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Evaluating the role of policy for electrification in Ethiopia

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List of Acronyms

AFD	Agence Française de Développement
CRGE	Climate Resilient Green Economic Strategy
ENEP	Ethiopian National Energy Policy
GoE	Government of Ethiopia
GERD	Great Ethiopian Renaissance Dam
GHG	Greenhouse Gas
GW	Gigawatt
GWh	Gigawatt hour of electricity
IEA	International Energy Agency
IFC	International Finance Corporation
IPP	Independent Power Producers
JICA	Japanese International Cooperation Agency
KWh	Kilowatt hour of electricity
kWh/ m ²	Kilowatt hour of electricity per Square Meter
MoWIE	Ministry of Water, Irrigation, & Electricity
Mt CO ₂ e	Metric Tons of Carbon Dioxide Equivalent
NEP	National Electrification Program
NEP 2.0	National Electrification Program 2.0
NEPE	National Energy Policy of Ethiopia
NGO	Nongovernmental Organization
PPP	Public Private Partnerships
RE	Renewable Energy
SD	Sustainable Development
SDG	Sustainable Development Goals
SSA	Sub-Saharan Africa
USAID	United States Agency for International Development

Evaluating the Role of Energy Policy for Electrification in Ethiopia

AKRAM YASIN ABDULRAHMAN

Abdulrahman, A., 2021: Evaluating the Role of Energy Policy for Electrification in Ethiopia. *Master thesis in Sustainable Development at Uppsala University*, No. 2021/19, 42 pp, 30 ECTS/hp

Abstract:

Access to electricity is a scarcity throughout sub-Saharan African countries. The region currently has the lowest rate of energy access in the world and a total of 13 countries have an electrification rate of 25%. Comprehensive energy security is regarded as essential to obtaining sustainable and economic development in which access to affordable and clean energy is part of the Sustainable Development Goals of the United Nations Agenda 2030. A country in the region that has had some sporadic success with electrification and unique developments with renewable energy, is Ethiopia. Despite the significant overall increase of access to electricity over the past two decades, the country still has an electrification rate that barely covers half of the population. An aspect that is viewed to have an impact on increased electrification and successful transitioning of deploying renewable energy, is the use and presence of strong policies. Several researchers and scholars have explored the effect that policy has on increased electrification and how they are useful for promoting renewable energy. This research aims to investigate the role of policy for electrification via renewables in Ethiopia. The objective of the thesis is to explore sustainable development in terms of energy development, how climate change and economic development is tackled, and what specific influences shape the energy outlook of Ethiopia. A case study was conducted which combined two different methods; content analysis of policy documents and semi-structured interviews with experts from various fields in which the data was triangulated in order to gain valuable perspectives and insights. The findings showcase that policy developments do seem to have an influence on increased electrification and sustainable energy transitioning to some extent, with other factors also playing a role. Thus, this research will contribute to how sustainable development can be understood from the context of energy policy of a global south nation and provide insights which can further be elaborated on how policies can be utilized for successful energy developments in other countries in the region.

Keywords: Sustainable Development, Electrification, Energy Security, sub-Saharan Africa, Ethiopia, Policy

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Summary:

Sub-Saharan African countries suffer an extreme underdevelopment of access to modern energy. There are currently 13 countries in which less than 25% of their given population have access to electricity making the region the energy poorest area in the world. Comprehensive energy security is vital in order to obtain sustainable and economic development and promote the well-being of people. Not to mention, access to affordable energy is part of the United Nations Sustainable Development Goals. A country in the region that has had some sporadic success with electrification and unique developments with renewable energy, is Ethiopia. Although there have been some major developments of increasing the electrification rate, less than half of the population still have no direct access to electricity. An aspect that is viewed to have an impact on increased electrification and successful transitioning of deploying renewable energy, is the use and presence of strong policies. Research indicates that increased electrification and energy transitioning to renewables is dependent on adequate policy, however, there appears to be more room for studies examining energy policy for increased electrification in sub-Saharan African countries.

Therefore, this research aims to investigate the role of policy for electrification via renewables in Ethiopia. The objective of the thesis is to explore sustainable development in terms of energy development, how climate change and economic development is tackled, and what specific influences shape the energy outlook of Ethiopia. A case study was conducted combining two different methods; content analysis of policy documents and semi-structured interviews with experts from various fields in which the data was triangulated in order to gain valuable perspectives and insights. The findings showcase that policy developments do seem to have an influence on increased electrification and sustainable energy transitioning to some extent, with other factors also playing a role. Thus, this research aims to contribute to the understanding of sustainable development from the context of energy policy of a global south nation. The findings will hopefully provide insights which can further be elaborated on how policies can be utilized for successful energy developments in other countries in the region.

Keywords: Sustainable Development, Electrification, Energy Security Ethiopia, Policy, Sub-Saharan Africa

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1. Introduction

Access to electricity is a scarcity throughout sub-Saharan African countries. Many countries are struggling with meeting their current energy demands to provide for their people, as well as the projected goals for the future. Countries throughout sub-Saharan Africa currently have the lowest rate of energy access in the world and a total of 13 countries have less than 25% access (Corfee-Morlot et al., 2020). Comprehensive energy security, specifically electrification by renewable energy is essential to obtain sustainable and economic development and promotes wellbeing of people (Tucho, Weesie & Nonhebel 2014).

It is also worth mentioning that achievements pertaining to SDG 7 “Affordable & Clean energy” will help alleviate poverty (Chirambo, 2018) and have the potential of overlapping synergies with other SDGs (Castor, Backa and Fuso Nerini, 2020). The notion of sustainable energy transitioning is an ongoing phenomenon that is highly linked with the efforts of improving energy security and promoting energy practices that are environmentally sound and efficient long term.

One sub-Saharan African country that has seen an increase in electrification via renewables as well as both successes and failures of nationwide electrification is Ethiopia. Access to electricity (of total population) was as little as 5% in 2000 and has seen an increase to 45% in 2018. (IEA, 2021). There has also been a significant increase of electricity production generated from renewable energy which constitutes the vast majority of the country’s electricity source. Ethiopia, which is heavily reliant on hydroelectric power, has almost doubled the production of electricity from hydroelectric sources (from 1970s to 2015 onward) over the last 50 years (World Bank, 2021). Simultaneously, the total percentage of electricity production from oil sources decreased from 10% (of total electricity production), to less than 0.05% (World Bank, 2021).

Despite its achievements, Ethiopia currently maintains a national electrification rate which barely covers 50% of the population. As recorded in 2018, around 90% of the population in urban areas have access to electricity while the number for people living in rural areas is only 30%. (World Bank, 2021). Despite the high numbers of urban electrification from data based on international platforms, there are concerns that need to be raised regarding accessibility of electrification and efficiency given the presence of continued power outages and high costs (Carlsson et al., 2018). Ethiopia, being a country that is attempting to lead the way and be an example for other nations by dedicating itself to become a “regional energy hub”, has ultimately major challenges in order to achieve comprehensive electrification and to meet the energy goals of Agenda 2030.

A key to the puzzle of improved energy security is the presence of strong policy serving as a framework to enable innovative energy developments. From a wider context, renewable energy for the purpose of sustainable development is fundamentally dependent on adequate policy as well as policy documentations to ensure sustainable energy transitioning (Lu et al., 2020). Seetheraman et al. (2016) explain that an absence of clear and strong policy prevents positive energy developments to take place and make the case that energy transitioning to renewable energy is fundamentally dependent on clear policy that entails sustainable development. Anything involving subsidies for a specific energy resource, what types of energy measures to increase access, complying with international standards etc, are all reliant on a clear policy trajectory (ibid). The process of improved energy development and promoting renewable energy in any given context will always be complex. Hence policy serves as a directive for successful energy development to take place.

1.1 Problem Statement & Aim

This work has been chosen to do a study on how policy initiatives have been used in Ethiopia to increase the country's electrification rate using renewable energy. This study is important because it will investigate an important aspect that is fundamental in its dimensions for increased electrification as well as achievements and setbacks. Countries in sub-Saharan Africa have a long way to go to increase their electricity production to meet their energy demands and fully transition to sustainable energy systems, and the findings from this research can potentially be used for other comparative studies pertaining to energy policy, energy transitioning, and increased energy access in developing nations. Most of the policy studies and academic literature on the subject have primarily been around energy transitioning in the global north, and more needs to be investigated in the context of a sub-Saharan African country given the dire situation and the complicated position of balancing economic growth with sustainable energy development. There has indeed been research that covers energy sector reform and studies covering various energy initiatives for increased electrification in the region (Karekezi, 2002; Müller et al, 2020; Dagnachew et al., 2020), however more can be investigated regarding the foundation of policy developments for increased energy security and sustainable development in the context of energy.

The study will examine how and to what effect policies in Ethiopia have played a role for increased electricity access via renewable energy as well as analyzing the emphasis on sustainable development. The theoretical lens of sustainable energy transitioning will be used to explore the case as well as set into the regional context of SSA, to derive relevant insights to address the research subject. The research will investigate from the perspective of governmental policy in Ethiopia as well credible actors and stakeholders with expertise in the field.

Due to its influential position in the region, being one of fastest and largest growing economies in both Africa and the World, with interesting and unique energy developments with the likes of the Great Ethiopian Renaissance Dam (GERD), Ethiopia was chosen for the study. It is also noteworthy that throughout the master's program I have focused on energy resource issues pertaining to sub-Saharan Africa and my connection to the country being of Ethiopian heritage made it a suitable choice. The findings from this case study will hopefully increase our understanding about sustainable development via energy policy and the successful initiatives for improved energy security in the context of a global south nation.

1.2 Research Question

The overarching research question of this study will be: "How has policy initiatives shaped the landscape for electrification by renewable energy in Ethiopia?" The research question will be divided into the following sub-questions:

1. How has sustainable development been framed in the context of Ethiopian energy policy?
2. How and to what extent is climate change and economic development addressed?
3. What mechanisms and influences have been present?

1.3 Structure of thesis

The thesis will begin with an in-depth background of the energy security conditions in sub-Saharan Africa followed by the regional and historical context of Ethiopia. The section includes history, developments with electrification, and the current situation. Following section is the literature review where the theoretical concepts of sustainable energy transitioning are presented and related to the context of policy for increased electrification. In addition, the literature review will provide a summary of publications and articles which have been used for the thesis, that discuss the importance of policy for increased energy security and highlight the gaps in existing work that the thesis aims to contribute with, as well as uplifting the theoretical concepts used in the research. In the method section, the selection of methods and rationale behind the given approach, and limitations are presented. Thereafter is the results section which demonstrates the empirical data chosen; policy review by the content analysis method and semi-structured interviews with individuals from various fields in which the findings will be triangulated to gain relevant insights for the subject matter. The data from the selected policy documents and interview answers will be analyzed in relation to the aim of the thesis as well as the chosen literature and various studies. Lastly, the conclusive findings which demonstrate the extensive emphasis on sustainable development, an energy scenario that focuses on green economic growth, and innovative policy initiatives that promote electrification via renewables will be summarized to give a brief answer to the research question and provide a case for further studies and explorations.

2. Background

2.1. Sub-Saharan Africa (SSA)

Sub-Saharan Africa currently has lowest electrification in the world and thus the region with the most severe energy poverty. Electricity is essential for necessities in daily lives including jobs, heating, production etc. From the context of a developing country, it is also worth mentioning that lack of access to modern energy options such as clean cooking, provides risks for women's health. Since women in poorer contexts have a disproportionate responsibility in the household, women therefore must rely on traditional fuel sources such as biomass and wood for daily purposes, which when combusted is associated with a range of cardiovascular health issues (Fullerton, Bruce and Gordon, 2018). The total electrification rate for sub-Saharan African countries is currently around 48% according to the World Bank (World Bank, 2021). Rural electrification rates are significantly lower. The total electrification rate for rural areas currently remains at slightly above 30% across all sub-Saharan countries (World Bank, 2021). However, when examining closely into the majority of the countries and excluding countries that already have a high electrification rate in their given country ($\geq 75\%$), the electrification rates appear much lower. Two categories: 1. There are currently 15 countries with an electrification rate between 25 and 50 %, and 16 countries with less than 25 %. There are currently over 30 countries in SSA with less than 50 % electrification and 16 of those countries have less than 25% (Blimpo and Cosgrove-Davies, 2019). Excluding the likes of Cape Verde, Gabon, Ghana, Mauritius, Seychelles, and South Africa where access to electricity is over 75%, this leaves us with over 600 million people in the rest of SSA without direct access to electricity (IEA, 2019). With these numbers and current progress, there are large concerns whether SSA will be able to meet the goals of SDG7 to provide access to modern energy for all people. SSA averages an annual increase in

access to electricity of only 0.8%, which unfortunately is significantly lower than other nations and not sufficient enough to meet the future energy needs (Blimpo and Cosgrove-Davies, pp.12 2019).

