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Knowledge network on sustainable household energy
in Southern and Eastern Africa

Scenario Analysis
TANZANIA

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An initiative of



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and Southern Africa (Zimbabwe/Mozambique)



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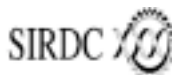
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Executive Summary

Tanzania is yet to have neither a strategy nor a comprehensive programme to address issues of household energy in an integrated manner. The country has recently reviewed energy policy and come up with a policy that has a strong focus on rural energy services improvement. Unfortunately no efforts have yet been made to put in place the necessary legislation, strategy and programme for implementing the new policy.

The Ministry of Energy and Minerals, Energy Department with the support of SIDA and UNDP has however continued to initiate several projects aimed at addressing the growing household energy problems. Some of such include; Institutional capacity building, solar PV market development, efforts to develop and promote improved bio-waste and charcoal stoves for improving household energy services in two Municipalities, Dodoma and Tanga

Other projects from other institutions include that of: increasing power capacity through generation from natural gas (TANESCO), improving management of natural resources for woodfuels supply (Ministry of natural resources), integrated sustainable energy services for poverty reduction and environmental conservation programme(TaTEDO), Enabling access to sustainable Energy services (EASE-TaTEDO)

Compared to the magnitude of the household problems and the growing demand for biomass energy, more resources and capacity is needed to result into positive impacts. More funding should be provided for from the government and donors to ensure development of appropriate legislations, strategies and programmes that will facilitate participation of key stakeholders i.e. public institutions, private sectors and civil society.

The growing dependency on biomass energy by both urban and the rural communities has seen women and children spending a lot of time in collecting firewood and financial expenditure. The use of traditional firewood three stone fireplaces has contributed to the prevalence of respiratory diseases on top of the HIV cases. This has definitely contributed to more rural population being further burdened by having to care for the sick. The time spent in collecting firewood, water, preparing meals and looking after the sick leaves very little time to embark on productive activities. The lack of modern energy services is further contributing to the burden and poor services to the sick Due to this the on going efforts to reduce poverty are being constrained.

There is also an urgent need to put in place a legal and regulatory framework, strategy and programmes for implementing the newly revised energy policy. The necessary capacity for implementing the policy, coordinating and monitoring its implementation at all levels should be put in place to ensure that the policy addresses the problem it intended to.

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1.0 Introduction

Sparknet is a multi-stakeholder interactive Knowledge Network focusing on how people, in the context of acute poverty, can gain access to better energy services and improve their livelihoods.

The network aims to make available resources for policy makers, companies, and civil society on energy poverty in Southern and East Africa. These are published through the network website www.sparknet.info. Sparknet focuses on three key themes – Health, Gender and Forestry – and the relationship of these issues with energy poverty. Output includes detailed country reports, scenario analyses, and policy assessments. Two e-conferences will be held during the project – one on the scenarios, and another on policies.

Through a network of associates in Africa and Europe, Sparknet brings together 70 organisations and over 110 people from research institutes, NGOs, Governments and private companies.

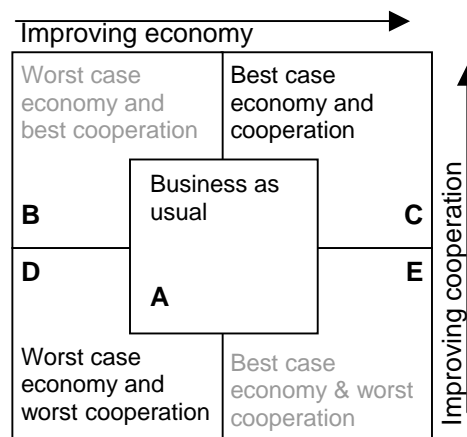
1.1 Scenarios – what they are and why we have done them

Scenario analysis is simply a way of exploring realistic futures and predicting, based on our knowledge and experience how things could look in the future, how things could develop. As with all predictions we are likely to get it not entirely correct but the exercise is useful to stimulate debate on key issues. Scenario building is a *process* providing a structure for discussion and debate on what is could happen within a timeframe of the next ten to fifteen years. We will explore how things could change and how these changes are likely to impact on access to household energy in each country and across the Sparknet region. From these discussions, we hope to be able to make policy recommendations for poverty alleviation through identifying the key areas where policy action needs to take place. The intention is not to produce definitive studies but to stimulate relevant policy dialogue and serve as a basis for further research. Using management jargon we are looking here for 'blue sky thinking'. To do this we need to know the status quo (work-package 2, the country reports – which are now available on the Sparknet web site) and also to have identified influential organisations and projects and key actors who will shape the future of household energy provision (work-package 3, the draft version also available online).

