P-ISSN: 2618-0723
E-ISSN: 2618-0731

Extension Journal

Impact Factor: RJIF 5.1
www.extensionjournal.com

International Journal of Agriculture Extension and Social Development

Volume 4; Issue 1; Jan-Jun 2021; Page No. 54-57

Received: 16-11-2020
Accepted: 19-12-2020

Indexed Journal
Peer Reviewed Journal

Review on access to affordable, reliable, sustainable and modern energy for all in Ethiopia

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Abstract
One of the sustainable development goal of the country is access to affordable, reliable, sustainable and modern energy is for all. It is underpinned by three targets: ensuring universal access to energy services, increasing the share of renewables in the energy mix, and improving energy efficiency. In Ethiopia people more still live without electricity, and an equal number suffer from an insufficient, unreliable supply of energy. The main objectives of this review focuses the opportunities and challenges of access to affordable, reliable, sustainable, and modern energy for all in rural parts of Ethiopia. Lack of well developed infrastures, inadequate knowledge, skills, abilities, and experience of effeciety use are the challeges and the opportunities are power generation such as; hydropower, wind power, solar energy, geothermal energy and cogeneration. There fore the review concluded and recommend for the any concerned body should increase the level of infrastructure and upgrading innovative technology to provide clean and more efficient energy in all countries of Ethiopia.

Keywords: affordable, modern, reliable, rural Ethiopia, sustainable development

Introduction

Background

The Sustainable Development Goals (SDGs) are a collection of 17 global goals designed to be a "blueprint to achieve a better and more sustainable future for all. Access to affordable, reliable, sustainable and modern energy is the focus of SDG number seven. It is underpinned by three targets: ensuring universal access to energy services, increasing the share of renewables in the energy mix, and improving energy efficiency. The services that energy makes possible from mobility to manufacturing, agriculture to heating and lighting are ubiquitous in the industrialized world, and have been around for so long that people commonly take for granted what makes these services possible. Not everyone has enjoyed the benefits that modern energy forms can provide, however. Energy resources are unevenly distributed around the world, and where they exist and are relatively easy to produce, the necessary energy extraction and conversion infrastructure (e.g. Gas drilling, oil refineries, wind turbines, electricity transmission lines) requires significant sums of money to bring online.

Constraints to financial and human capital (all the knowledge, talents, skills, abilities, experience, intelligence, training, judgment, and wisdom possessed individually and collectively by individuals in a population) often result in some among us being left out of the modern energy society.

According to [1] 1 billion people around the world still live without electricity, & an equal number suffer from an insufficient, unreliable supply. In addition, 3 billion people use dirty fuels to cook with or to heat their homes, thus increasing CO2 emissions. There is a clear need to stimulate the development and use of clean energy worldwide. Talking about sustainable energy means talking about cleaner production methods, and this is where renewable energy sources such as; solar, wind, hydropower geothermal and cogeneration come into play. Using energy as efficiently as possible, reducing the amount that is used, and generating savings. The energy efficiency target, meanwhile, is a „win-win" strategy on essentially all accounts. Every unit of energy saved, either through technological or behavioral/ conservation means, is a unit that does not need to be produced. This, in turn, lowers the easing the burden of attaining each.

Objectives

To review opportunities and challenges access to affordable, reliable, sustainable, and modern energy for all in rural parts of Ethiopia.

Discussion on related reviews

The energy infrastructure development: comprises expanding electrical transmission lines, providing reliable and efficient energy supply and distribution. Energy development across the nation is growing and expanding.

Power Generation

Hydropower: Refers to the conversion of energy from flowing water into electricity. It is considered a renewable energy source because the water cycle is constantly renewed by the sun. Several benefits of hydropower, cost competitive, reliable, base-load power, flood control, and water supply. The country has managed to increase its