Sub-Saharan Africa

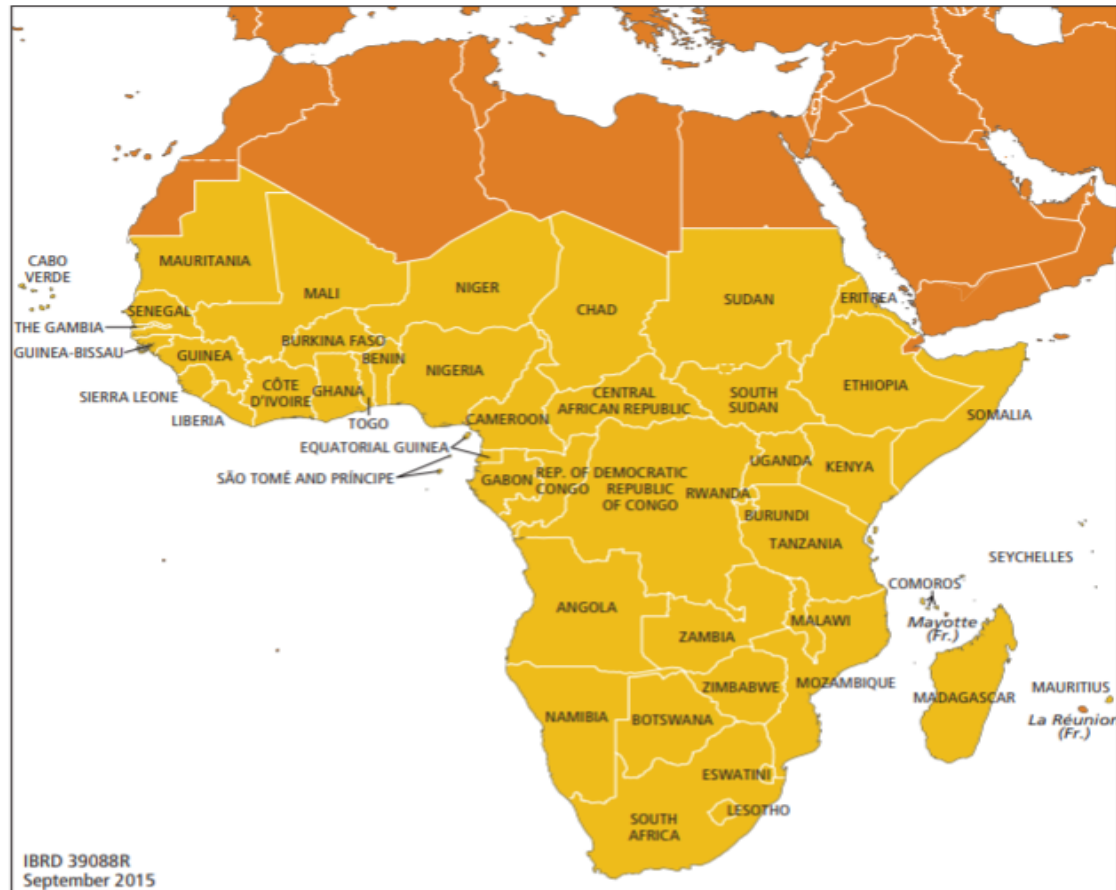


Fig. 1. Map of Africa with SSA countries highlighted in yellow (Blimpo and Cosgrove-Davies, 2019).

The lacking production of electricity among SSA countries is primarily not due to limited resources. In fact, studies show that the potential of electricity production specifically from hydropower is significantly unexploited. Despite contributing with 25% of total power supply in SSA, only 10% of total energy potential of hydropower has been exploited (IEA, 2014). In fact, Hailu and Kumsa (2020) points out that the total amount of electricity that would be generated if hydropower was fully utilized to its potential, would produce more than three times the current overall electricity consumption in SSA. Total electricity produced from traditional fossil fuel sources (oil, gas, and coal), has decreased over the past four decades from approximately 72% to roughly 64% of total production (World Bank, 2021)

2.2. Ethiopia

Ethiopia, the chosen country for my study, has had a sporadic history of positive developments in terms of increased electrification and higher energy security. Ethiopia, which sits at the Horn of Africa is a multi-ethnic nation with 80 ethnolinguistic groups and has a population of over 100 million making it the second most populous country in Africa after Nigeria. Like many other African countries, Ethiopia has a history of war primarily a 30 year long civil war between political

rebel groups against the then military regime known as Derg between 1974 and 1991, and then consequently a two year border war with neighboring Eritrea at the end of 90s with a peace deal officially only taking place in 2018.

Ethiopia is also one of the poorest countries on the planet in which it is currently among the bottom 20 countries with the lowest GDP per capita in the world (World Bank, 2021). Currently over 23% of the population live below the national poverty line (Poverty headcount ratio at \$1.90 a day) but put into perspective over the past decades the poverty rate has decreased with around 20% since 1999 (World Bank, 2021). Additionally, the country has also experienced major economic developments with an average annual economic growth of 10.5 % from 2003/2004 to 2016/2017 as well as 2.5 times increase in GDP per capita between the period of 2010/2011 to 2016/2017 (UNDP Ethiopia, 2018). Ethiopia's economy is mainly comprised of the following sectors: agriculture, industry, and services. The agriculture sector makes up nearly 35% of the economy and employs more than 70% of the population (Ethiopia - The World Factbook, 2021) with the most notable goods exported including coffee, seeds, and minerals such as gold and zinc (Ethiopia (ETH) Exports, Imports, and Trade Partners, 2021)

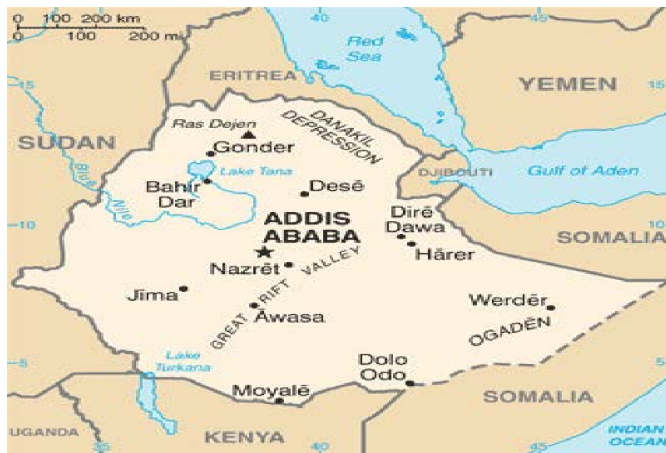


Fig. 2. Political map of Ethiopia (CIA, 2021).

2.2.1 Energy Status: Access to Electricity

Ethiopia's energy status has progressed over the past decades and has an overall strong energy potential. According to world bank data, access to electricity by population in Ethiopia rose from 23% in 2011 to nearly 45% in 2018. As highlighted in the background, the electrification rate for people residing in urban areas is around 90% while the number for people living in rural areas is only 30% which represents one of the largest rural populations without access to electricity on the planet (World Bank, 2021). Overall, Ethiopia has seen a vast increase in energy output. The International Energy Agency (IEA) highlights that the total primary energy supply increased with 143%, and final consumption of electricity increased with 741% between 1990-2018 (IEA, 2021). Even though overall access to electricity is slightly higher in Ethiopia than some other SSA countries, electricity consumption per capita is relatively low. In comparison with the net average per capita electricity consumption across the continent of 500kWh, Ethiopia's electricity consumption per capita in 2017 was estimated to be around 100kWh which is much lower (Hailu and Kumsa, 2020).

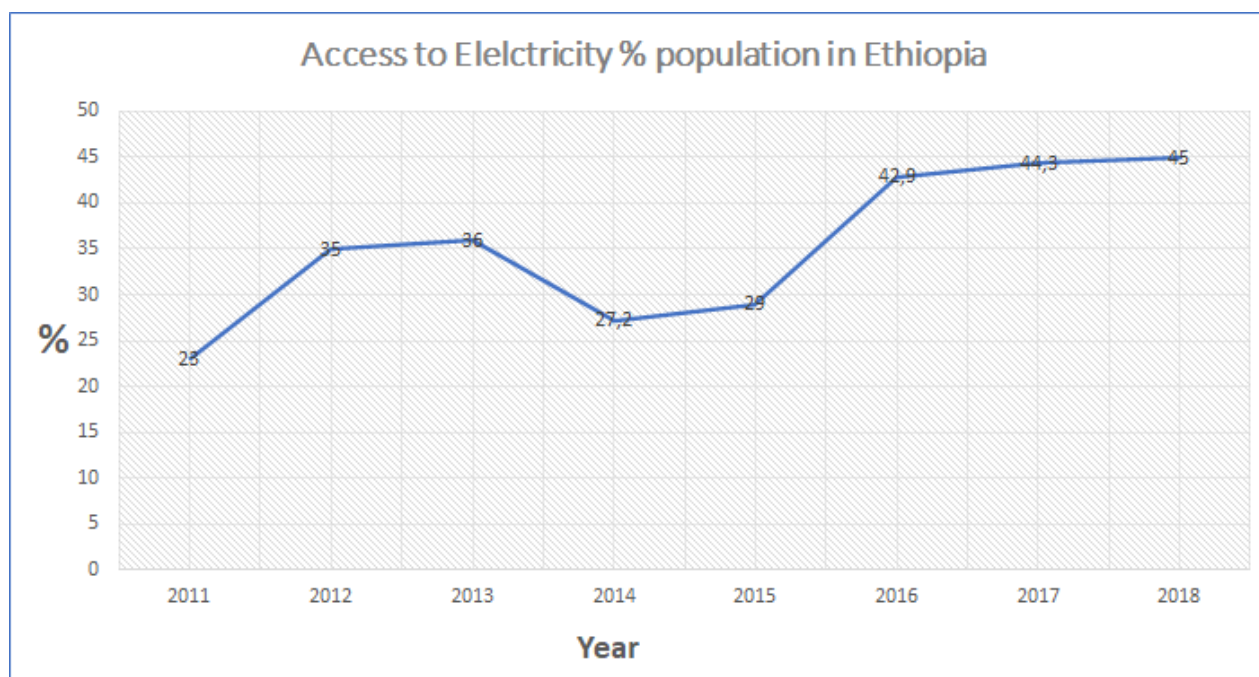


Fig. 3. Developments of electrification in Ethiopia from 2011-2018 (Data from World Bank, 2021).

2.2.2 Energy mix

Biomass accounts for the majority of the energy supply in Ethiopia. It makes up nearly 90% of all the energy supply followed by oil and hydro with 7% and 2% respectively. The rest of the energy supply is derived from coal and renewable sources of solar, wind, and geothermal which make up a negligible amount (IEA, 2019). From the total of 40,000 GWh of final energy consumption, roughly 90% goes to domestic appliances followed by the transport sector and industry with around 4% and 3% respectively of the total consumption (Hailu and Kumsa, 2020). A country in which agriculture is hugely important for the economy, the vast majority of people reside in rural areas. According to World Bank (2021) figures, despite the numbers going down Ethiopia's rural population makes up nearly 80% of the total population. Biomass is traditionally used for heating and cooking in which both the rural and the urban population have historically been reliant on. Traditional biomass including animal dung and wood is utilized by roughly 50% of the households in urban areas and essentially throughout the whole rural population (Tessema, Mainali and Silveira, 2014). Burning biomass for daily purposes is associated with a wide range of health issues due to exposure of hazardous smoke. According to the World Health Organization (2018), pollution caused from burning biomass increases the risk of contracting chronic heart and lung diseases and is the cause of an annual 4 million premature deaths which disproportionately affect women and girls. Thus, the energy situation in Ethiopia demonstrates a reliance on biomass and where renewable energy only provides a small portion to the overall energy consumption.

