

E-ISSN: 2469-4339

Management and Economics Research Journal, Vol. 5, Iss. S3, Pgs. 11, 2019

Original Research Article

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Special Issue S3: "Global Warming and Climate Change: Part 2"

HATASO, USA

Climate Change and Global Warming in Namibia: Environmental Disasters vs. Human Life and the Economy

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Received: Nov 13, 2018; Accepted: Mar 5, 2019

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Citation: Keja-Kaereho C, Tjizu BR. 2019. Climate change and global warming in Namibia: Environmental disasters vs. human life and the economy. Management and Economics Research Journal, Vol. 5, Article ID 836535, 11 pages. <https://doi.org/10.18639/MERJ.2019.836535>

Abstract

Climate change is one of the concepts in Namibian languages that does not have any meaning or cannot be easily translated into the native dialects. It is very alien to many Namibians but yet growing in popularity, as it has become a problem that is affecting the economy, natural resources, and tradition and culture of the native people. Climate change is probably going to worsen the dry circumstances that are currently experienced in Southern Africa or Namibia to be specific. If it happens that rainfall does come in good amounts regularly, it will probably erupt in greater power. This will eventually lead to floods and erosion damages in some parts of the country, though these expectations have had very little influence on Namibian policy. Reid *et al.* (2008) stated that over the past 20 years there has been annual decrease in the Namibian economy of up to 5%, which has been a result of the climate change mostly impacting natural resources in the country. The result was reported using the computable general equilibrium (CGE) model simulations for Namibia. However, this result has negatively impacted the poorest people the most, which is a consequence of decline in wages and employment opportunities, especially for uneducated or unskilled labor in rural areas. It is of utmost importance for Namibia to take initiatives to ensure that most of its policies and activities are environmentally proofed. Namibia should have a unique approach to deal with displaced farmers and farm workers and citizens of such nature by looking into its issues of colonialism. In addition, there is a clear need to mainstream climate change into policies of developing countries like Namibia, because it is the responsibility of these countries to muddle through with climate change impacts and plan for a climate-constrained future.

Keywords: Climate change; Global warming; Economic growth; Human activity; Sustainability.

1. INTRODUCTION

Climate change and global warming has been a topic of interest for many scholars and researchers around the world. In Africa, much specifically in Namibia in the sub-Saharan Africa, many people do not really understand what global warming and climate change are, the effect or impact they have on the environment, economy, culture, and politics of many of the African countries. Climate is considered as the one global variable that has a direct and profound impact on every aspect of human existence; hence, that makes it one of the most important topics to be discussed in the 21st century. As presented by Dilley (2003), climate change has been a major threat to the realization of the development goals (mainly the Sustainable Development Goals (SDGs), Millennium Development Goals (MDGs), Vision 2030, and our Namibian Harambee Prosperity Plan), hence those related to eradicating poverty and hunger and promoting environmental sustainability.

Namibia is a semidry country, and it has very low rainfall compared to the rest of other countries in the southern area of Africa. Due to this climate condition of Namibia, it is acknowledged as one of the countries most vulnerable to the impacts of climate change. There has been a predicted increase in temperature and evaporation, which has resulted in an increased variability of rainfall, aggravating the existing

challenges that Namibia faces. Global warming is of substantial concern to the society, and it will have profound impacts on human lives, through changes in food production, water supply, health, land availability, energy, and ecosystems.

In spite of the impact of global warming and climate change in Africa and its risk to the world, many people in Namibia do not know about it. Universities are also currently running modules on contemporary social issues, where environment and sustainability issues are embedded. However, the level of such modules is part of a very low level of thinking and will hardly transform current practices among the community or students to be specific. The government has been busy drawing up policies on climate change and global warming without enlightening the nation about the risk and their influence on the economy or other factors that can change their lives.

