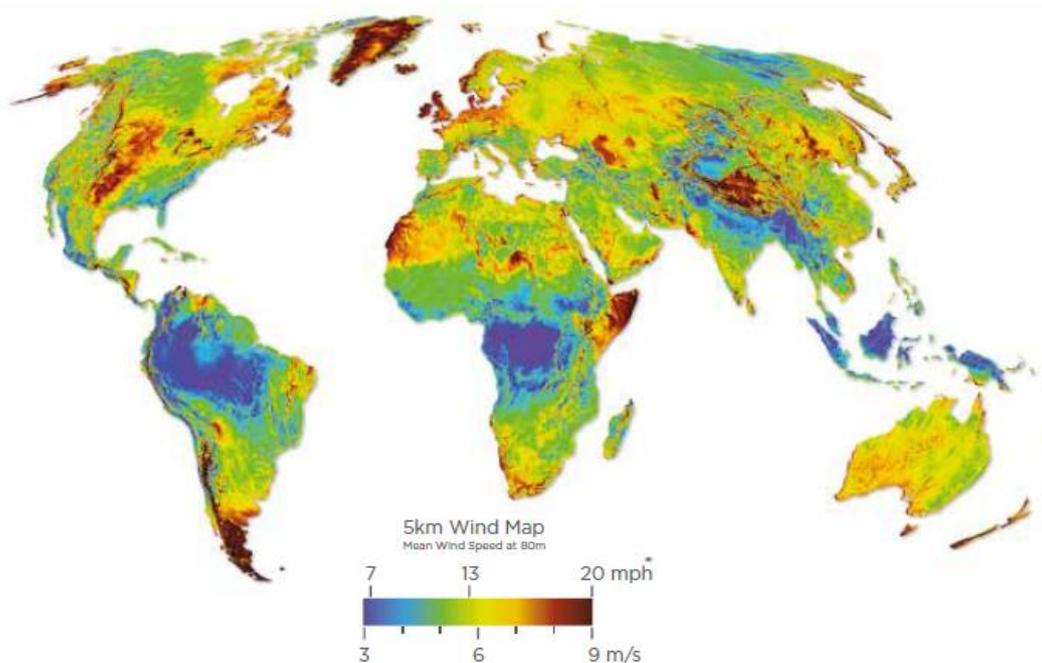


Figure 2. World wind potential
Source: adapted from IRENA (2019)

According to Eisen, 2011; Scholten, 2018; Scholten & Bosman, 2018, countries that develop technologies that favor renewable energy may evolve in the future as global winners because intellectual property can be considered the key to the energy transition. In this way, the transition is made from the export of fossil fuels, to the export of the technology necessary for the production of renewable energy (Freeman, 2018).

Smith Stegen (2018) conducted an analysis of countries that could lose or gain from global energy conversion based on 3 indicators: renewable energy potential, political receptiveness and hydrocarbon lobby.

Table 1. Geopolitical winners vs losers

<i>Main winners</i>	<i>Main Losers</i>
<i>Uruguay</i>	Brunei
<i>Namibia</i>	Qatar
<i>Kenya</i>	Bahrain
<i>Mali</i>	Kuwait
<i>Sweden</i>	Timor-Leste
<i>Finland</i>	Trinidad & Tobago
<i>France</i>	Bhutan
<i>Nicaragua</i>	Slovakia
<i>Honduras</i>	Belize
<i>India</i>	Georgia
<i>Jordan</i>	Bangladesh
<i>Mongolia</i>	Gabon
<i>Sri-Lanka</i>	Samoa
<i>China</i>	Puerto Rico
<i>USA</i>	
<i>Algeria</i>	

Source: adapted from Smith Stegen (2018) and Vakulchuk et al. (2020)