External influences, such as changes in economic growth and levels of regional cooperation, are circumstances over which we have limited control. By identifying what policies might be effective under varying best and worst scenarios we have a good basis for debating potential policy actions which are pro-poverty alleviation, take into account our three themes – health, gender and natural resources / forestry – and are realistic under a broad range of external circumstances. As defined in the original Sparknet proposal, the intention is to develop a number of scenarios based on levels of economic prosperity and regional cooperation. The five possible scenarios – A to E – are shown in the 'box matrix' figure alongside. We believe it is sufficient to deal only with scenario A (business as usual), C (best case economy and co-operation), and D (worst case economy and co-operation). The other two are variations of these main scenarios. Both variables relate strongly to globalisation and market developments.

This is the reason for including regional co-operation, since the Sparknet proposal was submitted to a funding window, which explored impacts of globalisation on energy poverty.

Because of the limited time/funding resources, these analyses are based – to a certain extent – on a subjective interpretation (the opinion of well-informed researchers, organisations and individuals in each country) of the impact of key variables and on findings of earlier studies (if available). It is focused mainly, but not exclusively on the issues identified by the three Northern partners on Health, Gender and Forestry (these papers are available online from the www.sparknet.info website.)



The scenario development follows the following process:

1. The development of peer reviewed scenario analyses for each country including 'business as usual' and alternatives based on levels of 'economic prosperity' and of 'regional co-operation'. This current document is a working version of the scenario.
2. An international e-conference (through the Internet) will be held based on the scenarios for each country. The provisional date for this conference is the end of September, over a 2-week period (see the www.sparknet.info website for additional details).
3. Publishing of conference proceedings from the e-conference on scenarios

The scenario analysis will lead naturally to an analysis of '*what do we think will happen*' and '*what do we want to see happening*' (or *how best we can deal with it if it does happen*) in each country and the region, and leads directly into work-package 5 (how to get from one to the other – i.e. policy recommendations).

1.2 Background information on the Scenario

The ongoing reforms in Tanzania in the sectors of the economy due to shifting from centrally planned economy to market forces oriented economy have started to have positive impact on the economy. The national economic objectives is to ensure economic growth rate of 6 percent per annum, with anticipation growth in agriculture sector, an investments, mainly in the mining, agro-processing and services industry. Agriculture in Tanzania continues to be the main stay of the economy, contributing about 44 percent of the GDP and over 60 percent of export earnings. The inflation rate has been contained at around 4.5 percent. Despite all the efforts, poverty is still the main socio- economic problem in Tanzania.

The last year Government budget aimed at sustaining the current macroeconomic stability and support on-going reforms for growth and poverty reduction, among others, as follows;

- Attaining a real GDP growth rate of 6.3 percent in 2004 and 6.5 percent in 2005, to be driven by agriculture, manufacturing, and exports.
- Inflation is targeted at 4 percent by end of June 2005 and stabilize at that level in the medium-term.
- Monitoring implementation of the micro-finance policy and the credit guarantee scheme for small –medium enterprises to create conditions for economic development through bank credit.

1.2.1 The energy situation

Tanzania is endowed with significant energy resources in terms of hydro , biomass, natural gas , coal , wind and solar, but so far with the exception of hydro and natural gas little of the other energy resources have been exploited. The energy utilisation in Tanzania is characterized by low per capita consumption of commercial energy sources. More than 80 per cent of the total energy is consumed in rural areas. Presently the total energy consumption in Tanzania is estimated at about 24 million tones of oil equivalent (toe) or about 29.89 GJ per capita. Majority of the population mainly rural, has low purchasing power and depends mainly on wood fuel for cooking, kerosene for lighting, and human energy for agriculture and transport activities, which have negative consequences for the environment and the life quality of the rural poor.

Biomass, particularly wood-fuels constitutes about 90 per cent of total energy consumption, which has significant impact on environmental degradation. The rest 10 per cent of consumed energy in the country is met by other sources such as fossil fuels, grid and non-grid electricity.

While electricity is an important source of modern energy for economic activities, only about 10 percent of the Tanzanian population have access to grid electricity and in rural areas (where 80 per cent of the population is living) only 1 percent of the population is connected to grid electricity. This low access to commercial fuels has obviously suppressed economic growth that is manifested in low level of agricultural mechanisation and industrialisation, which further perpetuates the poverty situation.

The overwhelming dependence on human and biomass energy is greatly contributing to poverty and environmental degradation, such as high deforestation, soil erosion and poor land productivity. Field experience indicates that there is strong linkage between high dependence on biomass-based fuels and human energy, poverty, gender-imbalance and environmental degradation.

In an attempt to address the above situation, energy sector (particularly in rural areas) has continued to receive some support from donors. New initiatives of the Ministry of Energy and Minerals (MEM) are taking place in the sector. The proposed programmes by UNDP/GEF and Sida to support solar PV market development; and the planned World Bank initiatives on rural transformation through energy are also promoting the initiatives to contribute in addressing the above worsening energy situation.