electricity generation capacity to 4269.5 MW. Many power generating development schemes are under construction every year. The grand Ethiopian renaissance dam (GERD) has reached 57 percent completion in 2016/17. Construction of the transmission line increased from 14,065 km in 2014/15 to 15,137 km in 2015/16. Coverage of electricity supply increased from 54.25 percent in 2014/15 to 56 percent 2015/16 fiscal year (Ministry of Water and Energy, 20170813) [2]. Sectors at all levels of government administration monitor the implementation of the SDGS and their targets. Monitoring reports reach the HPRs and the Standing Committee (SCS) of the parliament for performance assessment every year. Feedbacks on the performance assessments are sent to the section. The federal institutions prepare and submit performance reports of GTP II including SDGS to the NPC every end of each fiscal year. The NPC assesses the performances of GTP II including SDGs within each fiscal year [3]. The integration of the SDGs with the GTP II as accomplished to produce the SDG Integrated GTP II is notable. Objective realities in Ethiopia have of course influenced the integration. Ethiopia is preparing long-term national development plan; there is also a study being launched to assess financing needs for implementing the SDGs. Further integration of the SDGs with the GTPs is envisaged to be informed by the long term plan and the SDG financing needs assessment reports [3].

Wind power: To provide the mechanical power through wind turbines to turn electric generators is a sustainable and renewable energy, and has a much smaller impact on the environment compared to burning fossil fuels. Wind power is ideally suited to complement hydro power. The Ethiopian government increasingly focuses on wind power. In contrast to hydropower projects, which re-allocate water resources to some extent, only locals feel negatively impacted by wind farms to some extent. The leveled cost of electricity from wind power worldwide is falling and is now (2017) roughly that of hydropower. It is expected to fall further due to maturing technologies, increasing wind power popularity and more suitable sites where wind power plants can be installed when compared to hydropower. By taking these developments into account, the Ethiopian Ministry of Water and Energy revised its numbers on an economically feasible wind power potential within only a few years from 10 GW to 1,350 GW (EMWE, 2017.) [4]

Solar energy: Some decent conditions to use solar energy (photovoltaics) can also be expected in Ethiopia, in particular in Tigray region and on the eastern and western rims of the Ethiopian. Lighting Africa goal is to enable the more than 250 million people across sub Saharan Africa who are living without electricity to gain access to clean, affordable, quality verified off-grid lighting energy products by 2030 [5].

Geothermal energy: it provides reliable clean and affordable baseload power that can be easily dispatched whatever the time of year or day -unlike hydro, solar and wind [6].

Cogeneration: Cogeneration is well known as producing both power and process heat simultaneously at very high efficiency, and operates at optimum efficiency from the single fuel source. Renewability and sustainability make a vital meaning in the future energy generation, because the results of over exploiting current energy resources are becoming a disaster [7]. Producing electricity with smaller devices located near the user can dramatically increase the overall efficiency of energy use. Distributed generation is a term used for small power generators located near the point of electricity use as opposed to central power plants using transmissions grids. However as smaller scale power generation is usually less efficient in the production of electricity, the full benefits of distributed generation are only achieved with cogeneration applications [8].

Advancing sustainable development goal seven implementation in support of the 2030 agenda: All 46 voluntary national reviews submitted in 2018 provide an assessment of the progress in implementing SDG7. This underscores the importance of energy in national strategies, plans and programme for achieving the Sustainable Development Agenda by 2030. A detailed look at the reviews, however, shows both opportunities and challenges. Overall, the analysis found that the majority of countries referenced the existence of a national energy strategy. A strong correlation was also noted between the existence of a comprehensive national energy strategy and the level of ambition and details on SDG7 implementation. Countries with a well-defined energy strategy tend to set more ambitious targets with a clearer path to implementation [9]. Many reviews did not flesh out the elements of such a strategy in detail. On the other hand, the analysis showed the overall challenge, which resonates with the conclusions on of the 2018 Sustainable Development Goals report that "ensuring access to affordable, reliable and modern energy for all has come one step closer due to recent progress in electrification, particularly in LDCs, and improvements in industrial energy efficiency. However, national priorities and policy ambitions still need to be strengthened to put the world on track to meet the energy targets for 2030".
The analysis also reinforced the main message of Tracking SDG7: The Energy Progress Report 2018, published in June 2018, that "progress falls short on all four of the SDG7 targets, which encompass universal access to electricity, as well as clean fuels and technologies for cooking and call for a doubling of the rate of improvement of energy efficiency, plus a substantial increase in the share of renewables in the renewable energy; and scaling up investments in energy efficiency across all sectors of the economy. Ambition levels among countries in these areas vary greatly and many do not elaborate on specificities with special regard to renewables and efficiency targets [9]. The majority of the reviews do not contain sufficient data on the state of play with regard to the main SDG7 indicators, nor in most cases the specific targets to be reached by 2030.

