

Environment and Development: Biomass for Future

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Abstract:

People are relying upon oil for primary energy and this will continue for a few more decades. Other conventional sources may be more enduring, but are not without serious disadvantages. The renewable energy resources are particularly suited for the provision of rural power supplies and a major advantage is that equipment such as flat plate solar driers, wind machines, etc., can be constructed using local resources. Without the advantage results from the feasibility of local maintenance and the general encouragement such local manufacture gives to the buildup of small-scale rural based industry. This communication comprises a comprehensive review of energy sources, the environment and sustainable development. It includes the renewable energy technologies, energy efficiency systems, energy conservation scenarios, energy savings in greenhouses environment and other mitigation measures necessary to reduce climate change. This study gives some examples of small-scale energy converters, nevertheless it should be noted that small conventional, i.e., engines are currently the major source of power in rural areas and will continue to be so for a long time to come. There is a need for some further development to suit local conditions, to minimize spares holdings, to maximize the interchangeability of the engine parts, and of the engine applications. Emphasis should be placed on full local manufacture. It is concluded that renewable environmentally friendly energy must be encouraged, promoted, implemented and demonstrated by a full-scale plant (device) especially for use in remote rural areas.

1. **Keywords:** Emissions; Energy Efficiency; Environment; Renewable Energy Technologies; Sustainable Development

2. Introduction

Power from natural resources has always had great appeal. Coal is plentiful, though there is concern about despoliation in winning it and pollution in burning it. Nuclear power has been developed with remarkable timeliness, but is not

universally welcomed, construction of the plant is energy-intensive and there is concern about the disposal of its long-lived active wastes. Barrels of oil, lumps of coal, even uranium come from nature but the possibilities of almost limitless power from the atmosphere and the oceans seem to have special attraction. The wind machine provided an early way of developing motive power. The massive increases in fuel prices over the last years have however, made any scheme not requiring fuel appear to be more attractive and to be worth reinvestigation. In

considering the atmosphere and the oceans as energy sources, the four main contenders are wind power, wave power, tidal and power from ocean thermal gradients. The sources to alleviate the energy situation in the world are sufficient to supply all foreseeable needs. Conservation of energy and rationing in some form will however have to be practiced by most countries, to reduce oil imports and redress balance of payments positions. Meanwhile development and application of nuclear power and some of the traditional solar, wind and water energy alternatives must be set in hand to supplement what remains of the fossil fuels. The encouragement of greater energy use is an essential component of development. In the short-term, it requires mechanisms to enable the rapid increase in energy/capita, while in the long-term it may require the use of energy efficiency without environmental and safety concerns. Such programmes should as far as possible be based on renewable energy resources. Large-scale, conventional, power plant such as hydropower has an important part to play in development although it does not provide a complete solution. There is however an important complementary role for the greater use of small-scale, rural based power plants. Such plants can be employed to assist development since they can be made locally. Renewable resources are particularly suitable for providing the energy for such equipment and its use is also compatible with the long-term aims.

In compiling energy consumption data one can categorise usage according to a number of different schemes:

- Traditional sector- industrial, transportation, etc.
- End-use- space heating, process steam, etc.
- Final demand- total energy consumption related to automobiles, to food, etc.
- Energy source- oil, coal, etc.
- Energy form at point of use- electric drive, low temperature heat, etc.