Human means of support and the capability of nature to support humans have severely been affected by the impacts of climate change on natural resources and the functioning of ecosystems. Year after year Namibia is always a desolation, either through droughts or through floods, where many people in the country have to suffer. As a country that mostly depends on agriculture for food and economic growth, Namibia needs to raise awareness on the topic of climate change and global warming. There is a need for Namibia to adopt climate change plans that will reduce vulnerability and improve adaptive ability; meanwhile, the policies and plans in place should focus toward the long-term economic development goals of the country and not only short-term ones that comprise the dynamic changes we experience. This should be the main focus of different units and departments within public, private, and semiprivate sectors.

Although this is a research paper, no empirical research methods were employed. This paper is mainly focused on the overview and narratives of concepts on current practices and experiences within Namibia. Thus, the authors rely on qualitative research methods.

2. DEVELOPING COUNTRIES' VULNERABILITY TO CLIMATE CHANGE

A high number of developing countries are at misery from climate changes and global warming compared to developed countries economically and socially. These countries depend more on agricultural sector and this sector has been most affected by climate change (Reid *et al.*, 2008). The capacity to survive with climate change for these countries is also lower than that of developed nations; this has resulted from limited financial resources, skills and technologies, and high levels of poverty in developing countries. Namibia is very dependent on natural resources for maintaining its economic status. Reid *et al.* (2008) gave an estimate of up to 30% of Namibia's GDP as dependent on the environmental industries, such as agriculture, tourism, and fisheries. Climate change is thus not an easy and well-understood concept in Namibia, and therefore, there is a need for more and more awareness in Namibia. Preferably, awareness should be introduced through early childhood development programmes. At least, some sort of education for sustainability might be achieved and conquered.

Floods and drought are disastrous situations that affect populations and markets. The most likely to suffer from a disaster are the vulnerable groups within a community. The occurrence and focus of extreme events such as droughts and floods have increased across Namibia (Dilley, 2003). These events have been adversely influencing the economy of the country, as much government capital and other resources are required to address them when they are witnessed in parts of the country. Wilhelm (2012) estimated that the annual losses due to climate change impacts on natural resource alone in Namibia could be 1-6% of the country's GDP, thus making the impact of climate change much more larger for developing countries such as Namibia. When floods occur in Namibia (mostly in the northern parts of the country), families have to be relocated, and schools and businesses need to be closed down due to the damage the flood may cause. Many tourist attraction areas also suffer the same fate, as many people visiting Namibia cannot visit them. Temporary shelters need to be set up for families; in addition, the people are at higher risk of diseases such as malaria, which are caused by mosquitoes breeding in the floodwaters. Other health risks are also identified during floods, as this is an easy way for many diseases and viruses to spread through the waters.

According to Wilhelm (2012), some climate change effects, such as floods, are misfortunes that affect all populations. Wilhelm further asserted that climate change affects vulnerable groups within

communities such as children, orphans, women, elder people, or people with chronic diseases such as HIV and AIDS. These population groups need functioning health care, hygiene, safe water, and a healthy food supply. In addition, they also need centers for critical social care such as hospitals or primary health care centers and support networks such as roads and a clean water supply. The support networks that help people in Namibia are mostly the government and some nongovernmental organizations in the country such as the Namibian Red Cross Society, Global Fund, or UN member organizations. During floods, many people are forced to be away from important services such as health care services for about 3 or 4 months as all the networks that connect those with their health care service are either closed or surrounded by floodwaters. In every flood situation, a total of 41 health care services and 179 outreach health points have been inaccessible. Wilhelm (2012) has recapped the different situations faced by the people in Namibia, which are poverty, malnutrition, and limited access to health facilities, and now these have been worsened by climate change and global warming. When floods occur, the factors that are of most concern are the increased health risk of people with chronic diseases and some people who become sick due to the inaccessibility of health care services.

