Alignment to Climate Compatible Development: A Content Analysis of the Tanzania National Energy Policy

Magreth S. Bushesha
The Open University of Tanzania
magrethbushesha@yahoo.com

Abstract: *This paper examines the extent to which the Tanzania Energy Policy 2015 aligns to Climate Development pillars. The study adopts an exploratory researchl design where the Tanzania National Energy policy of year 2015 is a major source of data. Content analysis is undertaken using an analytical framework developed after literature review. Findings indicate that the Tanzania national energy policy of year 2015 aligns partially to Climate Compatible Development pillars. The paper therefore calls upon a policy review to attain high alignment to Climate Compatible Development pillars.*

Key words: Climate compatible development, energy policy, renewable energy resources, adaptation, mitigation and development

Introduction

Production and use of energy, especially which comes from fossil fuels contributes significantly to climate change. The burning of coal, natural gas, and oil for electricity and heat is the largest single source of global greenhouse gas emission accounting to up to 25% of the total greenhouse gas emission globally (IPCC 2018). The industrial sector contributes to up to 30% of the total greenhouse gas produced annually at global level excluding emissions from industrial electricity use (Fischedick *et al*, 2014 and IPPC 2018). Production and use of energy from fossil fuels accounts for more than 84% of U.S. greenhouse gas emissions (EPA 2019 and IPPC 2018).

Production and use of energy is one of the key issues featuring in Tanzania as far as climate change is concerned especially because the country aims to become a semi-industrialized country by 2025 (URT 2011). The contribution of manufacturing to the national economy is targeted to reach a minimum of 40% of the GDP by 2025 (URT 2011). The country however faces serious challenges regarding energy production and power supply which is necessary for industrial development. Energy production rate and power supply seems not catching up with the growth of power demand and is virtually threatening industrial activity in the country (URT 2011). Not only that but also power shortage and frequent outage for civilian life is more

serious in the country (Chandra et al., 2008; and Ebinger and Vergan 2011). Alam (2013), however, noted that increases in the incidence of power outages reduce the output and profits of some electricity-intensive industries.

For many years Tanzania has been relaying much on hydro power as the major source of energy. The country, however, like many other countries in the world, is experiencing climate change (IPPC 2018; Mwiturubani 2019; and Matata *et al.,* 2019). Climate change has already negatively impacted most developmental sectors in the country including the energy sector (Ebinger and Vergan 2011; URT 2011; and URT 2015). Repeating prolonged severe droughts, for example, have been a major cause for reduced water for hydroelectricity production in the country (Ebinger and Vergan 2011; and URT 2015); as a result, power cuts have been common in the country. Power cuts however have negative connotation on industrialization as warned by Alam (2013). This is especially because in the manufacturing sector electricity for energy and power is important for machines running. The literature elsewhere shows that the impacts of power outage goes beyond the industrial sector; services in such important sectors as health and education may be severely hampered from unreliable electricity supply (Franco *et al.,* 2017; Chawla, *et al.,* 2018 and Oum, 2019). Franco *et al.,* (2017) and Chawla, *et al.,* (2018), for example, share the view that, energy is an important variable when it comes to delivering and improving healthcare services and life-saving interventions especially among developing countries.

Oum (2019) on the other hand noted that in Nigeria, energy poverty negatively impacts education levels attainments and health status in the country. Tourism is also likely to be affected since most hospitality services are highly facilitated by electricity as Moutinho *et al.,* (2015) explains. Businesses as supermarkets which hugely use refrigerators are also vulnerable to power outage as the experience from Chile presented by Moreno and Shaw, (2019) demonstrates. Experiences from Chile shows that domestic activities also get affected by power cuts (Moreno and Shaw, 2019). Agriculture might also suffer from power cuts where irrigation and processing industries may be negatively affected, although, as Ali *et al.,* (2019) explains, electrification of agriculture can be detrimental to the environment, hence energy intensification in agriculture should embrace clean energy resources. Basing on the literature one my conclude that the combination of all the effects of power outages in the different sectors would generally hamper the overall socio-economic development of any country.

The government of Tanzania has embarked on several projects to ensure power supply to support industrial growth as well as to ensure power supply for civilian life (URT 2011; URT 2014; and URT 2015). One of such government efforts has been exploration and tapping of gas and oil resources as well as development of the Stigler's gorge project. Gas and oil are two important emerging energy resources in Tanzania. The two resources, if well harnessed, are likely to boost significantly the economy of the country (URT 2014). In the years between 2010 and 2013, relatively large gas discoveries were made (URT 2014). Natural gas discoveries totaling about 8 trillion cubic feet (TCF) were discovered from the onshore gas fields at Songosongo, Mnazi Bay, Mkuranga, Kiliwani North and Ntorya. As of June, 2013 natural gas discoveries of about 42.7 TCF (7.5 billion barrels of oil equivalent – BoE) were made from both on- and off-shore basins (URT 2013). The deep sea gas discoveries have brought about new exploration targets for hydrocarbons in Tanzania. These discoveries may result in large revenues and form a major source of income for the nation. There is therefore a huge potential for growth in the energy sector in Tanzania following the discovery of oil and gas in Songosongo and Mtwara as well as the development of the Stigler's gorge project. While production and consumption of gas from Songosongo is already taking place, in Mtwara preparations for production of gas and oil are underway where already the government is fixing the infrastructure for the same. The Stigler's gorge project is expected to boost the total power production for the country by about 145% (https://www.esi-africa.com/regional-news/east-africa/tanzania-continues-stieglers-gorge-hydroelectric-project/).

There is however a more recent paradigm pertaining addressing climate change impacts on development known as 'Climate Compatible Development (CCD)' paradigm (OECD 2015). CCD refers to '...development that minimizes the harm caused by climate impacts, while maximizing the many human developmental opportunities presented by a low emission, and creating a more resilient future" (Mitchell and Maxwell 2010 pg 1). With climate change policies need to be crafted in a way that enables societies to develop socially and economically but at the same time sustain such development (OECD 2015). Developing such policies need a critical analysis of the multiple threats and uncertainties created by climate change. But also, policies need to promote reduction of Green House Gases to the minimum level possible (Kaur and Ayers 2010). In tackling the challenges, CCD moves beyond the traditional separation of adaptation, mitigation and development strategies. Instead it emphasizes the integration of threats and opportunities of a changing climate into developmental goals and strategies.

With CCD, communities are expected to leap development in different developmental dimensions without been affected by climate change and also without aggravating climate change and its impacts, this is called

climate resilient and low emissions development' (Mitchell and Maxwell 2010). In simple terms climate compatible development encourages policies that can simultaneously promote low emissions, resilience and development (Kaur and Ayers 2010). Climate compatible development, therefore, advocates for developmental projects that are non-climate change vulnerable but at the same time same they are pro low emissions.

Climate compatible development is, however, as said earlier, a relatively new paradigm in climate change and development sphere of knowledge. As a result the literature is almost silent on case studies explaining the extent to which developmental policies have so far bought and taken aboard the paradigm especially in Tanzania. This study, therefore, explores the extent to which developmental policies in Tanzania incorporates the concept climate compatible development with reference to the national energy policy. The study specifically examines the extent to which the Tanzania national energy policy aligns with the three CCD pillars namely adaptation, mitigation and development.

Methodology

The study adopted an exploratory research design since scant literature is available as far as policy assessment on alignment to CCD is concerned. The study adopted qualitative document analysis (QDA) approach in line with Bowen (2009) to analyze the extent to which the Tanzania national energy policy aligns to the CCD pillars namely adaptation, mitigation and development. The energy sector was selected due to the fact that the sector is climate change sensitive in that it contributes to GHG emissions which lead to global warming but also it is vulnerable to climate change through among others, reduction of water resources which are important resources in power generation in the country. Not only that but also since the country is aiming to leap forward in industrialization by year 2025, it will obviously require a huge development in the energy sector; for that matter it was thought important to examine the way CCD is framed within the policy sector. It is acknowledged however that there are other many climate sensitive sectors in the country including agriculture, water, forest and tourism, yet it was important to draw a manageable boundary around the study, so other climate change sensitive sectors were purposively omitted as they are less directly linked to industrialization-GHG emission as the case is for the energy sector. To be precise, those "other" sectors are largely GHG emitters via industrialization-energy relationship. However, these other sectors will definitely form important areas of further research following findings from this study.

