

**THE AWARENESS OF SUSTAINABLE DEVELOPMENT POLICY ON SOLAR ENERGY USAGE****Dr. NAGARAJA POOJARI**

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9900502422,[Nagaraj.poojari@gmail.com](mailto:Nagaraj.poojari@gmail.com)**ABSTRACT**

Electricity plays a crucial role in the development and use of Information and Awareness in the process of striving to achieve sustainable development in emerging economies. It has been shown that electrical energy is intrinsically linked to economic, environmental and social dimensions of sustainable development. The demand for electricity in residential, commercial and industrial sectors in developing countries is likely to increase, both as a result of increase in population and expanding industrialization. It remains amongst others, a growing challenge for these nations to obtain and put in place reliable and secured electricity supplies, for accessing Information and Awareness and to work towards achieving sustainability. To address some of these challenges without compromising the goal of sustainability and development, it is important that low carbon emitting electrical energy sources such as solar electricity are given high priorities by policy makers, industries and R&D institutions in emerging countries. Solar electricity is of major interest for the energy sector in developing or emerging economies because it offers the possibility of generating renewable electricity using sunlight – a resource that is widely and free available in most if not all developing countries. This paper aims to systematically examine and draw attention to potential benefits of solar power generation for access to and use of Information and Awareness aimed at sustainable development in emerging economies. Specifically, the paper provides an extensive analysis of the major contribution of solar electricity in various sectors such as economic, social and environmental benefits. We point out the important issues that must be considered and addressed for the successful implementation of solar electricity programs for sustainable and development in developing nations. The paper concludes with a discussion on current status of solar electricity in major emerging economies, their planning policies and strategies for promoting solar power generation for increased access to Information and Awareness by people and sustainable development of society.

**KEYWORDS:**

Sustainable development policy, Information and Awareness and Solar Energy

**INTRODUCTION**

Apart from land, capital and labour, electrical energy is a crucial input in the process of sustainable development in emerging economies (Brazil, Russia, India, China and South Africa). It has been shown that electrical energy is intrinsically linked to environmental, social and economic aspects of sustainable development. However, for the past decades, the electrical energy demands in emerging economies have been met by non-renewable energy sources (specifically coal, thermal, oil and gas) which are pollution agent, not equally distributed and worse still, limited. On the other hand, the demand for electrical energy for technological use and sustainable development in emerging economies is likely to increase, both as a result of increase in population and expanding industrialization. The need for emerging economies to address climate change and increase its reliable, affordable, clean and secured electrical energy supplies, in both urban and rural areas, is a key challenge which requires market penetration of low carbon emitting energy technologies. Solar electricity (from photovoltaic) is clearly one of the most promising prospects to the problems since it is non-pollutant, renewable and sunshine is available to all emerging economy countries, although with varying intensity.

**OBJECTIVES**

- To analysis the Impact of Information and Awareness to Usage the Solar Energy
- To analysis the effects of energy and Environmental policy

**METHODOLOGY**

This Study focused on Reviews of literature and Secondary data and this study evaluated the Impact of Information and Awareness to Usage the Solar Energy and effects of energy and Environmental policy

