SOCIAL ACCEPTANCE OF RENEWABLE ENERGY: THE CASES OF EUROPE AND DEVELOPING AFRICA?

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Current energy systems are in most instances not fully working sustainably. The provision and use of energy only consider limited resources, risk potential or financial constraints on a limited scale. Furthermore, the knowledge and benefits are only available for a minor group of the population or are outright neglected. The availability of different resources for energy purposes determines economic development, as well as the status of the society and the environment. The access to energy grids has an impact on socio-economic living standards of communities. This not fully developed system is causing climate change with all its related outcomes. This investigation takes into consideration different views on renewable energy systems – such as international discussions about biomass use for energy production, “fuel versus food”, biogas use – and attempts to compare major prospects of social acceptance of renewable energy in Europe and Africa. Can all obstacles to the use of renewable energy be so profound that the overall strategy of reducing anthropogenic causes of climate change be seriously affected?

Keywords: renewable energy, energy production, future technology, society

JEL-codes: D71, O13, Q01, R11

1. INTRODUCTION

Biomass is any material that is or was alive. Trees, crops, garbage, and animal waste all represent potential biomass. The energy in biomass is produced by the sun and stored in plant leaves and roots by the sun's energy in various forms of sugar. It is possible to convert this energy from biomass to gas or liquid fuels. As the biomass and its stored energy is renewable, the natural production of biomass takes only a relatively short time. Biomass can also be used to produce biogas, an energy-rich gas. Biogas is similar to natural gas used in stoves and furnaces. In India, farmers already use garbage and animal waste to produce their private biogas for heating, light and cooking. They store the waste in anaerobic tanks and decompose the organic material. Most of the waste that is left after the biomass decomposes can be used as fertilizer to grow more crops.

The liquid fuel biodiesel can be made by the chemical reaction of alcohol with vegetable oils, animal fats, or greases like recycled restaurant grease. Nowadays, most of the available biodiesel is produced from soybean oil. Biodiesel exceeds normal general diesel in cetane number, the performance rating of diesel fuel which is important for superior ignition. It has a higher flashpoint which makes it more versatile, but also causes safety concerns. Horsepower, acceleration, and torque are comparable to diesel. Nevertheless, biodiesel has the highest BTU content (British Thermal Unit) of any alternative fuel but slightly less than diesel. The desirable characteristics of biodiesel are renewability, non-toxicity, and biodegradability. Compared to diesel, biodiesel reduces sulphur oxide (SO_x) emissions by 100 percent, particulates by 48 percent, carbon monoxide (CO) by 47 percent, unburned hydrocarbons by 67 percent, and hydrocarbons by 68 percent. As a side effect, nitrogen oxides (NO_x) emissions, however, increase slightly. Biodiesel blends generally reduce emissions in proportion to the percentage of biodiesel contained in the blend. When biodiesel is burned, it releases carbon dioxide (CO_2), which is a major anthropogenic cause of climate change. However, biodiesel is made from crops that absorb carbon dioxide and release oxygen. This cycle would maintain the balance of CO_2 in the atmosphere, but because of CO_2 emissions from farm equipment and production processes of fertilizers and pesticides, biodiesel actually adds more CO_2 to the atmosphere than it removes.

One concern with the use of biomass, biodiesel and biogas is that the required farmland for growing the biomass might compete with land needed to grow food for countries suffering from food insecurity. This could result in increasing food prices. It is interesting to note that in South Africa (SA) the "fuel versus food" debate has been stopped by the government by implementing legislation that no agricultural crop can be used for biodiesel production – interesting irony. This led to the initiation of much research into the potential of using algae (waste from the cooling towers of SASOL and ESKOM) i.e. energy suppliers that burn fossil fuels.

2. RENEWABLE ENERGY IN EUROPE

In Spain, biogas use has been increasing since a royal decree in 2007 compensated one kilowatt-hour (kWh) with 13.07 Eurocent (ct). Until end of 2011, the compensation was lifted to 14.11 ct/kWh, whereas the approval procedure became more complicated with the result that only 16 functioning plants were installed in Spain in 2012 with a capacity of only 10 Megawatt (MW) of power. Governmental plans provided 216 MW until 2020. Overall, the situation in Spain is daunting due to missing governmental investment incentives (Fachverband Biogas 2013a).