The study abided to the eight steps pertaining QDA as defined by O'Leary (2014). The first step was gathering relevant texts. During this stage, the

Tanzania National Energy policy of year 2015 was identified as the current energy policy for the country hence identified to be the right document for the analysis. But also, literature pertaining climate compatible development was identified, this was important for developing the CCD pillars. The second step was developing an organization and management scheme. Since the focus was on the Tanzania energy policy only as opposed to analysis of multiple policies the document was easily managed as there was minimal distraction from contents of unrelated policy documents. It was during this stage where the CCD pillars as well as the scoring criteria were developed (Tables 1and 2). The third step was assessing the authenticity of the document; the research ensured that the document was gathered from the relevant ministry. The next steps were to explore the document's agenda and purpose. Here the researcher scrutinized the document and ensured that it was the policy document for the energy sector in Tanzania. Questions as who produced the document, why, when and type of data to be found in the document were delineated prior to the analysis of the document contents. In exploring the actual content of the policy document in question, the study abided to the interview technique as prescribed by O'Leary (2014) where "the researcher treats the document like a respondent or informant that provides the researcher with relevant information" (O'Leary, 2014). The researcher "asks" questions then highlights the answer within the text. Meaning and implications of texts within the document was key to the analysis, rather than simply the presence of keywords. The policy document was thoroughly read to identify evidence in support of CCD as outlined in Table 1. Finally, the information was organized into what is "related to the central questions of the research" (Bowen, 2009, p. 32). Quotes from the policy are presented for almost each alignment assessment purposely to allow inspection of the assessment.

Table 1: Description of Climate Compatible Development Alignment Pillars

Pillars	Indicators	Description
Adaptation	Access to energy	Access to energy can alleviate supply constraints
	Energy diversification	Energy diversification eliminates reliance on one single generation source to enhance security of supply.
	Energy efficiency and demandresponse-side management	Energy efficiency and demand response-side management can alleviate supply constraints.

	Smoothing the demand curve for energy	Smoothing the demand curve for energy over the day and the year, can lower overall required energy capacity.
	Distributed as opposed to centralized energy systems	Distributed as opposed to centralized energy systems can increase resilience
Mitigation	De-carbonization of energy.	De-carbonization of energy can be met through use of renewable energy, use of nuclear power, or the use of carbon capture and storage (CCS) technology, all the options can significantly reduce amount of GHGs in the atmosphere although there are challenges attached to each option that countries need to address them to achieve de-carbonization
	Improvement of energy efficiency	This level of assessment is for checking the efficiency aspect of products and systems. Energy should be used in the most efficient way to achieve the greatest output. Energy efficiency has been improving worldwide, but the speed of improvement should be even faster if the world was to minimize the impact of climate change. In some sectors, energy efficiency at the product level is satisfactory, but not at the system or community levels. Hence, various levels of energy efficiency need to be assessed. Some policies to promote energy-efficient products do not always lead to overall emission reduction because they may stimulate increased consumption of products and energy at community level.
	Minimizing demand for energy service	While energy efficiency needs to be further improved, the best approach is to eliminate any need for energy. For instance, improvement of energy efficiency in automobiles is important, but people can use other means of transportation such as bicycles and public transportation while enjoying the same level of mobility. Energy demand management is another approach to reduce the pressure on insufficient electricity supply, rather than increasing the supply by burning more fossil fuels to meet the requirements.

	land use, land-use change and forestry (LULUCF)	LULUCF refers to reducing GHG emissions through: conservation and protection; efficiency improvements; and fossil fuel substitution.
	Sequestering of carbon	Increased forest area; increased vegetation cover; increased carbon storage in soils; and conversion of biomass to long-term products.
Development	Promotion of social-economic development	The policy need to promote social-economic development since the two can in turn capacitate communities to sustainably adapt to climate change

Source: Modified from Antwi-Agyei (2013)

Table 2: Scoring criteria for alignment of the sector policy documents with key pillars of CCD

Type of alignment	Description of alignment	Score
High alignment	The sector policy aligns strongly with the indicators of triple wins (adaptation, mitigation and development (A/M/D). Policy devotes attention to the particular building block and includes specific activities for achieving the particular block.	3
Partial alignment	Although the policy supports the various indicators of A/M/D, it is less clear and less distinct in terms of how the indicators and each particular building block could be achieved. There is limited evidence present of how the specific indicators as well as the building blocks could be achieved in practice	2
Limited alignment	The sector policy supports a particular indicator of the A/M/D building block but there is a lack of evidence to support alignment with it.	1
No alignment	There is no evidence in the document to suggest that the sector policy supports the implementation of the building block or even encourages it.	0

Source: Gouais and Wach (2013)

Findings

Policy Alignment to Adaptation Pillar

Improving access to energy in rural areas

Improving access to energy in rural areas is one of the main indicators that a given energy policy aligns to the adaptation CCD alignment pillar. It is believed that rural electrification reduces vulnerability to climate variability and change especially among rural dwellers and particularly in developing countries (Stuwart 2017). The Tanzania energy policy (2015) aligns implicitly with this adaptation indicator. The policy first defines clearly why rural electrification is an issue. It identifies the magnitude of the problem to be serious since the largest population in Tanzania (70%) depends on wood

fuel, and it is so because majority of such population reside in rural areas where other sources of energy are not yet available (URT 2015). Hence most operations in institutions including domestic operations such as cooking, as well as industrial operations such as the processing industries depends on wood fuel for energy (URT 2015). For sure such heavy reliance on wood fuel is contrary to the millennium developmental goal that propounds for cutting down emission of CO_2 and other GHGs in order to save the environment. After defining the problem and its magnitude the policy states its objective as "To accelerate rural electrification to foster socio-economic transformation" (URT 2015 pg 16). The actions to address the objective are also clearly stated as follows: that the government shall i)Facilitate private sector participation including community groups and financial institutions in provision of modern energy services; ii) Facilitate local capacity building for manufacturing, installation, maintenance and operation of rural energy systems; and iii) Strengthen institutional capacity for effective coordination, administration, implementation and monitoring of rural energy projects.

The policy concern, however, sounds to be primarily facilitation of social economic development in rural areas vs. cutting down GHGs emissions. But social economic development may mean more production activities including industrial activities especially agro-processing industrial activities, as well as farm expansion through land clearance; such activities are highly advocated under the current paradigm namely 'value adding in the chain of production' as demonstrated in Ali *et al.,* (2019). *Ali et al*., (2019) argued for example that, electrification of agriculture can enhance food production hence contribute to social-economic development but at the same time can be detrimental to the environment unless electricity is made from non fossil fuel. For that case, objectives targeting at lowering levels of GHGs emissions must state categorically the focus on cutting down emission instead of having an implied objective. Clear objectives help in identifying areas of collaboration with other relevant sectors in attaining the intended objective, which for this case would be cutting down GHG to the minimum level possible. With unfocussed objectives there tend to be greater chances for ending up with sectoral operations instead of having greater connection among sectors; such sectoral approach however in most cases fail to resolve tensions and trade-offs between sectors and stakeholders (Amani and Mkumbo 2012). Therefore, one may conclude that although social economic transformation is good as it may mean poverty reduction yet focusing at social economic transformation may disorient the whole intention of saving the environment to social economic development, which may not necessarily address the issue of sustainable environmental management unless the concept of sustainable development is taken

onboard. The building block score 2 points meaning that it partially aligns to CCD.