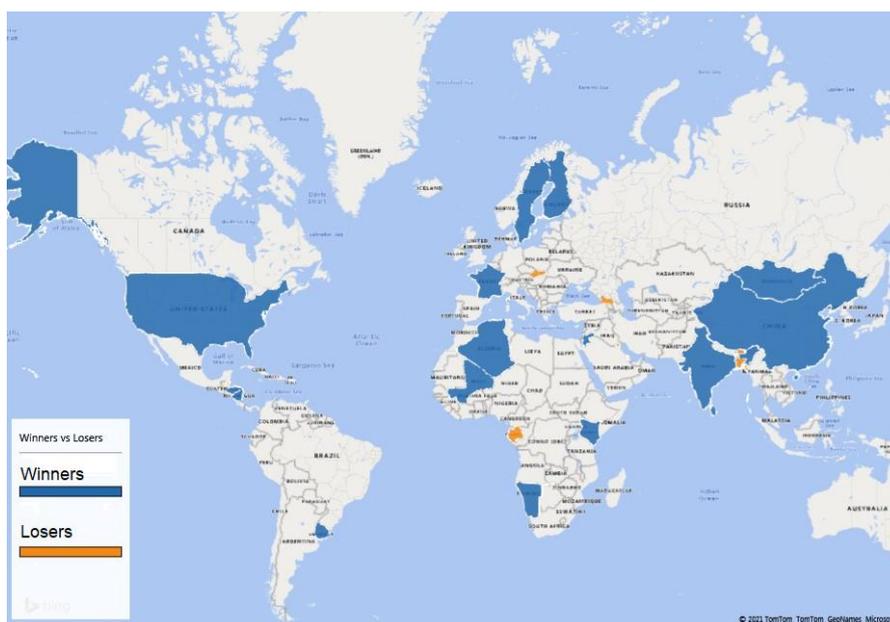


Figure 3. Main geopolitical winners vs losers

Source: author, adapted from Smith Stegen (2018) and Vakulchuk et al. (2020)

According to the authors, the energy conversion will affect particularly the big oil exporters, which are characterized by a low resilience to the changes due to national strategies promoted during the years. From the Figure 3 we can easily see that countries with known potential for renewable energy are on their way of being winners of the energy system conversion, Sweden, Finland, France, USA and China being recognised as countries with an important role regarding the use of renewable energy.

Even if Qatar, Bahrain of Saudi Arabia and the United Arab Emirates are classified as losers at first sight, they have begun to use their foreign exchange reserves to introduce measures to increase the share of renewable energy in the consumption of the population, but

also to invest in other types of organizations, not related to petroleum products (Vakulchuk et al., 2020).

In addition to the renewable potential of states, another aspect that puts pressure on relations between nations is related to the critical materials used in the production of renewable energy technologies (Rothkopf, 2009). Competition for critical materials is growing, while dependence on fossil fuels is declining. Umbach (2018) and Gulley et al. (2018) highlighted that “the expansion of renewables also creates new geopolitical dependencies”, and there will be a competition between states for minerals which cannot be substituted in new technologies. On the other hand, there are also opinions that consider exaggerated publications that highlight the risks associated with critical materials. Grandell et al. (2016) and Lovins (2017) believe that a number of materials such as magnets used in wind turbines can be replaced with electronic solutions, which are cheap at the moment. Moreover, rare earth elements can be found in numerous countries (China, Russia, India, Brazil, USA, Australia). The real problem is that 57% of the known global reserve is localized in Russia and China, and this can lead to a monopoly and to geopolitical threat.

6. CONCLUSIONS

This article has considered the systematization of the literature on the transition to renewable energy and the consequences that this could have from a geopolitical point of view. It briefly addressed the history of the subject and how it has evolved over time, before stating 3 themes: the forces of change, the peace potential of renewable energy and the possible relationship between states taking into account the implications of renewable energy and critical materials needs.

The debated topic is not as new as it seems at first sight, the '70s marking the beginning of scientific approaches on these topics. Currently, the topic has been developed by specialists from the Nordic countries and updated to the current context, which gives weight to the importance of the analysis.

As in the case of the circular economy, there is a diversified opinion on the impact of renewable energy on the relationship between states, this being explained by the novelty of renewable energy in relation to the world scale. Although more than 50 years have passed since the first publications, this time is very short to be able to make scenarios in terms of international evolution.

Renewable energy can be considered the energy of the future through the 6 dimensions that favor its acceptance and use: declining costs, pollution and climate change, renewable energy targets, technological innovation, corporate and investor actions and public opinion. Given these forces that govern the conversion of traditional energy systems and the fact that they are far superior to the targets that use fossil fuels, it is imperative that as many countries worldwide take steps to streamline the energy system from now on.

As in every activity, the energy transition to renewable sources has winners and losers. But even if some states are now in the category of losers, not everything is lost; the use of funds currently obtained from the production or export of fossil fuels for investments in companies with other fields of activity or in changing national energy supply strategies can lead to long-term positive effects.

Conflicts between states on energy issues may continue in the future, but renewable energy can be seen, at least at this time, as a possibility to reduce misunderstandings, fostering development through innovation.

Future research in the field can now move in two directions: first, forecasting and scenario methods regarding the transition to renewable energy which can be seen in a short-term effort. Secondly, in a longer term, there can be built a tool which can be used in order to see and predict the relationship between geopolitics and implications of renewables.

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