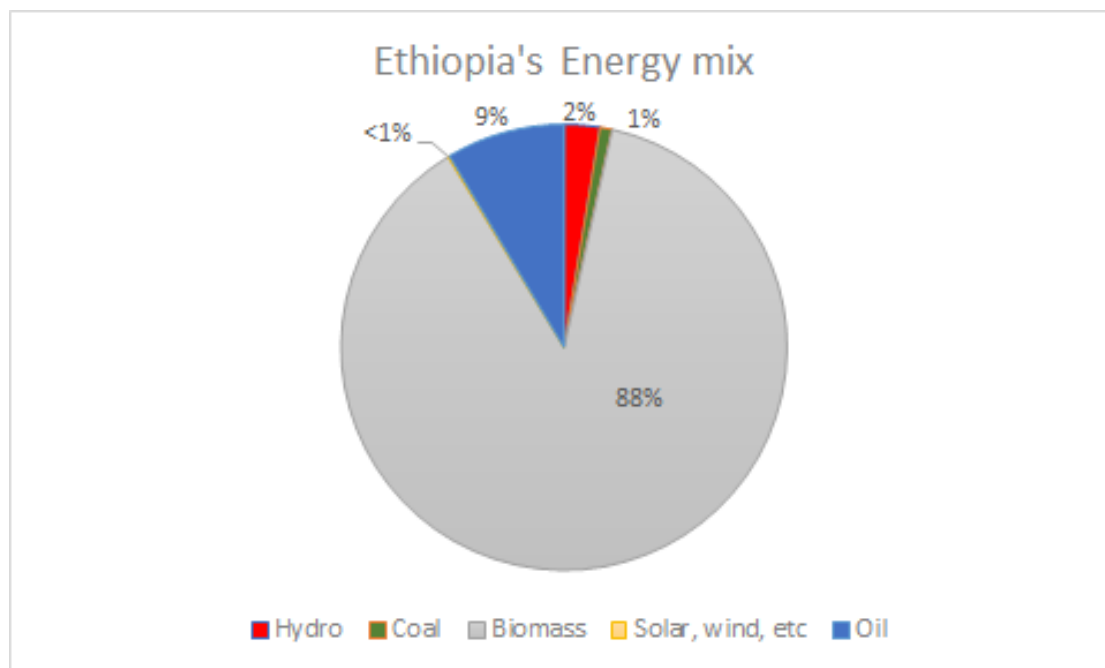


Fig. 4. Illustration of Ethiopia's energy supply (Data from IEA, 2021).

2.2.3 Renewable Energy:

Ethiopia is a country with enormous hydropower potential in which it is a fundamental source for the electricity production. Geographically, Ethiopia is a diverse country with different natural settings ranging from highland to depressions and with several water sources including river basins and lakes which makes it suited for hydropower generation. There are currently 14 major hydropower plants in Ethiopia that provide around 4.5 GW electricity generation and the government is increasing dam projects in the country, with the Great Ethiopian Renaissance Dam (GERD) constructed on the Blue Nile being the most notable one. Once completed, it will be the sixth greatest dam in the world and the largest dam in Africa with a planned capacity of 6GW minimum which will be used domestically and to export electricity to other countries in East Africa. (Hailu and Kumsa, 2020). Currently, electricity generated from hydropower makes up almost 90% of total electricity produced which signifies the importance of the energy source (ibid).

The overall potential for the main renewable energy sources are the following: 45GW for hydro, around 5kWh/ m² of Solar (daily irradiation), 10GW for wind, and 5GW for geothermal energy (Mondal et al., 2018). With these numbers at hand, it is evident that like across the continent the energy is heavily underutilized in comparison to the total potential. The concern about climate change definitely comes in hand since much of the water resource is dependent on rainfall. Ethiopia, a country that relies on hydropower and agriculture which is dependent on rainfall, is extremely sensitive to climate variations. Like other agriculturally based societies, Aragie (2013) points out that the effects of climate change in Ethiopia have played a detrimental role in environmental degradation which have resulted in severe drought, floods, and consequently political tensions between groups causing displacement due to land loss and failed harvest. It is therefore evident that the potential of renewable energy in Ethiopia supersedes current utilization and that climate change needs to be addressed in the context of both economy and energy dynamics.

Source	Unit	Potential	Exploited amount	Total % exploited
Hydropower	GW	45	4.5	<10
Solar	kWh/ m ²	5.2		< 1
Wind	GW	10	≈ 0.3	< 1
Geothermal	GW	7	≈ 0.007	<1

Table 1. Potential and exploited amount of renewable energy sources in Ethiopia (Data from Mondal et al., 2018 & Hailu and Kumsa, 2020 & IEA, 2019).

3. Literature Review and Theoretical Framework

This part of the thesis makes up the theoretical framework for the analysis of the empirical data collected in the research by extrapolating important aspects from the academic literature on sustainable energy transitioning, the regional context of SSA, as well as the role of policy for electrification by renewable energy.

Sustainable energy transitioning is a widely discussed subject that is heavily present in both societal discourse and academia. Although the findings of this research will be specifically focused on Ethiopia and the context of SSA, sustainable energy transitioning is a global concern in which many industrialized countries are expected to do more in terms of shifting their energy systems.

To shed perspective on the bigger discussion, insights from publications regarding the energy situation in SSA will be presented. Energy, which is regarded as a vital means for development for developing countries, the regional context of SSA in particular has been addressed in various literature over the past decade (Blimpo & Cosgrove-Davies 2019; Jingura & Kamusoko 2019 etc).

The last part of the section will present important highlights from academic literature on the relevance of policy for sustainable energy transitioning and increased electrification as an angle of energy security. Although policy can be defined as a decision made from any organization or entity, this research will deal with the energy policy as part of government plans. The term energy policy in this research refers to government policies that directly deal with the energy supply of a given country and are generally characterized to address affordability, environmental impact, and secure access (Kohl, 2004).

3.1. Sustainable Energy Transitioning

In this given part of the section, the concept of sustainable energy transitioning will be discussed,

and the contextual importance will be emphasized. The most relevant aspects of the theoretical lens will be addressed including the importance for energy and the dynamic of finding a balance of transitioning to cleaner and renewable energy sources while pursuing sustainable development.

Smil (2017) explains that energy transition is the gradual change from one energy source to a completely new system of energy provision. The idea of sustainable or renewable energy transition can also be characterized as the direction of shifting the global energy provision in order to significantly reduce greenhouse gas emissions from traditional fossil-fuel based sources with the intention of preventing severe effects of climate change (IRENA, 2021). Easier said than accomplished, the challenge of energy transitioning involves multiple dimensions. Barriers for countries developing and industrialized nations include economic concerns of job loss, requirement of extensive infrastructure, and availability of sufficient resources. The theoretical understanding drawn from much of the literature however suggests that transitioning requires more than just a technical solution. Berkhout, Marcotullio and Hanaoka (2012) addressed the fact that energy transitions are dependent on a spectrum of aspects that combine political, economic, and institutional changes which ought to be influenced by an ethical framework that ties sustainability and technology together.

The importance of sustainable energy transitioning stems primarily from the essence of sustainable development and the attempts of reducing and mitigating severe effects of global climate change. The need for significantly reducing global greenhouse gas emissions as well adopting technological practices that are less environmentally harmful are fundamental aspects behind the rationale of energy transitioning. Based on the study of historical energy transitions, it is understood that a reduction of greenhouse gases at the hands of the global economy will be key in obtaining climate stability (Fouquet and Pearson, 2012). Indeed, energy plays an important role in societal affairs and a significant role in regard to emissions. Another concern involved is the uncertainty of comprehensive energy provision. Fossil fuels have to a large extent historically been easily exploitable, rather cheap to utilize, and thus the ability to maintain a main source of energy provision across the world.

Along the core of environmental concern for the need of sustainable energy transitioning, lies the many evident downsides with traditional fossil fuels. Whether it be coal, gas, or oil, Midilli, Dincer and Ay (2005) explains that the offset of traditional energy sources also contributes with various health concerns for human beings, and the overdependence of fossil fuels has created an intolerable situation which ultimately requires a shift to more environmentally friendly practices. In addition, sustainable energy transitioning emphasizes the importance of significantly reducing the utilization of limited and nonrenewable resources that are environmentally harmful, and gradually adopting technical practices that utilize energy sources that are renewable. (ibid). This notion is highly important since it addresses and underpins the rationale behind the bigger concept of sustainable development; the idea of developing without overly compromising the ability for future generations to meet their needs (Brundtland, 1987)

In addition to the main objectives of mitigating climate change and preventing environmental harm, it is arguable that the existing alternatives to fossil fuel sources have become less reliable. Berkhout, Marcotullio and Hanaoka (2012) highlights that increased concern about alternative practices that are greenhouse gas efficient such as nuclear power, has therefore caused a stronger urge to transition to other renewable sources for energy provision.

The challenges for energy transitioning however are deeper than what they sometimes appear. The complexities of sustainable energy transitioning go beyond the conventional reasons of economic growth and efficiency. Many indications from the literature and the theoretical studies of the subject indicate that the dynamics of energy transitioning remain multifaceted. Geels et al. (2017) argue that the process of energy transitions is non-linear and by default disruptive. Sustainable energy transitioning poses an economic threat to large and influential industries and is therefore as a concept met with resistance. The changes involved challenge current major industries but also require a completely different societal discourse and cultural attitudes to newer practices. There is also an element of disagreement since various stakeholders differ in their understanding of the need as well the preference of the different solutions. (ibid).

Despite the many challenges of transitioning the energy systems in place (fossil-fuel dependent) to renewable energy sources, energy transitioning is nonetheless an integral part of sustainable development. Ruszel, Mlynarski and Szurlej (2018) demonstrate that the transition to more renewable energy systems will in the long term stimulate economic development since there will be an increase in competition among renewable energy sources as a result of the longevity of benefits provided to cope with climate change, and the pressure to move away from fossil fuels due to the environmental harm. Therefore, from a theoretical understanding sustainable energy transitioning remains an important subject in the midst of the wider discourse of sustainable development.

3.2. Energy & Development – Regional Context of SSA

The subject of energy security and energy transitioning in SSA is a widely discussed topic with numerous publications addressing the challenges and implications. This section will go over important aspects regarding energy, electricity access, and development from a theoretical understanding based on selected studies that deal with the issue from the context of SSA.

Energy security is a fundamental aspect for development. Although not being sufficient by its own, Winkler et al. (2011) describes that energy is a key aspect for development and that affordable access to energy services is vital for developing countries.

While being the energy poorest region on the planet, countries in SSA have the dilemma of finding a balance of adopting greener energy systems while also being able to provide sufficient energy for people. Transitioning also has a relevance in regard to the regional effects of climate change. Karekezi (2002) explains that countries in SSA are disproportionately affected and extremely vulnerable to climate change which have resulted in severe drought, famine, and floods. To illustrate, the African continent only emits 2% of global emissions and is not expected to increase beyond 3% of total GHG emissions by 2040 (IEA, 2019). In addition, some of the least developed and poorest nations on the planet are found in SSA, where the overwhelming priority in the hands of lawmakers fall under economic growth and poverty reduction. According to Jingura and Kamusuko (2016) renewable energy transitioning in SSA will be crucial to meet the goals for sustainable development as well as obtaining economic growth, thus exemplifying the notion of the nexus between energy and development.

In addition to the concerns of economic growth, various studies analyze the subject of renewable energy transitioning in SSA through the theoretical lens of energy justice. In their article “Is green a Pan-African colour?” Müller et al explains that the idea of energy transitioning in Africa as opposed

to countries in the Global north in which most of the discourse has revolved around, need to address the element of justice as part of a deeper idea of sustainability (Müller et al., 2020). Since wealthier nations perhaps will not struggle as much to provide energy for all its people, there is a relevant concern regarding comprehensive accessibility in poorer countries with energy transitioning given the current status of poor energy security. If the current energy systems in some SSA countries are already failing to provide comprehensive energy, then there needs to be questions asked if renewable energy systems will only be accessible by the ones who can afford it.

The concerns of sustainable development, energy justice, and economic growth, is characterized in the discrepancy of energy use and increased energy demand. 18 out of the top 20 countries with the fastest population growth are found in SSA (O'Neill, 2021). With this reality, energy transitioning becomes hard to address given that the energy average consumption per capita is almost 7 times lower in Africa than in OECD countries (Ahuja and Tatsutani, 2009), and therefore it is only logical that there are measures taken to meet the current and future energy demands.

Much of the literature addresses the clear linkages of challenges as potential solutions. Granted SDG 7 Affordable & Clean energy remains a global objective which is used as a framework for visualizing a world that can sustain the energy needs of people whilst not contributing to environmental harm. Renewable energy transitioning and increased electrification is also emphasized based on the benefits of sustainable development. In the study of policy implications for increased electricity access in SSA, Valickova and Elms (2021) highlight that the overwhelming traditional energy sources used for in daily lives including kerosene and solid fuels (charcoal, wood, dung) are hazardous to human health, environmentally harmful, and economically unsustainable since average households are required to spend more money on solid fuels as opposed to if modern energy systems were placed instead. This idea goes hand in hand with the overarching idea of sustainable energy transitioning and can therefore also be applicable in the context of SSA.