Energy diversification

Diversification is an indicator for adaptation to climate change in the energy sector. In principal, energy diversification eliminates reliance on one single generation source which in turn enhances security of supply Stuwart (2017). With ensured supply chances for turning to environment unfriendly sources of energy such as wood fuel tends to be minimized. One of the Tanzania energy policy objectives provides for energy diversification as it intends " To enhance utilisation of renewable energy resources so as to increase its contribution in diversifying resources for electricity generation" The government intends to scale up utilization of renewable energy resources through: (i) promoting renewable energy sources and sustainable use of biomass for power generation; (ii) facilitation of integration of renewable energy technologies in buildings and industrial designs; (iii) establishment of feed in tariffs for renewable energy technologies; (iv) establishing framew orks for renewable energy integration into the national and isolated grids; and (v) promoting sustainable biofuel production and usage.

In principal Tanzania depends much on hydroelectric power, therefore utilization of renewable resources is an important move towards adaptation to climate change in the sector especially because water resources is one of the most vulnerable resources to climate change. Investing in solar, wind, biomass, and geo-thermal is important for diversification from energy from fossil fuel, as well as from hydroelectric which is vulnerable to climate change hence less reliable especially during prolonged drought a phenomenon that has become common nowadays partly due to climate change. The policy however presented a number of challenges, which for a long time have hindered harnessing such renewable resources as solar, wind, biomass, and geo-thermal. One would, therefore, expect the policy to present policy statements, which are directed towards addressing such challenges so that harnessing of renewable resources is made possible.

Unfortunately, the policy fails to provide a clear picture as to how the identified challenges which for many years made harnessing of such alternative sources of energy source not possible. For example, as far as utilization of solar power is concerned the policy states that "solar utilization is constrained by high initial cost; poor after sales service; insufficient awareness on the potential and economic benefits offered by solar technologies, and appropriate credit and financing mechanisms" (URT 2015 pg16). If this is the problem then one may ask, which policy statement of the five statements provided is intended to address it? How promotion of renewable energy resources will be done without first addressing the issues raised as constraints to harnessing renewable resources? Where will the

resources to meet the allegedly high initial coasts come from, what strategies are in place to handle that challenge, will establishment of feed in tariffs for renewable energy technologies suffice to handle the high initial coasts and to what extent? What about the challenges related to poor after sales service? What about appropriate credit and financing mechanisms? One may note that it is difficult to answer these questions basing on the information provided by the policy. Ross (2014) for example noted that initial costs for solar projects is a real challenge facing transformation in the energy sector; he therefore, implicitly, advocates that policies should demonstrate strategies which guarantees that renewable energy resources can sustainably compete with fossil fuel energy resources. Ross (2014) provides an example from Asia where doubling cumulative installation capacity of photovoltaics was a strategy used to reduce solar energy price allowing solar energy to compete with energy from fossil fuels sustainably (Ross 2014). Therefore, it would be important for the 2015 Tanzania National Energy Policy document to demonstrate how it takes on board strategies for ensuring that all stabling blocks towards transformation in the sector are eliminated.

For biomass, the policy states that "Challenges associated with biomass include: low conversion and end-use efficiency deforestation; indoor emissions; inadequate legal and institutional framework to support sustainable production, distribution, supply and use of wood fuel"(URT 2015 pg 17). One may note that there are about four barriers hindering the taping of biomass for energy. Surprisingly there is only one generic policy statement for biomass i.e. promoting sustainable bio fuel production and usage. Yes, but how? How will the issue of low conversion be handled? How will the issue of end-use efficiency be addressed, and what about indoor emissions? All has been wrapped up in one phrase - '...sustainable bio fuel production and usage..' It would have been more helpful if objectives could be self explanatory and reflecting specific problems to be resolved. To minimize deforestation Ross (2014) advocates for roof-top solar installations against solar farming which usually lead to land to facilitate installation and native vegetation is cut or removed to avoid shading.

OECD (2015) noted that energy policies need to demonstrate strategies towards ensuring sustainable land-management practices which will assist reducing deforestation, restoring degraded land, foster low-carbon agricultural practices and strategies for increased carbon sequestration in soils and forests. England *et al.,* (2018) noted that policy approaches that advocate promotion and expansion of renewable energy sources (such as solar, wind, biomass, geothermal) score highly as far as alignment to CCD owing to their support for reducing CO2emissions. However, the analysis

by England *et al.,* (2018) did not show how problems, objectives and action statements were assessed to determine achievability of the objectives and statements as opposed to the analysis in this study.

For wind power, the identified problems by the policy document are wind regime data; high investment costs; integration and compatibility to the grid system and distance from grid and load centers. For geo-thermal the problems identified include high investment costs; high exploration risks; inadequate data, human and capital resource required to undertake necessary studies; remote location of geothermal fields and undeveloped infrastructures (URT 2015 pg18). Again, there is a very weak link between the identified problems for both wind and geo-thermal power and the prescribed policy action statements, which are to: (i) promote renewable energy sources and sustainable use of biomass for power generation; (ii) facilitate integration of renewable energy technologies in buildings and industrial designs; iii) establish Feed-in- Tariffs for renewable energy technologies; iv) establish frameworks for renewable energy integration into the national and isolated grids; and v) promote sustainable bio-fuel production and usage. As Walker (2000) put it, "...a policy is a set of actions taken to solve a problem. The policymaker has certain objectives that, if met, would 'solve' the problem" (Walker 2000). This means, for any given policy, there need to be a clear link between policy action statements and the policy problem (policy issue) stated in order to achieve the intended objectives; this is what is lacking here as far as the policy under scrutiny is concerned.

Generally, the policy issue and the objective indicate some alignment with the adaptation indicator in question, the major problem is that the policy statements are weakly connected to the existing hindrances towards harnessing renewable energy resources. As a result, although the policy statements sound good in the sense that they seem to focus at promotion of renewable energy resources, yet in real sense they may not change the situation since they fail to beam out any indicator that they can resolve the existing barriers towards promoting such renewable energy resources.

Good policy statements could come up with clear variables to be worked upon to resolve specific issues. It would have been of help if there could be objectives and action statements for each renewable energy category. Therefore, the analysis here concludes that the policy scores 1 point meaning limited alignment with the energy diversification indicator since it fails to provide policy action statements clear enough to demonstrate that once such actions taken the existing barriers towards harnessing of the resources in question will be removed hence the intended objective will be attained. A study by Antwi-Agyei *et al.,* (2017) indicated that stakeholders in

Ghana were not happy with their National Energy Policy partly because it lacked specificity on who should do what to achieve prescribed objectives.

Energy efficiency and demand response - side management

Energy efficiency, water efficiency and demand—side management alleviate supply constraints. The Tanzania National Energy policy, however, does not seem to address clearly the concept 'energy efficiency and demand response - side management'. Of course the policy does explain ways to handle issues of energy efficiency and demand but in a separate manner that the nexus between them does not feature out clearly. One of the relevant policy objectives to energy efficiency is "to promote energy efficiency and conservation in all sectors of the economy" (URT 2015 pg21). The action statements to meet the objective are somewhat troublesome though, they are six of them as follows: i) facilitate establishment of standards and code of practice for energy management; (ii) ensure energy uses are benchmarked to industry prudent practices; (iii) facilitate efficient biomass conversion and end-use technologies; (iv)ensure integration of energy efficiency aspects in housing policies and building codes; (v) Enhance fuel switch from wood fuel to modern energy; and (vi)Facilitate adoption of appropriate cooking appliances to promote alternatives to wood fuel. Both the policy objective and the policy action statements clearly reflects the government vision towards enhancing energy efficiency. With reference to URT (2015), one may note that the six statements largely address the identified challenges pertaining promotion of energy efficiency despite language being generic. The prescribed policy statements clearly matches proposed policies for reducing GHG emission in Maxwell (2016). However the generic language is not encouraged since if not handled with care it may cause leakage of actions during policy implementation. Due to such generic language, for example, there are some challenges which can be perceived to have been left hanging. For example, energy inefficiency use in industries is associated with old and sub-standard equipments as well as outdated technologies (Maxwell 2016).