Furthermore, in the on-going energy sector restructuring, the role of the government has changed to that of a facilitation: responsible for providing an enabling institutional and legal framework; and creating incentives to motivate other actors such as private sectors, NGOs and CBOs to take up the task of providing sustainable energy services.

Therefore, this proposed programme will complement the on-going government efforts to implement the revised energy policy including the establishment of regulatory framework, rural energy agency and rural energy fund, the framework for preparation of rural electrification master plan.

1.2.2 Energy and Poverty Linkage

Recent findings of a detailed assessment (TaTEDO, 2000) of the energy and poverty linkages clearly show that energy is a critical input in all efforts to alleviate poverty. It is paramount in the execution of almost all economic activities, including:

- **Energy for Agriculture**

Agriculture is the backbone of the Tanzanian economy. The sector employs about eighty percent of the employed people in Tanzania and contributes to about 60 percent of the GDP. Agricultural energy needs in rural areas of Tanzania are largely met by human energy particularly women. About 70 percent of cultivation in Tanzania is carried out by hand-hoe, 20 percent by ox-plough and 10 percent by tractors.

Apart from the large-scale use of human energy, the use of direct solar energy and firewood for drying and processing agricultural products is widespread. In agriculture energy is specifically required for land preparation, irrigation, weeding, harvesting, processing and transport. In order to increase agriculture production, the current high dependence on human energy for several activities and traditional energy for processing agricultural products need to be reversed.

- **Energy for Rural Industries**

Rural industries are in most cases small to medium in size. The industries have a significant role in providing off-farm income for many rural populations. Such industries are crucial in the process of rural development. The most common industries found in rural Tanzania include among others, brick burning, local beer brewing, pottery/ceramic, crops processing, fish smoking, baking, lime burning, salt drying, and charcoal production. The industries have a strong linkage with rural development objectives. These industries have potential of improving income generation of rural population through processing of perishable agricultural and forest products to fetch higher market value.

- **Energy for Rural Transport**

In Tanzania the rural areas have high dependence on human energy for Transportation. It is common in rural areas to see people mostly women, walking while carrying head loads of firewood, water, grass and various harvested crops. Few areas use animal energy for transportation purposes.

Poorly developed or maintained infrastructure, particularly roads, is one of the main reasons for lack of better means of transportation in rural areas. To achieve economic growth, social development and environmental conservation, more efforts need to be put into developing the country's infrastructure to alleviate the problems of poor transportation.

2 Development of the scenarios

This section of the report is the main body. The summary table in gives an Overview of the Scenarios and the important points in each section.

2.1 Business-as-Usual Scenario

The year 2014, forty-three years after freedom from the British Colonial Rule. Tanzania will strive to maintain significant progress of restoring macro-economic stability. The country will maintain economic growth of 5.6% from 2004 to 2014. Inflation will fluctuate but remain at average rate of less than 5%. After passing through several economic adjustment measures, the government will concentrate on strengthening investments for local entrepreneurs, which will be preceded by formulation of a legal and regulatory framework. Tanzania will have in place a number of key economic policies and strategies, which will not be implemented adequately despite of existing regional and international co-operations.

2.1.1 Fuel Access

In the business as usual scenario, the energy demand for household sector in Tanzania in 2014 will increase for more than 70 % compared to 2004. There will be limited access to commercial fuels such as electricity and petroleum products. Woodfuel as a source of energy will dominate compared to other sources. Renewable energy will still be limited to small part of population. Wood and charcoal would remain to be the major energy sources in the household sector although a large number of people will use improved energy technologies. A large number of people, due to urbanisation, electricity and charcoal will have the largest annual growth of 3.8 to 4% respectively. The demand of renewable energy will increase and because of unaltered regional cooperation, the installed renewable energy technologies will increase covering about 20 percent of the off-grid areas.

Generation of hydro-power will continue to fluctuate annually due to drought. Power rationing as a result of power fluctuations will be averted by using thermal generation. However, the distribution of hydro electricity will be improved in the urban sector. Rural electrification investments will increase due to the government efforts through Rural Energy Agency and Rural Energy Fund. Songo Songo will continue to supply gas for generating electricity and supply the electricity in the growing industrial sector.

2.1.2 Fuel Choice

There will be very limited fuel choice for households. Wood and charcoal would remain to be the major energy sources in the household sector although a large number of people will use improved energy technologies. The charcoal will continue to be the major fuel in urban areas while firewood will dominate the rural energy use. The energy balance in the households will have the demand of biomass in the households exceeding the annual yield. This means that alternative measures will be necessary in order to avoid further deforestation. However, due to limited private financial resources, other alternative energy investments sources will be required, which necessitate development efforts from the donors. In fact, with the current consumption in the household sector, deforestation will continue to take place.