In neighboring countries like Angola, the potential health impacts of climate change are especially serious due to high levels of vulnerability and a relative lack of adaptive ability with respect to technology and medical services. Some of these issues are relatively transferred to Namibia at the borders and within towns, which is due to global issues including migration of different forms. The country has one of the weakest health care services in Africa and the effects of climate change on health are likely to include a greater incidence of heat-related mortality. The numbers of people at risk of death, disease, and injury due to floods and storms and other extreme events have increased. Climate Change in Angola Report (2012) states that the health system in the region is troubled by the increase of diseases such as malaria, which have resulted from mosquitoes' population increase during floods and have been identified as a rising problem in Angola and northern parts of Namibia. The occurrence of malaria in the Angolan highlands, which currently have a low rate of malaria transmission, could increase by the 2080s. Meanwhile, malaria transmission rates in more low-lying areas could increase after periods of heavy rainfall, and this will affect the northern parts of Namibia. Other diseases might result due to other events, such as droughts in the country like malnutrition; because of a lack of rain in the area, agricultural activities have become reduced (Climate Change in Angola Report, 2012). Namibia here is referred to as the country and people residing with in and not Namibians per se.

Most of the countries in sub-Saharan Africa have a lot to face when they deal with climate change in the area. With climate change, many people in the area are losing their traditional economic activity on the land such as agriculture. Land is becoming increasingly scarce and unaffordable, leading toward conflict among citizens in some areas. Land mainly affects the rural community, as its lack and lowered productivity increases poverty in rural areas. Climate change has reduced the value of the land, by reducing groundwater recharge due to increased runoffs and lowering the quality of the soil, as top soil is washed away during floods. This results in the replacement of perennial grasses with grasses of low-nutrient value, which contributes to high livestock mortality in periods of droughts.

Most of the vulnerable people in the community are found in the rural areas of many African countries. Elder citizens, young children, and sick people mostly inhabit the areas, and they are the ones who need to adapt to the changes occurring in the environment. Water and land scarcity affect many aspects of the nation's economy; the scarcity of resources has forced many societies to change their ways of life and become more dependent on employed age groups. Safe drinking water and sanitation are vital for good health, especially for people living in rural areas. Through observation of sub-Saharan Africa, the well-being of the people, the performance of the economy, the circumstances of the environment in this region can be closely linked to climate change patterns. Climate change is likely to impact ecosystems, with a probable negative impact on tourism as well as livelihood opportunities for the people. The question is how does Africa get ready for the changes due to impacts on people by climate change and global warming? Africa needs new and strong strategies and policies that can help the people and the social economy adapt and survive climate change and global warming. Hence, before any of this discussion on the economy of Africa, we need to understand the impact it has on native culture and the tradition of the people in the area.

3. DROUGHT IN NAMIBIA AND IMPACT ON THE ECONOMY

The country received below-average and unpredictable rainfall during the early part of the 2012-2013 rainy season. As per the analysis of the Namibia: Drought Final Report (2014), by the Namibia Red Cross Society, the period from January to March 2013 was dominated by very hot and dry conditions over the greater part of Namibia, with covers of moderate rainfall only in the northeastern parts of the country. This was the period that marked the beginning of a heavy drought in the country. It is currently witnessed in some parts of the country where there are severe unbearable droughts, while three quarters of the country received enough rain to cater for all relative necessities. The climate of Namibia can generally be described as dry, and this may lead to confusion when areas of low average rainfall are being identified as drought areas. For a semidry country, drought should be occurring more regularly, but Namibia has an unpredictable climate where it is not known if it will rain or not, as the weather changes frequently. However, most of the country receives much lower than average rainfall, compared to the years before. Namibia is estimated to become hotter every year, and the weather will become more unpredictable resulting in drought or other events.

Of the results of climate change in Namibia, drought has been one of the most devastating, as many people there depend cripplingly on agriculture. Most of the native people in Namibia believe in working in urban cities and towns to help support agriculture in the rural parts of the country, thus making the sector one of the most important for the people in the country. Farming was mainly about the production of food for family and not much for commercial purposes or trade. However, in recent years more people have noticed the growing number of consumers, which in turn has led to farmers improving their skills to supply more food commercially. Mendelsohn (2012) claimed that more land is used for agriculture than any other activity, and about 64 million hectares or 78% of the country is used for farming. Hence, the remaining 22% consists of national parks, game farms, urban areas, mineral concessions, and areas too dry or remote to be used for agriculture. This has really marked the importance of land for agriculture in Namibia.