3.3. Policy for Renewable Energy & Electrification

Adequate policy is crucial in order to increase electrification and improve overall energy security. Various academic articles and research have analyzed policy scenarios for increased electrification and stressed the importance of having comprehensive policy with necessary elements to obtain an improved energy situation of a given country.

The importance of policy for sustainable transitions and comprehensive energy access is tackled in various publications pertaining to energy transitioning and sustainable development. Lu et al. (2020) stresses that successful policy initiatives are fundamental in order to combat the global energy challenges and to transition to more renewable energy practices. Their analysis found that effective policies that focused on accelerating the deployments of renewables and providing affordable energy prices via financing mechanisms such as subsidies proved to increase the share of renewables in the energy mix in five different countries (U.K, China, Germany, Denmark, USA). While the challenges for comprehensive electrification in SSA remain high, the difficulties have not been prescribed to a lack of energy resources. Dagnachew et al. (2020) illustrate that the main challenges for increased electrification in SSA past and present, are due to insufficient finances to satisfy the investment needs as well as poor institutional governance. This reality extends throughout the region including in Ethiopia. To illustrate, Gebreslassie (2019) demonstrated that Ethiopia has struggled to meet its energy ambitions due to policies failing to enable localized development of solar and wind power relying on

imports of technology instead. Similarly for comprehensive electrification, Wolde-Ghiorgis (2002) made the case for policies that primarily emphasized renewable energy to electrify the country's rural population which at the time and to a large extent still today is energy poor. He also addressed that the existing policies at the time failed to adequately address rural electrification in which it was more or less non-existing in the then current policies, which signifies the low development.

There are various studies that analyze policies and attempts for energy reform in different regions with developing nations, including South & South-east Asia, North Africa, and SSA. There are several types of policies useful for energy transitioning and increased energy security. Policies that emphasize on market based and private sector investments, policies that depend and allow for donor initiatives, and policies focusing on finding innovative ways to deploy more renewable and expand energy access including off-grid solutions. For instance, current renewable energy policy in Morocco allows both private and public actors to compete for production of electricity from renewable energy sources (Ghezloun, Saidan and Voucher, 2014). The same study from Ghezloun, Saidan, and Voucher (2014) illustrate that both Morocco and Algeria address the vast potential of solar energy and that the sustainable development and the objective of energy transitioning has shaped the energy policies of both respective countries. This phenomenon is also examined by Pollitt (2012) whose analysis indicates a moderate increase of renewable energy utilization worldwide as a result of policies focusing on liberalizing energy sectors. Ultimately the indication from the literature is that the types of policy in place will have a determining factor on the outcome of a country's energy production. Dagnachew et al. (2020) also concluded in their study for policy implications in SSA for increased electrification, that new technologies and modern energy systems (such as off-grid solutions) require policies that are consistent and provide clarity in order to obtain synergies between relevant stakeholders.

It is also relevant to uplift counter narratives to the case in which policy promoting renewable energy in of itself, fails to produce an outcome where renewable energy is successfully established. Blazquez et al. (2018) stipulate that achieving universal electrification by renewable energy is unrealistic due projected cost-efficiency and generational capacity of conventional renewable energy technologies (solar, wind, hydro). Policies that target renewable energy will in the long run be inefficient as long as they operate in a liberalized market. They refer to this scenario as the “renewable energy policy paradox” in which from a macroeconomic perspective illustrate a case where renewable energy options can only operate in a scenario where fossil fuel alternatives are also present in the energy mix.

Efficient policy can however be seen as a gateway for implementing modern energy systems. Already existing energy scenarios in certain contexts makes it difficult for more innovative technologies to take place. Whitley and Van der Burg (2015) explains that market distortion exists where fossil fuels are subsidized which makes it hard for renewables to take a significant portion of the energy despite the availability of the resources. Also, for contexts where electrification is underdeveloped like the SSA, Dalla Longa and van der Zwaan (2021) showcase that policies which promote small scale renewable energy production, appears to be much more efficient than extending the grid to unconnected areas and reduce the dependency on fossil fuels. Thus, policies that allow for market competitiveness and for renewables to enter the energy sphere while being able to generate investments would promote energy transitioning.

3.4. Summary

Insights from the literature and previous research indicates that sustainable energy transitioning is vital in order to successfully combat the challenges of preventing exacerbated effects of climate change and to achieve sustainable development. Not only does transitioning enable a reduction of GHG emissions, but the shift to “cleaner” and renewable technologies limits the reliance on conventional practices that are harmful for the natural environment and human health, and not sustainable due to their finite nature. One can not hide away from the fact that the procedure of fully transforming an energy system in any context is complex.

In the regional context of SSA, the subject of energy becomes arguably more complex. Being the energy poorest region on the planet along with other major societal concerns, countries in the region face a layer of challenges addressing their energy situation. As pointed out by Karekezi (2002) and others, SSA disproportionately experiences negative effects of climate change given the geographical landscape and poor resilience compared to Global North nations, SSA countries must therefore find a balance of energy development and transitioning to renewables. Regarding the reality of poverty, which is undeniably prevalent in SSA, it is only reasonable that policy makers prioritize economic development and poverty alleviation, especially considering that Africa as a whole contributes with a negligible amount to global GHG emissions. The notion of energy justice which Müller et al. (2020) highlight becomes an important angle by making sure that modern energy is accessible and affordable to all sectors of society.

With the background of sustainable energy transitioning and an outline of the energy scenario in SSA, research indicates that policy initiatives can help shape an energy outlook that works towards meeting the energy demands of a given country as well as promoting electrification by renewable energy. As shown by Lu et al. (2016) and Seetheraman et al. (2016), policy serves as a framework for development, and comprehensive energy policy that details an emphasis on renewables is integral for energy development and energy transitioning to take place. Although there are limitations as to what extent policy can sufficiently promote renewables as discussed by Blazquez et al. (2018), there are however many indications which show how policies via the help of market-based activities for instance can enable energy transitioning to and be efficient.

4. Methods

This part of the thesis outlines the chosen methods and approach for the research about policy for electrification in Ethiopia. A case study was chosen using the approach of mixed-method research with the objective as portrayed by Cresswell (2014), to integrate different types of data in order to obtain a more thorough understanding of the given subject to address the research question. Yin (2018) explains that the case study method ought to be considered when examining complex contemporary phenomena within a worldly context, specifically when there is no clear connection between the context and phenomenon in real world scenarios. The combination of methods which generated different sets of data allows the research to be approached through different angles, thus allowing for an in-depth understanding of the findings.

4.1. Selection of case

Since beginning the Master’s program in Sustainable Development at Uppsala University, I gradually got more interested in the field of energy resources and energy security in the context of

sustainable development. Throughout previous courses in the program, I decided on a number of final projects that dealt with energy resources and climate issues in SSA. As detailed in the background, the subject of energy security, energy poverty, and access to electricity in Ethiopia and the wider region is a very relevant issue in terms of development, and in which more qualitative understanding is needed. Additionally, I am of Ethiopian descent and closely follow the developments of the country which therefore made it very suitable. Aside from my academic interests and ambitions, it is worth noting that from a theoretical point of view there appears to be more room for research in the area of policy for successful energy transitioning and development in African countries which is highlighted by Müller et al. (2020), who explain that most of the research and discourse revolve around the Global North. Also, research indicates such as in Lu et al. (2020) and Pollitt (2012) that policy plays an important role for successful and improved energy security which therefore makes it very relevant to investigate the role of policy in the context of Ethiopia.

I had initially planned and prepared to conduct a field study in Ethiopia to get a first-hand experience doing the research, but unfortunately due to Covid-19 and ongoing political tension in the country it prevented me from going and limited the research to be done remotely. Because of this, I reoriented the plan by excluding interviewing staff representing the Ministry of Water, Irrigation, and Electricity (MoWie), and focused on conducting the research through a more holistic understanding by incorporating different stakeholders who were easier to establish contact with but possessed relevant expertise and experience. The goal was to get hands-on research with direct access to relevant data as well interviewing policy makers and experts who reside in the country. Given the dire situation of poor energy security despite the vast potential for electrification, I wanted to get a closer understanding of how Ethiopian energy policy addresses the challenge for electrification and overall, how sustainable development is framed in the context of energy policy from the perspective of a SSA country.

4.2. Case Study Design

The aim of the thesis was to evaluate Ethiopian energy policy in relation to the challenges of electrification, and to understand how sustainable development is framed in the context of improved energy security. The objective was to understand how policy has played a role for increased electrification, what measures and initiatives have been useful, and identifying challenges and external influences. Therefore, 6 national energy policies representing the framework for governmental energy initiatives in Ethiopia were studied in combination with a total of 10 semi-structured interviews. Due to poor digitalization and connectivity issues, finding policy documents became a hard task. Thankfully, the policies were gathered from an independent consultant and legal firm (Mekdes Mezgebu) that deals with legal matters pertaining to energy investments in Ethiopia. The consultant website has a collection of many policies from different sectors that are official from the Ethiopian government. The selected policies stretch as far back as from 1994 to 2019 which will allow for a comprehensive examination of the policy developments. The semi-structured interviews were held between February and March 2021, and all interviews but one was digitally recorded and transcribed accordingly. The results from the content analysis of the policies and interviews were triangulated.

4.3. Content Analysis: Ethiopian Energy Policy

By analyzing energy policy in the context of increased electrification, I am able to get an insight and

understanding into the rationale of the developments and strategies of the country. It is also worth mentioning that documents as a data source tend to have several strengths making them appropriate for case study research such as specificity, comprehensive information, and not reproduced as a result of the research (Yin. pp 179, 2018). Documents are also firm which therefore allows repeated access and review without interruption.

As the objective of the thesis indicates, 6 official energy policies that present the bulk of energy outlook from the government of Ethiopia and outline the goals and vision for Ethiopia's energy situation were collected for analysis using the content analysis method. Content analysis is defined as "a research method that provides a systematic and objective means to make valid inferences from verbal, visual, or written data in order to describe and quantify specific phenomena" (Down-Wambolt, cited in Bengtsson, 2016). The content analysis method is divided into these four steps:

1. Overview and data familiarization.

This entails collecting and becoming familiar with the data in order to get an understanding of the selected information for analysis. After fierce searching and inquiring, I found and gained access to the policy documents through an independent consultant and legal firm that deals with energy investments in Ethiopia.

This procedure was extremely difficult due poor connectivity to low digitalization of policy documents in the governmental websites. The literature review and overview of secondary research provided an in-depth understanding of the energy outlook in Ethiopia, to then serve as a framework to get a sense of the policy documents.

2. Break down of text

The content should be divided into meaning units and then if needed be further summarized into condensed meaning units. Meaning units are segments (sentences, meanings, paragraphs) of the content that reflects relevant key details and information that are useful for the research.

3. Establish codes

Based on the policy documents, chosen codes with relevant insights to address the research question were identified and highlighted. Codes were generated inductively and deductively by going over and highlighting specific keywords from the text including the ambitions of the energy policy, types of initiatives for increased energy etc, which will then be connected and differentiated from each other.

3. Categorization

The listed codes are then categorized into groups of codes which relate and are similar based on their content. Codes that deal with similar issues such as drought, crop failure, and climate mitigation may fall under the category of addressing climate change for instance.

4, Analysis

Once the coding and categorization has taken place the data can be analyzed. Manifest analysis has been chosen which as described by Bengtsson (2016) deals with what the data actually expresses as opposed to trying to explore the underlying intentions of what is being expressed.

4.4. Interviews

A total of 10 semi-constructed interviews were held with professionals and experts in the field. To get an overall perspective and comparative angles, the interviews included both Ethiopian and non-Ethiopian individuals. It was also important to gain insights from individuals who have expertise working with other SSA countries as well, which would potentially highlight some interesting synergies and contrasts. As explained by Mason (2002), semi-constructed interviews are useful when attempting to generate useful knowledge by getting an insight from individuals with relevant experience, and as a complementary approach to another method to get a broader understanding of the research question. The interviews had an open structure where each individual presented their background and from there questions were asked about the effect of policy for increased electrification/energy security, specific policy prioritizations, the emphasis on sustainable development, concern for climate change, and possible external influences such as aid.