With respect to household energy technologies, the modern energy technologies such as electric cookers, microwaves, energy saving bulbs, fluorescents, etc will continue to be imported mainly for urban users. This is a result of open market and globalisation, which will continue to attract more business from outside the country. However, the local-made improved energy technologies will dominate the market and demands in a large number of households in both urban and rural areas. People will choose fuels and related technologies depending on places they are located (urban or rural) and their purchasing power.

Co-generation will remain to be supplementary for energy needs in few wood processing areas like Mgololo/Sao Hill where wood is used for manufacturing papers. There will be a high potential of applying this mode of producing energy in other related areas.

Coal, bagasse and related sources will remain unexploited. This is caused by inability of attract more investments in these sub-sectors and which is associated with high costs of investments

2.1.3 Health

In the business as usual scenario, the efforts of disseminating improved energy technologies and modern energy appliances will still be inadequate. As the sector reforms have been implemented without regulation of market for petroleum products, it will disrupt the competition in the sector due to collusion amongst petroleum product vendors such as kerosene. The tariffs for electricity will continue to escalate, prices for petroleum products (kerosene inclusive) will continue to be unstable, installed renewable energy capacity will not significantly increase due to high investment costs. This situation will perpetuate utilization of unclean energy technologies. This is attributed to inadequacy of resources and low purchasing power of poor people in the urban and rural areas.

High prices for petroleum products (especially kerosene) and increased electricity tariffs will shift some urban and rural energy demand back to traditional fuels. With this situation in place, in-door air pollution will still be a problem, although the magnitude of its adverse effect on health will not be clearly known due to unavailability of research and documented information.

The in-door pollution will continue to partly cause acute infections like tuberculosis, respiratory infections, lung cancer, conjunctivity, etc, although some of them will be speeded up by HIV/AIDS. There will be some possible chances of deaths due to poisonous gases such as carbon monoxide in cold geographical areas of the country. The effect will continue to enlarge in complement with unorganised house construction and in areas with non-ventilated houses.

2.1.4 Gender

Energy has direct linkage with the gender in both domestic and income generating energy use or production activities. The differing work and social roles of men and women will continue to be culturally established and vary from place to place. The fuel for domestic use will remain to be a role of women in the communities operating at subsistence level. It is expected that in year 2014, men and women within more households in urban areas will continue to share burden of paying basic household needs (household energy being one of them). Women in rural areas will continue to collect firewood and prepare meal in the household sector. Firewood and charcoal business will continue to be shared by both men and women.

With current efforts of providing improved energy technologies, the frequency of firewood collection will be fairly reduced in some areas and rural women's labour will be used for other productive undertakings, benefiting themselves, their families and communities. The community attitude towards woodfuel collection in rural areas will remain the same i.e. men will listen gender issues and leave them as they are without putting them into practices.

In order for both men and women to sustain their lives, woodfuel will continue to be used for productive purposes in SMEs like restaurants, cafes, meat roasting places, local brewing, street food vending, baking, pottery, brick burning etc. Although there are some policy measures for mainstreaming gender in Tanzania, there will be no much change in the role of men and women in use, production, provision and distribution of energy.

2.1.5 Forestry

Tanzania has about 33.5 million hectares of forests and woodland that constitute 38% of the total land area. Most of the forest reserves will continue to be target for production and only 1.6 million hectares will remain to be under protection. Forest will increasingly become important in terms of rural and urban livelihoods and poverty. Deforestation will continue to escalate because of timber logging, bush fires, livestock overgrazing, woodfuel requirements and land clearing for agriculture. The dependence on biomass fuel will continue because of the high cost of developing alternative source of energy and the cost of adopting other fuels. The long-term effects will be serious land degradation and wood fuel scarcity. The basic problem related to high dependence on woodfuel will continue to be lack of affordable sources of energy and lack of wood conversion technology.

The regions characterised by acute firewood deficit and scarcity will be Kilimanjaro, Shinyanga, Dodoma and Singida. The most valuable natural forests/woodlands in the country will continue to be Mtwara, Lindi, Rukwa, Kigoma, Ruvuma, South-west Morogoro and Coast Region. The Coast, Tabora and Tanga regions will continue to be prone to effects of deforestation due to excessive charcoal production and timber logging.

With current trend in which deforestation outweigh afforestation, increase in population will lead to further encroachment of forests. Renewable energy source could serve as the alternative energy supplies but will be inadequately exploited.

The efforts of developing sustainable supply of woodfuel will still be inadequate in highly population density areas compared to growing demand of woodfuel. This will create a difficult situation in alleviate poverty to the majority of people whose the main component is woodfuel.