3.1. Result of Drought in Namibia

Drought in Namibia has yielded a variety of results in the agricultural sector of the country. Drought that has been persistent for the last four years, 2012-2017, in the country marked hardship in the economy and livelihood of people. The first sign of drought in the country was marked by low rainfall toward the end of 2012, in most of the regions in Namibia. At the beginning of 2013, more rain was predicted, but this prediction did not yield any result. Some of the arid regions of the country—for instance, the southern and eastern parts of the country—had very low to no rainfall in general, though they bear the best grass with the strongest proteins and carbohydrates for the livestock. However, regions that were declared to be heavily affected by drought were Kunene, Ohangwena, Oshikoto, Kavango, Omaheke, and Erongo for the past 3-5 years.

In 2013, Namibia's crop harvest was 42% less than in 2012, and the dry land crop producers planted up to 50% less in the same season than they were expected to. These producers were supposed to have started in November but were deferred by the absence of rain and soil humidity (United Nation Development Programme Report, 2015). The UNDP Report (2015) further states that 2 years (2012-2013) of limited rainfall have devastated the mahangu or millet and maize plantations, dried up watering holes for livestock, forcing inhabitants to search for precarious or unjustified water supplies. The shortage of grass and water for livestock resulted in a high mortality rate for the animals in Namibia. Small-scale farmers in rural village areas suffered a dramatic loss of livestock as a source of capital.

The Namibia Drought Final report by the Namibia Red Cross Society, state that "the response to this cholera outbreak in January 2014, allowed a needs assessment to undertaken in the Kunene region and the assessment team noted a need for additional wells to be either repaired or outfitted with new equipment" (2014, p. 4). The report further indicated that a second cause of death was malnutrition, which was mostly recorded in children under 5 years, even in nondrought years. However, with the commencement of the year's drought, that an estimated 109,000 children under 5 were at risk of serious malnutrition was reported (The Namibia: Drought Final Report, 2014). This led the government of the country to launch drought-related programs in the areas that were heavily affected. Mostly food was made available for the people in such areas, to help the families who could no longer support their families. Not much was done to save the livestock and crops during the drought, as many of the animals were only living on small plants and dried-up grass. With a lack of water, it was even harder for any plan to be structured to

save the livestock. The year 2012-2015 was really hard for many families, as they watch their cattle die and could simply do nothing.

The drought affected not only rural areas but the capital city of the country too. In 2015-2016, there was a shortage of water in Windhoek, as dams in the city did not have any water. At the end of the year 2013, the City of Windhoek set out restrictions on water usage that resulted in the closing down of some informal businesses in Windhoek. Schlechter (2014) reported that the total shortage in the three central area dams dropped to 36.6% in 2014, compared to 2012, which was at a total of 91.0% and at 63.3% in 2013. In the beginning of the year 2014, major dams in the country did not receive any inflow of water (p. 8). In the mid of 2016, the city had a cholera outbreak, which was a result of lack of clean water mostly in informal settlements of the city.

Other major complications caused by drought were effects on water supply for irrigation. In many cases, the inflow of water into dams and rivers was reduced, and there was not enough water for irrigation purposes, and this forced farmers to grow crops that require less water or crops that have a shorter growing period. During the phases of drought, crop production decreased, resulting in the increase of prices of agricultural produces and affecting demand (Nickanor and Kazemba, 2016). However, the farmers benefited from higher prices that were the result of more demand, but the consumers were badly hit by this price increase. Droughts adversely affect the soil structure of farmlands, which in most cases in Namibia is already in a fragile state. The water holding capacity of the soil can be heavily reduced by droughts, and the soil organic matter and other microbiotic contents of the soil can also be damaged, leading to reduced fertility and increased soil-borne diseases. This, by extension, increases the production costs for farmers, as more biological agents will be required to ensure healthy and fertile soils (United Nations Development Programme PIMS 4711 Report, 2015).