Greece in contrast has 41 MW installed from biogas plants in 2010. But this power production is based only on landfill gas and digester gas, but not on anaerobic fermentation from farming. Since 2010, a price of 220 Euro/MWh is guaranteed by Greek law which remains the highest price in Europe. Since then several approvals have been handed out and the majority of plants have been built by the end of 2011 and early 2012. The most important duty of the industrial union Biogas is the educational advertising of the communities (Biogas Fachverband 2012a).

Finland had the first biogas plants already between 1902 and 1904. In 1940, about 100 vehicles were fueled by biogas. After 1993 and the Rio convention on climate change, the captivation of biogas was ruled by law so that about 35 plants with about 110 million m^3 capacity per year were constructed. In 2009, about 60 percent of biogas was used for energy production of about 290 Gigawatt-hours (GWh). The annual capacity of fuel from biogas was 8 GWh in 2011 with about 15 filling stations in Finland. Nevertheless, the production of biogas from wastewater treatment plants is rare. Most of the biogas resources are almost unused (Biogas Fachverband 2012b).

France has a focus on bio-methane. The tariff is a combination of a basic tariff and a bonus which deviates related to the used substrate. This could be a stimulation for gas producers to increase bio-methane production for biofuel. This tariff requires governmental subsidies. Therefore, the French government has total control over the amount and quality of biogas produced nationally. This market is only effective if governmental subsidies will continue to be paid (Biogas Fachverband 2011a).[1]

In Turkey, farming and animal breeding are one of the most successful economic sectors. Specifically, intensive cattle and poultry production are causing the most serious environmental problems. Poultry dung is mostly used as fertilizer in farms but liquid manure from cattle mostly ends in the sewage system or in local water bodies. In addition to this environmental pollution, greenhouse gases (GHG) are emitted in alarming amounts. Together with waste production, the total annual amount of biogas production is about 2.6 billion m^3. Since January 2011, the benefit for power from biomass is 10 ct/kWh. This price will be fixed for all plants which were functioning between 2005 and 2015. From 2015, the price will be discussed again but will not be higher than now. In 2011, about 37 biogas plants exist and are connected to the power grid – only one of them is an exclusively agricultural biogas plant. In collaboration with Germany, a holistic biogas concept was invented with the aim to produce power from animal excrements with additional fertilizer production by digestate. This reduces GHG emissions, improves soil fertility, and minimizes the pollution of water bodies (Biogas Fachverband 2011b).

Ukraine is generating only 0.35 percent of its power production from renewable energy which is highly expandable. In the agricultural sector, only 5 biogas plants exist with a capacity of only 1 MW. In 2013, a law for biogas production was published which regulates energy prices, and especially the price for biogas with 12.39 ct/kWh fixed for the next 20 years. Ukraine has an agricultural area of about 33 million ha of which about 5 million ha are not in use. Mostly extensive agricultural structures are dominating the sector with the highest export of grain worldwide. In addition to agricultural waste, industrial and organic waste is also fermented. Experts say that it is possible to produce up to 26.5 billion m^3 bio-methane per year. With this potential, Ukraine could be independent from Russia in terms of gas. Currently, there are no facilities available to feed the local power grid. The aim is to establish a bio-methane program to feed the national grid with up to 3 to 5 billion m^3 per year by 2020. This amount of biogas is mainly for direct local use but also for international exports, mainly towards the EU. To summarize, it is clear that Ukraine has a huge potential in producing

[1] Additionally, it is important to mention that the average emission from a gas power plant in Europe is about 0.72 Mt CO_2/year (0.36 tCO_2/MWh, corresponding to a thermal efficiency rate of 55%). This is important to mention in relation with the educational advertising for the public living close to these kind of power plants (CDC 2014).

biogas. Some obstacles still exist, but are mostly related to the lack of knowledge. Practical samples will convince all doubt (Biogas Fachverband 2013b).[2]

3. RENEWABLE ENERGY AND TECHNOLOGY IN AFRICA

In terms of the energy consumption three regions can be identified on the African continent. Coal is dominant in South Africa, North Africa relies on oil and gas, while biomass application is typical in the Sub-Saharan Africa (SSA) region (Karekezi 2002). The dependency on biomass has a major impact on the poorest societies and the environment as a whole. For example, it causes respiratory illness and encourages land degradation. However, despite the negative effects of biomass consumption, many potentials and benefits can be derived such as the cogeneration of electricity. Relative to the available hydropower capacity in Africa, its utilization is the lowest in the world. The unexploited geothermal energy provides potentials for generating renewable energy in the continent.