There is no policy objective to address demand response rather there is an objective to address issues of supply which states as follows: "To mainstream sectoral plans into Energy Sector planning". This objective emanates from the problem of poor planning on the side of the energy sector; this means, the energy sector admits that it is not well informed on who needs how much energy and at what time, hence the energy sector is calling upon an integrated plan that well take care of the issue of proper energy supply at a particular time. The policy action statements on planning are presented in the next section where the paper discusses in details the 'smoothing the demand curve for energy' adaptation indicator.

Looking both the policy objective and the respective policy action statements one would note that the policy does not indicate any aspiration to make the demand side accountable for the energy used so that the demand side can use energy sensibly. The policy could indicate for example that it intends to impose extra charges to users who would need supply at times when energy is not that much necessary basing on their nature of operations, that would likely lead to careful use of energy and eventually demand would be regulated to balance the need, the coast and the supply as it is proposed in NAPEE (2010). The policy could also impose positive incentives packages to user who happen to use energy wisely. Such that they generate more energy in store for other users especially during peak hours. If for example domestic users can be encouraged to use cold preserving cabinets during peak hours instead of having refrigerators on throughout. Such practices can create an opportunity for energy serving during peak hours hence balancing the demand and supply without necessarily affecting quality of service.

Energy efficiency and demand response management when properly handled reduces the pace for expansion of energy production, which is desirable for adaptation to climate change. The current option in the demand side suggests a likelihood of expansion in energy production to meet the demand; this is contrary to the adaptation and mitigation requirements. Expansion of energy production means more emission of the GHG and therefore more global warming. Box 1 presents a description of energy efficiency and demand response nexus. Failure to clearly show the demand response measure to be taken by the energy sector leads to rating this indicator as no alignment (0) since there is no evidence in the document to suggest that the sector policy supports the implementation of the building block i.e. energy efficiency and demand response side management.

Box 1

Energy efficiency - demand response nexus

Energy efficiency refers to using less energy to provide the same or improved level of service to the energy consumer in an economically efficient way; it includes using less energy at any time, including during peak periods. In contrast, demand response entails customers changing their normal consumption patterns in response to changes in the price of energy over time or to incentive payments designed to induce lower electricity use when prices are high or system reliability is in jeopardy. Better coordination of energy efficiency and demand response programs at the provider level could bring about cost efficiencies and more rational allocation of resources for both program providers and customers. Coordination could help customers, as most customers do not understand or care about the difference between energy efficiency and demand response and would be receptive to an integrated, packaged approach to managing their energy usage. Greater customer willingness could also increase demand response market penetration and capture energy savings and customer bill-reduction opportunities that might otherwise be lost. Over the long term, customer and utility smart grid investments in communications, monitoring, analytics, and control technologies will blur many of the distinctions between energy efficiency and demand response and help realize the benefits of this integration (NAPEE 2010pg.1-2)

Smoothing the demand curve for energy

Smoothing the demand curve for energy over the day and the year, will lower overall required energy capacity; this can be attained through reducing and shifting energy demand away from peak hours (National Action Plan for Energy Efficiency 2010; and REN21. 2019). The problem is implied under the description of the planning problem in the electricity sub-sector. The sector describes the problem pertaining planning for the electricity subsector as follows: "Inadequate planning has led to conflicting and competing interests among various sub-sectors of the economy with regard to the development and utilization of energy resources; occasional shortages or disruptions in supply of fossil fuels; power rationing as well as frequent power interruptions" (URT 2015 pg 44). Hence the policy advocates for mainstreaming sectoral plans into the energy sector planning (ibid pg 44) which will lead into having a robust integrated plan that takes on board the needs of government actors, regional and international energy trends.

In that regards, the government is committed to: (i)promote inter-sectoral and cross-sectoral energy planning; and (ii)facilitate development of energy master plans, programmes and projects as these are its prescribed objectives specific to solve the problem of poor planning which has caused poor energy demand curve due to conflicting and competing interests across sectors. Likewise, the petroleum subsector advocates for proper management of energy through an integrated plan that considers all energy users in a manner that energy demand and supply are determined in advance thus reducing burning more fossil fuels to facilitate high energy demand. The objective and associated action statement to resolve the planning problem in the electricity sub-sector; also, the objectives and action statements to resolve the problem of proper management in the petroleum sub-sector; may definitely address the issue of smoothing the demand curve. However, the implications of the given actions towards ensuring a smooth demand curve might be detrimental if production of energy can be expended unless such expansion is taken care with alternative sources of energy, which are less detrimental to the environment. The policy fails to control the demand response, which could otherwise assist in ensuring a smooth demand curve without necessarily calling upon expansion of energy production, which is costly and may not be environmentally friendly. This building block is rated partial alignment (2) for its problem definition is just by implications and also action statements do not clearly reflect on environmental conservation agenda.

Distributed as opposed to centralized energy systems

Distributed as opposed to centralized energy systems is another important climate change adaptation indicator in the energy sector. Distributed energy system can increase resilience (National Action Plan for Energy Efficiency 2010; and Avila et al., 2017). With distributed generation energy is produced next to its point of use. Renewable energy-based generation can enhance resilience due to its modular nature, ability to operate in severe weather when designed to do so, and lack of fossil fuel requirements (REN21. 2019). According to Stout et al., (2018) policies for distributed energy for climate change resilience need to observe commitment to spatial diversification, micro-grids installations, addressing the water-energy nexus, and redundancy.

Spatial diversification -The modular nature of renewable energy technologies, such as wind turbines and solar photovoltaics, allows greater spatial diversification of energy supplies compared to conventional power generation systems, which deliver power from a concentrated point or central location (Avila et al., 2017; and REN21. 2019). This increased spatial diversification reduces the vulnerability of the energy supply to cause damage from a single event or a single critical location, which increases overall energy system resilience (National Action Plan for Energy Efficiency 2010; and Avila et al., 2017). The Tanzania National Energy Policy a sound objective regarding spatial diversification of energy production, which states as follows: " To enhance utilization of renewable energy resources so as to increase its contribution in diversifying resources for electricity generation (URT 2015 pg 18)". The policy provides the following action statements to attain the objective are attainable. Such action statements are presented as follows: (i) Promoterenewable energy sources and sustainable use of biomass for power generation; (ii) Facilitate integrationof renewable energy technologies in buildings and industrial designs; (iii) Establish Feed-in- Tariffs for renewable energy technologies; (iv) Establish frameworks for renewable energy integration into the national and isolated grids; and (v) Promote sustainable biofuel production and usage(ibid pg 19). But as presented earlier these objectives do not reflect on the problem, which hinders development of the specific renewable energy sources i.e. solar, biomass, liquid fuels, wind, small scale-hydro, and geothermal presented on pg 17-18 of the 2015 Tanzania National Energy Policy document (URT 2015). It may not be very realistic to throw one generic objective with a focus to address issues from different types of sources of energy with different kinds of challenges towards exploitation of such resources. Hence there is partial alignment to CCD as far as this aspect is concerned and therefore the sub building block scores 2 points.

Microgrids installations - Microgrids capable of islanding based on distributed energy systems can disconnect from the central grid during a major climate event to allow energy to be diverted to critical loads (Stout et al., 2018). This allows utilities flexibility in restoring generation stations, responding to critical

outages, and shutting down systems before a major event to prevent damage (ibid). Islanded energy systems, therefore, ensure consumers have access to power during long-term power outages that severely impact central grid systems, which can occur after major natural disasters (ibid). The Tanzania National Energy policy commits the government to this requirement as one of its objects focuses at "Enhancing power reliability and coverage of transmission and distribution networks" (URT 2015 pg 15). More efficient energy use is one of the main options for achieving global sustainable development in the 21st century; support interconnection with neighboring countries. The action statement which goes as follows: i) Ensure timely investment in construction, rehabilitation and expansion of the transmission and distribution infrastructure; ii)Ensure establishment of appropriate legal and regulatory framework for an Independent System Operator and Independent Market Operator; iii)Ensure reduction of power losses in transmission and distribution networks; and iv)Establish a framework to allow open access to distribution networks (ibd pg 15), well links up with the challenges identified regarding achieving reliable transmission and distribution which include aged infrastructure, high power technical losses, lack of proper rehabilitation and maintenance and system overload; vandalism of transmission network; land and way-leaves acquisition, dilapidated networks, outages as well as technical and non-technical losses. The policy therefore is highly aligned to this sub-building block scoring 3 points.