United Nations Development Programme PIMS 4711 Report (2015) claims that low and highly variable rainfall that are associated with droughts can lead to increased temperatures and shorten winters, which can in turn affect the growth periods of winter vegetables and other cereals such as wheat. In addition, increases in temperatures can also affect the work of pollination agents such as bees and impact further negatively on crop production. This water and heat stress, particularly during the complex crop growth stages, will occur and has a detrimental effect on crop development and harvest. This places a major threat to Namibia's objectives in terms of sustainable economic growth, poverty eradication, reduced income inequality, and environmental sustainability. Many people in rural Namibia can no more produce the quality and quantity of crops they desire, as only some people can afford irrigation systems (United Nations Development Programme PIMS 4711 Report, 2015).

Comparing the drought and flood situation in the country, there is much difference that exists between the two. Drought is misunderstood and under research, compared to floods in Namibia that have a high volume of research, and many people are quite aware of the events. In Namibia drought comes in many cases as a surprise as rain is usually forecasted. Many areas in Namibia are highly vulnerable to droughts; there is a great impact on water supply, due to the low water flow that has resulted from insufficient rainfall. Namibia relies extensively on using surface water and underground water, and this reduces sufficient inflow to rivers and dams. In contrast, floods in Namibia mostly affect the northern regions of the country, yet more attention is given to them, as they occur more frequently. With so many recent years of drought in Namibia, the economy of the country has been much affected. Industries of meat and crop production had to close down or come up with new strategies to keep operating, reducing the country's GDP.

3.2. Climate Change on Tourism

Kotir (2011) claimed that the intensity of extreme events, such as floods and droughts, has increased in Africa over the past few years (p. 590). Particularly in Namibia, this has caused major disruptions to the economy, hence exacerbating the country's vulnerability. Namibia is heavily reliant on rainfed agriculture, tourism, and marine ecosystems. According to Kotir (2011), increased extremes of climate change might have aggravated food security in Africa and much more in Namibia. The country's ability to grow its own crop products, such as maize, has been decreasing due to climate change. High demand of the products has given way to much importing from neighboring countries like South Africa. It is not that Namibia as a country is unable to produce maize, but the need of seeds that are able to adopt to the climate of the country is what should be considered. Reid *et al.* (2008) suggest that the possibility for irrigation could increase with the quantity of

land available and its quality, hence allowing more production (p. 15). Climate change has shown that probably there will not be any improvement in extended irrigation but rather a reduction in its potential benefits.

Tourism is a key economic activity in Namibia, particularly wildlife and coastal tourism. With the recent changes in the climate of Namibia, the industry is more at risk, as some activities in the sector are being forced out such as the visit to some area due to floods or other disasters. Since tourism relies solely on Namibia's base of natural resources, to some extent, the "impacts to biodiversity and natural ecosystems will impact on tourism" (Reid *et al.*, 2008, p. 19). Visitors coming to Namibia are nature and landscape tourists and game viewers; with wildlife threatened by drought or flood, this plays a major role in the economy of the country.

Reid *et al.* (2008) pointed out three of the economic impacts of climate change in Southern Africa, which might likely impact tourism activities: first a change in supply due to loss of habitat, second "change in supply and demand due to loss of biodiversity," and last "change in demand due to increases in temperature, humidity and malaria" (p. 19). In addition, majority of the visitors to Namibia value its "biodiversity and desert landscapes" (p. 19); however, it is difficult to know how complex tourism demand will be; for example, an expansion of deserts may lead to an increase in tourists who might still enjoy such sights. Hence, it is very difficult to estimate the importance of biodiversity to tourism, because tourism demand is dependent on many different features of the chosen target (Reid *et al.*, 2008, p. 20). Furthermore, it is very hard to understand the impact climate change has played on the tourism sector of Namibia.