Exploiting renewable energy incorporates several advantages for developing countries. Production and consumption of this kind of energy decrease GHG emissions and positively impact the economies of the concerned countries in terms of production, trade, and job creation (Aïssa 2014)

Biomass. Even if South Africa's contribution to global GHG emissions is modest (1.1% in 2005), its per capita emission rate of 9 tons of CO_2 per person exceeds the global average (5.8 tons CO_2 per person) and is about six times higher than the average for Sub-Saharan Africa (SSA) (1.4 tons CO_2 per person). The "food, energy/development and environment trilemma" (Tilman et al. 2009), as it relates to biomass production and organic waste management, is therefore particularly relevant within an African context. Some two billions people around the

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[2] The total opposite is the example of biogas use in the Philippines. The technique is well-known and the potential of using biogas is high. Only small private plants – about 1,000 plants – are established and the production is only used in private kitchens for cooking or as a source of power. For an effective production, more than 20 cattle units are necessary. The feeding of the governmental power grid is not common at all. The Philippine government has the aim to raise the part of renewable energy of total power consumption and especially the use of biogas in the near future. Current biogas plants are producing about 26.46 MW. Until 2015, the government is planning to raise the power from biomass up to 277 MW where 22.45 MW are only produced from biogas. The Philippines already established some pilot projects for biogas production but technical problems in gas capturing and high investment costs for different provinces restrained most of the projects so far. In 2008, the Philippines established a renewable energy law (RA9513) with fiscal benefits – as tax incentives and tax-free technology import – and also non-fiscal benefits, like national grid feeding compensations of about 12 ct/kWh which is a very positive perspective for the Philippines biogas market (Biogas Fachverband 2012c).

world, including 89 percent of the Sub-Saharan African population, use biomass for cooking and heating. Although energy access is an important aspect of comprehensive development, access alone does not reflect the sustainability of that development, especially in terms of the use of global atmospheric space. The world has a finite carbon budget which needs to be equitably shared. Clearly, it is incumbent on developed nations – that currently over-occupy the carbon space – as well as developing nations to shift to a low-carbon economy. Eighty five percent of the people in Sub-Saharan Africa rely on biomass for energy. In a quest for modern energy, 70 percent of household income is spent on energy (diesel, kerosene, charcoal); 0.4 million hectare forests are cleared each year in Africa. Furthermore, SSA largely depends on biomass and its associated products, the production of which (like charcoal and the use of fuel wood) are inefficient. As a result, deforestation is rampant. It is also worth noting that exposure to indoor pollution is globally responsible for about 1 to 2 million premature deaths and a substantial portion of these deaths occur in SSA. So, if properly designed and used, a biogas digester mitigates a wide spectrum of environmental undesirables: it improves sanitation; it reduces greenhouse gas emissions; it reduces demand for wood and charcoal for cooking, and therefore helps preserve forested areas and natural vegetation; and it provides high-quality organic fertilizer. From the developing world's perspective, the greatest benefit of biogas may be that it can help alleviate the very serious problem of poor indoor air quality (Brown 2006).

