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RENEWABLE ENERGY TENDENCIES IN DEVELOPED AND DEVELOPING COUNTRIES

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Among the dramatic events that shaped the world in recent years was the devastating impact of the earthquake and tsunami that hit Japan in March 2013. The crisis at the Fukushima nuclear power plant transformed the public perception of national energy systems globally. Additionally, events in North Africa and the Middle East have increased tensions in oil markets and intensified price volatility.

Observable trends of climate change (global warming, air quality, and the impact of disasters) continue to cause serious concerns worldwide.

These trends force the participants of energy market sector and national governments to look for alternative energy resources, being less harmful for the environment and more effective for the development of the international economic society.

A majority of experts consider that the optimal decision for these problems can be provided by intensive development of renewable energy resources, what cause dramatical increase of interest to renewable energy nowadays.

Renewable energy sources (RES) refer to energy resources which are naturally replenished: wind, solar, hydro-power, biomass, geothermal energy, ocean energy.

The economics of renewable energy are generally not competitive, as production costs per unit of energy are usually higher than for fossil fuels.

The only financially valid way to compare the costs of different sources of energy production is to calculate the per kilowatt-hour (kWh) cost (1):

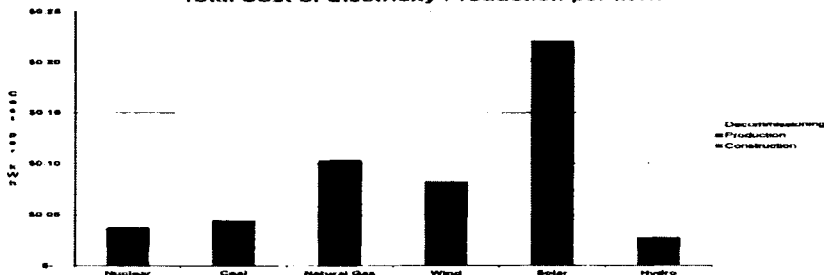
$$\text{Construction cost per kWh} + \text{Production Costs per kWh} + \text{Decommissioning Costs per kWh} \\ (\text{Nuclear only}) = \text{Total Cost per kWh (1)}$$

The main cost components of energy are construction costs and production costs, for nuclear energy you must also add the per kWh decommissioning cost.

The figure below compares total costs of electricity production per kWh from different energy sources.

Hydroelectric is the most cost effective at \$0.03 per kWh. Nuclear and coal are tied at \$0.04 per kWh. This comes as a bit of a surprise because coal is typically regarded as the cheapest form of energy production. Another surprise is that wind power (\$0.08 per kWh) came in slightly cheaper than natural gas (\$0.10 per kWh). Solar power was by far the most expensive at \$0.22 per kWh.

Total Cost of Electricity Production per kWh



Source of data: <http://nuclearfissionary.com/2010/04/02/comparing-energy-costs-of-nuclear-coal-gas-wind-and-solar/>

and-solar/

Figure 1. Most Cost Effective Form of Energy Production

Renewables represent a rapidly growing share of energy supply in a number of countries and regions. Here is a list of nations having the best record for using renewable energy:

1. The United States: 24.7 percent of the world total.
2. Germany: 11.7 percent of the world total.
3. Spain, 7.8 percent of world total.
4. Brazil: 5 percent of world total.
5. China: 7.6 percent of world total.

These countries are certainly making good progress, but there are countries in the world powered entirely by renewable energy.

Here are some forgotten pioneers of the renewable energy world:

1. Iceland – built as it is on a volcano, Iceland has tapped the earth's natural warmth to supply 85% of the country's housing with heat. Between geothermal and hydropower, the electricity supply is 100% renewable energy.

2. Lesotho – a small mountainous African country of Lesotho also has practically 100% renewable electricity. thanks to the Lesotho Highlands Water Project. The network of dams exports water into South Africa, providing almost all of Lesotho's power along the way.