**RESULT AND DISCUSSIONS****Impact of Information and Awareness in Advance and Emerging Economies**

By definition, Information and Awareness include electronic networks, embodying complex hardware and software that is linked by a vast array of technical protocols. It covers internet service provision, telecommunications equipment and services, information technology equipment and services, media and broadcasting, libraries and documentation centers, commercial information providers, network-based information services, and other related information and communication activities. It has been reported that the Information and Awareness is about electronic means of capturing, storing, processing, sharing, displaying, protecting and managing information. For the past two decades, the role of Information and Awareness in economic growth, social change and transformation in various developmental sectors has received considerable attention. The reason is that Information and Awareness enables the production of goods in a short amount of time with the assistance of computerized systems. Information and Awareness is regarded as a reliable vehicle for changing and modernizing educational systems, a platform for communication, a means for improvement in health sector and a powerful tool for economic growth. It has been argued that extensive applications of Information and Awareness creates 'intangible assets' (in the form, for example, of organization or managerial improvements), which contribute to increasing the overall efficiency of all sectors of production, thus increasing the total factor of productivity (TFP). Investment in Information and Awareness is a capital input which contributes to overall capital-deepening in other sectors, thus helping to increase labour productivity. The Organization for Economic Co-operation and Development (OECD) views Information and Awareness as a tool for increasing efficiency that provide access to new markets or services, create new opportunities for income generation, improve information and knowledge management inside the firm and reduces transaction costs and increase the speed and reliability of transactions for both business to business and business to consumer transactions. The use of email, online banking and e-commerce have significantly cut down on the physical transportation involved in sending mail, banking and buying goods, which results in saving money and time; the production of Information and Awareness and services contributes significantly to economic growth (e.g. USA, Finland, China and India) For example, the Information and Awareness sector was a major source of employment growth for the 1995-2000 period were Information and Awareness services employment grew to 10.5% in the United Kingdom, 10.2% in the Netherlands, 9.8% in Finland, 9.5% in the United States, 7.3% in the Czech Republic and 7.3% in Spain. In addition, the Information and Awareness sector contributed significantly to the increase in the international trade. For example, in 1990, trade in Information and Awareness, defined as the average of imports and exports, and accounted for over 12% of OECD-wide trade in goods and by 2000, the share had reached almost 20%. Other contribution of Information and Awareness includes the use of Internet where users purchase goods over the Internet and communication via e-mail to providing information about a company's products, services and technologies. In 2001, the share of individuals using the Internet to order products was about 38% in Denmark, Sweden, United Kingdom and United States while in Canada and the Netherlands it was 24% and 20%, respectively. The contribution of Information and Awareness in education varied significantly from one country to another. Report from 'Education at a Glance' showed that the percentage of students with access to a computer varies from 25% in Italy to over 90% in Canada, Finland and New Zealand (Note: the average number of students per computer is an indicator of students' access to new technologies). The percentage contribution of Information and Awareness to Gross Domestic Product. (GDP) growth for the period of 1995-2000 in selected developed countries increased as is shown in table 1. The World Bank often classifies the economy of a country by its Gross National Income (GNI) per capita. Developing countries are characterized by low per capita income and consider this to be a statistical indicator for general unemployment, poverty, scarcity of highly paid jobs, low-level of personal income, energy crisis, insufficient capital resources and lack of investment in technology.

**Table 1.** The percentage contribution of Information and Awareness to GDP growth for the period of 1995–2000 in selected developed countries.

| Country   | Labour | INFORMATION | Non- | TFP  | GDP |
|-----------|--------|-------------|------|------|-----|
| Austria   | -0.2   | 0.3         | 0.7  | 1.7  | 2.7 |
| Belgium   | -0.1   | 0.7         | 0.2  | 1.9  | 2.8 |
| Germany   | -0.3   | 0.3         | 0.3  | 1.4  | 1.7 |
| Denmark   | 0.4    | 0.7         | 0.9  | 0.8  | 2.8 |
| Spain     | 2.9    | 0.3         | 1.1  | -0.3 | 4   |
| Finland   | 1      | 0.7         | 0.1  | 3.1  | 4.9 |
| France    | 0.2    | 0.3         | 0.7  | 1.6  | 2.7 |
| Greece    | 0.7    | 0.3         | 0.6  | 2.2  | 3.8 |
| Ireland   | 2.2    | 0.6         | 2.2  | 4.8  | 9.7 |
| Italy     | 0.4    | 0.4         | 0.7  | 0.5  | 2   |
| Luxemburg | 1      | 0.2         | 1.6  | 1    | 3.9 |
| Holland   | 1      | 0.2         | 1.6  | 1    | 3.9 |
| Portugal  | 1      | 0.5         | 1.2  | 1.1  | 3.9 |
| Sweden    | 0.7    | 0.8         | 0.4  | 1.7  | 3.5 |
| United    | -0.8   | 0.4         | 0.6  | 1.4  | 1.7 |
| USA       | 1.3    | 0.8         | 0.6  | 1.5  | 4.2 |