An extract of some of the major questions asked were the following:

- What policy initiatives have worked well for increased electrification?
- From the context of a developing country in sub-Saharan Africa, Ethiopia in particular, what have according to your own experience been the main challenges of establishing adequate energy policy?
- In your perspective, are countries in sub-Saharan Africa (Ethiopia in particular) on the right track to meet their energy demands?
- Have external influences such as aid, foreign investment, international agreements, impacted positively or negatively towards electrification?

First, two Ethiopian senior academics with research backgrounds in economics and energy, and one senior German researcher with expertise in economics and energy policy in sub-Saharan African countries were interviewed. Secondly, two senior experts one from Kenya and the other from Ethiopia who historically worked and contributed to a major African NGO dedicated to energy developments in SAA were interviewed as well. From there, three senior energy advisors for a Scandinavian development cooperation agency working with energy financing in SSA were interviewed.

An interview with a professional from a German development company dealing with renewable energy and mini-grid projects in Ethiopia was conducted which allowed for cross-sectional perspectives. Lastly, a former Ethiopian senior expert in energy and water resources as advisor to the Government of Ethiopia between 1997-2005 was interviewed.

All interviews except for the former advisor to Ethiopian government were digitally recorded and held between 45-60 minutes. To keep it as ethical and convenient as possible, the interviewees were reassured that their identities would not be revealed in the thesis and that their answers are strictly for the purpose of the research.

Respondent	Background/Role	Currently Based in
1.	Senior Research in Energy Development & Policy	Kenya
2.	Energy Economist with research background in Energy poverty in Ethiopia	Ethiopia
3.	Energy, Environmental & Development Economics	Germany
4.	Research in Energy Economics and Climate Policy	Ethiopia
5.	Research in Development and Energy Economics	U.K
6.	Energy Advisor at Development Cooperation Agency	Sweden
7.	Energy Advisor at Development Cooperation Agency	Sweden
8.	Energy Advisor at Development Cooperation Agency	Sweden
9.	Program Officer at Development Company	Ethiopia
10.	Engineer and former energy advisor to Ethiopian government	Sweden

Table 2. List of interviewed experts.

4.5. Triangulation

Triangulation between two different methods, content analysis of policy documents and qualitative interviews was done. Nightingale (2002) explains that triangulation is a procedure where two or more types of methods or data are conducted and analyzed, in order to obtain varied data sets which allows the research questions to be approached from different angles. By triangulating between two methods, the results of the selected methods can be used in a complementary manner in order to gain a nuanced understanding of the findings from the research (ibid). Hence, the choice of two types of qualitative data sets and interviews with experts representing different fields and stakeholder groups.

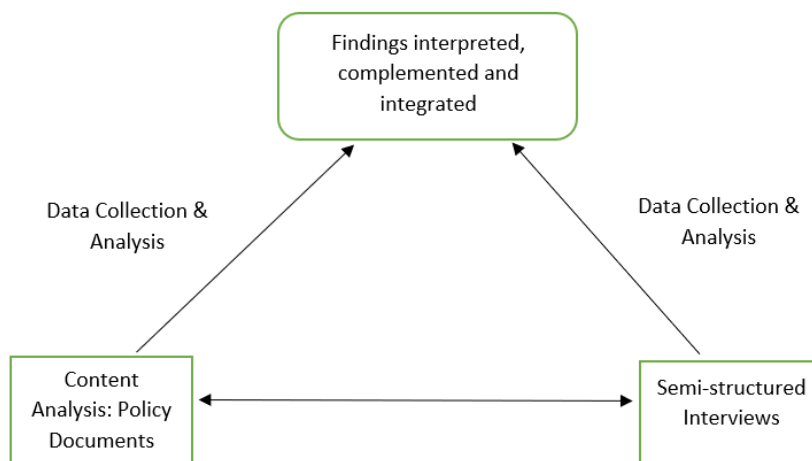


Fig. 5. Diagram of the triangulation approach between two methods using policy documents and interviews.

4.6. Analysis of Empirical Findings

A successful and rigid analysis as expressed by Yin (2018) and Lincoln and Guba (1986) should take

into consideration four key principles;

1. The analysis should demonstrate that all the evidence is addressed, including interpretations.
2. The analysis should examine possible counter interpretations.
3. The most significant element of the case study should be addressed, and the most important and relevant issues need to be emphasized.
4. Showcase knowledge and familiarity of the existing discourses and ideas regarding the case study subject.

First, a content analysis of the policy documents was conducted. To ease the procedure, the content analysis using both an inductive and deductive approach was used via the MAXQDA software that provides efficient tools to generate codes and themes. The interviews were then transcribed and coded with the help of the Otter AI program which automatically categorized the main identified and concurring themes of the conversation. Combining an approach that involves prior theoretical understanding (deductive) as well as new findings from the data (inductive) allows for trade-offs and efficiency. (Miles and Huberman, 1994 cited in Perry and Jensen, 2001).

Codes were generated based on the research question and the theoretical background. Using both an inductive and deductive approach, sections of the policies such as policy instruments, rationale, goals, and objectives were analyzed. Several themes were generated in the first screening based on the questions and the coding revolving around the key concepts mentioned above. After a second narrowing down of the most concurring and important themes, a total of 8 key themes were then highlighted (listed below) and will be presented in the context to the concepts making up the theoretical framework of the thesis. The identified themes are centralized around policy and positioned towards to the theoretical framework of energy transitioning and the regional context.

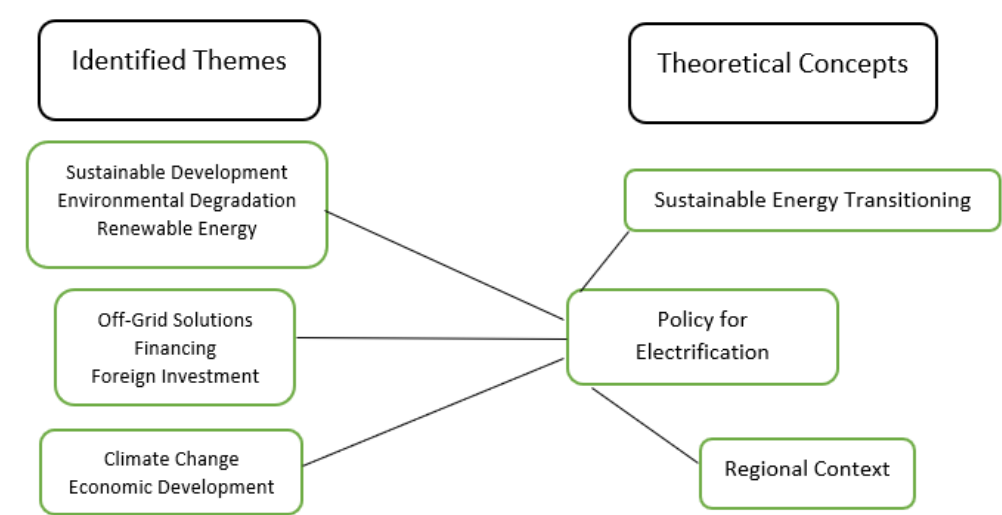


Fig. 6. Illustration of the main identified themes from the policy documents and interviews as well as the theoretical concepts shaping the analysis. The identified themes are placed in context and concepts making up the theoretical framework.

4.7. Ethics

Seidman (2006) explains that interviewing for qualitative research is dependent on a number of measures to reassure an ethical and convenient understanding when consenting to be interviewed. The principles and guidelines for sound research from the Swedish Research Council (2017) were followed. For each person that I interviewed, I had sent a request along with my research proposal and tentative questions. In the document with questions (see annex), I had stated my intention of recording and keeping the answers for the purpose of the research and that the identities will be anonymous. I also made sure that the objective was to gain perspectives and to get a better insight into the role of policy for increased electricity; thus, their inputs to the best of their abilities will serve as qualitative data to be analyzed.

4.8. Limitations

When conducting a case study, Yin (2018) advises that any limitations of the research should be expressed and made transparent. The most notable limitation for my research was not being able to conduct a field study in Ethiopia. As mentioned, the plan was set to do a field study at site which would have given a more proximate connection to the subject and a closer chance to speak with relevant experts residing in the country who understand the context.

As formulated among strengths and weaknesses with data sources, Yin (pp 179, 2018) also illustrates that interviews will inevitably allow for bias, inaccuracies in collecting the information, and reflexivity. These matters have been taken into account as limitations in regard to obtaining the qualitative data.

Roughly half the number of people that I interviewed currently in Ethiopia, and have an insight in the electricity situation and the policy context, while the rest also had a strong insight as well. In addition, I was only able to successfully contact and interview one expert who has worked with energy matters for the government in Ethiopia. It is also worth noting that as well as the pandemic, a political conflict took place which is still ongoing in parts of the country. I have been informed that in times of political tension, government staff are even harder to reach and also reluctant to discuss matters which may be seen as controversial.

The methodological process was indeed quite challenging. It was very hard to get in touch with government workers and to access material from the websites of Ethiopian energy departments and authorities. Finding the policies was also challenging. Luckily enough I was able to collect a total of 6 policies from three decades as well as a diverse group of interviewees which gives an overview for the results and analysis.

5. Results

The results section presents the empirical findings from the research. This study involved two different methods generating a varied data set. The results are first presented by a table outlining the chosen policies with a brief description followed by the findings from both the policies and the interviews categorized thematically. The findings from the content analysis of the policy documents and answers from the semi-structured interviews are triangulated and complemented in order to broaden the

perspective and get a thorough understanding of the research subject. The answers from the respondents will be indicated with the given number as shown in Table 2 in the section 4.4. The answers have been paraphrased and adjusted for spelling and context however the meaning of the given messages have not been changed.

5.1 Ethiopian Energy Policy

Number	Name of Policy	Year	Description/Objective
1	National Energy Policy of Ethiopia	1994	First official energy policy from the newly formed federal republic formulated to address all sectors of the country. Aims to serve as a comprehensive energy policy to radically utilize the energy resources of the country as a means for development. Minimal focus on electricity but comprehensive outline on energy objectives.
2	Climate Resilient Green Economic Strategy	2011	Initiative that outlines energy & economic strategies planned to cope with Climate Change with the goal of becoming a climate resilient economy and middle-income country by 2025.
3	Ethiopian National Energy Policy	2012	Revised and updated version of 1994 policy that takes into account of changes resulted from economic development, the wider global context, and attempts to address all renewable energy sources.
4	National Electrification Program: Implementation Road Map and Financing Prospectus	2017	Governmental program that outlines strategies and initiatives with the goal of achieving universal electricity access by 2025 by expanding the national grid and increasing off-grid implementations throughout the country.
5	National Energy Policy	2018	Updated and complemented version of the first energy policy, with a focus on energy issues and challenges that were not addressed in the first policy. Along with other strategies, the objective of achieving middle-income status by 2025 is still intact.
6	National Electrification Program: Integrated Planning for Universal Access	2019	Updated version of NEP 2017, with revisions that details the then current progress as well suggestions based on analyses in order to be on track with the goal of reaching universal electricity access by 2025

Table 3. List of energy policies chosen for the research.

5.2 Sustainable Development

The first core concept drawn from the content analysis of the policies and interviews is Sustainable Development. Sustainable development gradually becomes an integral part of the energy objectives of Ethiopia. Throughout the policies, various passages address the need for energy development via renewable energy that meets the demands and that is environmentally sound. Even as early as 1994, the first National Energy Policy of Ethiopia (1994) (NEPE) explains that need to “ensure that energy development is based on sound management practice and is benign to the environment” and “3.2 To ensure and encourage a gradual shift from traditional energy sources use to modern energy sources”. Sustainable development is also framed in the ambition of becoming a middle-income country in 2025, a goal which has been maintained throughout all policies.

Respondent 10, the former advisor the advisor to GoE working with the energy ministry time explained the following:

“In terms of our energy, in our country the concept of sustainable development was not a priority in the beginning. However, as experts in the field, we always did our best to plan and advise policy makers for energy development that does not harm the environment and is efficient long term. That’s why sustainable development became more important later.”

The second chosen policy Climate Resilient Green Economy (CRGE) (2011) addresses sustainable development as an approach to avoid severe effects of climate change by noting that: “Ethiopia is experiencing the effects of climate change. Besides the direct effects such as an increase in average temperature or a change in rainfall patterns, climate change also presents the necessity and opportunity to switch to a new, sustainable development model”.

CRGE (2011), declares the national goal of producing energy to a surplus which would then be exported to neighboring countries and allow other nations to transition their energy system and become less reliant on traditional fossil fuels.