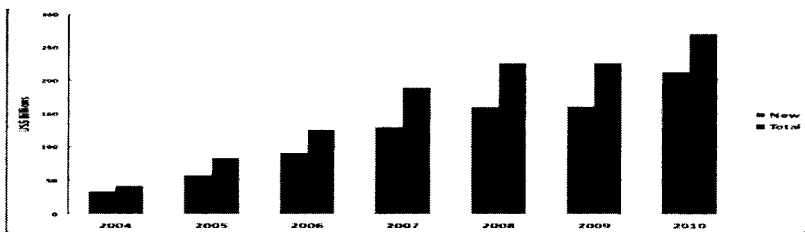
3. Paraguay – Itaipu dam (took 30 years to build), one of the world's largest, provides 90% of Paraguay's electricity and 19% of Brazil's.

4. Mozambique's energy infrastructure tells a sad story, with the ambitious Cahora Bassa dam completed just in time for the outbreak of civil war. Underused throughout the 80s, it came back online recently and now exports electricity into South Africa and Zimbabwe.

5. Norway's renewable energy (hydroelectric, geothermal and wind) sector has developed to serve the export market rather than domestic consumption. The country's generating capacity is around 98% renewable, while the consumption falls to 24% because most of the clean energy is exported.

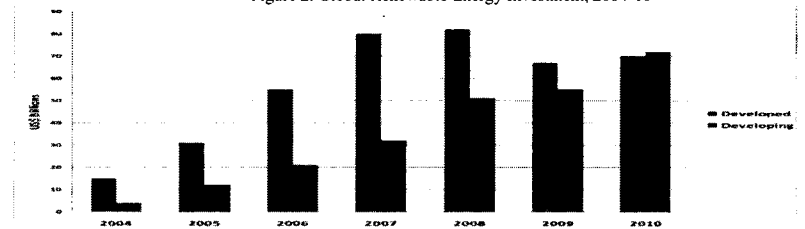
The biggest problem in developing renewable energy policies and projects is lack of investments.

The figures bellow reflect the amount of global investments in renewable energy in recent years and renewable energy investments in developed countries compared with those in developing countries.



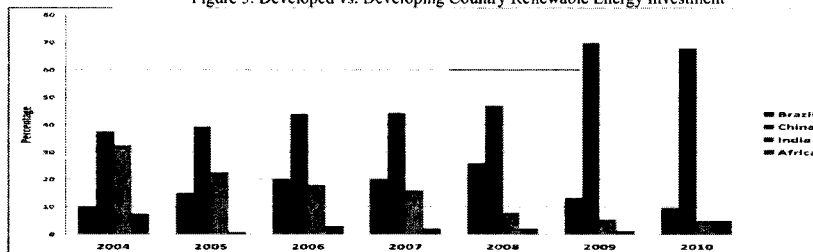
Source of data: <http://www.ids.ac.uk/publication/financing-renewable-energy-in-developing-countries-mechanisms-and-responsibilities>

Figure 2. Global Renewable Energy Investment, 2004-10



Source of data: <http://www.ids.ac.uk/publication/financing-renewable-energy-in-developing-countries-mechanisms-and-responsibilities>

Figure 3. Developed vs. Developing Country Renewable Energy Investment



Source of data: <http://www.ids.ac.uk/publication/financing-renewable-energy-in-developing-countries-mechanisms-and-responsibilities>

Figure 4. Share of Developing Countries' Renewable Energy Investments

The last figure shows that China accounted for almost 70% of total developing country investment in 2009 and 2010. Brazil had the next largest share at around 10%, while India only accounted for around 5%, as did Africa in 2010.