On the other hand, emerging economies are subgroup of developing countries that are characterised by fast economic growth, economic liberalization and economic transition from controlled markets to more open markets while increasing transparency and accountability. Countries classed as emerging economies are faced by demand for economic growth, climate changes, lack of affordable and sustainable electrical energy, insufficient capital resources, environmental degradation, lack of availability and investment in technology, insufficient food supplies in remote areas, high rate of unemployment, high population growth, lack of transport and communications (particularly in remotes areas), lack of education infrastructures, poverty and climate change. However, some of these large scale problems can be addressed if education is promoted with access to and use of Information and Awareness made possible for the people in the public, private and voluntary sectors.

Furthermore, competing in the global market has become more challenging and complex and therefore attaining sustainable development is not only about liberalisation of the economy, but also entails how far Information and Awareness is being used in the country. It has been argued that the contribution of Information and Awareness to economic growth and sustainable development in emerging economies depends on the way new information technologies are used by individuals and businesses. The authors pointed out that the greater use of Information and Awareness in the production process may, for example, help raise the overall efficiency of the use of capital and labour, e.g. by reducing inventories and transaction costs. For technologies based on networks, such as the Internet, the more people who are connected, the greater the potential benefits. In addition, the Information and Awareness sector has the potential to play a powerful role in tackling climate change in emerging economies by enabling other sectors (such as transport, construction, power and industry) to become more efficient. According to a report published by the Climate Group and the Global e-Sustainability Initiative, Information and Awareness could reduce global carbon emissions by 7.8 GtCO<sub>2e</sub> by 2020, an amount that is five times larger than its own carbon footprint.

#### **Information and Awareness in Emerging Economies**

Sustainable economic development requires a well-developed infrastructure and a substantial number of high value added industries. Thus in emerging economies, Information and Awareness should be regarded as an enabler and catalyst for successfully shifting away from economic dependency on low value added industry sectors, such as agriculture and raw materials extraction. Many studies have identified various sectors where Information and Awareness can make a great impact in emerging economies. These include economic growth, good governance, education improvement], business growth, organizations, human development, health sector, Social well-being, employment, agriculture, poverty eradication, and providing cheaper, quality and empowered communication to marginalised communities. While the Information and Awareness contribution still accounts for a relatively small share in these sectors, it can make a relatively large contribution if it can be accessible and affordable by the majority in both urban and rural areas like in the developed countries. However, in order to

make this technology truly available, accessible and affordable to the majority, especially in rural areas, there are number of important factors which should be tackled before the emerging economies can reap the benefits of Information and Awareness . The major constraints facing the Information and Awareness sector in emerging economies include:

- a) The digital divide due to imbalance of diffusion of Information and Awareness infrastructure between urban and rural areas ,
- b) High cost of the technology such as high cost of bandwidth and high cost of Information and Awareness devices,
- c) Lack of human resource capacity which limits the Information and Awareness implementation ,
- d) Lack of awareness about the benefits of Information and Awareness ,
- e) Local content and language barrier and
- f) Lack of sustainability, i.e., meeting the ongoing costs of maintaining equipment, staff training, connectivity and content materials acquisition.

While all these are very important prerequisites conditions for Information and Awareness development and implementation in emerging countries, they are insufficient conditions. Electricity availability and reliability is the major pre-condition due to the fact that all Information and Awareness devices use and need regular supply of electricity. Electricity is the engine for development, access and implementation of Information and Awareness . It is impossible to operate any form of information and awareness in remote locations without electricity or urban areas without adequate and reliable grid electricity. In fact, Information and Awareness would have no significant impact if the website in the rural areas cannot be accessed because of lack of electricity or computers cannot be used in urban areas because of grid electricity rationing. Since information and awareness can make impact on all developmental activities, it is anticipated that as soon as information and awareness become accessible to most people in the public, private and voluntary sectors (both in urban and rural areas), new employment, economic growth, information on health, marketing assistance (using ebay-like auction exchanges), access to best practices to improve productivity, natural disaster warning and mitigation, life-long learning, education improvement, free flow of government information, increased government transparency, good price for food products, forecast and Information and Awareness ion, access to finance information (credit and payment), tourist information and entertainment information (TV show, sports, movies, music, newspaper and books) emerge. These will result in sustainable development in emerging economies.