2.1.6 Policy Options

The problems and potential solutions are required to address specific needs of people in their areas. These solutions require policies and actions to address energy needs:

Policy Options on Health

- Promote energy efficiency and conservation as a means towards cleaner production and pollution control measures.
- In view of prevalence of effects of Indoor Air Pollution, there is need of further research in order to determine extent of acute respiratory infections and come up with possible measures specific to particular areas.
- There is also need for ensuring ventilation in the households by creating awareness of constructing ventilated house and use of improved and modern stoves.
- To ensure the health centres have proper treatments and drugs for indoor air pollution related diseases.
- Establish and strengthen a proper information collection and networking system in order to share and exchange information on effects of in-door pollution, nationally and regionally including acute respiratory infections.

Policy Option on Gender

- In order to work properly, household energy policies must be tailored to the specific circumstances of men and women in their areas.
- Household energy programmes must be approached from a dynamic perspective and must be related to trends and actual development needs of the different genders in that specific area.
- The household energy issues and problems should not be considered in isolation from the context of socio-economic development and gender requirements.

- Household energy interventions particularly in rural areas must be planned with gender consciousness based on needs identified through multi-disciplinary, multi-sectoral and participatory approaches.

Policy Options on Forestry

- Create awareness and ensure management of forest resources with people around forest areas against bushfire, encroachment of forests, excessive timber logging etc
- Effort should be made to assess local biomass resources available and wood fuel consumption, evaluating not only per capita consumption but also actual biomass resources used. Then come up with possible measures to address deforestation.
- Enhancement of the biomass resources activities should be participatory through decentralization of tree nurseries, agro forestry and improved management of existing resources in rural areas especially areas around natural forests.
- Tax exemption and smart subsidies policy measures are required to boost use and installation of renewable energy technologies in off-grid areas.
- Establishment of the private woodlots and plantation for woodfuel production will be encouraged and supported through research, extension services and financial incentives.
- The capacity of local authorities to administer and manage forest resources will be strengthened and a coordination mechanism between the local and central government established.

2.2 Worst Case Scenario

The Worst-Case Scenario has considered a number of factors on global and national economic trends, which have impact on development of energy infrastructure and services, and in addressing the major challenges of sustainable development, including among others, fighting poverty, environmental protection, and empowering human resource. As the global economy and technological developments are undergoing dramatic changes, the scenario assumes that Tanzania will not fully adjust its macro-economic structure to respond to emerging opportunities and consequential threats of changes in the world economy.

The scenario assumes a slow national economic growth of less by 50% of national target of 6.2% and less donor aids from the current level. This will result in a slow pace in developing the energy infrastructure and services, which in turn will constrain further the national economic growth and efforts for fighting poverty. In addition, it will be difficult to effectively implement provision of modern rural energy services and make local contribution to the proposed rural energy fund. The country will continue to use traditional fuels mainly for cooking in households and for the majority of its people in the next 10 to 15 years. The level of access of rural population to electricity will continue to be stagnant at less than 1%. As the country relies mostly on imported fossil fuels, the scenario predicts foreign exchange constraints for procurement of needed fossil fuels for industrial, transportation, households, spare parts and other sectors, etc. There will be little incentives for private sector investment in energy, and lack of foreign aid and local resources to develop better access and for better management of traditional fuels utilization.

2.2.1 Fuel Access

The Scenario does not favour increased connections of households to modern energy services, as there will be little development of infrastructure for grid electricity and other energy options such as solar PV systems, particularly in rural areas. There will be increased problems even to the existing system in urban centres due to cash constraints and hence difficulties in procurement of fossil fuels, spare parts and maintaining system for better services. Currently 10% of the population have access to electricity. With the constraints resulting from the scenario, the percentage may even decline due to population growth country-wise at a rate of 2.9% while resources for infrastructure expansion will be minimal and possibilities for growing demand and sustainability will decline. Therefore, lack of progress on improving access to modern energy services hinders exploitation of opportunities for income generating activities and makes poverty fighting more difficult.

2.2.2 Fuel Choice

The Worst-Case Scenario hinders development of modern energy infrastructure, as there will be limited incentives for private investments in provision of modern energy services. Therefore fuel choice particularly in households will be skewed to inferior energy carriers, which need less investment to the majority. Fuel choice remains, mainly on biomass based fuels, kerosene, candles, and agriculture residues and to lesser extent, electricity for lighting in households.

2.2.3 Health

The worst-case scenario assumes that due to continued use of inferior energy carriers such as fuelwood, and kerosene. Combustion of such fuels during cooking and lighting, respectively, result to pollution and smokes, which cause respiratory and red eyes problems to women and children hence deaths related to these problems. Health centres also will continue without modern energy services e.g. vaccine refrigerators and lights for emergencies during nights. Therefore treatment in such situation will not be affordable.

2.2.4 Gender

Lack of access of better energy services will have several negative impacts to households. Both men and women will be affected in several ways. Women and children will continue to have the burden of collecting woodfuels from distant areas. There will be limited economic activities such as small-scale industries and agro-processing emerging, and little improvement of social services, mainly schools, health centres and water pumping. Women and children will mostly carry the burden as a result of poor energy services.