The Ethiopian National Energy Policy (ENEP) of 2012 served as an update to the first policy from 1994 by noting the need to incorporate a rationale that takes the context of the global discourse of energy into consideration which the first policy did not address. ENEP (2012) emphasizes Ethiopia’s need for sustainable development and energy transitioning in order to prevent being dependent on traditional sources: “Projections indicate that unless action is taken to change the traditional development path annual petroleum and fuel wood consumption will rise significantly”.

Gender equality in terms of energy development is also addressed. ENEP (2012) states: “Energy development and utilization is highly intertwined with gender such that the conditions and positions of women tend to be compromised in the process of energy procurement and use.”

Similarly, the National Electrification Program (NEP) (2017) explains that “The GoE is committed to the achievement of gender equality across all sectors, in accordance with

the 1995 Constitution and Women's Policy of Ethiopia, and the GTP II targets, such as improving women's economic benefits in rural areas, their role in development, and participation in leadership positions".

Similarly, respondent 1 who is based in Kenya and has extensive experience with energy policy primarily from an NGO operating in East Africa mentioned the following:

"Successful energy policy in the region needs to incorporate gender and poverty reduction. We have for example worked with initiatives to provide clean cook stoves used for injera (Ethiopian staple food/flatbread) which women use daily allowing for better conditions.". These kinds of considerations in policy are explained to empower women both economically and health wise, as well as reducing the negative impact on the environment.

Regarding universal access of electricity, it was not until the National Electrification Program (NEP) 2017 the concrete goal of reaching universal electricity access by 2025 was formulated which remained through for both National Energy Policy of 2018 and of course NEP 2.0. NEP 2.0 states: "Clean electricity access is an essential pillar of sustainable development, economic growth, and social and environmental development."

Furthermore, the policy also targets comprehensive electrification for all primary and secondary schools as well as health facilities in accordance with WHO standards (National Electrification Program 2.0, 2019). The policy underlines the importance that universal electrification has towards meeting the SDGs as well allowing a shift from the over reliance of traditional biomass, mitigating climate change, and preventing deforestation. (ibid).

Respondent 1 expressed the importance that policy has in integrating electrification goals as part of a greater objective of sustainable development:

"In terms of electrification, policy can use the SDG as a framework and set targets accordingly. This not only helps countries on their way to meet their goals, but it can also help countries in the region to compare with each other which ones have done better and what has worked."

Sustainable development is according to most of the respondents an integral part of the rationale of policy makers when dealing with energy. For instance, respondent 4 stated that:

"Policy makers are definitely paying more attention to Sustainable Development. If we take a look at Ethiopia's GTP (Grand Transformational Plan) and CRGE, it is quite clear that sustainable development is considered, and the government are aligning the plans with the SDGs".

According to the energy advisors at the development cooperation agency, most beneficiaries of aid in sub-Saharan Africa that expand their energy via renewable energy incorporate SDGs and sustainable development in their policies and thinking. Respondent 7 concludes:

"The SDGs are definitely put in place on paper and influence policy throughout the bureaucracy, but at times it may not have the strongest effect."

5.2.1 Environmental Degradation

With Sustainable Development being thoroughly uplifted, the closely related subject of environmental degradation is extensively present. The concern for environmental degradation is widely expressed throughout the policies. As previously mentioned, NEPE (1994) envisions an

energy expansion and development which is “benign to the environment”. One of the four pillars of the CRGE is: “Protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks “.

Environmental degradation at the expense of energy is described as a major concern. ENEP (2012) addresses deforestation in particular: “Deforestation and forest degradation must be reversed to support the continued provision of economic and ecosystem services and growth in GDP. The environment is addressed by the emphasis on its general importance to society as well the relationship with energy.

“Energy and environment are like two sides of the same coin. Energy depends on the environment for extracting its resources. The production, transportation, and utilization of energy releases pollutants that pose the bulk of the environmental threats at local, national, regional, and global levels which has an impact on the society”.

Respondent 4 who has an experience with CRGE and climate policy uplifted that:

“Commitments that focus on distributing millions of clean cookstoves will help contribute to the reduction of deforestation and reduce the amount of fuel used.”

In the policy objective #5 “Strengthen environmental and safety management practices”, the policy aims to:

“Enforce environmental rules and regulations that reduce environmental pollution during power generation and transmission”, and “Integrate environmental and social impact assessment in all power system investment projects and environmental audits”.

The National Electrification Program (NEP) 2017 also addresses deforestation and presented an initiative that is dedicated to protect Ethiopia’s forest environment:

“under the Reducing Emissions from Deforestation and Forest Degradation (REDD) framework, the country has been the beneficiary of US\$13.6 million, and a grant of US\$18 million (with further disbursements based on results up to US\$50 million) was provided under the Bio-Carbon Fund Initiative for Sustainable Forested Landscape”.

Like previous policies, NEPE (2018) declares the need to establish environmental and social impact assessments abiding by international standards for all new energy developments and projects.

5.2.2 Renewable Energy

As much as environmental degradation has been emphasized, part of the core of the ideals of Sustainable Development in the energy policies is the strong focus on Renewable Energy. RE is emphasized to be the main priority for the country's energy production. It has gradually become the main source for electricity and there is a clear objective of increased utilization of the country’s renewable sources. Additionally, all the respondents expressed that energy transitioning to renewables is the primary way to go and explained that successfully policy attempts to find an interlinkage between the various sources of renewable energy.

While the first policy of 1994 only mentioned wind, solar, and geothermal a few times as alternative energy resources, the policy does however place importance on hydropower by uplifting that:

“Hydro power will form the backbone of the country's energy sector development strategy.” In addition, the CRGE (2011) also emphasizes on the increased electrification via renewables. Among of the four pillars to establish a Green economy is the following: “Deployment of renewable and clean power generation”.

ENEP (2012), complements the missing details of renewables from the first policy of 1994. It explains the need for new understandings of modern energy development and to give more emphasis on the utilization of all renewable energy sources. In addition, the policy also envisions Ethiopia to become a leading example in the region for the other countries to follow by declaring the vision for Ethiopia to become “a renewable energy hub in the Eastern Africa Region by 2015.” (ibid).

It also addresses some of the concerns that come with large scale hydropower. ENEP (2012) declares that “reliance on large-scale hydro has its own drawbacks such as threats of natural and manmade disasters such as drought, earthquakes, and deterioration of dams”. One of the objectives addresses the need to utilize other sources of renewable energy for which there is great supply from, in order to obtain an energy mix which will be sufficient, cost-effective, and long lasting. (Ethiopian National Energy Policy, 2012).

The National Electrification Program (2017) envisions a scenario where a total of 12,300 MW (450 MW from solar, 910 from wind, and 340 MW from geothermal) of electric power will be generated by the end of 2020.

Concerns of over reliance and drawbacks of hydro as expressed in the policies, allows for an increased focus on other forms of renewable energy. Respondent 4 stated that: “It’s good that policies are focusing on wind and geothermal because there is potential, and they will contribute to the electricity supply”.

Similarly, respondent 10 who have worked with the Ethiopian government expressed that: “Policy should focus on smaller hydro projects and try to make use of solar and geothermal more. We knew that big dams like GERD would cause controversy especially with other countries and they take long to build”.

In the National Energy Policy of Ethiopia (NEPE) (2018), more emphasis was laid out on other forms of renewable energy including wind, geothermal, bioenergy, and bagasse which is the crushed material from sugar cane that can be used for fuel and energy. At the time of the policy being presented, the Adama I wind park had been constructed and the policy declared that the Ashegoda Wind Park with a capacity of 120 MW in Tigray (Northern Ethiopia) was being constructed. In terms of geothermal energy, the policy explains that it has only been utilized to a minimal extent with only one site generating 7 MW implemented at the time. The policy explains that there are plans to establish more sites around the Rift Valley for electricity via geothermal energy with a total capacity of 500 MW (National Energy Policy of Ethiopia, 2018).

NEPE (2018) also introduced significant intentions of exploring bio energy and bagasse for electric production. It mentions that neither bioenergy nor bagasse have historically been used for electricity generation and urges that it could be of great use considering the vast accessibility. The policy indicates that sugar factories can contribute over 600 GWh of energy annually for heat and electricity (ibid). NEPE (2018), also declared a goal to enhance the landscape of electricity production via bagasse.

This policy element was addressed by respondent 1 who explained that several countries in sub-Saharan Africa, Ethiopia included, have failed historically to utilize their sugar resources for electricity production and compared with the case of Mauritius, a country that has almost a 100% electrification rate making it a notable outlier in Africa.

“Of course, Ethiopia which is 100 million people, you can’t adopt all the policies that Mauritius have being a country of 2 million people that's understandable. But there are lessons to be learned. One lesson, for example, is that Mauritius took a very aggressive attitude towards developing agro energy, if you are aware of it. Mauritius gets 60% of its electricity from its sugar”.

NEPE (2018) presents three major hydropower plants “(with a total installed capacity of more than 8.4 GW), the Grand Ethiopian Renaissance Dam at 6,350 MW, Koysha at 2,160 MW) and Genale Dawa III at 254 MW, are all under construction.”.

NEP 2.0 (2019) also uplifts the importance of wind power by declaring that two wind power projects (Adam 1 & 2, and Ashegoda) had successfully been generating electricity to a capacity of 324 MW.

5.2.3. Off-Grid Solutions

Having outlined the main precepts for sustainable development, this subsection focuses on the policy measures deemed to be the most effective for increased electrification. Increasing electrification is heavily emphasized through off-grid initiatives both in policy but even more so by the respondents. Particularly the ones representing the development cooperation organizations. Off-grid solutions are also presented as solid means to electrify the rural areas. In the CRGE (2011), the goal was to extend access to grid connectivity covering the whole country geographically by 2020. The policy also targets an ambitious off-grid electricity expansion with the goal of 100% electric power being generated from renewables (90% hydro, 6% geothermal, and 4% wind) from 2015 (ibid). NEP (2017) also indicates that off-grid and small-scale grid power will be prioritized for the rural population until the capacity of extending the national grid is fulfilled. An outlined goal of the policy stated that 5.7 million households would be provided with solar energy via mini-grid networks by the end of 2025, which is part of the overarching goal of achieving universal electricity access by the same year (ibid). According to the policy, Ethiopia had at the time successfully established 33 small-scale grid outlets that provided power for 8000 people in rural neighborhoods (NEP 2017).

The policy that dedicates most emphasis on off-grid efforts is undoubtedly the NEP 2.0 (2019) which served as an update to NEP 2017 with a goal of universal access to electricity where 65% of the population would be connected to the grid and the remaining 35 % via off-grid solutions by 2025. In numbers, the policy targets to establish over 8 million new grid connections, which would serve over 6 million people by 2025.

Respondents from the Scandinavian Development Cooperation Agency addressed the importance of off-grid solutions. Respondent #6 said the following:

“Expanding the national grid to connect all the areas is not a tangible goal. Policies should focus on pushing for off-grid, mini grid and small-scale electricity production especially when attempting to reach the rural population.”

Similar sentiments were shared by respondent 9 (Representative of development company based in Ethiopia) who stressed that:

“Policy solutions that allow for more clever off-grid/mini grid solutions prove to be as efficient if not more efficient than trying to connect people who are close to grid connections with the main grid”.

5.3 Financing (Private sector and Public investment).

Following the previous section which outlined the types of initiatives that are viewed as the most prominent towards increased electrification in the previous section, this thematic category uplifts the various financing mechanisms that shape Ethiopian energy policy for electrification. The need for initiatives that allow private sector involvement and competition is widely expressed in the policies and the respondents. The first policy of 1994 highlights “5.5 To provide the private sector with necessary support and incentives to participate in the development of the country's energy resource.” (National Energy Policy of Ethiopia, 1994).

The majority of the respondents placed a strong emphasis on the need for policies that promote and incentivize market-based initiatives as means for increased electricity.

Respondent 3 stated that: “In a wide range of low and middle income countries, these types of policy have allowed for increased electrification”.

The CRGE (2011) underlines the massive costs required to expand electric power and calls for external private sector financing. An estimated 2 Billion USD is needed annually to make sure that the power generation meets the goals of Agenda 2030. Hence it calls for a “combination of tariff adjustments and the attraction of private capital, climate finance and sovereign wealth funds” to meet the financial demands (CRGE, 2011). ENEP (2012) attempts “to Encourage the participation of the private sector and enhance investment for exploiting RE resources”.