#### **Electricity Scenarios in Emerging Economies**

All emerging economies are blessed by enormous non-renewable energy resources such as petroleum, natural gas, coal and uranium and renewable energy resources such as solar energy, wind, geothermal and hydropower. However, the status of electricity in both urban and rural areas in these countries does not reflect the enormous resources they have although the magnitude varies considerably from one country to another. Due to variation in technology, economic growth and the type of energy sources, the dominant energy sources for electricity also varies from one country to another. For example the report from indicates that in 2003, 66% of total production of electricity in Russia came from natural gas while the share for hydro electrical power and nuclear power was 17% and 16%, respectively. In 2008, hydropower was the main source of electricity (72.6%) in Brazil, followed by thermoelectricity generation (14.7%). In the remote isolated villages, electricity is supplied through decentralised small diesel plants. However, the cost of electricity generated from diesel power plants in rural areas is high due to high costs of fuel and transportation. Access to electricity in rural areas has widened strongly throughout the past years. By 2007, 55.35 million out of a total 56.34 million permanent residences were connected to electric energy. In 2009, the overall Brazilian electrification rate reached 97.8%. The rate was 99.5% in urban areas and 88 % in rural areas, which means that over 80% of Brazil's population located in rural areas were without access to electrical power. According to OECD/IEA, in 2008, China had a total electricity production amounted to 3.45 trillion kWh, an increase of 5.6% compared to 2007. Thermal electricity from coal accounted for about 81% of total production, with hydropower accounting for about 17% and nuclear energy for 2%. The electrification rate in urban areas was 98%. In late-2007, a total of 11.5 million people had no access to electricity, with wide variation among provinces (China Mid and Long-Term Renewable Energy Development Plan by 2020). Latest statistics from the National Energy Administration indicated that in 2008, 2 million rural households still lacked electricity. Through the deployment of decentralized power systems, the government aims to supply 10 million people with electricity by the end of 2020. The government however expects that beyond 2020 some Chinese households will still be lacking electricity, indicating that these people will also still