2.2.5 Forestry

There will be increase pressure on forests for energy needs. In most households, fuelwood and charcoal will continue to dominate. Although there is a private initiative to promote LPG use for cooking, development of infrastructure is constraints due to limited resources. With the worst-case scenario the situation will become more worse, the cost of LPG and electricity tariffs will go high, making people to continue depending mostly on biomass fuels.

2.2.6 Policy Options

In order to go away from the worst-case scenario, the following options need be considered:

- Promote increased access to modern energy supplies, especially in rural areas, including promoting of renewable energy technologies.
- Promote private sector solutions to management and investment constraints through various mechanisms such as forging public/private partnership with foreign and domestic investors.
- Promote regional development of energy infrastructure to benefit from economies of scale.
- Promote more efficient and sustainable utilization of traditional fuels.
- Developing village based energy systems through adoption of renewable energy technologies and ensuring that the community are strongly involved in the design, planning and implementing of initiatives.

2.3 Best Case Scenario

This is expected to be characterised by an economic growth beyond the current 6 percent, with greater participation of more Tanzanians in the gains of economic growth benefits particularly those living in the rural areas. Growth of the economy at such rates is expected to facilitate improvement in the energy infrastructure and institutional capacity building including greater participation of the private sector in the energy development efforts.

The limited access to modern energy in the rural areas with electrification of only 2 percent of the households is a major impediment to social and economic development.

There could be greater participation of Tanzania both in the regional cooperation i.e. East African Community and Southern African Development community based on the past efforts. This could contribute to the development of new markets for energy and improved electricity availability due to interconnections to the regional power pool. A booming economy will lead to more people accessing modern energy services, thus reducing dependence on biomass energy. This could definitely have a positive impacts on income, health gender and would contribute to reduced pressure on forest resources. A growing economy could facilitate increased commercialisation of energy services leading to improved availability of energy and appliances, thus increasing access to rural households in the country. Over time, this scenario will enhance accessibility through mobilisation of resources for distribution and outlets.

2.3.1 Fuel Access

There will be increased availability of energy especially electricity connections to more people both in urban and rural areas through the successful increased generation (Hydro, natural gas, coal, wind, diesel and solar) expansion of grid and linking to the regional power pools. The regional (SADC and EAC) economic cooperation would result to improved economy and increased access to goods and services, this will further create opportunities for market growth thus impacting on growth of the energy sector.

With increased access to improved biomass technologies, reduced use of biomass for meeting energy needs would result to improved environment, increased income generation and business opportunities thus contributing to poverty reduction.

2.3.2 Fuel Choice

With the improving economy and the enabling policy environment, it is likely that the public- private cooperation would be enhanced thus attracting increased investment in modern energy technology options. Furthermore the growing economy will enable more people to access better energy services resulting to improved income and better health.

With the growing economy, people will have several fuel choices from a range of available options, electricity, kerosene, LPG, Natural gas and biomass. This will definitely further reduce dependence on biomass with increased use of electricity and other modern fuels leading to reduced negative impacts on women and forest resources.

2.3.3 Gender

Access to better energy services, will reduce the burden on women and children for collecting firewood and cutting of trees for charcoal making in rural areas. Time for cooking will be reduced significantly. The reduced chances of IAP will lead to lesser chances of respiratory disease as such reduce the burden of caring for the sick. The saved time would allow women to engage in productive and income earning opportunities. Such opportunities will significantly contribute to the ongoing efforts to reduce poverty. With better access to modern energy, more children particularly girls will have more time to study and attend to school home work, this could lead to more opportunities to further improve their quality of life.

2.3.4 Health

Biomass as the major source of household energy will be reduced significantly under this scenario. There will be reduced incidences of ALRI because of increased use of modern energy technologies. With better income more people will move up the energy ladder with the resultant health benefits. Women and children will have better working environment with greatly reduced exposure to IAP. With better economy, incidences of malnutrition will be reduced since more will have ample energy and food for cooking

2.3.5 Forestry

Even with the improved economy, biomass energy is expected to remain the dominant source of household energy for the majority both in urban and rural areas. However with improved economy greater percentage of people will use of modern energy and technologies leading to some reduction on dependence on biomass energy that currently stands at more than 90 percent. Other barriers to address supply of wood such as, limited efforts of tree growing, and lack of awareness on available modern energy options etc are expected to change as result of better education resulting from improved economy.

2.3.6 Policy options

Under this scenario, it is assumed that energy policy and related policies will have relevant legislations, strategies and programmes for their implementation in place.

Health- policy options

In order to come up with appropriate policies, there will be a need of getting a better inside of effects on both the household, rural national and global environment of producing and using energy. Greater collaborative efforts are needed to study on various emissions from biomass and kerosene use in poorly ventilated houses. Based on the findings, efforts to develop and implement appropriate mitigation measures including formulation of appropriate policies should be initiated.