Water and energy: The water-energy nexus is a critical factor in resilience. Water is used for energy generation in hydro-electric plants and in cooling systems for nuclear plants. Simultaneously, energy is used for treating and pumping water supplies. Technical solutions ranging from making power-generation plants more efficient, to using clean-energy technologies, and designing systems to utilize gravity-fed options can enhance resilience of both energy and water systems. The Tanzania National Energy Policy, however presents that Tanzania has considerable potential of small hydro, the problem is that the proven sites have not been fully exploited due to lack of funds to develop the sites and restrictions on water rights (URT 2015 pg 18). The policy however does not provide clear policy action statements to resolve the problem related to lack of funding although it intends to promote renewable energy sources, promotion of renewable energy sources however definitely need funding. Hence there is less commitment to this requirement since and the sub building block is rated partial alignment scoring 2points.

Redundancy - Redundancy may be explained as the extent to which multiple power lines are committed into energy supply to a given entity (community, industry, etc). Communities served by only one power line or water supply have limited resilience. Increasing supplies, routes, or incorporating

redundancy to overall systems will reduce the risks of those systems (Stout et al., 2018). The Tanzania National Energy policy intends to "Establish frameworks for renewable energy integration into the national and isolated grids" (ibid pg 19), which in a way may improve redundancy. For this case the policy is fully aligned to this requirement scoring (3). For this building block therefore the policy scores an average of 2.5 therefore rounded to 3 and hence it is voted for full alignment score**.**

Policy Alignment to Mitigation Pillar
De-carbonization of energy
All countries, in one way or another, should reduce consumption of fossil fuel. As an alternative, countries can increase the use of renewable energy, the use of nuclear power, or the use of carbon capture and storage (CCS) technology. While all these options are effective in reducing CO2 emissions, the latter two face other issues. These options could be considered as intermediary solutions until renewable energy is widely diffused. The use of renewable energy is far more supported by the people than the other two options. However, some voices emphasize economic and technical concerns related to renewable energies. These are the challenges that need to be overcome for a wide diffusion of renewable energy technologies.

There is much evidence that the policy is aligned to the de-carbonization of energy requirement as it advocates for promotion of use of renewable energy resources. The policy identifies such sources as wind, solar, biomass, small-scale hydro, geothermal, tidal, waves, and ocean thermal conversion. The specific objective on use of renewable energy resources is "to enhance utilization of renewable energy resources so as to increase its contribution in diversifyingresources for electricity generation." The government is committe d to (i) Promote renewable energy sources and sustainable use of biomass for power generation (ii) Facilitate integration of renewable energy technologies in buildings and industrial designs (iii) Establish Feed-in- Tariffs for renewable energy technologies iv) Establish frameworks for renewable energy integration into the national and isolated grids; and (v) Promote sustainable biofuel production and usage (URT 2015pg 9). Implicitly, the objective is set to address one of the key drivers for the formulation of the policy, which is "promoting compliance with environmental, health and safety standards in the Energy Sector" (ibid pg 9). Likewise the policy statements indicate that activities related to electricity generation will encourage de-carbonization in the energy sector. Promotion of renewable energy resources and suitable use of biomass power generation for example would mean more investments in wind, solar, geothermal and other sources of renewable energy; and that will mean increase in electricity from such non-fossil fuel, as a result electricity from fossil fuel will be produced minimally and that will mean energy used in the country will be non Co_2 generator.

Likewise, facilitating integration of renewable energy technologies in buildings and industrial designs means ensuring infrastructure that is friendly to renewable resources based energy. That enables use of energy that is based on non renewable resources, that way, use of energy from fossil fuels will be reduced and that will transform into de-carbonization of energy. When the government establishes Feed-in- Tariffs for renewable energy technologies it actually encourages importation of relevant materials for renewable resources energy taping, distributing and use since all such materials will be available at a relatively affordable price. Frameworks for renewable energy integration into the national and isolated grids are important for smooth operations. Promotion of sustainable biofuel production and usage means ensuring that production and usage of biofuel does not compromise other relevant parameters of human life including environmental conservation. Hence, implicitly the government is committed to ensuring more forests conservation, more tree planting campaigns, use of improved stoves that consumes less wood etc. This is another action that will improve de-carbonization in the energy sector.

However, as pointed out in the previous sections, the policy identified challenges which constrains the harnessing of the different renewable energy sources but its policy action statements hardly connects to such problems. This creates a gap between the existing hindering factors regarding promotion of renewable resources and actions to be taken. It would have been better if policy actions would have been set specifically to address specific challenge facing a specific resource rather than having generic action statements which reflects on a single generic objective. This is a pitfall on the side of the policy since one may not clearly anticipate changes in the shortcoming. This building block score partial alignment (2) since the action statements fail to prove how they will address the existing challenges facing harnessing specific renewable resources.

Improvement of energy efficiency

Energy should be used in the most efficient way to achieve the greatest output. Energy efficiency has been improving worldwide, but the speed of improvement should be even faster if we were to minimize the impact of climate change. In some sectors, energy efficiency at the product level is satisfactory, but not at the system or community levels. Hence, various levels of energy efficiency need to be assessed. Some policies to promote energy-efficient products do not always lead to overall emission reduction because they may stimulate increased consumption of products and energy at community level. However, this goal only intends to assess the efficiency aspect of products and systems.

URT (2015) defines energy efficiency and conservation as measures aimed at reducing energy consumption without sacrificing productivity, level of service or increasing costs. This definition clearly addresses efficiency at consumption level. Likewise, the general objective for energy efficiency in the Tanzania National Energy policy of 2015 which states "To promote energy efficiency and conservation in all sectors of the economy" (URT 2015pg 21) is well focused to ensuring efficiency in the energy policy. The four policy statements, which are important for action, prescribe action to be taken by the government for just some of the issues raised as stabling blocks for ensuring efficiency in the sector. The statements are as follows: (i) Facilitate establishment of standards and code of practice for energy management; (ii) Ensure energy uses are benchmarked to industry prudent practices; (iii) Facilitate efficient biomass conversion and end- use technologies; and (iv) Ensure integration of energy efficiency aspects in housing policies and building codes (ibid pg 21).

The issue of awareness rising and capacity building does not appear to be addressed by the prescribed action statements despite the fact that the policy recognizes the importance of awareness rising as an approach towards enhancing energy efficiency as in URT (2015 pg 20). Also, issues surrounding transport are not well addressed by the action statements; for example, one may wonder how the issues of driving behavior, poor transport infrastructure and traffic congestion will be addressed with the prescribed action statements.

Furthermore, a more thorough analysis is required for the transport sector, marine, air, and inland transport system need specified analysis rather than just generic analysis as presented in URT 2015 pg 20 where there is no where such transport segments are been specifically addressed. This sub building block is therefore rated partial alignment (2) since although the policy presents an objective which clearly supports the energy efficiency mitigation indicator, it is less clear and less distinct in terms of ways in which each particular stabling block will be addressed to affect the indicator and ultimately achieve the prescribed objective.

Minimizing demand for energy service

While energy efficiency needs to be further improved, the best approach is to eliminate any need for energy. For instance, improvement of energy efficiency in automobiles is important, but people can use other means of transportation such as bicycles and public transportation while enjoying the same level of mobility. Energy demand management is another approach to reduce the pressure on insufficient electricity supply, rather than increasing the supply by burning more fossil fuels to meet the requirements. It is becoming more important to reduce unnecessary demand for energy and products to reach the climate mitigation goal.