The need for Independent Power Producers (IPPs) is also demonstrated from 2012 and forward. ENEP (2012) aims to “Encourage wide participation of IPPs in renewable energy development”. The policy instruments for :5.6 Energy Pricing, include enabling market mechanisms to play a role in the development of renewable energy (ibid).

This is also followed in the NEP 2017 in which the policy explains that the government is enabling private sector initiatives through IPPs and Public Private Partnerships (PPPs) in order to diversify the energy supply. (National Electrification Program, 2017). NEPE 2018 also asserts that IPPs and PPPs would help fill the investment gaps needed for comprehensive electrification and that future renewable energy production will be dependent on private IPPs. (NEPE, 2018).

“The participation of the private sector through Public Private Partnership (PPP) or through Independent Power producer (IPP) in electricity generation and sales is essential in easing high investment requirements”.

Among the policy Instruments to “Increase access and connectivity to affordable modern energy”, is to “Encourage energy cooperatives and societies as well as private sector in energy service delivery.” In the policy objective of increasing access and connectivity to electricity services, there is a policy instrument that seeks to expand off-grid electricity production by incentivizing private sector investment. The same strategy and objective are thoroughly outlined in the NEP 2.0.

Respondent #4 who is based in Ethiopia believe that the private sector can only play a limited part due to high production cost and lack of guaranteed profits and return. However, all the development cooperation representatives emphasized the importance of decentralizing electric utility, as well allowing for investment via IPPs etc, to allow for increased production.

5.4 Foreign Investment

With one thematic subject of financing being presented, this subsection presents the importance of foreign investment, an external element which influences the Ethiopian energy outlook as noted in the policies and answers from respondents. The exploitation of electricity and energy in general is heavily dependent on foreign investment. CRGE (2011) declares that foreign investment increased from 820 million USD in 2007/08 to more than 2 billion in the fiscal year of 2010/11. CRGE also estimates that energy developments in the country need around a total 38 Billion USD to meet the energy goals in line with Agenda 2030. The policy outlines that cost optimization and tariff adjustments play an important role to capitalize on foreign investment and thus reducing the finance gap. Tariff adjustment is also stressed in ENEP (2012) which explains that an improved tariff structure would allow for market competition and provide affordable energy. As explained in NEP (2017), Ethiopia has historically had among the lowest tariffs for electricity in Africa.

Respondent #7 who is a senior energy advisor and has worked in several countries in East Africa complemented the issue of tariffs and addressed inefficient cost measures as a major issue. “Tariffs might be low, but other developing nations in South-East Asia for example have even lower. And because policy is focusing more and more on small-scale power solutions, it becomes cost-inefficient to produce at large amounts, so tariffs need to be desirable for investment.”.

Respondent #6 explained the following: “There needs to be cost reflective tariffs because otherwise national utilities won’t afford producing enough electricity and it creates a financing climate that nobody wants to invest in.”.

In terms of external investments, it is evident that multinational and development cooperation organizations play a huge role in financing energy development projects in Ethiopia. NEP (2017) presents an initiative to scale up 500 MW solar energy through IPPs which was funded by the International Finance Corporation (IFC), and 5 solar power sites in Northern Ethiopia that generate minimum 100 MW supported by the USAID. Other agencies that have helped finance renewable energy projects via IPPs include the World Bank as well as Agence Française de Développement (AFD) and Japanese International Cooperation Agency (JICA) which have invested in small geothermal plants around the Tendaho dam in North Eastern Ethiopia. In addition, the World Bank, African Development Bank (AfDB), and AFD have financed the construction of an electric transmission (total cost around US\$1.2 billion) connection between Ethiopia and neighboring country Kenya which once fully completed would generate 1,000 MW of electric power.

When asked whether development aid has been influential towards increased electrification, the unanimous response from the respondents was that aid has had an overall positive effect.

5.5 Climate Change

With the previous sections focusing on the financial aspects involved, the following thematic

category presents the importance of climate change and how it is dealt with from the context of energy development. The concern of climate change is present and addressed in every single policy except the first one. All the policies except for the policy of 1994 emphasize the importance of energy development via renewable energy with the intention of minimizing emissions and to protect the country from negative impacts of climate change. In the CRGE (2011), addressing climate change as a national concern serves as the rationale behind the strategy with the objective of transforming Ethiopia to a sustainable economy. The strategy expresses the challenges of climate change imposed on the country, and the need to develop in a manner that does not heavily contribute with GHG emissions and prevents excessive depletion of natural resources.

As the sources for electricity generation traditionally have not contributed to a significant number of emissions, the CRGE (2011) however declares that the goal is not only to maintain low emissions but to even become climate neutral by relying on renewable and fossil fuel free energy. The strategy uplifts that “Ethiopia is endowed with ample natural resources to meet this demand, primarily by exploiting its vast potential for hydro, geothermal, solar and wind power – all of which would deliver electricity at virtually zero GHG emissions”. The strategy presents the ambition of development where GHG emissions do not exceed 250 Mt CO₂e by 2030. Overall, CGRE is an initiative that seeks to protect and prevent harsh effects from climate change and put Ethiopia on a track of becoming a middle-income country by 2025.

Respondent 4 who has worked with the government in overseeing the CRGE believes that climate change is a genuine concern for policy makers because of the country's vulnerability. “Policy reflects the actual ambitions because our country, especially for electricity, is dependent on rainfall. And a society that is hugely based on agriculture and we know what climate variations can do”.

Respondent 5 explains that climate change should be a concern but stressed the ambitious efforts should reflect the capabilities of sustainability without compromising economic development. “It is a good move to prioritize energy transitioning because the world system will collapse if development in Ethiopia and Africa doesn't consider emissions. However, the rich countries are the biggest polluters, and they need to do more. We can do our part but without over compromising our economic growth.”.

Climate change is also tackled as part of the rationale of the ENEP (2012) where it declares: “the current climate change has presented the necessity and opportunity to switch to a new energy sustainable development model”. ENEP (2012) demonstrates that the goals of the policy are aligned with the CRGE to prevent adverse effects of climate change and to establish a green economy. The goal of expanding electricity production while maintaining emissions below 250 Mt CO₂ is also addressed in both NEP (2017 and NEP 2.0 (2019).

5.6. Economic Growth

As the previous section showcased how climate change was rationalized, the last thematic category making up the content analysis elaborates on how economic growth is formulated. Energy is addressed as an integral means for development and economic growth. The rationale behind the first policy NEPE (1994) explains the need “2.6 To formulate comprehensive energy prices in order to ensure financial and economic profitability;”. Non-renewable energy sources were also considered to ensure

economic gain as expressed through “4.2 4.2 To promote and strengthen the development and exploration for natural gas and oil;” and that fossil fuel companies would be provided with incentives for natural gas and oil exploration (ibid).

As part of the objective of economic development, Ethiopia aims to become an economy that is built on green growth. CRGE (2011) addresses the need for economic development by highlighting that “Ethiopia must continue to grow: with a GDP per capita of around USD 380, Ethiopia is still one of Africa's poorest countries.”. The policy also illustrates Ethiopia’s ambition of green growth and economic development that is environmentally friendly. CRGE (2011) states that:

“If Ethiopia were to pursue a conventional economic development path to achieve its ambitious targets, the resulting negative environmental impacts would follow the patterns observed all around the globe.”.

Moreover, sustainable development is indirectly addressed as part of the growth objectives where the CRGE (2011) declares that uncontrolled economic growth will ultimately provide challenges including unsustainable usage of natural resources and over-exploitation of agricultural land. In terms of electrification as a means for economic development, the 2011 strategy addressed a need to scale up electric generation to support economic development. CRGE (2011) declares the objective of increasing electricity supply with more than 14% annually in order to fulfill the ambitions of an annual economic growth of 10%.

Ethiopia also seeks to aggressively increase its energy output and generate an excess energy supply which will be used for foreign exports. The CGRE (2011) states that “via electricity exports, Ethiopia can share its green development to other countries in the region while contributing positively to its trade balance.”

This view was also expressed by interviewee A who mentioned that: “Ethiopia needs to scale production in order to export energy and generate revenue that can be used in other sectors of society”

According to the CRGE (2011), exports will also contribute with reducing the reliance on fossil fuels by using the revenue to focus on fully transitioning and utilizing renewable energy. Excess supply of energy is sought to be exported in which the country aims to become a leading “regional hub” for renewable energy. CGRE (2011) states that “Electric power exports would not only directly increase Ethiopia’s exports and generate additional foreign income, they would also contribute to the economic viability of the plans to build power generation capacity, hence helping to build up (and eventually finance) the power generation potential, increase employment, and contribute to GDP growth.”.

Both the NEP (2017) and NEP 2.0 (2019) also addresses the importance of economic growth and estimates great revenue from exports to neighboring countries Sudan, Djibouti, Kenya, and Tanzania. Both policies envisage an annual revenue potential of over US\$500 million from the exports in which the revenue would be able to sustain the domestic demand.

The reality of Ethiopia going its way to produce electricity in surplus to export to neighboring countries was addressed by a few of the respondents. Respondent 4 explained the following: “Yes it may seem like a contradiction to produce excess energy to be sent to other countries when so many people don’t have access to electricity, but we can’t forget that other sectors in the country are lacking. Because of this these exports can help finance and build infrastructure like the health sector for

example”.

6. Discussion

This section presents the discussion of the empirical findings in correlation to the theoretical framework of sustainable energy transitioning, the regional context, and the importance of policy for electrification and energy security. The findings are discussed in context to the theoretical framework and used to address the research questions.

6.1 Sustainable Energy Transitioning

The background and the empirical findings indicate that energy transitioning has taken place in Ethiopia and is evidently the prioritized approach for increased electrification and improved energy security. Sustainable development is generously emphasized and the policies showcase that renewable energy will continuously be exploited to increase electrification and to meet the energy demands.

The main challenge as portrayed in the case of Ethiopia is primarily revolved around actually utilizing the energy resources which are heavily under exploited. As indicated in the first policy NEPE (1994), there were initial objectives of consuming traditional fossil fuels for the sake of pure economic profit. Given that Ethiopia has an extensive amount of resources for renewable energy, in this context policy objectives have indicated what seems a more practical solution than relying on traditional fossil fuels. As outlined in the literature regarding the concern for climate change which is a key principle of energy transitioning, Ethiopia is committed to play a role in utilizing energy that does not contribute to climate change. The benefits of early energy transitioning in the long term as described by Ruszel, Mlynarski and Szurlej (2018) will promote economic development due to increased competition and financial strength with renewables which is a notion that is reflected in the analyzed energy policies.

Other important aspects which fall under the wider idea of sustainable development that were addressed in the results, were the focus on gender equality and inclusive economic growth. As laid out in the background of the thesis, women in developing countries are marginalized in many regards but in the case of utilizing energy they suffer disproportionate health conditions due to proximity of working with traditional fuels sources that are harmful. As well as the addressing of radical poverty reduction indicates the essence of inclusive economic growth which therefore tells us that the aims from both SDG5 (Gender Equality) and SDG 1 (No Poverty) are integrated. It is easy to implement a strategy that does not cover different parameters, and the focus on these two aspects is a testament to a well-rounded embracement of sustainability in addition to environment and climate.

All the respondents and all the policies except the first one of 1994, thoroughly expressed in their rationales, objectives, and insights that the goal for the energy development in Ethiopia is to utilize renewable energy which have historically been underexploited and to become climate neutral. This goes back to the thematic categorization of sustainable development in the findings, in which Ethiopian policy underlines the need to switch an energy system that is sustainable because of experiencing climate change effects and preventing further complications. (CRGE, 2011).

Climate change was expressed as a concern in regard to energy developments in all but one policy and described by all respondents as an element that needs to be dealt with from an energy standpoint. In context to the global discourse of mitigating climate change, it is evident that Ethiopian energy policy

is onboard by addressing the need to maintain development and growth with minimal emissions.

This notion in of itself can be seen as quite extraordinary. Nations that struggle with electricity and overall energy exploitation, are committed to cleaner options which may seem inefficient and costly in the short term. Whereas there are wealthier nations that at times struggle with formulating and achieving sustainable goals for energy transitioning. Data shows that Ethiopia and all African countries combined only emit 0.04% and 2% respectively of total GHG emissions globally, which therefore shows a significant ambition in trying to contribute to climate stability (Ritche and Roser 2020; IEA, 2019). The phenomenon of developing countries adopting a serious dedication to abide by international agreements is regarded by some studies as a matter of preventing excessive international pressure. Teklu (2018) for instance argues that Ethiopia should abide by climate standards and maintain its ambitious climate goals, in order to prevent unnecessary sanctions from the international community.