Better provision of better energy services would also assist with improved access to other basic services such as better lighting, better storage of medicines in dispensaries, clean and safe drinking water.

Gender-policy options

More efforts are needed at all levels for gender mainstreaming in the energy sector to facilitate greater participation and representation of men and women in energy decision making in particular those related to household energy needs.

Forestry-Policy options

Woodfuels will remain a dominant source of both urban and rural household energy for the foreseeable future. Even under the booming economy more efforts will be needed to ensure sustainability of biomass supply. Such efforts could include enhancing supply through improved management of forest resources, improving production and utilisation of woodfuels, and encouraging fuels substitution.

Closure

Energy services such as lighting, cooking heating, cooling, refrigeration and communication and their accessibility are essential for sustainable socio- economic development. Lack of access to reliable and affordable energy services limits ability to meet basic and productive needs. Also limits economic growth, jobs and improved living standards.

The present patterns of energy supply and use are definitely unsustainable. Reliance on traditional fuels for cooking and heating is having serious impacts on the environment and on people's health. More efforts for change to come about are needed in the existing energy services delivery mechanism so that energy can become an instrument for sustainable development.

Increased energy use depends very much on the performance of both micro and macro economy. Participation of a wider cross section of the population is crucial for the economy to benefit majority and hence be able to afford better energy services.

The expected increased and fair regional cooperation and globalisation would offer wide range of opportunities for initiatives among countries and businesses to invest in economic development and better energy systems that would ensure security and reliability of supply.

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APPENDIX A: OVERVIEW OF SCENARIOS

Criteria/Issues	A: Business as Usual	C: Best Case Economy and Co-operation	D: Worst Case Economy and Co-operation
<p>Current situation – short summary: What are the key issues / constraints which you have identified within your country regarding provision of household energy at the current time – particularly with regard to health, gender and forestry?</p>	<ul style="list-style-type: none"> • Tanzania is endowed with significant energy resources in terms of hydro, biomass, natural gas, coal, wind and solar, but so far with the exception of hydro and natural gas little of the other energy resources have been exploited. • The energy utilisation in Tanzania is characterized by low per capita consumption of commercial energy sources. • More than 80 per cent of the total energy is consumed in rural areas. • Majority of the population mainly rural has low purchasing power and depends mainly on wood fuel for cooking, kerosene for lighting, and human energy for agriculture and transport activities, which have negative consequences for the environment and the life quality of the rural poor. • Biomass, particularly wood-fuels constitutes about 90 per cent of total energy consumption. • The rest 10 per cent of consumed energy in the country is met by other sources such as fossil fuels, grid and non-grid electricity. • only about 10 percent of the Tanzanian population have access to grid electricity and in rural areas (where 80 per cent of the population is living) only 1 percent of the population is connected to grid electricity. • The overwhelming dependence on human and biomass energy is greatly contributing to poverty and environmental degradation, such as high deforestation, soil erosion and poor land productivity. • Women and children are facing drudgery of collecting woodfuels and spending long hours in meal preparation while prone to risk of suffering in-door pollution related infections 		
<p>What are the impacts on Fuel Choice for household energy under BAU and worst case / best case scenarios for the economy and regional co-operation over the next 10-15years?</p>	<p>Very limited fuel choice for households. Wood and charcoal would remain to be the major energy sources in the household sector although a large number of people will use improved energy technologies.</p>	<p>With the growing economy, people will have several fuel choices from a range of available options, electricity, kerosene, LPG, Natural gas and biomass. This will definitely further reduce dependence on biomass with increased use of electricity and other modern fuels leading to reduced negative impacts on women and forest resources.</p>	<p>Worst case scenario will not favour increased connections of households to modern energy services, as there will be little development of infrastructure for grid electricity and other energy options particularly in rural areas. There will be increased problems even to the existing system in urban centres due to cash constraints and hence difficulties in procurement of fossil fuels, spare parts and maintaining system for better services. Lack of progress on improving access to modern energy services hinders exploitation of opportunities for income generating activities and makes poverty fighting more difficult.</p>
<p>What are the impacts on Fuel Access for household energy under BAU and worst case / best case scenarios for the economy and regional co-operation over the next 10-15years?</p>	<p>Limited access to commercial fuels such as electricity and petroleum products. Woodfuel as a source of energy will dominate compared to other sources. Renewable energy will still be limited to small part of population</p>	<p>There will be increased availability of energy especially electricity connections to more people both in urban and rural areas through the successful increased generation (Hydro, natural gas, coal, wind, diesel and solar) expansion of grid and linking to the regional power pools</p>	<p>Fuel choice particularly in households will be skewed to inferior energy carriers, which need less investment to the majority. Fuel choice remains, mainly on biomass based fuels, kerosene, candles, and agriculture residues and to lesser extent, electricity for lighting in households.</p>