3. Methods and Materials

The increased availability of reliable and efficient energy services stimulates new development alternatives. This communication discusses the potential for such integrated systems in the stationary and portable power market in response to the critical need for a cleaner energy technology. Anticipated patterns of future energy use and consequent environmental impacts (acid precipitation, ozone depletion and the greenhouse effect or global

warming) are comprehensively discussed in this chapter. Throughout the theme several issues relating to renewable energies, environment, and sustainable development are examined from both current and future perspectives. It is concluded that green energies like wind, solar, ground-source heat pumps, and biomass must be promoted, implemented, and demonstrated from the economic and/or environmental point view. The key factors to reducing and controlling CO₂, which is the major contributor to global warming, are the use of alternative approaches to energy generation and the exploration of how these alternatives are used today and may be used in the future as green energy sources. Even with modest assumptions about the availability of land, comprehensive fuel-wood farming programmes offer significant energy, economic and environmental benefits. These benefits would be dispersed in rural areas where they are greatly needed and can serve as linkages for further rural economic development. There is strong scientific evidence that the average temperature of the earth's surface is rising. This was a result of the increased concentration of carbon dioxide (CO₂), and other greenhouse gases (GHGs) in the atmosphere as released by burning fossil fuels. This global warming will eventually lead to substantial changes in the world's climate, which will, in turn, have a major impact on human life and the environment. Energy use reductions can be achieved by minimizing the energy demand, by rational energy use, by recovering heat and the use of more green energies. This study was a step towards achieving this goal. The adoption of green or sustainable approaches to the way in which society is run is seen as an important strategy in finding a solution to the energy problem.

4. Renewable Energy Potential

The increased availability of reliable and efficient energy services stimulates new development alternatives [1]. This communication discusses the potential for such integrated systems in the stationary and portable power market in response to the critical need for a cleaner energy technology. Anticipated patterns of future energy use and consequent environmental impacts (acid precipitation, ozone depletion and the greenhouse effect or global warming) are comprehensively discussed in this approach. Throughout the theme several issues relating to renewable energies, environment and sustainable development are examined from both current and future perspectives. It is concluded that renewable environmentally friendly energy must be encouraged, promoted, implemented and

demonstrated by full-scale plants (devices) especially for use in remote rural areas. Globally, buildings are responsible for approximately 40% of the total world annual energy consumption. Most of this energy is for the provision of lighting, heating, cooling, and air conditioning. Increasing awareness of the environmental impact of CO₂, NO_x and CFCs emissions triggered a renewed interest in environmentally friendly cooling, and heating technologies. Under the 1997 Montreal Protocol, governments agreed to phase out chemicals used as refrigerants that have the potential to destroy stratospheric ozone. It was therefore considered desirable to reduce energy consumption and decrease the rate of depletion of world energy reserves and pollution of the environment. One way of reducing building energy consumption is to design buildings, which are more economical in their use of energy for heating, lighting, cooling, ventilation and hot water supply. Passive measures, particularly natural or hybrid ventilation rather than air-conditioning, can dramatically reduce primary energy consumption. However, exploitation of renewable energy in buildings and agricultural greenhouses can, also, significantly contribute towards reducing dependency on fossil fuels. Therefore, promoting innovative renewable applications and reinforcing the renewable energy technologies market will contribute to preservation of the ecosystem by reducing emissions at local and global levels. This will also contribute to the amelioration of environmental conditions by replacing conventional fuels with renewable energies that produce no air pollution or greenhouse gases.

There is strong scientific evidence that the average temperature of the earth's surface is rising. This is a result of the increased concentration of carbon dioxide and other GHGs in the atmosphere as released by burning fossil fuels. This global warming will eventually lead to substantial changes in the world's climate, which will, in turn, have a major impact on human life and the built environment. Therefore, effort has to be made to reduce fossil energy use and to promote green energies, particularly in the building sector. Energy use reductions can be achieved by minimizing the energy demand, by rational energy use, by recovering heat and the use of more green energies. This study was a step towards achieving that goal. The adoption of green or sustainable approaches to the way in which society is run is seen as an important strategy in finding a solution to the energy problem. The key factors to reducing and controlling CO₂, which is the major contributor to global warming, are the use of alternative approaches to energy generation and the exploration of how these alternatives are used today and may be used in the future as green energy

sources [2]. Even with modest assumptions about the availability of land, comprehensive fuel-wood farming programmes offer significant energy, economic and environmental benefits. These benefits would be dispersed in rural areas where they are greatly needed and can serve as linkages for further rural economic development. The nations as a whole would benefit from savings in foreign exchange, improved energy security, and socio-economic improvements. With a nine-fold increase in forest – plantation cover, a nation's resource base would be greatly improved. The international community would benefit from pollution reduction, climate mitigation, and the increased trading opportunities that arise from new income sources. The non-technical issues, which have recently gained attention, include:

- Environmental and ecological factors, e.g., carbon sequestration, reforestation and revegetation.
- Renewable as a CO₂ neutral replacement for fossil fuels.
- Greater recognition of the importance of renewable energy, particularly modern biomass energy carriers, at the policy and planning levels.
- Greater recognition of the difficulties of gathering good and reliable renewable energy data, and efforts to improve it.
- Studies on the detrimental health effects of biomass energy particularly from traditional energy users.

The renewable energy resources are particularly suited for the provision of rural power supplies and a major advantage is that equipment such as flat plate solar driers, wind machines, etc., can be constructed using local resources and with the advantage resulting from the feasibility of local maintenance and the positive influence such local manufacturing has on small-scale rural based industry. This study gives some examples of small-scale energy converters, nevertheless it should be noted that small conventional, i.e., engines are currently the major source of power in rural areas and will continue to be so for a long time to come. There is a need for some further development to suit local conditions, to minimise spares holdings, to maximize the interchangeability of the engine parts and of the engine applications. Emphasis should be placed on full local manufacture [3].

5. Energy Consumption

Over the last decades, natural energy resources such as petroleum and coal have been consumed at high rates. The heavy reliances of the modern economy on these fuels are bound to end, due to their environmental impact, and the fact that conventional sources might eventually run out. The increasing price of oil and instabilities in the oil market has led to search for energy substitutes. Society and industry in Europe and elsewhere are increasingly dependent on the availability of electricity supply and on the efficient operation of electricity systems. In the European Union (EU), the average rate of growth of electricity demand has been about 1.8% per year since 1990 and is projected to be at least 1.5% yearly up to 2030 [4]. Currently, distribution networks generally differ greatly from transmission networks, mainly in terms of role, structure (radial against meshed) and consequent planning and operation philosophies.

5.1 The Future

- In the most of the developing countries, the governments acknowledge that, renewable energy can resolve many pressing problems. Yet, the matter stops at this level “Acknowledgement”. Much more is needed, like laws regulating and encouraging business, tax concessions, both to investors and customers, and most of all, a sustained, coordinated and well-planned official publicity campaign to enlight, inform and educate the public at a large.
- To avoid the problems of fuel altogether (uncertain availability and skyrocketing prices), and minimize spare-parts, solar and wind pumps are proposed to replace diesel engines in the predominant irrigation areas.
- Local manufacture, whenever possible, is to be emphasized to avail renewable energy devices since limited funds are the main constraints in commercialization and dissemination of the technology. Low cost devices as well as reliable devices have to be provided.
- Embarking on conservation energy and reduction of pollution of environment to be undertaken without delay:
 - To save fossil fuel for premium users/export.
 - To accelerate development of new and/or remote lands otherwise deprived of conventional energy sources.
 - As a preventive measure against shortage of future energy supply against prospective national energy demand.
 - Launching of public awareness campaigns among investor’s particularly small-scale entrepreneurs and end users of renewable energy technologies to highlight the importance and benefits of renewable.
- To direct Sudan resources away from feeding wars and the arms industry towards real development, this will serve the noble ends of peace and progress.
- The energy crisis is a national issue and not only a concern of the energy sector, and the country has to learn to live with the crisis for a long period, and develop policies, institutions and manpower for longer term, more effective solutions.
- To invest in research and development through the existing specialized bodies, e.g., Energy Research Institute (ERI).
- To encourage co-operation between nations, in fact will be much easier in this era of information and the communications revolution.
- Government should give incentives to encourage the household sector to use renewable energy technologies instead of conventional energy.
- Promotion of research and development, demonstration and adaptation of renewable energy resources (solar, wind, biomass, and mini-hydro, etc.) amongst national, regional, and international organisations which seek clean, safe, and abundant energy sources.
- Execute joint investments between the private sector and the financing entities to disseminate the renewables with technical support from the research and development entities.
- Promotion of the general acceptance of renewable energy strategies by supporting comprehensive economic energy analysis taking account of environmental benefit.
- Availing of training opportunities to personnel at different levels in donor countries and other developing countries to make use of their wide experience in application and commercialisation of renewable energy technologies.
- To encourage the private sector to assemble, install, repair and manufacture renewable energy devices via investment encouragement, and more flexible licensing procedures.