However, in addition to mitigating climate change, energy transitioning also serves the purpose of reducing and preventing environmental harm. It is clear from the findings that energy policy prioritizes energy development that is environmentally sound. Although, the policy of 1994 did not explicitly address climate change it did however throughout the document outline the goal of changing and expanding the energy system that is benign to the environment.

In regard to environmental degradation, it is emphasized by addressing the importance of the natural environment and calls for measures that protect, preserve, and do not overexploit the natural environment at the expense of energy production. The more recent policies (NEP 2017, NEPE 2018, NEPE 2.0 2019), all place special attention on combating deforestation and declare the goals of implementing environmental and social impact assessments throughout new energy development. These examples demonstrate the intentions of sustainable energy transitioning which serves as the rationale of the Ethiopian energy sphere for increased electrification.

6.2 Regional Context

The theoretical background presents the idea of energy as crucial means for development for SSA countries. The context which is presented in the examined literature raises the question whether complete sustainable energy transitioning via renewables in SSA will serve as the most efficient way for development and provide modern energy to all. This critique is what Müller *et al.* (2020) conveys by highlighting the importance of energy justice, which is characterized by the perspective of energy access to all. The findings from the policies unequivocally align with this idea which is reflected in the ambitious goals of universal electrification via renewables and the target of Ethiopia becoming a middle-income country by 2025.

Ethiopia is almost entirely transitioned to renewables but with insufficient measures of exploiting the vast potential of energy from renewables, there is a risk of fossil fuel alternatives emerging for energy use. For example, speaking about failures of current electrification respondent 2 said: “Even in the urban areas, the electric power is inefficient and power outages are normal. Some households rely on LPG gas because of this inefficiency.”

Accessibility to electricity in an inefficient power system explains the conclusions from the

literature regarding some inevitable shortcomings with renewable energy policy. The reality depicted from the answer of the respondent correlates to the findings from Blazquez et al. (2018) which explains that generating electricity from renewable energy can only be sufficient with the presence of fossil-fuel alternatives present, and that 100% electrification via renewables is unlikely (in any context) due to cost-inefficiency.

With the inefficiency present and the need to radically increase energy, countries in SSA experience and are disproportionately vulnerable to adverse effects of climate change as previously pointed out by Karekezi (2002), and therefore need to take it into account in terms of energy development.

The findings from both policy documents and interviews show that the concern for climate change is widely prevalent in the context of Ethiopia. The ambitions of Ethiopia's electrification objectives are compatible with what academics perceive as the most beneficial approach, i.e., to fully transition and deploy renewable energy which will be fundamental for both economic growth and sustainable development. (Jingura and Kamusuko, 2016). Considering the fact that Ethiopia and the wider region are both among the poorest and energy poorest nations on the planet, economic development will inevitably be prioritized. Energy-development nexus along with the notion of energy justice, by principle incorporate the most vulnerable in society.

Based on empirical findings from this study, one can observe that the findings from the research showcase that Ethiopian policy incorporates elements of energy justice by integrating a gender perspective and a clear focus on the rural population. This is in accordance with the findings from Valickova and Elms (2021) which raise the health concerns involved with traditional energy sources which overwhelmingly affect women and the need for cleaner energy options. It also reflects the improvements called for by Wolde-Ghiorgis (2002), with the gradual focus on deploying off-grid connections to electrify the rural population.

Similarly, balancing economic development and energy transitioning is described as an ideal solution for any given country and not just in SSA. Ethiopia's general push for green growth is exemplified by the endeavor of becoming a leading renewable energy hub in the region. The findings from this research illustrate the efforts of expanding the domestic energy transitioning to neighboring countries. As indicated in the later policies, Ethiopia aims to export excess power supply to neighboring countries in the region which is aimed to ease the process of energy transitioning to renewables throughout East Africa while using the revenue for infrastructure development in the country.

6.3 How has Policy shaped the landscape for Electrification

The findings from this research can hopefully address and help analyze how other nations in SSA with similar energy potential, can formulate their energy outlook via policy. By contrasting policy content and responses from the respondents, there were some interesting discrepancies which highlight the obstacles and struggles for improved energy security.

As mentioned in the literature primarily in Dagnachew et al. (2020), Ethiopia's failure to improve electrification is primarily due to poor financing and governance which exactly correlates with the points addressed by the energy advisors from the development cooperation organizations that all stressed the need for policy that allow for efficient investment conditions. Likewise, as presented in

the literature, policies that allow for private sector competition and incentivize market-based activities are pivotal in order to secure the finances needed to produce energy at large masses.

Ethiopian policy vividly addresses and promotes off-grid connections for increased electrification. Small scale and off-grid power supply was described as the most efficient procedure by all respondents, given the complexities extending the national grid nationwide to all areas. Tenenbaum et al. (2014) points out that the approach of prioritizing off-grid power production is seen as the ultimate way forward and should guide policy makers in SSA in order to scale up electrification.

Respondent 2 mentioned that increasing electrification is beyond the issue of transparent policy. “I believe that the policies are there with clear goals. But whether it gets implemented is another story. Energy policy goes hand and hand with other societal concerns, and if something else is present like the election coming up that will be prioritized.”.

Respondent 10 also concurs with the idea that the goals are more less set, and the policy structures are adequate, however governance needs to be improved. “Policy has now become more comprehensive than before. We have the roadmap, we just need to enforce what is actually visualized”. As alluded in the theoretical framework, Karekezi and Kimani (2004) explains that stated policies just by themselves do not operate under a vacuum but depend on governance as well as strong policy instruments that allow for improvements of the energy sector that are needed to increase electrification.

The findings from this research sheds more light on the implications of comprehensive policy to promote energy transitioning and successful energy developments. From a wider context, evidence shows that despite not being fully integrated, several countries in the global north have gradually been able to increase renewable energy in the mix as a result of policies which outline a clear structure, deal with the complexities, and contain mechanisms allowing for the promotion of renewables. (Lu et al., 2020; Seetheraman et al., 2016). Ultimately, the findings indicate that regardless of the regional context, with the right ambitions and initiatives sustainable energy transitioning and full-scale electrification is not unattainable. As Dagnachew et al. (2020) points out, historically policies which lack clarity and poor governance have been among the main challenges for universal electrification in SSA. This can be reflected in the sense that although Ethiopian energy policy from the findings appear to gradually become detailed and goal-oriented, the first policy of 1994 however was very limited, and developments have taken time.

Overall, sustainable development gradually becomes the core rationale of energy policy and a main framework used for increased electrification. Conclusively, it is also evident from the findings that foreign investment and aid play a big role for electrification in Ethiopia and they both serve as external mechanisms that are greatly impactful.

6.4. Future

The findings from this study have placed a focus on policy content for electrification and energy transitioning, and the views from experts who have based on their expertise provided some limelight for what measures need to be conducted from a policy standpoint to improve the energy situation in Ethiopia and SSA in general.

The visions for the outcome in the foreseeable future vary between what is outlined in the policies and among the different experts interviewed. In the NEP 2.0 (2019), the GoE expresses its confidence in

achieving universal electricity access by 2025 and the SDGs by 2030.

When asked whether Ethiopia can achieve these goals a few of the economists and researchers based in Ethiopia believed that it could be achievable due to Ethiopia's fast economic growth and the possession of policy initiatives with clear strategies. The three energy advisors working for the Development Cooperation Agency however were not too optimistic and fully convinced that universal electrification can be done in such a short time given the high percentage of people without access, and the huge investments needed within the time frame.

As Ethiopia is leading the way to become a regional hub and aims to be among the countries that completely rely on renewable energy for its energy production, the successes of improved energy security and increased electrification has indeed been sporadic. The per capita consumption of electricity has more than quadrupled from barely 23KWh to roughly 100KWh in over the past two decades, which still puts it quite far behind the total per capita consumption in Africa of around 500KWh (Hailu and Kumsa, 2020; World Bank, 2020). Although the power generation may have increased significantly, data shows that the total electrification rate is still below 50% and scaling up to 100%, let alone the rural environment will be extremely challenging to accomplish before 2025 if not impossible.

The renewable energy resources available have historically all been notably underexploited. As highlighted in NEP 2.0 (2019), new power projects including the Koysha hydropower project and the renowned GERD dam are expected to generate 2160 MW and over 6300 MW respectively once completed, while the Genale Dawa III was fully constructed by the beginning of 2020 with a capacity of 254 MW.

Other successful initiatives using off-grid solutions, is the initiative from the GoE of hybrid solar power plants generating electricity of 325 KW for 2,000 homes in villages in the Somali region, Southeastern Ethiopia, and initiatives like these will contribute to electrification of the rural population (Takouleu, 2020). Bagasse for electricity production which was presented contributing to the supply with biomass plants using bagasse for electricity being built 2013 and 2018 with 5 more currently under construction with a total capacity of roughly 490 MW (ibid).

Thus, the findings illustrate that increased electrification is dependent on adequate policy and from the case of Ethiopia conveys an outlook that includes a wide range of measures which will contribute towards improving the energy security in the future.

7. Conclusion

In this research, an evaluation of Ethiopian energy policy for electrification using a qualitative approach was presented and how policies play a role in increased energy security was examined. The thesis tackled the research subject by looking at the angles of how sustainable development is framed, the attempted balance of economic growth and climate change concerns, and the possible mechanisms influencing the energy developments for electrification.

Based on the findings, it is evident that sustainable development generally both directly and indirectly shaped the rationale of Ethiopian energy policy for electrification. The core objectives focused on

comprehensive utilization of renewable energy that is environmentally sound and to become a middle-income country with universal electrification by 2025. The balance of climate change and economic development was exemplified via the formulated efforts of “green growth” and the ambitious targets of almost becoming climate neutral in energy production. Finally, mechanisms involved that were influential included foreign investment, private sector and public financing, and an emphasis on off-grid energy production.

Does policy play a role for energy transitioning, increased electrification, and improved energy security? While it is a question involving many complexities, it is fair to say that policies do play a role for energy development and tell us parts of the story.

From the context of Ethiopia, increased electrification has been dependent on comprehensive policy that includes a wide range of different measures. Based on the policy documents and the interviewee responses, there is a clear disagreement in the expectation of the outcome. Experts based in Ethiopia and operating from an African context expressed that based on the positive developments, Ethiopia (and other SSA countries) are on the right track to meet their energy demands. Professionals who operate from a western context however are not as optimistic on the overall energy developments and believe that countries in SSA have other systemic issues that prevent increased energy access. In addition, they also believe it is going to be extremely difficult to meet the objectives of SDG#7 given the large investment gap.

Conclusively, it is important to understand that policy plays a specific role for increased electrification via renewables, as part of a bigger picture with several other explanations pertaining to finance, governance, political stability and so forth. Considering the findings from this study, future research could eventually extend this review by comparing and contrasting with other SSA countries considering the many similar challenges posed in the regional context and hopefully contribute with more understanding.

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10. Appendix

Interview Questions

Namn of interviewee	
Organization/title	
Date & Time	
Interviewer	

Thank you for agreeing to participate in the interview. I would like to record the conversation in order to be able to extrapolate the answers into the analysis as smoothly as possible. The answers will be confidential, paraphrased, and your names will not be cited.

Introduction

1. Can you tell me a little bit about your current role and your past career history
2. To what extent is policy useful for increased energy access and electrification?

Policy

1. From the context of a developing country in sub-Saharan Africa Ethiopia in particular, what have according to your own experience been the main challenges of implementing adequate energy policy?
2. What (policy) initiatives have worked well for increased electrification?
 - a. In your opinion, what should be included in comprehensive energy policy for increased electrification?
 - i. More nationalized
 - ii. Focus on renewables first
 - iii. Private actors

Sustainable Development

1. In the context of energy policy, how is sustainable development framed in regard to energy transitioning and electrification?

2. How has the challenge of balancing economic & sustainable development and concerns regarding climate change been addressed?

External influences

1. Have external influences such as aid, foreign investment, debt, impacted positively or negatively towards electrification?
 - a. If positive how?
 - b. If negative how?
2. Any other mechanisms that perhaps are not as evident that are impactful for the electrification in Ethiopia.

Conclusive

1. In your perspective What should policy makers prioritize in order to increase overall access to electricity
2. In your perspective, are countries in sub-Saharan Africa (Ethiopia in particular) on the right track to meet their energy demands?
3. Looking forward, what do you think will be the most important factors and developments in the near future (10 years from now)?
3. Can you suggest anyone else with expertise in this field that I could perhaps contact to interview?