Solar energy. The economic growth of developing countries is primarily based on the consumption of fossil energy. The available energy systems contribute directly to the economic and social improvement of the countries. The volatility of price and the decreasing shortage of fossil energy have impacts on the sustainability of the consumption. Many requirements should be considered to use fossil energy or to find substitute resources, like cost, pollution, stability of supply, efficiency, and the available technology. The needs for increasing economic indicators – like reducing carbon emissions – and the necessary energy supply should be assured in developing countries (Suberu et al. 2013). The natural solar radiation endowment as one of the main sources of energy is not fully exploited in SSA. This energy would be enough for the SSA households to use appliances in their houses; the irradiation exceeds the daily domestic load requirements (Mohammed et al. 2013). Solar power radiation is expressed in Photovoltaic (PV). The average intensity of solar power radiation is between 3,000 and 7,000 $W/h/m^2$. As a result of the lack of proper technology, solar energy consumption is limited in the African countries except in South Africa, Nigeria, Ghana, Kenya, and Mauritius. Incentives for programmes for exploitation of solar energy potential are missing in African countries, although this source would be a solution for many households in rural settlements.

Wind energy. Wind is another alternative source for energy production. Wind energy provides great potential for territories where velocity is sustainable and where any of grid electricity is inaccessible. In SSA, wind energy has some disadvantages compared to solar or biomass power: as most of the SSA countries are landlocked, wind speed is low and the investment in wind energy technologies is very modest.

Water energy. Hydropower is the fourth source of renewable energy. This type of energy is produced from any type of fluid body, like rivers or lakes. The hydroelectric power turbine converts water energy into electrical energy. In SSA, the potentials are available for hydro-energy. Whilst the necessary dams are available, only a few of them are able to produce cost-effective electricity. The increasing tendency and the needs for using green and sustainable energy urge harnessing hydroenergy. Globally, 16 percent of the power supply is supported by this technology. Only 8 percent of hydropower potential is discovered in the African continent. The available potentials are equal with the total electricity consumption of four European countries: France, Germany, United Kingdom, and Italy. Half of this potential is available in the Democratic Republic of Congo (Aïssa 2014. Suberu et al 2013).

4. SOCIAL IMPACTS AND OBSTACLES

Despite all positive aspects and benefits of the potential biomass use and biogas production described above, negative aspects are also available. As usual, this market also depends on supply and demand. If a market for goods is easy accessible and potentially derived benefits have higher value than the own consumption, farmers will rather sell products for the benefit. Many studies have substantiated these facts (Susanti 2012). The most common observed side effect is the long-term degradation of farmland due to over-exploitation in striving for greater benefits (Susanti 2012).

If the use of biomass and biogas production is limited to mainly self-utilization, then these options are more than efficient with no significant unintended negative consequences. However, if it is seen as a commercial product for the market, then the effects could be more negative.

Internationally, the dilemma of competition between biomass for energy production and biomass for nourishment has been exhaustively discussed. Therefore, it is very important that the input for the production of biogas be manure and maize silage (Figure 1) – input substrate without any valorisation potential. If production is for personal use only, then no criticism can be made anyway.

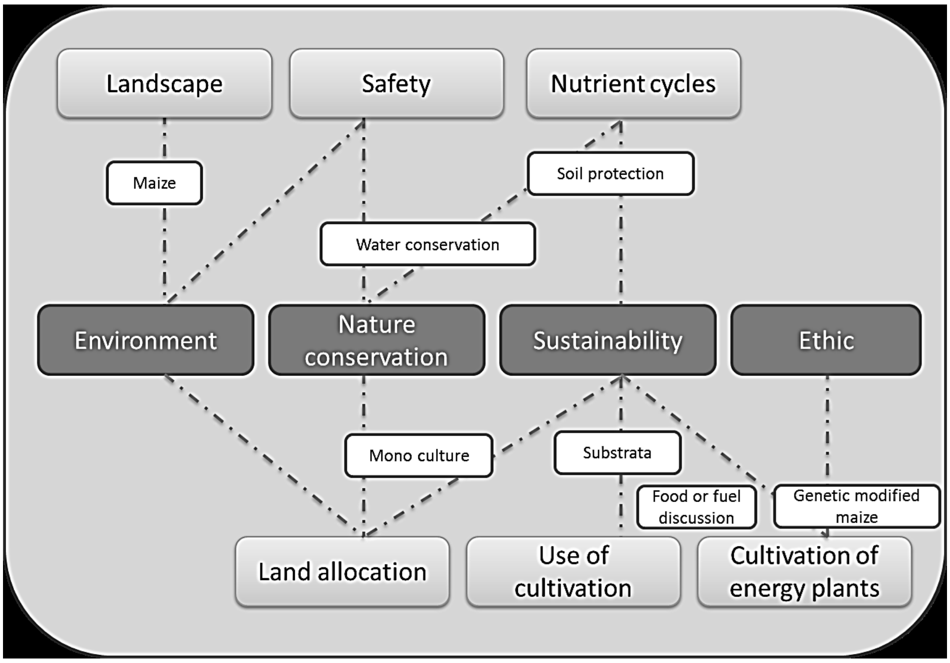

Figure 1. Potential effects of biogas plants

Source: Fraunhofer (2012)

