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DEVELOPMENT OPPORTUNITY FOR RURAL AREAS USING SOLAR ENERGY

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Abstract
The global deployment of renewable energy has taken off. The renewable energy electricity sector grew by 36% between 2005 and 2012. Today it provides about 20% of the world's power. Hydro-electric power generates 84% of the world's renewable electricity, while the other newer renewable energy electricity technologies have also grown rapidly, doubling their production between 2005 and 2012. Wind has grown most rapidly in absolute terms. Solar photovoltaic has grown at a rate of 50%, and installed capacity reached about 70 GW by the end of 2013. Renewable energy for heating, cooling and transport fuels is also steadily growing. The production of heat from renewable sources grew by 6% between 2005 and 2009, with the use of biomass (e.g. wood) still the dominant technology. However more "modern" heating technologies – particularly solar heating, but also geothermal heating – have seen an overall growth rate of nearly 12% between 2005 and 2009. The production and use of biofuels for transport have also been growing rapidly, providing 3% of road transport fuels (2% of all transport fuels) in 2009. Biofuel production and consumption are still concentrated in Brazil and the United States (ethanol) and in the European Union (biodiesel). Energy consumption is a cornerstone for sustainable growth and advancement. The main purpose of this current paper involves determining the role of solar energy on sustainable development. Thus, the paper finds that energy efficiency plays multiple roles towards sustainable economic development. For that reason, it contributes to carbon reduction which results in minimized climate change. It also results in employment creation thereby reducing poverty which enhances sustainable livelihoods. The paper also introduces additional information about the solar energy with its merits and demerits. New technologies that convert solar power to energy are being developed and used every day.

Keywords: Renewable Energy, Sustainable Development, Rural Areas, Solar Energy.

Introduction

Energy is central to achieving the goals of sustainable development. The magnitude and scale of energy needs facing the world today in relation to sustainable development can be gauged by the fact that nearly one third of the global population of six billion, mostly living in developing countries, continue to lack access to energy and transportation services. Wide disparities in the levels of energy consumption within and between developed and developing countries exist. Current patterns of energy production, distribution and utilization are unsustainable. Applying solar energy in innovative way, a sound and cost-effective systems apply to all sectors of the economy. Energy resources are plentiful, and environmentally sound technological options exist and should be made available and facilitated by developed countries to developing countries as well as countries with economies in transition with a view to making energy or sustainable development a reality. Ensuring adequate and affordable access to energy for present and future generations, in an environmentally sound, socially acceptable and economically viable way will require considerable efforts and substantial investments, including from the private sector. In order to make energy stems more supportive of sustainable development objectives, contributions from all stakeholders, as well as increased investments, will be needed. Change will not be driven by resource constraints for a very long time to come. Energy for sustainable development can be achieved by providing universal access to a cost-effective mix of energy resources compatible with different needs and requirements of various countries and regions. This should include giving a greater share of the energy mix to renewable energies, improving energy efficiency and greater reliance on advanced energy technologies, including fossil fuel technologies. Policies relating to energy for sustainable development intended to promote these objectives will address many of the issues of economic and social development as well as facilitate the responsible management of environmental resources. In view of the different contributions to global environmental degradations, States have common but differentiated responsibilities.

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The financial resources play a key role in implementation, but choice and implementation of policies to improve the ways to achieve energy for sustainable development basically rest with Governments. However, For developing countries, (ODA) official development assistance is a main source of external funding, and substantial new and additional funding for sustainable development implementation. The way in which energy issues are addressed in a country depends on the national energy situation and needs. Therefore, a range of options and strategies becomes necessary to address the issues involved. Accordingly, a number of options and strategies that could affect a change in the way energy is dealt with are delineated subsequently. The choice of any specific option would obviously depend on the domestic situation. By the year 2025, 83 per cent of the expected global population of 8.5 billion will be living in developing countries. Yet the capacity of available resources and technologies to satisfy the demands of this growing population for food and other agricultural commodities remains uncertain. Agriculture has to meet this challenge, mainly by increasing production on land already in use and by avoiding further encroachment on land that is only marginally suitable for cultivation. In 2011, the global public and private investment in renewable energy amounted to USD 211 billion (UNEP, 2011). The total investment exceeded USD 1 trillion between 2002 and 2011. A large share of the rural energy boom is occurring in the OECD's rural areas, which are sparsely populated, amply endowed with renewable sources of energy, and spacious enough for land-hungry developments like wind farms. Renewable energy (hereafter, RE) is being championed as a potentially significant new source of jobs and rural growth in OECD countries, and a means of addressing environmental and energy security concerns. In most countries, governments have invested large amounts of public money to support RE development and are requiring significant quantities of it to be sold by energy providers. What are the economic impacts of these policies and investments? Can RE really help to develop rural economies? These are some of the questions explored by this report, which presents the results of a two-year study of the impact of RE on rural development. Drawing on case studies in 16 regions across Europe and North America, it finds that while RE indeed represents an opportunity for stimulating economic growth in hosting communities, it also requires a complex and flexible policy framework and a long-term strategy. RE is not going to create lot of jobs, but rather some additional employment opportunities in rural areas. Making a positive connection between RE development and local economic growth will require more coherent strategies, the right set of local conditions, and a place-based approach to deployment.