The Tanzania energy policy advocated for an integrated planning for energy management to smooth the demand curve as explained early; the policy, however, falls short in terms of promoting use of non-automobiles such as use of bicycles for transport as opposed to use of automobiles. The policy, for example, identifies the transport sector to be one of the major consumer of fossil fuels in the country particularly petroleum yet its measures to address emissions from the transport sector focuses only at dealing with such issues as driving behaviors, standard of vehicles and age, quality of transport systems and the mode of transport (refereeing to use of public transport over private transport). The policy also observes that poor transport infrastructure causes traffic congestions, which result in high fuel consumption and air pollution (URT 2015). The policy observes that exploration of possibilities for fuel switch to other forms of energy such as electricity, ethanol and compressed natural gas to the best options for addressing emissions in the transport sector. Although ethanol cuts GHG emissions from petrol by more than half, yet use of non automobiles need to be priorities number one as they cut GHS emissions in the transport sector by almost 100% (not counting emissions related to production of such non automobiles means of transport such as bicycles). This sub building block is therefore rated limited alignment (2) since there are no much evidence as to how energy demand services will be significantly minimized.

Land use, land-cover change and forestry (LULUCF)and sequestration:
Another indicator for aligning to mitigation pillar is promotion of proper land use and forestry conservation for minimizing Green House Gases (GHG) emission. In this regards the energy policy need to stipulate specific objectives as well as policy statements that indicate government commitment to forestry conservation and sustainable land use. Standards, regulations, and subsidies for conservation of forests; promotion of wise-use of wood products; projects that may lead to minimization of land-use change from forests to other non-vegetative land use/cover are highly recommendable. One of the key drivers for the development of the 2015 Tanzania National Energy Policy is "Promoting compliance with environmental, health and safety standards in the Energy Sector" (URT 2015 pg 9). The energy sector for that matter is expected to promote -conservation and protection of forestry resources through financing research and community based conservation activities including awareness building. The sector also is expected to promote efficiency improvements in bio related fuel production and energy use.

Moreover, promotion of carbon sequestration related activities such as those focusing at increasing forest area, increasing vegetation cover, increasing carbon storage in soils and conversion of biomass to long-term products would be highly recommended for any energy policy. The policy provides a

clear description of the environmental problems associated to production of energy resources including implied deforestation. The policy also provides a clear objective, which aspires to abide to environmental standards. Likewise the policy provides three action statements that clearly indicate that the policy can attain the intended objective, these are (i) Enforce environmental, health and safety standards and laws governing the Energy Sector; (ii) Ensure that contractors in the energy sector establish a decommissioning fund for environmental restoration where appropriate; and (ii) Strengthen institutional capacity in monitoring and enforcement of laws and regulations on safety, occupational health and environmental management (URT 2015 pg48). This sub building block is therefore rated high alignment (3) since the problem is well defined, the objectives reflects the need to address the problem and action statements are practical enough to attain the intended objective.
Overall, mitigation building block, therefore, scores 2.25 points meaning that the building block partially aligns to CCD.

Policy Alignment to Development Pillar
Social economic development

Socio-economic development is key to CCD. Poor people are more vulnerable to the impacts of climate change but at the same time such people are more likely to degrade the environment due to limited adaptation options (Climate Change and Poverty Conference 2015). Therefore socio-economic development is an important CCD building block. The socio-economic development indicator, however, is weakly handled in the policy under scrutiny. The policy recognizes the importance of local communities in development of the petroleum subsector and it sets an objective to attain as "To optimize benefits of petroleum industry for social and economic development (URT 2015 PG37). The policy also sets action statements to attain the prescribed objective as to (i)Ensure available opportunities in petroleum industry are utilized by communities; (ii) Strengthen coordination of local content issues and petroleum industry; and (iii) Ensure oil and gas players support Tanzanian communities in their economic activities in order to effectively participate in the petroleum value chain (ibid). The problem here is that the policy fails to explain why social economic development is a policy issue. What are the issues surrounding the Tanzanian community which if not sorted may hinder the development of the petroleum sub-sector? Also what are the available opportunities in the subsector for socio-economic development of the Tanzanian community? Answering these questions could provide a good answer as to why socio-economic development is a policy issue and there after assessing whether policy action statement are objective or not could be easy. As for now it may not be easy to assess the objectiveness of the policy action statements since the question why socio-economic development is an issue is not fairly delineated.

Furthermore, Despite the fact that the policy recognizes the important entities for social and economic development yet it provides no clear definition of the issues surrounding such entities; it therefore does not provide any objectives specifically to address such issues hence forth there is no specific policy statements for promoting social economic development in the Tanzanian community. Some of the social economic development entities that the policy recognizes include the private sector, academia and research institutions, Non Governmental Organizations (NGOs), media, and the community. The policy for example recognizes that "Private sector including Independent Power Producers (IPPs), Oil Marketing Companies (OMCs) and Oil and gas companies play important role in providing substantial capital investment and technologies needed in theenergy sector.

The policy therefore states that the government will continue to work with the private sector to promote, build capacity and facilitate PPP projects or other arrangements in the energy sector. The private sector is expected to implement credible local content programmes" (URT 2015pg 86). Though the policy indicates some commitments to promote developmental activities through corporation with the private sector yet there was a need to define issues surrounding the private sector in the country and thereby pin down areas, which the energy sector could provide a helping hand for enhancing development. The way it is at the moment it is as if all is well with the private sector, which is not true. Relevant and areas of priority need to be stipulated rather than having such generic statements as 'the government will continue to work with the private sector to promote, build capacity and facilitate PPP projects or other arrangements in the energy sector' Such kind of statement does not give clue on the kind of projects to be promoted by the energy sector. The private sector for example faces challenges related to capital; one would ask which kind of projects are likely to be supported in terms of capital by the energy sector is important to be described. Same applies to NGOs; the policy need to outline the nature of NGOs that could be supported by the energy sector; are those that working towards environmental conservation? is it those NGOs working to promote education? What Kind of support such NGOs should expect from the energy sector? These are some of the questions that need some clarifications.
The policy recognizes that the role of the media in providing balanced public information on the Energy Sector activities is important. In this regard, the media need to strengthen their capacity in understanding Energy Sector activities to ensure delivery of information accurately and timely. This will increase public awareness, enhance transparency and ensure accountability on Energy Sector. But there is nowhere in the policy document that indicates commitment of the government to support the media in its undertakings to support the energy sector and thereby stimulate social economic development.

The policy also recognizes the importance of the local community in that, local communities are important entities in safeguarding the integrity of the infrastructure in the energy sector. The policy therefore outlines that, because such local communities benefit from the infrastructure they therefore have the responsibility to maintain security and safety of such infrastructure for sustainability purposes. Of course the local communities benefits either directly or indirectly from the use of the infrastructure related to the energy sector, however, that alone is not enough in promoting social economic development in the local communities. The energy policy need to define clearly all major social and economic issues surrounding local communities in Tanzania and identify priority areas for the energy sector. Education for this matter could be one of the priority areas for the energy sector in that with education community can stand a better chance to protect the energy infrastructure. The policy promotes education, training and research in the energy sector through working close with academic and research institutions. This implicitly means that the policy is committing the government to support education higher levels.

However, promotion of primary and secondary education would be the most important thing since majority of the population in Tanzania fall at that level of education. Other social services as water, health, transport and communication are issues surrounding local communities in the country. It would have been better if the policy could direct investors to prioritize development of such services to communities surrounding respective projects. Furthermore, poverty is rampant in rural areas where most energy related projects are located. Poverty alleviation to communities surrounding such projects need to be a policy issue and be articulated more clearer than the case is at the moment.

The policy indentifies gender issues as one of its priority areas. The policy clearly shows its commitment in areas of employment and training as well as on preventive, curative and education on HIV & AIDS. Unfortunately the policy does not clearly articulate its promotion of training in such important aspects as training on use of non wood sources of fuel as well as fuel effective stoves.