Achieving universal access to electricity: Off-grid solar solutions, ranging from solar home systems to solar mini-grids are important drivers of rural energy access, which complement grid electrification in some countries. While off-grid solutions feature in many reviews, they typically do not discuss the exact barriers to implementation of low-cost, off-grid solar solutions, outline strategic plans clearly

delineating the role for grid and off-grid approaches nor define the right partnership models between the public and private sector for financing grid extension. Several reviews (Viet Nam and Niger in particular) highlight the difficult balancing act between affordable energy prices and prices that are attractive enough for the private sector to invest in the energy sector, with special regard to transmission and distribution systems. Efforts and best practices to address energy poverty (e.g., through targeted subsidy programmes) do not receive enough attention in most of the reviews. A critical issue highlighted prominently by Canada, Australia and the State of Palestine is the disproportional access-deficit challenges for indigenous communities. Both Canada and Australia focus heavily on addressing the challenge. Best practices access Togo's solar street lights programme is an inspiring example of urban electrification relying on modern energy technologies. 10,000 solar powered street lights were installed in the five regions of Togo, including 7,000 standard solar street lights, 2,000 solar street lights with five outlets for charging appliances and 1,000 solar street lights with five outlets for charging devices and a Wi-Fi "spot" for internet connection.

Achieving universal access to clean and modern cooking fuels, technologies and services: The ministerial declaration of the 2018 high-level political forum calls upon governments and all stakeholders to make clean-cooking solutions a priority. The global agenda for accelerated SDG7 action promotes the importance of place-specific policies, cross-sectoral plans, public investments, and game-changing, multi-stakeholder partnerships.

The majority of the reviews from countries commonly considered as most affected by a lack of clean-cooking facilities, however, have not outlined plans to address the problem in sufficient detail. Access to clean-cooking fuels and technologies is an area typically overlooked by policymakers, a view reinforced by the reviews. Only 27 per cent of the reviews in the 2018 cycle report on the clean cooking issue. Out of the 20 countries with the largest clean-cooking deficit identified in the 2018 energy progress report, only Vietnam and Sudan feature in the 2018 review cycle. Cooking is not mentioned in Vietnams national review, although, in the energy progress report, Vietnam was singled out as having made the most rapid progress in that area, along with India, Pakistan, Indonesia in Asia.

Best practices: clean cooking the government of Cabo Verde launched its household energy strategy to address the inter linkages between clean-cooking solutions, health and gender equality, supporting the dissemination of enhanced stoves and promoting the use of locally manufactured stoves at affordable prices. This is contributing not only to the achievement of the clean cooking target as part of SDG7, but is also addressing SDG1 (no poverty), SDG3 (health), SDG5 (gender) and SDG15 (life on land) [6].

Ireland is showing exemplary leadership in supporting SDG7 targets globally. The country is committed to supporting developing countries in their transition from the inefficient useof traditional energy supplies towards the use of modern, cleaner sources of energy, such as solar energy and energy efficient cook stoves. A number of small-scale pilot projects have been supported to explore off-grid household energy solutions for rural communities in sub-Saharan African countries, such as Malawi and Uganda, and offer options to be considered for scale-up as part of an overall energy solution.

Substantially increase the share of renewable energy in the global energy mix: All the countries that submitted reviews in the 2018 cycle reported on the status or progress of renewable energy, which shows a strong momentum worldwide. Most countries indicate their confidence in achieving the SDG7 target on renewables. Modern forms of renewable energy, such as bioenergy, geo-thermal, hydropower, solar and wind, are the most frequently mentioned renewable sources in the reviews submitted. That also aligns with the global trend that these most technologically advanced sources count for over half of the total final energy consumption from renewable sources obtained worldwide as of 2015. The Ministerial Declaration of the 2018 High-level Political Forum calls upon Governments and all stakeholders to accelerate the pace of transition towards renewable energy, especially in end-use sectors such as transport, buildings, agriculture and industry. Indeed, renewable energy made impressive gains in the electricity sector albeit from a low base, but these gains are not being matched in other end- use sectors, such as transport, industry, and heating and cooling, which together account for 80 percent of global energy consumption. In the 2018 reviews, this perspective is also scantly mentioned or presented with examples. In the electricity sector, most of the reviews focus over-whelming on electricity generation, but not enough attention is given to the development of transmission and distribution systems, where investments typically lag.