What Does Renewable Energy Offer Rural Areas?

The global deployment of RE has been expanding rapidly. For instance, the RE electricity sector grew by 36% between 2005 and 2012 globally and currently provides about 26% of the world's total power (including hydro-power). Rural areas attract a large part of investment related to renewable energy deployment, tending to be sparsely populated but with abundant sources of RE. The case studies have found that RE deployment can provide hosting communities with some benefits, including. RE increases the tax base for improving service provision in rural communities. It can also generating extra income for land owners and land-based activities. For example, farmers and forest owners who integrating renewable energy production into their activities have diversified, increased, and stabilized their income sources.

New job and business opportunities, especially when a large number of actors is involved and when the RE activity is embedded in the local economy. Although RE tends to have a limited impact on local labour markets, it can create some valuable job opportunities for people in regions where there are otherwise limited employment opportunities. RE can create direct jobs, such as in operating and maintaining equipment. However, most long-term jobs are indirect, arising along the renewable energy supply-chain (manufacturing, specialized services), and by adapting existing expertise to the needs of renewable energy.

Innovation In Products, Practices in Rural Areas

In hosting RE, rural areas are the places where new technologies are tested, challenges first appear, and new policy approaches are trialed. Some form of innovation related to renewable energy has been observed in all the case studies. The presence of a large number of actors in the RE industry enriches the "learning fabric" of the region. Small and medium-sized enterprises are active in finding business niches as well as clients and valuable

suppliers. Even when the basic technology is imported from outside the region, local actors often adapt it to local needs and potentials.

The Capacity Building in Rural Areas

As people become more specialized and accumulate skills in the new industry, their capacity to learn and innovate is enhanced. Several rural regions have developed specific institutions, organisms, and authorities to deal with RE deployment in reaction to large investment and top-down national policies. This dynamic has been observed both in regions where local communities fully support RE and in regions where the population is against potentially harmful developments. RE provides remote rural regions with the opportunity to produce their own energy (electricity and heat in particular), rather than importing conventional energy from outside. Being able to generate reliable and cheap energy can trigger economic development.

Solar Energy

Solar energy is radiant energy from the sun. It is the primary source of energy for all life forms. The sun shines, allowing plants to grow for food sources or bio fuel. The sun's heat causes temperature differences, producing winds that can power wind turbines. The sun also causes water to evaporate, making hydropower possible. The term solar energy is often used to refer to the various ways we can use the sun's energy to produce light, heat and electricity. It is defined as every day we rely on energy to provide us with electricity, hot water, and fuel for our cars. Most of this energy comes from fossil fuels, such as coal, oil, and natural gas. These are nonrenewable energy sources, which mean that if we use them all up, we can never get more during our lifetime. Fossil fuels also contribute greatly to global climate change by releasing carbon dioxide into the air when they are burned. Because fossil fuels can run out and are bad for the environment, it is important that we start switching to other energy sources, like renewable energy sources. These are energy sources that are constantly being replenished, such as sunlight, wind, and water. This means that we can use them as much as we want, and we do not have to worry about them running out. Additionally, renewable energy sources are usually much more environmentally friendly than fossil fuels. Overall, they release very few chemicals, like carbon dioxide, that can harm the environment. Currently, less than 10% of all the energy we use comes from renewable sources. So you might be wondering, if renewable energy sources do not harm the environment and will not run out, then why are we not using them everywhere and all the time? It is because many of them are currently expensive to harness, are inefficient, or have other disadvantages. For example, using energy from the wind might be great in an area that is really windy all year round, but it wouldn't work so well in an area with very little wind.