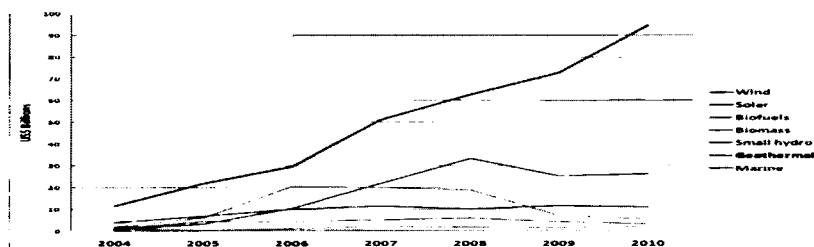


Source of data: <http://www.ids.ac.uk/publication/financing-renewable-energy-in-developing-countries-mechanisms-and-responsibilities>

Figure 5. Renewable Investment in Africa 2010 (US\$ Billions)

In 2010 investment in renewable energy grew rapidly in Africa. This was partly due to the very low rates prior to this, and investment was dominated by Egypt and Kenya.

The next two figures show global renewable investment by sector and developed and developing sectoral investment.

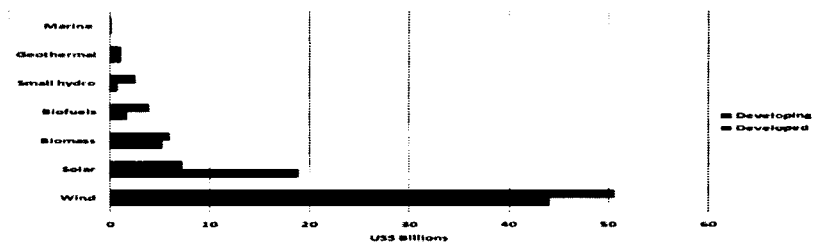


Source of data: <http://www.ids.ac.uk/publication/financing-renewable-energy-in-developing-countries-mechanisms-and-responsibilities>

Figure 6. Global renewable investments by sector

Globally, wind power captures the largest share of global investments, reaching 66% in 2010. The next largest sector is solar, with a little over 18%. The dominance of wind power was even more pronounced for developing countries in 2010. This is almost entirely accounted for by the huge increase in Chinese investment in large-scale wind-farms.

It is interesting to note that developed countries' investment in solar energy was more than double that of developing countries, particularly given the much higher concentration of solar potential in the latter.

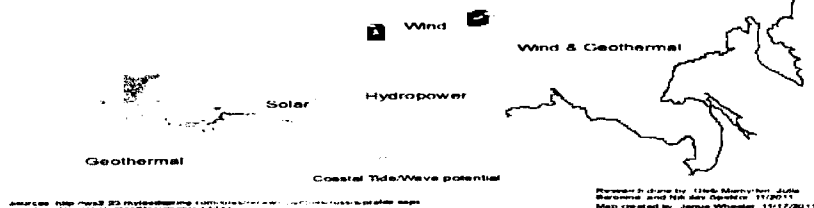


Source of data: <http://www.ids.ac.uk/publication/financing-renewable-energy-in-developing-countries-mechanisms-and-responsibilities>

Figure 7. Developing vs. Developed Sectoral Investment 2010

Russia is one of the largest countries in the world and is situated in different climatic zones, which result in high renewable energy potential. The Russian government has set a target to increase the share of renewable energy generation from the current 0.8 to 4.5 percent by 2020.

Renewable Energy Potential, 2011 Russia



Source of data: <https://sge.lclark.edu/2012/09/20/percent-of-renewable-energy-produced-per-country-map/>

Figure 8. Renewable Energy Potential of Russia

First of all, it is important to note, that Russia is a well-established producer of hydroelectric energy. 6% of Russia's electricity is generated from hydropower, and less than 1% is generated from all other renewable energy sources combined.

Geothermal energy is the second most commonly used form of renewable energy in Russia. The most important region for geothermal energy is Kamchatka, followed by Western Siberia, Northern Caucasus and Lake Baikal.

Wind energy is the most dynamically developing renewable energy sector in Russia. The highest wind energy potential is concentrated along seacoasts, in the vast territories of steppes and in the mountains.