Double the rate of energy efficiency improvement: The Ministerial Declaration of the 2018 High-Level Political Forum calls upon Governments and all stakeholders to accelerate the pace of energy efficiency across all sectors of the economy, including cooling and district heating, rationalizing inefficient fossil fuel subsidies and promoting innovation and investments in energy efficiency across all sectors of the economy. The Global Agenda for Accelerated SDG7 Action calls forth "scaling up of investments in energy efficiency across all sectors of the economy, supported by well-designed, evidence-based policies (e.g., building codes, minimum energy performance standards, energy performance labels, cost-reflective energy tariffs and fuel economy requirements), as well as by regional, national and local action plans (with effective enforcement and monitoring)", and concludes that despite concerted energy efficiency programs in place by multiple countries, the "rate of global energy efficiency progress falls far short of the annual rate of 2.7 percent needed between now and 2030".With the exception of five countries, energy efficiency is mentioned as part of the country strategies to implement SDG7, but more often than not, detailed strategies and ambitious cross-sectoral integrated policy approaches that promote improvements through targets or fiscal incentives are not elaborated on. Whenever a detailed strategy is included in reviews, the countries typically focus more on demand-side energy efficiency measures such as building codes, energy performance requirements for

construction and renovation, energy performance standards and labels for electric and electronic products. Supply-side measures tend to remain untapped in electricity generation, transmission and distribution. The Global Agenda stresses the importance of developing cost-reflective energy tariffs, and reforming damaging fossil fuel subsidies both in energy consumption and energy supply, an aspect that is ignored in most of the reviews.

Financing sustainable development goal seven: The voluntary national review from Greece contains a particularly well fleshed-out action plan on boosting energy efficiency. An energy efficiency obligation programme has been in place since January 2017, requiring energy suppliers to make savings against an annual target, based on the market share of the obligated entity, targeting oil suppliers and the transport sector. In the building sector, which counts for almost half of the energy consumption, the focus has been on the refurbishment and renovation of the existing building stock in line with new efficiency obligations to improve thermal insulation among other factors.

Sustainable energy technology innovation: Less than one third of the reviews contain any reference to energy innovation and technology, a crucial aspect of accelerating SDG7 action, with special regard to the enduse sectors of transport, industry and buildings, through increased public and private investment and increased international co-operation. The critical role of digitization and smart appliances in energy transition is not the focus of attention in any of the reviews from developing countries, while it features highly in developed countries.

Enhancing capacity-building: While flagged as a priority in the ministerial declaration of the 2018 high-level political forum, less than one third of the 2018 reviews outlined plans for scaling up capacity building and education to develop the necessary human and institutional skills and capacities in support of universal access and energy sector transformation that are critically important elements.
Knowledge sharing, learning by doing, pilot studies, education and capacity-building programmes are a few examples of capacity-building interventions. The capacity-building activities reported in the 2018 reviews are narrowly focused and not tightly aligned with the needs of the energy sector.

Strengthening interlinkages between sustainable development goal and other goals: The global agenda calls for the harnessing of cross-sectoral linkages to maximize multiple benefits and synergies by promoting energy as an enabler for all the sustainable development goals and a unified approach to achieving SDG7 and, at the same time, meeting the goals of the Paris agreement on climate change. The majority of the reviews make no direct connection between the specific country's energy goals and its nationally determined contributions under the Paris agreement, which underplays the critical interplay between SDG7 and SDG13 (climate action).The Global Agenda calls for the integration of gender equality and women's empowerment into all energy actions to advance the Sustainable Development Goals. Linkages between SDG5 (gender equality) and SDG7 are rarely spelled out in the reviews.

Summery

In generally, this tem paper review focuses on access to affordable, reliable, sustainable and modern energy which underpinned by three targets such as; ensuring universal access to energy services, increasing the share of renewables in the energy mix, and improving energy efficiency.

- Ensure universal access to affordable, reliable, and modern energy sources that ensure adequate levels of energy services to meet basic productive household and community needs.
- Investing in solar, wind and thermal power, improving energy productivity, and ensuring energy for all is vital if we are to achieve sustainable development.
- Expanding infrastructure and upgrading technology to provide clean and more efficient energy in all countries will encourage growth and help the environment.

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