The socio-economic development building block is rated limited alignment (1) due to the fact that, the policy seem to appreciate that development is one of the important aspects to be considered in the energy sector. However, there is no clear description of the social and economic problems in the policy as a result there is no clear focus on what the policy intend to achieve as far as social economic development is concerned.

Table 3: Policy alignment Score to CCD

CCD building block	Indicator	Evidence of alignment	Score
Adaptation	Improving access to energy in rural areas	The sub-building block is rated partial alignment (2) since the policy aligns with the adaptation indicator just by implications, it does not state categorically that improvement of access for rural electrification is for ensuring reduction of GHGs emission for environmental conservation and not otherwise. There is no any strategies identified to overcome the identified challenges regarding rural electrification, that raises questions on whether the objective can be attained.	1.5points
	Energy diversification	There is a clearly defined problem and objectives but the action statements fails to link up with the identified problems as a result there is no clear evidence that during implementation the stabling blocks towards attaining the objective will be overcome. Therefore, the score is limited alignments (1)	
	Energy efficiency and demand response-side management	There is literary no definition of energy efficiency and demand response - side management as a policy issue, objective as well as action statements. The score therefore is no alignment (0) since there are no aspects that indicates that the policy acknowledges efficiency and demand response side management s important for CCD.	
	Smoothing the demand curve for energy	The problem is implied under the description of the planning problem. The objective and associated action statements to resolve the planning problem may indirectly address the issue of smoothing the demand curve. However, the implications on actions towards ensuring a smooth demand curve might be detrimental if production of energy can be expended unless such expansion is taken care with alternative sources of energy which are less detrimental to the environment. This building block is rated partial alignment (2) for its action statements are controversial as far as environmental conservation is concerned.	

	Distributed as opposed to centralized energy systems	The policy scores an average of 2.5 from the three aspects for this building block hence rated as having partial alignment to CCD.	
Mitigation	De-carbonization of energy	This building block score partial alignment (2) since the action statements fail to prove how they will address the existing challenges facing harnessing specific renewable resources.	2.25
	Improvement of energy efficiency	Partial alignment (2) since although the policy presents an objective which clearly supports the energy efficiency mitigation indicator, it is less clear and less distinct in terms of ways in which each particular stabling block will be addressed to affect the indicator and ultimately achieve the prescribed objective.	
	Minimizing demand for energy service	This sub building block is rated limited alignment (2) since there are no much evidence as to how energy demand services will be significantly minimized	
	Land use, land-cover change and forestry (LULUCF)	This sub building block is rated high alignment (3) since the problem is well defined, the objectives reflects the need to address the problem and action statements are practical enough to attain the intended objective.	
Development	Social and economic development	The socio-economic development building block is rated limited alignment (1) due to the fact that, the policy seems to appreciate that development is one of the important aspects to be considered in the energy sector. However, there is no clear description as to why social-economic development is a policy issue hence the policy fails to pin down burning issues which could otherwise target to sort them out, as a result the policy provides a generic objective and action statements where it may be difficult to determine their objectivity.	1
Average score			1.58

Having computed scores from the three CCD alignment pillars the policy scores an average of 1.58points which means the policy alignment to CCD is limited.

Discussion

The analysis indicates that overall the energy policy has limited alignment to CCD. The policy scored significantly low in terms of adaptation (1.5points) and also in terms of Development (1point). The policy however scored better in terms of mitigation (2.25points). This is to say the policy is skewed towards climate change mitigation hence failing to meet the CCD requirements. Most alignment pillars are implied in the policy document.

What falls the policy is the weak link between defined policy issues and action statements. In some cases, the policy defines clearly policy issues but policy statements fail to reflect likely actions to be taken to address the identified challenges so as to meet the prescribed objectives. In other cases, the policy issues fail to come out clear such that one find it difficult to assess the objectivity of the accompanying policy action statements even though such statements may seem to be sound. In Antwi-Agyei *et al.,* (2017) the Ghana energy policy scored zero (0) on adaptation alignment pillar since it failed to demonstrate clearly ways in which objectives and actions could be met. As the case is in this study, the Ghana policy scored highest in terms of mitigation (Antwi-Agyei *et al.,* 2017). Having a policy which leans towards mitigation may not be welcoming news especially for developing countries where technology and capital to ensure de-carbonization of energy, improving efficiency and minimizing the demand for energy service (as in defined in NAPEE 2010) is a problem. Although CCD is arguably best policy approach for now yet when things are tough at least developing countries are expected to focus on adaptation (IPPC 2014). In South Africa the energy policy scored least in alignment to CCD pillars as it offered minimal strategies which demonstrated a possibility for achieving objectives and statements (England *et al.,* 2018).

Alignment to the 'development' pillar is not well prescribed in the policy. It would be interesting to see how opportunities brought by the new discoveries on oil and gas can be used in a manner that maximizes promotion of the climate compatible development including investing more in low carbon emission projects such as supporting woodlot for carbon sequestration projects, wood fuel effective stoves, etc. These kinds of investment would not only promote reduction in GHG emission but will also create employment opportunities among local communities ultimately reducing poverty as proposed in Jain *et al,* (2009). Investors in the energy sector and other beneficiaries would be made not to concentrate only on what they get from the sector, but also support the sector in the fight against the impact of climate change. There could be a policy statement that could, for example, specifically focus on reinvesting the profit generated from oil and gas in renewable energy such as solar energy. Although already the policy shows government commitment to the use of energy from renewable energy resources yet it could be important to stress the point of reinvesting the gains from the sector to more use of such renewable energy resources with a view to sideline use of fossil fuel completely in future as suggested in NAPEE (2010). Already studies indicate that the use of renewable energy technologies such as solar systems has helped to facilitate sufficiently appropriate and cost effective energy supply in rural areas where there is no national grid and now people enjoy modern communication by charging their mobile phones with the aid of solar electricity" (Mnzava A 2011).

Reinvesting in such renewable energy resources could enable harness more energy enough to run all domestic operations as well as small industries; once this is achieved there would be a significant cut of GHG emission from the sector. The policy needs to clearly indicate strategies for improving technology in view to improve infrastructure for renewable energy. So far there are no clear goals for revamping renewable energy technologies as interventions to the energy policy.

The legal and regulatory framework is another area that needs to be improved for proper implementation of the policy actions. The policy document indicates that some laws and regulations are still drafts and they are yet to be enacted, this leads to a lack of legal support for the operations in the sector; this has serious implications when it comes to implementation of the policy. Gao (2013) argued that lack of strategic implementation plan as well as measurable indicators on policy implementation; and finally lack of awareness at local level are all pitfall for the success of the policy objectives all of which have implications on alignment to CCD.

Conclusions and recommendations

The Tanzania national energy policy of 2015 has limited allignment to CCD pillars as far as the analysis in this study is concerned. This has implications on the fight against climate change and its associated impacts. Ultimately this also has implications for sustainable development especially because although reliable energy is essential for socio-economic development yet processes leading to energy generation and use make up a significant portion of global greenhouse gas (GHG) emissions contributing to climate change (IPCC, 2014). Climate change also impacts seriously even ecosystems which are important sources of energy resources. This symbiotic relationship presents both near-term and chronic challenges in providing reliable, affordable, equitable, and sustainable energy services. This is why reviewing the policy to ensure that it highly aligns to the CCD pillars is important.

References

Alam, M.M. (2013), Coping with Blackouts: Power Outages and Firm Choices, Department of Economics, Yale University.

Ali, M., Geng. Y., Robins, D., Cooper, D., and Roberts, W. (2019) Impact assessment of energy utilization in agriculture for India and Pakistan, *Science of The Total Environment* 648(15):1520-1526.

Altheide, D., Coyle, M., DeVriese, K., Schneider, C. (2008) Emergent qualitative document analysis. In *Handbook of Emergent Methods*; Guildford Press: New York, NY, USA,pp. 127–151. ISBN 9781609181468.