Globally, the importance and acceptance of biogas plants is varying. On the one hand, this technology is a huge bonus for countries with either high farming potential or with high amounts of organic waste and biomass. On the other hand, the discussion on food security in the context of biomass use is constricting these benefits. Additional governmental benefits – like tax incentives or subsidies – can even make investments in biogas and biomass use more complicated.

The technology for the use of renewable energy can modify the use of land or the landscape. Local energy production is more decentralised and considers the needs of local consumers. This consumption should be balanced by gird networks between local consumption and country demand. Local energy production and distribution have some positive technical advantage as well as economic impact. The decreasing of losses, as the distribution over long distance and the availability of renewable sources, can modify the industrial patterns locally. The environmental concerns of renewable sources should be the more decentralised supply of energy with their own technological solutions that have additional impact on the use of solar cells and the use of biomass for heating and energy production (Elliot 2000).

Wüstenhangen et al. (2007) made some investigations into the relationships among stakeholders and policy makers. They examined the mode and method of the contribution to the social acceptance and the public attitude. In case of wind power, they found a strong support of technology innovation to use renewable energy. It was pointed out that many approaches influence the acceptance of renewable energy application such as public, market and political as well as regulatory acceptance. Kerekes and Luda (2011) defined the decision on renewable energy as "energy security decision game" and evaluated wind turbines as a reasonable choice. They concluded that for taking part in the decision processes, knowledge and competence are necessary for the final votes.

In their study, Edenhofer et al. (2013) intend to make a link between the economics of renewable energy, the technology behind the energy, and policy decisions. They set up a model to estimate the economic potential of renewable energy. The basic concept of this model was that there are different social objectives. They found that the technological choice is determined by the location and timing reflected by policy. The policy choice is usually based on the avoidance of climate externalities caused by fossil fuel. Today the debates are on the possible additional benefits of the development of renewable energy technology. Most industrialised countries are dependent on the use of fossil energy, like fossil oil. The rising price of fossil energy has a potential to increase renewable energy consumption in the transportation sector by the use of biofuels or electrification as examples. The application of renewable energy in the electricity and heating sector contributes to the substitution of fossil energy and contributes to the energy security. The stimulus of subsidising the renewable energy deployment creates new jobs and can be a driving force of economic growth as well as decreasing harmful emissions. The renewable energy utilization contributes to the reduction of local environmental damages – such as environmental degradation and local air pollution. The consumption of renewable energy supports social and economic development. Results are the reduction of poverty and unsustainable development practices due to the independence from traditional fuel supply. Kerekes (2011) emphasised the importance of states in preserving the environment over investments to compensate environmental damages caused by business activities.

Kosenius and Ollikainen (2013) emphasised the differences of societal and environmental effects of renewable energy. To get financial information on people's preferences, they examined different renewable energy, like wind power, hydropower, energy from crops and wood. The focus was the impact of four types of renewable energy production on biodiversity, jobs, carbon emission and the electricity costs of households in Finland. They revealed the determinants of renewable energy choice as opposed to traditional energy. High income, males, young age and environmental consciousness strongly determine the consumption of renewable energy. Stated preferences determine the willingness to pay for renewable energy as well. The choice between the available energy sources is determined by the level of understanding of the environmental impact of the energy sources, the valuation of these sources, and the marginal rate of valuation. The willingness to pay is positive in the society. The factor analysis pointed out a non-consensual basis among citizens towards GHG emissions and their climate change effects. The part of the society which has a positive attitude towards fighting climate change and renewable energy use is willing to pay more for their bills. In his study Schaltegger (2011) emphasised the role of applied media on social communities and sustainability.