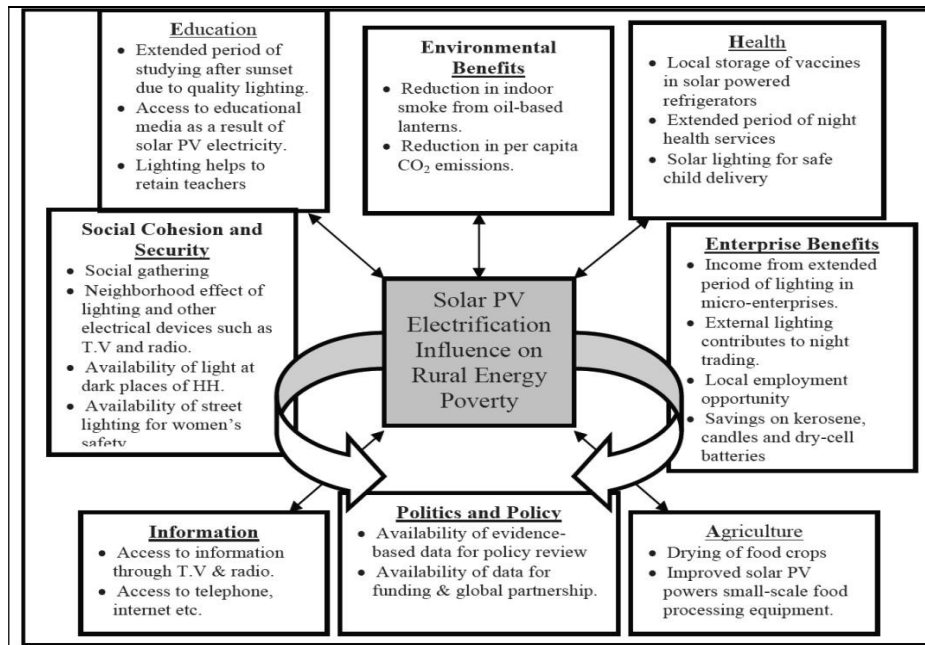
lack Information and Awareness As of mid-2009, 63.8% of the electricity in India was generated from thermal power plants, 52.19% by gas, 24.56% by hydroelectric power plants, 10.90% by gas, 8.82% by renewable energies, 2.73% by nuclear and 0.8% by oil . In 2005, a total of 412 million people in India had no access to electricity, with 380 million of them (92% of total population) living in rural areas and 32 million in urban areas . According to OECD/IEA recent report, the electrification rate in India in 2009 was 64.5%, with an urban electrification rate reaching 93.1% and a rural rate of only 52.5%. With the largest rural population in the world, India is facing a huge electrification challenge if the dream of achieving the Information and Awareness ed economic growth of over 5% by 2030 has to be met. In 2001, 93% of electricity in South Africa was generated from coal, with nuclear energy and hydropower accounting for the remaining 7%. In the same year, the national electrification level was about 66% with an average electrification level of 46% in rural areas and 80% in urban areas. According to OECD/IEA , South Africa achieved 75% electrification; with 88% urban and 55% rural populations who gained access to electricity services. It has thus become evident that each country is facing challenges in providing universal access to clean and affordable electricity which requires more effort and strategies. **Solar Electricity for Information and Awareness and Sustainable Development**

As shown in section 4, with the exception of Brazil, high percentage of electrical energy demands in emerging economies have been supplied by non-renewable energy sources (mainly thermal, coal and gas) which are environmental pollutant agent, not equally distributed and worse still, limited and their prices are increasing tremendously. On the other hand, the demand for electrical energy for sustainable development is likely to increase in these countries, both as a result of increase in population and expanding industrialization. Furthermore, a close attention should also be paid to the Information and Awareness s and electricity divide between urban and rural areas. In terms of electricity, it has been reported that extending grid electricity to many rural villages in most emerging economies would not be economically viable in the near future and in some villages not practically possible due low load densities, low capacity utilisation rates, high electricity line losses and requirement for accompanying infrastructure development such as roads This suggests that the rural communities in these countries will continue to live without Information and Awareness for several decades; a situation that not only deteriorates their economic growth but also threatens the process of climate change mitigation. To address these challenges, it is important that low carbon emitting electrical energy sources must be given high priorities in emerging economies. Solar electricity is clearly one of the most promising prospects to these problems since it is non-pollutant, renewable and available to all emerging economy countries, although with varying intensity.

Electricity from solar energy is obtained through stand-alone Photovoltaic (PV) system which is defined as a small autonomous energy station, powered by a PV module, that provides electricity for basic services such as lighting, radio, television, computer, internet devices and operation of small appliances. For a household or building with grid electricity, solar electricity acts as back-up electricity. Stand-alone solar system consists of a solar module which converts the solar radiation into electricity; rechargeable battery which stores the generated energy for use in the night and during cloudy days; charge controller which controls the charging of the battery; an alternative current (AC) inverter to covert direct current (DC) to AC current, information and Awareness interconnecting wires and PV mounting rack. It may also include circuit breaker to prevent the cabling from overloading. All emerging economies recognize the importance of expanding access to modern energy services for their rural areas through renewable energy sources, particularly solar electricity.