Production of Solar Energy

The sun sends heat and light to our planet. But solar energy produced by,

- The sun is a star primarily made up of hydrogen and helium atoms. In a process called nuclear fusion, four hydrogen atoms combine to form one helium atom.
- Some matter is lost during the fusion process.
- Lost matter travels outward to the surface of the sun. This radiant energy reaches our planet, providing us with heat and light.

Working of Solar Energy

Think of your car on a sunny day. Sunlight passes through the window and is absorbed by the interior. This newly converted heat energy becomes trapped, making the car warmer than the outside temperature. Solar Energy Passive solar homes are carefully constructed to operate as a solar collector. Using no mechanical devices, these homes rely on properly placed windows to draw in sunlight. The sunlight is absorbed by the floors and walls, heating the home. Active Sola Energy Active solar energy systems use pumps and other mechanical devices. Solar collectors are used to absorb energy from the sun. The most common type of solar collectors look like black glass boxes and are found on rooftops. Inside these flat boxes are metal plates that absorb the solar radiation and convert it into heat. Either air or liquid is warmed by this heat, making it ready for home use or storage.

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Storing of Solar Energy

Storing solar heat can be a challenge. Materials such as stone or concrete can be used to absorb and store excess heat. Heat is absorbed during the day and released into the home after dark. Water tanks are commonly used for heat storage in active solar homes. Batteries or a grid system are used to store solar electricity.

Uses of Solar Energy

Solar energy is being used in a variety of ways all over the planet. California currently has the largest solar power plant in the world. Totaling nine solar thermal plants in the Mojave Desert, these technologies are used to create electricity by heating water into steam. Two large solar plants using photovoltaic cells were recently built in Europe. These have the capabilities to provide a large amount of power directly to an electrical grid. Solar energy can be used to cook your meals, heat your home and charge your cell phone. Thermal plants in the Mojave Desert, these technologies are used to create electricity by heating water into steam. Two large solar plants using photovoltaic cells were recently built in Europe. These have the capabilities to provide a large amount of power directly to an electrical grid. Solar energy can be used to cook your meals, heat your home and charge your cell phone.

Efficient Of Solar Energy

Many factors contribute to the efficiency of solar power. Although there is an abundance of solar energy on our planet, it is spread over a large area. Collecting it can be a daunting task. Variables such as climate, time of day and type of solar cells all must be considered. Why Aren't More People Using Solar Energy? There are several other problems with solar energy, including the high cost of solar panels. How is solar energy used in everyday life? From lighting street signs to warming our water, we can all find ways to benefit from the sun's rays. Solar Electricity for Homes (Solar Photovoltaic's) Using solar energy at home is becoming increasingly popular. Due to government incentives and dry solar systems, the price of solar shingles and panels are becoming more affordable to the everyday consumer. Home solar power can be used independently from a grid system. Excess electricity made during the day is stored for night use. More commonly are solar energy systems that are tied to a grid and trade electricity. During night hours and cloudy days, electricity from the grid is used. Solar Heat for Homes (Solar Thermal Energy) solar thermal energy can be used to warm the air in your home or the water for your morning shower. Heating swimming pools and cooking with solar energy is possible due to solar thermal power. Outdoor Solar Lights If you are looking for energy efficient outdoor lighting, solar power is a great option. Most outdoor solar lights are low maintenance, easy to install, free of wires and cords and turn on automatically at night. They don't get too hot, which means they don't pose a fire risk. This is especially important in dryer climates. Solar Yard Lights landscaping style solar yard lights are the most popular on the market. Used to line walkways and gardens, these affordable lights are typically packaged in sets of two or four and can be Found in home improvement stores. Solar lamp post light starting at Rs.12, 000, maintenance free solar lamp post lights make a nice addition to outdoor entryways And front lawns. Solar Patio Lights From tabletop containers that look like candles, to tike-torch style.