Social well-being is determined by the perception of society members. The fair interaction among group members supports the acceptance of using natural resources or the investment into infrastructure development. If the final outcome is perceived as unfair or dissatisfying, the community could be divided, community members can protest against the applied solution. This community determines environmental management. Gross (2007) had threefold aims in a study: to discover the role of procedural justice, to explore the level of contribution to the increase of acceptance of the applied principles, and to explore the role of justice theory in decreasing conflicts. The study examined the possible application of wind energy technology in the Australian town of Taralga. The importance of perceived fairness has a central role on acceptance. It is clear that the involvement of community members in decision making processes strengthens the legitimacy of a decision on a wind power farm.

Elliot (2000) pointed out the market and the institutional and industrial obstacles in front of the introduction of renewable energy use in society. Beside the size of technology that is necessary for renewable energy, sources of renewable energy are more diffuse. The missing institutional and financial framework and infrastructure do not support the spread of renewable energy utilization. For the possible progress, a case from Denmark was presented as example, where existing technology supports the application of wind energy production. Denmark provides an example for a "bottom-up" approach of the local agricultural engineers to develop and increase the capacities of wind turbines instead of the construction of large megawatt sized turbines supported by governmental programme in the UK and USA where wind power generation does not meet the size of the megawatt machines. Small-scale development in the framework of local ownership contributes to the avoidance of opposition, supports easier fundraising for smaller development and encourages people to join the system more easily as the Danish case demonstrates.

Devine-Wright (2007) listed three groups of factors for public acceptance. Among the personal factors, socio-demographic characteristics show that the older generation has a high level of awareness and opposition towards renewable energy. The younger generation has modest awareness compared to the middle age group. Gender approach of strong support of renewable energy presents women domination, while men represent a higher level of awareness of the importance of renewable energy. In relation to support, a positive correlation was presented between social class and income.

Among the physical factors, the degree of awareness and understanding has no positive correlation with knowledge. Political beliefs have impact on the social acceptance of low carbon technology. Environmental concerns motivate people to accept the renewable energy technology and its applications. Local attachment shows a high level of motivation in technology development. It depends on the evaluation as a threat or opportunity for local supporters or opponents. Public acceptance is determined by the perceived fairness or the level of trust. Procedural justice explains the people's negative attitude towards wind energy in Germany or public opposition towards biomass from the people with low level of trust in the key actors in the UK. Contextual factors like technology, institution and spatial issues represent the public attitudes. The scale and type of technological factors – such as carbon technology, photovoltaic panels, wind turbines, and biomass fuelled plant – determine socio-economic and environmental impacts. Ownership structures, the distribution of benefits, and the use of participatory approach to public engagement provide the institutional factors of renewable energy.

Pegels (2010) identified the innovation system and the economy as the main barriers to renewable technology in South Africa. Coal abundance provides resources to electricity generation and fuel. This bias is reinforced in the country by the fact that a few number of providers and their monopolistic position in employ young graduates dominate the market. The market for renewable energy is very new. Although there is a fee in the tariffs of the country, the uncertain legislative procedure modifies the expected economic results of a project. The high volatility that leads to greater risk and the increasing cost of renewable energy characterises this market. The price of renewable energy is still one-third of the European price. The available solar radiation, the proportion of high radiation on the South African territory is the best source for electricity production in the world. The level of investment transmission line is high without national programmes and financial resources.

Selection and use of renewable energy are determined by rapid positive economic and social effects in Africa. In many cases, market failures – such as the lack of material suppliers, the small quantity requirements and its adaptation or the lack of qualified people – provide obstacles for the reasonable choice. In addition to these technical elements, political, social, environmental and economic sustainability as secondary elements determine the application of renewable technology. The institutional framework and the increasing choices in technology do not support the implementation. The selection procedure of renewable energy could be strengthened by education and training to increase the consumers' awareness of renewable energy technology. Government participation and its support over different programmes, like tax or duty reductions and financial support, are essential. The community involvement into the programmes, the first adapters of the innovation can contribute to the spread of innovative technology among the population (Barry et al. 2011).