A possible solution and way to understand climate change in the tourism sector will be through land use. Land being one of the main resources in the tourism sector might be key to understanding or basic analyses. Either research or basic observation on how the land is used in the sector will show what beneficial results climate change has on the sector. Namibian tourism sector is highly dependent on natural resources, so there should be concerns that any climate change impacts on biodiversity and natural ecosystems might significantly affect tourism (Reid *et al.*, 2008). However, tourism is dependent on many external factors that cannot be addressed in a single examination but should focus on other factors including global incomes, regional stability, and competition. Additionally, past growth rates in the tourism sector during the last decade are no guarantee of future growth in Namibia. Each period should be sustainable in nature. The government of Namibia recognizes the need for conservation of biodiversity and ecological complexity as a priority. However, more sustainable development activities should be done and should be embedded in many of the initiatives that are carried out.

With the drought that occurred from 2012 to 2016, much research needs to be taken to understand how the tourism industry has been affected. Tourism is mostly a seasonal industry, booming in some seasons of the year, compared to other industries that are stable throughout the year. Reid *et al.* (2008) suggest that there is a high possibility for Namibia tourism sector to expand as a supernumerary to production in climate-sensitive sectors (p. 20). However, one can disagree, as there are no specific studies on tourism demand and the demands of individuals change; therefore, it is hard to predict how tourism would be affected by climate change. Hence, there is reason to be cautious about tourism potential, as there is a risk that at least some areas will probably be less suitable for tourism if the land becomes drier. Tourists will keep visiting the country much for its landscape, but to what extent will this be possible? Tourists visit Namibia for a variety of reasons, and these reasons can be affected by climate change. The fact that tourists are currently visiting the deserts along the west coast does not mean that they would also like to visit other desert-like areas in other parts of the country in the future (Reid *et al.*, 2008). In addition, it is of significance to repeat the importance of understanding climate change, as it might be a key to help the sector grow.

3.3. Food Security and Climate Change

Namibia's temperature has been rising having quite an impact on the food production, with little rain received in 2013 and very hot temperature prevailed. Climate change and agricultural production are interrelated processes, which take place on a global scale. Agriculture depends highly on a good or conducive climate, which will allow production to yield good results. Climate change affects agriculture in a number of ways, including through changes in average temperatures, rainfall, and climate extremes (Kotir, 2011). This also has related changes in pests and diseases, changes in atmospheric carbon dioxide and ground-level ozone concentrations, changes in the nutritional quality of some foods, and changes in sea level.

Despite technological advances, such as improved seed varieties, technological boreholes, and water irrigation systems, weather patterns are certainly a key factor in agricultural productivity as well as soil properties for natural communities. As much as technology is embraced, more people to be trained in these changes as to get the intended results. The effect of climate on agriculture is related to inconsistency in local climates rather than in global climate patterns. Kotir (2011) insisted that due to dry and hot climate blowing over sub-Saharan Africa, some countries, including Namibia, could see agricultural yields decrease by 50% by 2050. This would lead to over 50% of the population of these countries starving. According to Kotir (2011), an increasingly dry and hot climate will make sub-Saharan Africa less suitable for agriculture, reducing the length of growing seasons, lowering yields, and shrinking revenue. This will bring the region to become more dependent on other sources for survival and increase the level of poverty.

The recent estimation has put the total number of constantly malnourished people during the period 2012-2014 at 805 million down from 870 million in 2010-2012 but a disturbing 214 million undernourished live in sub-Saharan Africa (Nickanor and Kasemba, 2016). Hence, in Namibia, more children under the age of 5 were suffering from malnourishment in the areas affected by drought in the country (Final Report Drought, 2014, p. 4). The Red Cross team did an assessment in the Kunene region to ensure access of food and basic commodities and contribute to food and nutrition security (Final Report Drought, 2014, p. 4). During events such as droughts and floods, a lot of people become more dependent on the government and nonprofit organizations. There has been insufficient progress toward meeting international hunger targets in sub-Saharan Africa, where more than one in four people remain starving.