Solar patio lights can be found in a variety of shapes and sizes. Solar Address Light A solar address sign is great for the pizza delivery driver, emergency personnel, or anyone else that may need to find your home after daylight hours. These easy to install solar house numbers are becoming increasingly popular. Solar Powered Christmas Lights Solar powered Christmas lights work in the same way as other outdoor solar lighting. For those of us that live in cold climates with short days, there may not be enough sunlight to power the lights during the holiday season. If you live in the south, using solar Christmas lights during the holidays can be a great way to reduce your carbon footprint. Solar rope lights are another great option.

Other Solar Energy Items

Any product that requires electricity and has access to the sun can receive part, if not all, of its power from solar energy. As solar technology continues to grow and evolve, more products will become available. Solar fountains, fountain pumps, and birdbaths, solar pool pumps, heaters and covers, solar watches, calculators and phones, solar powered generator, solar fans, flashlights and radios. As long as the sun shines, solar energy is a free resource.

Solar Energy Advantages

- Cost-effective: Although the initial investment of solar panels is high, energy from the sun is free. The payback period may take several years, but money will be saved in the long term.
- Clean: Solar energy is clean. No fossil fuels are used to produce heat or electricity with solar energy. The only pollution produced is in the manufacturing, transporting and installing of solar panels.
- Easy Installation: Solar panels are usually easy to install on different roof types, including flat or pitched roofs.
- Maintenance Free: Solar energy systems require little to no maintenance and last for several decades.
- Multiple Uses: Among other things, solar energy can be used to light your home, cook your meals and heat your water.
- Safer: Collecting energy with solar panels is much safer than mining coal or transporting oil from overseas.
- Storage: when a solar energy system produces more energy than necessary, it can be stored for later. This is especially convenient for those times it's not producing electricity, such as after the sun has set or on cloudy days. If there is excess energy in storage, your utility company may be willing to buy it from you.
- Tax Credit Incentive Receive: A tax credit of up to 30% on solar panel costs through 2012. Useful in Remote Locations Very remote locations are often difficult for power companies to access. In many of these areas, solar panels are a great option.

Solar Energy Disadvantages

- Cost: The greatest disadvantage of solar energy is the initial cost of solar panels. Having a commercial grade system professionally installed can cost Rs.6,00,000 to Rs.24,00,000.
- Due to new tax incentives and increased competition with DIY solar energy systems, solar panels are slowly becoming more affordable.
- Generated Only During Day: For solar energy to generate electricity, it must be daylight. During night hours, stored solar energy or an alternative energy source must be used.
- Location: Matters Solar power is not the best option for all locations. Regions that have an abundance of cloudy, overcast, or rainy days find it hard to benefit from solar power.
- Pollution: Pollution can interfere with the efficiency of solar panels. Solar energy may not be an option in large cities or heavily polluted areas.

History of Solar Energy

The history of solar power is extensive, taking us all the way back to the 7th Century B.C.
7thCenturyB.C. -Magnifying glasses used the sun's rays to make fire.
1st to 6th Century A.D. The Greeks and Romans used passive solar designs. Creating buildings with south facing windows allowed the sun to heat and light indoor spaces.

Solar Energy History 1800-1899

1861: Auguste Mouchout invented a device that turned solar power into steam. This soon became the first steam engine powered completely by the sun.
1873: British electrician Wiloughby Smith discovered the photoconductivity of selenium.
1876: William Grylls Adams and Richard Evans Day discovered that when light is shined on selenium, electricity is created. Electricity produced from light is now referred to as the photovoltaic effect.
1883: American inventor Charles Fritz turned the sun's rays into electricity with the first solar cell.
1885: Frenchman Charles Tellier installed a solar energy system to heat water for his home.
1891: American inventor Clarence Kemp patented the first solar water heater.

Solar Energy History 1900-1999

1905 : Along with a paper on his Theory of Relativity, Albert Einstein published a paper on the photoelectric effect.

1908: William J. Bailley invents a solar collector. Made with copper coils and an insulated box, the solar collector is similar to current designs.
1921: Albert Einstein wins the Nobel Prize for his theories on the photoelectric effect.
1954: Calvin Fuller, Gerald Pearson and Daryl Chaplin of Bell Laboratories create the first silicon solar cell able to generate enough power to run common appliances.
1956: Commercial solar cells went on the market at a hefty price of $300 per watt.
1958: Vanguard I became the first space satellite to use solar cell technology. Space programs still use photovoltaic powered systems today.
1973: As oil prices virtually doubled overnight, the U.S. government became determined to reduce dependence on foreign oil. Among other things, the government heavily invested in the solar electric cell that Bell Laboratories produced in 1953.
1990: U.S. investments in the solar electric cell were successful, but weren't paying off in a monetary sense. Costs of solar energy had dropped, making it more competitive and affordable. However, the costs of fossil fuels had dropped as well. Solar power simply wasn't as affordable.
1993: Pacific Gas and Electric installs the first photovoltaic grid system in Kerman, California.