Lombard and Ferreira (2013) examined the possible deployment of wind turbines in the West Coast Region of the Western Cape Province of South Africa. They pointed out the site dependency of the project and the attached interest in the natural environment of the communities. Such a project is not a simple application of the available technology but there are some other influencing factors like socio-economic factor that determine the level of acceptance of the renewable technology. The deployment can be considered as a threat for the natural environment and distorts the landscape identity. The environmental concern is about the local versus global interests of environmental preservation. A survey was conducted involving fifteen towns from the region to collect data. The support of the wind farm development projects from the residents' side was notable. The distance from their home strengthens their commitment to the project. Individuals support the wind energy if it is not deployed locally. In this empirical case, the ratio was one quarter of the residents. People expressed their place dependence and the special natural characteristics of their own living area. Residents neither think that the wind farm project would disrupt their living area nor improve the area around their living place. To fight against climate change and to decrease its effects, people are willing to sacrifice from their area for wind farms (Lombard – Ferreira, 2013).

Mallett (2007) investigated solar water heaters. A qualitative analysis was based on the examination of the different actors, such as technicians' representatives of the industry and local governments and the local community. The importance of decision making in social acceptance of renewable energy innovation was pointed out. As the basis of the research was Rogers' technology adaptation model for social acceptance, additional influencing factors on the acceptance, like complexity or relative advantages, were analysed. According to the representative of the industry, the penetration of solar technology's main obstacle is the passivity of the government, which has no intention to promote the new technology against the state run petroleum industry as one-third of government revenue comes from this industry. The community members ignore the technology – either they do not understand it or they do not have appropriate knowledge on it. They found the cost and the installation as key factors especially because of the delayed reward in time. Beside the pervious points, the lack of communication among the actors of the sector and potential consumers considerably affects the diffusion of the technology.

According to their research in Rwanda, Tanzania and Malawi, Barry et al. (2011) found several technological factors that strengthen people's confidence and acceptance of innovative renewable energy technology. All these factors relate to knowledge, amenities and costs to users such as maintenance, backside support, quality installation or the trainings for stakeholders, and the knowledge transfer for users. In relation to the site selection, the local champion is important. The communication in rural areas requires different modes that are adjusted to local possibilities. Key persons' satisfaction from the community who has the new technology is important to demonstrate the good performance of the unknown technology for the majority of community members. The economic advantage should be expressed by concrete cost and time savings and possible incomes for the household. The lack of financial basis is one of the main obstacles to install the new technology. That is why the government and financial organisation have an important role to play in launching renewable energy programmes in these countries.

5. CONCLUSIONS

Energy endowment has an inevitable role in a countries' economy and in their energy policy and planning. The availability of different resources determines economic development, and the status of the society and the environment. The access to energy grids has an impact on socio-economy living standards of communities. The running out of fossil energy and its harmful emissions encourage countries to turn to renewable energy and to support innovative technology for the consumption of this type of energy. To transform these natural resources into a valuable commodity, it simply has to be converted by transformation into usable energy for cooking or electricity and heating in the households.

International trends are to support countries by establishing a market for renewable production, with the aim of advanced energy production, resource efficiency, emission reduction – and it has to be balanced with the internationally supervised and important issue of food security.

The majority of people are averse to innovative solutions and refuse to accept different systems than their traditional ones. Prior to the introduction of renewable energy, the involvement of the public and especially the community members is of high importance. With direct communication, most of the rising uncertainties can be discussed and also mostly these problems can be solved upfront. Some of important criteria for wide spread acceptability in planning are as follows: precocious involvement of the public; an open conversation and realistic description of possible impacts. Involvement of supporters, clarification of exact location of the plant, cost-saving benefits of the project for the community, and options for cooperation add to the positive evaluation of renewable energy projects. Ideal for a smooth planning of a biogas plant is to embed them in the regional context, structures and processes at an early stage.

The main differences in using renewable technology between the two continents, Africa and Europe, are the level of development, exploited renewable energy, and the available technology. The governmental programmes can support community understanding and acceptance of the new technology. These initiatives have to be adjusted to community needs and the available resources in the territory.

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