Climate change continues to worsen existing threats to food security and societies due to a mixture of factors that include the increasing frequency and intensity of climate hazards, fading agricultural yields, reduced production in defenseless regions, and rising health and sanitation risks (Nickanor and Kazembe, 2016). Changes in climate will be felt mainly through increasing temperatures and changing rainfall patterns; these are the main factors that will influence crop production in Namibia. According to a study by Nickanor and Kazembe (2016), "there is a strong relationship between malnutrition and both rainfall and temperature in Namibia that result in malnutrition in some areas of the country" (pp. 5-8). Commonly, the risk of malnutrition has been increasing since 2010, when compared to 2014, however, lower in 2008 and 2009 (Nickanor and Kazembe, 2016). There have been a number of natural disasters such as flood and drought that started in 2012; this has also show clear relationship between natural disasters in Namibia and food security (Nickanor & Kazembe, 2016).

In Namibia, food security is an issue that is much understood. During floods and droughts, food is one of the main resources that is brought as aid. Some people live far away from road networks, making it hard for all those people to receive food on time. Crop production and livestock farming are only possible to a limited extent to help the countries' rural communities. This is primarily due to infertile soil and unreliable rainfall patterns. Food insecurity is threatening, in particular, Namibia's densely populated northern region, where more than half of the country's population live. The main activity in this region is subsistence agriculture, which is primarily rainfed. Older people are often left to carry out the agricultural work, as younger people are moving to urban areas.

Rapid urbanization and persistently high unemployment rates at 34% of the total labor force affect mostly youth and women who have contributed to a growing number of poor lacking access to food and basic social services. Poverty again in the country mars the security of food in the country, and adding on to that, the land is becoming harder to work on. The reduction in rainfall in Namibia will put the country in much danger, as many people will face starvation due to a high lack of food. In the last years, Namibia has been depending highly on imports from other countries such as South Africa. If this trend continues, this will bring much of the country's GDP down, as fewer products will be produced locally.

Namibia should look at other methods to tackle food security issues that will allow the country to adapt to climate change and avoid starvation and other health-related issues caused by lack of food. Among the factors impacting on Namibia's competitiveness are a decline in the quality of governance and low productivity in the country. Land ownership practices restrict access to land, preventing people from producing products that are of good quality. In addition, policy restrictions on labor migration restrict the entry of qualified staff from outside the country even for a temporary period to transfer knowledge, and these are some of the key issues that the country should tackle.

4. REGULATING CLIMATE CHANGE FOR IMPROVING ECONOMIC GROWTH

The government of Namibia is burdened by billions of bills to keep up with due to the impact of global warming and climate change on to the Namibian economy (Köhler, 2012). Climate change has been influencing environmental sectors such as agriculture, tourism, and marine ecosystems. These are vulnerable sectors, and the changes in productivity caused by climate change will not only directly affect the value these sectors add to national income but also the incomes of the people who depend on these sectors. The people primarily in the rural areas depend heavily on the cultivation of the land to grow crops either to trade or for their own food supply. Apart from the direct effects on production, there might also be indirect effects on other economic sectors that sell goods to the directly affected sectors or to the people who depend on these sectors for their income.

Economic impacts often involve loss of money either by individuals or families, businesses, and governments. An example of the economic impacts resulting from droughts is this: farmers will have to spend more money to irrigate the crops and provide water for livestock on animal farms and ranches.

Economic outlook (2016) accounts that the economy was estimated to rise by 4.4 and 5.4% during the year 2016 and 2017. The fundamental problems of drought and other related sectors have been projected to have a negative growth effect on the economy during 2016. Moreover, the negative effects were expected to decrease as growth accelerated in 2017. No rain in that year was the cause of the resulting decrease. Livestock farming is illustrated in Economic outlook (2016) to have made central progression in agricultural growth during 2016. Farmers are expected to combine their stocks and thus increase investment and growth in the sector. In this regard, growth for livestock farming was expected to improve from a contraction of 14% in 2015 to a contraction of 6.9% in 2016.