Solar Energy History 2000-Today
2000: Production begins at First Solar in Perrysburg, OH, the world's largest photovoltaic manufacturing plant.
2001: Featuring a solar electric canopy, the first BP Connect gasoline and retail store opens in Indianapolis, Indiana.
2002: In the Solar Decathlon competition sponsored by the Department of Energy, students at the University of Colorado built an energy efficient home that utilized solar power.

Today
Use of solar energy is increasing at a rapid rate of an estimated 30% per year. Demand for solar energy products is currently greater than supply. Thanks to increased competition from manufacturers and DIY solar energy kits, the cost of solar panels are falling. Solar power is being used to light and heat homes, warm water, and cook food. New solar energy items are appearing on the market almost daily. Solar powered Christmas lights, solar yard lights and solar house numbers are popular items. Demand for solar energy items is currently greater than supply. This won't be changing anytime soon. As technology continues to develop, here are a few things to look for in the future.

Putting Renewable Energy to Work in Rural Areas

A well-designed framework for regional policy could offer a real opportunity to reconcile policy trade-offs and identify potential complementarities among the three objectives of energy security, climate change mitigation, and job creation. These findings underline the need for a shift in the approach to rural development policy in many OECD countries away from a model that emphasizes sectoral policy and subsidies, to one that is place-based and grounded in local conditions and opportunities and that focuses on the competitiveness of rural areas. Specific factors to bear in mind include: Embed energy strategies in the local economic development strategy so that it reflects local potentials and needs. Environmental and energy security arguments tend to be the main impetus for promoting renewable energy, and the local economic benefits tend to get overlooked. Integrate RE within larger supply-chains within rural economies, such as agriculture, forestry, traditional manufacturing and green tourism. Limit subsidies in both scope and duration, and only use them to induce RE projects that are close to being viable in the market. If subsidies are too high, they can attract “rent-seeking” investors, can lead to high-cost energy that is only viable as long as high levels of subsidy are sustained, can have a negative impact on land use and displace other activities such as agriculture and tourism. Avoid imposing types of RE on areas that are not suited to them. For example, wind power is only appropriate in certain places – more care is needed to identify those places rather than adopting policies that somewhat arbitrarily spread RE projects across national landscapes.

Focus on relatively mature technologies such as heat from biomass, small scale hydro and wind. These proven technologies are not likely to experience big jumps in technology that can make recently completed plants instantly obsolete.

Create an integrated energy system based on small grids able to support manufacturing activities. Policy should take into account backstop technologies for intermittent power sources. In several regions, the capacity to deploy RE is constrained by grid limitations; however, there are no incentives to improve transmission infrastructure. Recognize that RE competes with other sectors for inputs, particularly land. Poor sitting can adversely affect local residents and disrupt tourism, which is typically a much larger source of income and employment.

To Conclude

The future of solar energy is brighter than ever before. As new solar products continue to become available, we will all find ways to benefit from this vast and renewable resource. The solar energy market is expected to grow by more than 30% every year for the next few decades. This boom is expected to create many solar energy jobs. New solar energy products will appear on the market. From solar energy automobiles to solar powered clothing, expect to see all types of solar energy items in the future. In the next decade, it's expected that photovoltaic power will be similar in price to traditional sources of electricity. As the cost of solar panels continues to decrease, home solar energy systems will be increasingly popular. Solar panels will become a standard addition to newly constructed homes.

Tax incentives, easier access to solar panels, and DIY solar energy kits will encourage home owners to consider solar energy for home use. Research demonstrates that there are no shortcuts to rural development. Policy makers should always take into account the overall cost of energy, and implement the least expensive energy solution that can also satisfy carbon emission reduction requirements. Only a coherent and integrated development strategy can achieve the goal of promoting growth together with a better environment.

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