Amani, H., and Mkumbo E. (2012). Strategic Research on the Extent to which Tanzania has Transformed its Rural Sector for Economic Growth and Poverty Reduction., Presented at REPOA's 17th Annual Research Workshop held at the Whitesands Hotel, Dar es Salaam, Tanzania; March 28-29, 2012.

Antwi-Agyei, P., Dougill, A. J., and Stringer., C. (2017) Assessing Coherence between Sector Policies and Climate Compatible Development: Opportunities for Triple Wins, *Sustainability*, 9: (2130): 1-16.

Avila, N., Carvallo, J. P., Shaw, B. and Kammen, D. M, (2017),The energy challenge in sub-Saharan Africa: A guide for advocates and policy makers: Part 1: Generating energy for sustainable and equitable development. Oxfam Research Backgrounder series.

Bowen, G. A. (2009). Document analysis as a qualitative research method.

Chandra, V., Kacker, P., and Li, L.Y. (2008) Fostering Growth, Export, Competitiveness and Development in the Manufactiring Sector, in Utz, R.J. 2008) Sustaining and Sharing Economic Growth in Tanzania, World Bank, Washington.

Chawla, S., Kurani. S., Wren, S. M., Stewart, B., Burnham, G., Kushner, A., and McIntyre, T. (2018), Electricity and generator availability in LMIC hospitals: improving access to safe surgery, Surgical Research, 223:136-141.

Dwijen, Mallick., Ashraful Amin and Atiq Rahman(2012) Climate Compatible Development (CCD) in Agriculture for Food Security in Bangladesh, The Climate and Development Knowledge Network, available on line at: https://germanwatch.org/en/download/8347.pdf Accessed 27/1/2015.

Climate Change and Poverty Conference (2015), Climate Change and Poverty: Conference Summary February 9-10, 2015 Washington, DC https://www.worldbank.org/content/dam/Worldbank/document/Climate/Climate accessed on 26.02.2019.

Ebiger, J., and Vergara , W. (2011), Climate Impacts on Energy Systems: Key issues for Energy Sector Adaptation, World Bank Washington DC.

Ellis, E. Cambray A., and Lemma A (2013) Drivers and challenges for climate Compatible Development CDN Working Paper.

England, M.I., Stringer, L.C., Dougill, J.A., and Afionis, S. (2018), How do sectoral policies support climate compatible development? An empirical analysis focusing on southern Africa, *Environmental Science & Policy* 79:9-15.

Environmental Protection Agency (EPA) (2019), Inventory of U.S. Greenhouse Emissions Gas and Sinks 1990-2017 https://www.epa.gov/ghgemissions/ inventory-us-greenhouse-gas-emissions-and-sinks.

Fischedick M., J. Roy, A. Abdel-Aziz, A. Acquaye, J. M. Allwood, J.-P. Ceron, Y. Geng, H. Kheshgi, A. Lanza, D. Perczyk, L. Price, E. Santalla, C. Sheinbaum, and K. Tanaka, 2014: Industry. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

Franco, A., Shaker, M., Kalubi, D., and Hostettler, S. (2017), A Review of Sustainable Energy Access and Technologies for Healthcare Facilities in The Global South., *Sustainable Energy Technologies and Assessments,* 22:92-105.

Gao, A. M., (2013), Development of a Legal Framework for Climate Change in Taiwan: Lessons from Europe and Germany, *Carbon & Climate Law Review* 7(1):54-70.

Gouais, L. A., and Wach, E. (2013) A qualitative analysis of rural water sector policy documents. *Water Alternatives,* 6, 439–461.

IPCC, (2018) Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.

https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data as of accessed 15.08.2019.

https://cdkn.org/wp-content/uploads/2012/10/CDKN-CCD accessed on 24.02.2019

https://www.esi-africa.com/regional-news/east africa/tanzania-continues-stieglers-gorge-hydroelectric-project/ accessed on 26.02.2019

Intergovernmental Panel on Climate Change (IPCC) Climate Change (2014) Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland

Jain, Theresa B.; Graham, Russell T.; and Sandquist, Jonathan, tech. eds. (2009), Integrated Management of Carbon Sequestration and Biomass Utilization Opportunities an a Changing Climate: Proceedings of the 2009 National Silviculture Workshop; 2009 June 15-18; Boise, ID. Proceedings RMRS-P-61. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station

Kaur, N., and Ayers, J. (2010), Planning climate compatible development: lessons from experience, CDKN IIED Policy Brief December 2010/A

Matata, P., Bushesha, M. and Msindai, J. (2019) Assessing Rainfall and Temperature Changes in Semi-Arid Areas of Tanzania. American Journal of Climate Change, 8, 173-189. https://doi.org/10.4236/ajcc.2019.82010 Mitchell, T., and Maxwell S. 2010. Defining climate compatible development. Climate and Development Knowledge Network (CDKN) Policy Brief.

Maxwell, S. (2016) Climate compatible development: pathway or pipe dream? Centre for Policy Dialogue Anniversary Lecture, CDKN.

Mitchell, T., and Maxwell, S. (2010) Defining climate compatible development, CDKN IIED Policy Brief December 2010/A.

Moreno, J., and Shaw, D. (2019), Community Resilience to Power Outages after Disaster: A Case Study of the 2010 Chile Earthquake and Tsunami *International Journal of Disaster Risk Reduction* 34:448-458.

Moutinho, V., Costa, C., and João Paulo Cerdeira Bento, J.P. (2015) The impact of energy efficiency and economic productivity on CO_2 emission intensity in Portuguese tourism industries, *Tourism Management Perspectives* 16:217-227.

Mwituruban, D.A., (2019), The Impacts of Climate Change Variability and Change on Communities Access to and Utilization of Coastal Resoiurces in Pangani District Tanzania, In Yanda, P.Z., Bryceson, I., Mwevura, h., and Mung'ong'o, C.G. (2019), Climate Chnage and Coastal Resources In Tanzania: Studies on Socio-Ecological Systems' Vulnerability, Resilience, and Governance. Springer Climate Switzerland

National Action Plan for Energy Efficiency (NAPEE)(2010). Coordination of Energy Efficiency and Demand Response. Prepared by Charles Goldman (Lawrence Berkeley National Laboratory), Michael Reid (E Source), Roger Levy, and Alison Silverstein. www.epa.gov/eeactionplan.

OECD., (2015). Aligning Policies for the Transition to a Low-Carbon Economy. Paris.

Oum, S. (2019). Energy poverty in the Lao PDR and its impacts on education and health, *Energy Policy*, 132(C):247-253. DOI: 10.1016/j.enpol.2019.05.030

O'Leary, Z. (2014). The essential guide to doing your research project (2nd edition).

Ram, B., (2015) Tanzania Energy Sector-Challenges and Opportunities, African Development Bank Main DPG Meeting, Dar Es Salaam, 2nd June 2015.

REN21. (2019). Renewable 2019 Global Status Report, Paris: REN21 Secretariat. ISBN 978-3-9818911-7-1.

Ross, M.M. (2014), Diversification of Energy Supply: Prospects for Emerging Energy Sources, ADB Economics Working Paper Series, No. 403 2014.

Stout, S., Hotchkiss E., Lee N, Holm A, and Day M, (2018). Distributed Energy Planning for Climate resilience, American Planning Association – National Planning Conference 2018 New Orleans, Louisiana.

Stuart, C., (2017) Energy and Climate Change Adaptation in Developing Countries European Union Energy Initiative Partnership Dialogue Facility (EUEI PDF), Eschborn.

United Republic of Tanzania (URT) (2015) National Energy Policy.

United Republic of Tanzania (URT) (2014) The National Petroleum Policy of Tanzania.

United Republic of Tanzania (URT) (2013) The National Natural Gas Policy of Tanzania.

United Republic of Tanzania (URT) (2011) Integrated Industrial Development Strategy 2025.

Walker, W., (2000), Policy Analysis: A Systematic Approach to Supporting Policy making in the Public Sector, *Multi-Criteria Decision Analysis* 9(13): 11-27.