<p>In the left hand side boxes below, review specialist paper and others and identify issues, which will be impacted by the changes identified above. In each of the boxes below, jot down points on the relevance, developments, and implications of each of the scenarios on the issues raised in the left hand column.</p>	<p>In each of the boxes below, jot down points on the relevance, developments, and implications of each of the scenarios on the issues raised in the left hand column.</p>		
<p>Health Issues - impacts on health</p>	<p>High prices of electricity and other commercial energy will perpetuate utilization of unclean energy technologies. The situation will shift some urban and rural energy demand back to traditional fuels. The in-door pollution will continue to contribute to acute infections like tuberculosis, respiratory infections, lung cancer, conjunctivity, etc, although some of them will be speeded up by HIV/AIDS.</p>	<p>There will be reduced incidences of ALRI because of increased use of modern energy technologies Women and children will have better working environment with greatly reduced exposure to IAP. The incidences of malnutrition will be reduced since more will have ample energy and food for cooking</p>	<p>Due to continued use of inferior energy carriers such as fuelwood, and kerosene. Combustion of such fuels during cooking and lighting, respectively, result to pollution and smokes, which cause respiratory and red eyes problems to women and children hence deaths related to these problems. Health centres also will continue without modern energy services e.g. vaccine refrigerators and lights for emergencies during nights. Therefore treatment in such situation will not be affordable.</p>
<p>Health Issues - policy options on health</p>	<ul style="list-style-type: none"> • Promote energy efficiency and conservation as a means towards cleaner production and pollution control measures • Ensure ventilation in the households by creating awareness of constructing ventilated house and use of improved and modern stoves 	<ul style="list-style-type: none"> • Greater collaborative efforts are needed to study on various emissions from biomass and kerosene use in poorly ventilated houses. • Better provision of better energy services would also assist with improved access to other basic services such as better lighting, better storage of medicines in dispensaries, clean and safe drinking water. 	<p>Promote increased access to modern energy supplies, especially in rural areas, including promoting of renewable energy technologies</p>
<p>Gender Issues - impacts on gender</p>	<p>The fuel for domestic use will remain to be a role of women in the communities operating at subsistence level. It is expected that men and women in urban households will continue to share burden of paying basic household needs. Woodfuel will continue to be used for productive purposes in SMEs like restaurants, cafes, meat roasting places, local brewing, street food vending, baking, pottery, brick burning etc</p>	<p>Access to better energy services, will reduce the burden on women and children for collecting firewood and cutting of trees for charcoal making in rural areas. The saved time would allow women to engage in productive and income earning opportunities. Such opportunities will significantly contribute to the ongoing efforts to reduce poverty.</p>	<p>Both men and women will be affected in several ways. Women and children will continue to have the burden of collecting woodfuels from distant areas. Women and children will mostly carry the burden as a result of poor energy services.</p>
<p>Gender Issues - policy options on gender</p>	<p>Household energy interventions particularly in rural areas must be planned with gender consciousness based on needs identified through multi-disciplinary, multi-sectoral and participatory approaches.</p>	<p>More efforts are needed at all levels for gender mainstreaming in the energy sector to facilitate greater participation and representation of men and women in energy decision making in particular those related to household energy</p>	<p>Developing village based energy systems through adoption of renewable energy technologies and ensuring that both men and women are strongly involved in the design, planning and implementing of initiatives</p>

Scenario Outlines

		needs.	
Forestry Issues - impacts on forestry	Deforestation will continue to escalate because of timber logging, bush fires, livestock overgrazing, woodfuel requirements and land clearing for agriculture. With the current trend in which deforestation outweigh afforestation, increase in population will lead to further encroachment of forests.	Biomass energy is expected to remain the dominant source of household energy for the majority both in urban and rural areas. Greater percentage of people will use of modern energy and technologies leading to some reduction on dependence on biomass energy.	There will be increase pressure on forests for energy needs. The situation will become more worse, the cost of LPG and electricity tariffs will go high, making people to continue depending mostly on biomass
Forestry Issues - policy options on forestry	<ul style="list-style-type: none"> • Create awareness and ensure management of forest resources with people around forest areas against bushfire, encroachment of forests, excessive timber logging etc • Establishment of the private woodlots and plantation for woodfuel production will be encouraged and supported through research, extension services and financial incentives 	<ul style="list-style-type: none"> • More efforts will be needed to ensure sustainability of biomass supply. • Such efforts could include enhancing supply through improved management of forest resources, improving production and utilisation of woodfuels and encouraging fuels substitution. 	<ul style="list-style-type: none"> • Promote regional development of energy infrastructure to benefit from economies of scale. • Promote more efficient and sustainable utilization of traditional fuels. • Promote private sector solutions to management and investment constraints through various mechanisms such as forging public/private partnership with foreign and domestic investors.