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For example, the largest existing markets for solar home systems are India (450,000), China (150,000), Kenya (120,000), Morocco (80,000), Mexico (80,000), and South Africa (50,000). Kenya and China are the fastest growing markets, with annual growth rates of 10%–20%. Other notable emerging markets for solar electricity include Argentina, Bangladesh, Botswana, Bolivia, Brazil, Dominican Republic, Indonesia, Namibia, Nepal, Philippines, Sri Lanka, Tunisia, and Zimbabwe. There is evidence that access to electricity services in rural areas in the developing world and emerging economies has significant impact on the standard of living of rural communities. Some of the benefits are summarized in figure 1 and also can be found in other sources. In addition, providing inexpensive charging solution through the use of solar electricity increases mobile phone access and improve social and economic situation in the rural areas. It has been found that solar charger extends service availability and boost average revenues per user by 10–14%

**Figure 1** Multi-sectoral linkages of solar electricity influence on quality of life in off-grid rural communities. Despite these impacts, which will be the cases for Information and Awareness and sustainable development, solar electricity in rural areas in emerging economies has not been utilized as much as it should have been due to:

Lack of qualified solar technicians which result into system failures leading to high cost for users, disappointment with the solar electricity and a strong negative about the technology, Lack of established markets and establishes business modes, Lack of renewable energy education at various levels. Studies have found that education systems in most emerging economies have been designed along established non-renewable energy sources. The reason is that there is considerable uncertainty about the path of renewable energy sources as a major component in the energy sector, Uncertain or unrealistic grid expansion plans, High cost of the technology, particularly the cost of PV modules, Lack of financing mechanisms for rural communities. Funding either from governments, domestic financing institutions or international organisations (through cooperation) have been seen as a driving force in rural solar electricity projects due to the fact that it is difficult for rural electrification projects to be accomplished by profit companies as there are no immediately returns, and Other constrains such as subsidies, tariff structures and import duties.

### Development of Solar Power Generation

For significant penetration of solar electricity in rural areas and urban areas without reliable grid electricity, which will in turn, support extensive use of Information and Awareness as well as accelerating sustainable development and reducing the effect of climate change, we therefore recommend the following: Training skillfully qualified solar electrical technicians, in both urban and rural areas, who will be able to design, install and provide timely solar system maintenance. Renewable (solar) energy courses should be introduced to all

people, at all education levels and through all possible modes of education. The content of the courses and the mode of delivery should vary with the age of the learner. The government should put policies and programs in place that will maximize private, community and public investment in rural solar electricity. The government should support policies that encourage community investment in stand-alone solar systems including community finance funds and training. Since stand-alone solar system can be built in phases, we also recommend the use of 'modularity approach' for low income families. Modularity approach is the method of adding components (particularly the PV modules, inverter and storage battery) to the existing system depending on financial availability. It may also include a process of purchasing one component at a time, until the whole system is complete. This has not been done in the past due to lack of basic knowledge in solar electricity as most people regards stand-alone solar system as a 'generator'. For solar electricity to be available for use by everyone the government of each country must view electricity as a basic need the way water, air and roads are perceived. That means it has to be free or at marginal cost or provided as part of public infrastructure.

### CONCLUSIONS

In emerging economies, Information and Awareness is growing rapidly, but its effects to sustainable development have been heavily concentrated amongst the few due to fact that it is not accessible to many people who live in rural areas. In order to make INFORMATION AND AWARENESS truly available, accessible and affordable to the majority, especially in rural areas, one of the important factors which should be tackled before the emerging economies can reap the benefits of Information and Awareness is clean, reliable and available electricity. This has the potential to lead to expanded and sustained use of e-Learning for all sectors and at all levels of engagement with knowledge and skills acquisition, thereby promoting education for all and improving the workforce through lifelong learning. Solar electricity has been identified as the best option to these problems as well as accelerating sustainable development and reducing the effect of climate change. However, some constrains must be addressed properly before its effect can be clearly seen. These include qualified solar technicians, established PV markets and business modes, renewable (solar) energy education, appreciation of solar electricity as one of the major energy component, lowering initial cost of the PV technology, availability of finance mechanisms for customers, import tax exemption and regarding electricity as one of the basic needs like food, shelter and cloth.

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