5.2. Recommendations

Recommendations may be classified into three broad categories: policy, institutional and enterprise levels.

5.2.1. Policy Level Action

At the policy level, the following aspects may be considered:

- Giving priority to pollution prevention rather than pollution control.
- Using market based instrument complements to command and control measures.
- Recognizing small and medium scale industry (SMI) as a special case in environmental legislation.
- Adopting proper industrial sitting and relocation policies.

5.2.2. Institutional Level Actions

- Setting up environmental extension services for small and medium scale industry (SMI).
- Creating information dissemination cells.
- Facilitating common waste treatment facilities.
- Promoting outreach from large plants to small and medium scale industry (SMI).

6. Enterprise Level Actions

- Supporting the demonstrations of measures that are of financial and environmental benefits, for pollution prevention, by enterprises.
- Promoting self-initiated demonstrations by enterprises through the provision of grants to them.

7. Conclusion

Sudan as an agricultural country has a good rational of energy from agricultural residues, forestry resources, and animal wastes. Sudan has an excellent annual mean solar radiation of ($5.44 \text{ kW h m}^{-2} \text{ day}^{-1}$) which could be of strategic importance in substituting for energy from oil, electricity, wood and charcoal; in assisting in rural development, and in improving the quality of life in rural areas. Sudan is rich in wind; about 50% of Sudan's area is suitable for generating electricity (annual average wind speed is more than 5 ms^{-1}), and 75% of Sudan's area is suitable for pumping water (annual average wind speed $3\text{-}5 \text{ ms}^{-1}$). Production of bio-fuels such as ethanol from sugarcane, takes advantages of year-round cultivation potential in a tropical country like Sudan. Benefits extend from local to regional to national to global. Local rural economies benefit through new economic opportunities and employment in the agricultural sector. Urban regions benefit through cleaner air and health improvements. The nation benefits through substituting domestic resources for costly imported

gasoline. The world benefits from reduced CO_2 emissions. In a country with a population dense, there are extreme pressures on energy and waste systems, which can stunt the country's economic growth. However, Sudan has recognized the potential to alleviate some of these problems by promoting renewable energy and utilizing its vast and diverse climate, landscape, and resources, and by coupling its solutions for waste disposal with its solutions for energy production. Thus, Sudan may stand at the forefront of the global renewable energy community, and presents an example of how non-conventional energy strategies may be implemented. Sudan's energy system is in the midst of a transition away from fossil fuels towards a more sustainable energy system based on biomass and other renewable options. Biogas plants offer renewable options that are relatively inexpensive and well suited to rural areas. Hydropower will continue to play a role in smaller-scale energy supply. There is also potential for expanding wind and solar applications in Sudan, particularly in rural areas. Energy efficiency brings health, productivity, safety, comfort and savings to the homeowner, as well as local and global environmental benefits. The use of renewable energy resources could play an important role in this context, especially with regard to responsible and sustainable development. It represents an excellent opportunity to offer a higher standard of living to the local people, and will save local and regional resources. Implementation of renewable energy technologies offers a chance for economic improvement by creating a market for producing companies, maintenance and repair services.

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