Solar potential is reasonable despite the country's location in the northern latitudes. The highest solar potential is in the southern regions, especially in the Northern Caucasus. Solar power is very poorly developed in Russia with the first plant having opened in Belgorod Oblast in November 2010. The government of Belgorod oblast has adopted a targeted program "The Development of Renewable Energy Resources 2013-2020". A biogas station "Luchki" has already been built under this program. The station was launched last summer and is planned to provide energy for the dwellers of the village Prochorovka, where it is located.

Solar panels were mounted on street lamps along a highway plot in February, 2012. However, they are used parallel with electric lightning, as the panels collect solar power for 2-3 hours lightning a day only.

One of the pioneers in renewable energy projects is Krasnodar Region, which launched an energy efficiency target program in 2006. The decision to hold the Winter Olympic Games in Sochi 2014 to as environmentally friendly standards as possible, had a positive impact on renewable energy projects in the entire region. Currently, the region is using solar panels not only for electricity production but also for water heating purposes.

Although renewable energy is less popular among the wider masses in Russia than it is in Europe, there are still a significant number of small scale and pioneer projects.

In the conclusion of the article we can compose a list of the main characteristics of renewables, to clarify the ability to find balance between environmental impact and economic efficiency of these energy sources.

Advantages:

- Renewable are available in the abundant quantity and free to use.
- Traditional sources of energy are limited and bound to expire.
- Renewable sources are considered as green and environment friendly, as they have low carbon emissions.
- Renewable energy development helps to stimulate the economy and creating job opportunities.
- Use of renewables make countries more independent from imported energy.

- Renewable are forecasted to be less costly in the long run.

Disadvantages:

- It is not easy to set up a plant as the initial costs are quite steep.
- Solar energy can be used during the day time and not during night or rainy season.
- Geothermal energy which can be used to generate electricity has side effects too. It can bring toxic chemicals beneath the earth surface onto the top and can create environmental changes.
 - Hydroelectric provide pure form of energy but building dams across the river which is quite expensive can affect natural flow and affect wildlife.
 - To use wind energy, you have to rely on strong winds therefore you have to choose suitable site to operate them. Also, they can affect bird population as they are quite high.

One of the dominant features of the global Renewable Energy landscape in 2011 was falling technology costs, what means growth of their economic effectiveness and competitiveness. If the tendency continues the amount of investment in renewables will definitely increase and will give a boost to intensive development of this energy sector.

Such trends will probably result in lowering the harmful impact of power production on the environment. However we discovered that renewables are not so harmless, as they are considered to be. At the same time we can't deny the fact that use of renewables is the less evil compared with traditional energy sources.

And the main good news is that renewable resource potentials exceed today's world energy consumption, despite the rapid growth of the latter.

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ANALYSIS OF THE INFLUENCE OF THE IMPORT SUBSTITUTION ON THE COMPETITIVENESS OF THE AGRICULTURAL PRODUCTION IN BELGOROD REGION

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Nowadays, the development of the agriculture in Russia is characterized by the growth of food import deliveries and scarcity of internal sources of food production. Consumption of food per capita also tends to have a negative dynamics, which finally promotes an aggravation of a problem of food security in Russia. During 1990-2007 we observed the tendency to the reduction of animal production. The level of meat and milk production dropped more than by 40%, eggs – by 20%. As for crop production, there is decline in corn production by 33% and a significant growth in potatoes production by 25% and vegetables production by 52% [1].

The main reason of drop in meat and dairy production during the period of reforms is a decrease of the cattle at the farms of all categories. There are a lot of factors which could affect this. The main of them are: condition of food supply, financial and economic problems of the agriculture. The situation with crop production during 1990-2007 is characterized by the reduction of cultivated areas of the main crops more than by 35%. It is vital to note, there has been a growth of production indicators and consumption of the main types of food products per capita. However, the fact that foodstuff and raw materials for their production take one of the biggest shares in the structure of the Russian import to compensate a lack of raw materials on the domestic market, arises a question about proportionality of the growth of outputs and import of the food. The main problem is that the dynamic of food import is much steadier unlike the dynamics of agriculture growth and development, fluctuating during the years. Import substitution has to be conducted by means of stimula-