Droughts in Namibia have much greater impact on industries that have a high dependence on the supply from agriculture. Occurrence of droughts forced farmers to market their livestock and thereby increased activities in the meat-processing subsector. The meat-processing sector in the country suffered a great deal, as many farmers lost their livestock to droughts, bringing the industry down. The Meat Corporation of Namibia (Meatco) was closed down in many of the regions, for the reason that farmers no longer had sufficient and quality livestock to sell. Quantity and quality were both affected. With the closedown of this company, more people became unemployed, and more youth were not able to find work in the country. Climate change has been somewhat crippling to much of the environmental sectors that were the backbone of many countries' economic growth for the many years. This has led to the adaption to new economic sectors such as mining, banking, and other secondary sectors of the economy.

4.1. Adapting to Climate Change in Namibia

Countries in sub-Saharan Africa perceive that it is impossible for them to adapt to climate change and make profit from new businesses that are derived as a response to the issue. As it is very important to address the issues of climate change, this paper focused on how climate change has been one of the major socio-economic problems faced by developing countries like Namibia. With knowledge on the existence of the problem and having known that it is there, Namibia has to find methods to adapt to the changes occurring. Adaptation is not simply a matter of designing projects or putting together lists of measures to reduce the impacts of climate change. More needs to be done to ensure that all the strategies being developed to adapt to climate change integrate with other national issues, particularly economic growth, poverty reduction, and employment creation measures.

To start understanding climate change adoption measures, one has to understand its occurrences. It will be for the societies to start taking influential and beneficial actions in changing the burning issues of climate change for worse. Global communities took preliminary steps under the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and again in 1997 through the Kyoto Protocol to try and discuss mechanisms to control global greenhouse gas emissions (Facilitating an International Agreement on Climate Change, 2009). Experts in environmental issues came together to discuss the impact climate change has on many economy and ways to adapt to climate change. It is best to replicate where applicable some contextual solutions that worked in different settings. At the UNFCCC convention, members were of a high-level task force of world leaders committed to addressing climate change through international negotiations. At the beginning of the 21st century, the UN came up with Sustainable Development Goals, aiming at reducing the carbon footprint and encouraging people to adapt to climate change across different industries.

Namibia needs to change a lot in order to reshape the farming system in the country. In order to understand how rural communities will respond to climate, one must first understand how climate directly affects household decisions. There are factors that are climate sensitive, meaning they are at high risk of being influenced by climate change. These factors must be first analyzed and understood, as this will identify new ways to provide the same factors. In rural Namibia, firewood has been one of the major means of energy, and hence, new measures need to be put in place to reduce firewood and coal industries in Namibia. This is one of the measures that can help in reducing the carbon footprint in the country. If the measure makes the household better off, it is an efficient adaptation—in particular, using alternative energy sources such as solar systems or power.

Governments consequently have a critical role to play in adaptation, to ensure that public adaptations are done efficiently. The role of many developing countries in climate change requires a lot on involvement of private sectors and local governments to ensure that people know what is expected from them. The government of Namibia has put in place controlling measures of cutting down trees to build houses or for firewood. As a result, people are forced into poverty and are restricted from building shelter for their families. The government needs to first help introduce alternative sources for construction and energy before implementing policies that inhibit the people. For all projects whose benefits exceed the cost, the government can work efficiently for their citizens, but there is not a perfect match between who pays for a good and who benefits. The policy or law that is in place should be compared to other effective measures and then only implemented.

Development can encourage a more strong economy by developing service, manufacturing, and other sectors of the economy. This will help Namibia to reduce investing in climate-sensitive sectors like agriculture. Entrepreneurship should be encouraged in strong economic sectors such as mining and tourism. Explicitly, tourism in particular has been identified as one of the sectors that is not influenced by climate change (Reid *et al.*, 2008, p. 22). The main reasons visitors coming to Namibia are nature and landscape touring and game viewing; these are some of the sectors not influenced much by climate change. Visitors also come to do some sort of research for their studies, personal knowledge, and capacity building, and some due to university and world demands. With perfect information, adaptations would be planned to occur surely as the climate changes. Changes that involve a great deal of planning would have to be considered before the climate changes.

In agriculture, the amount of land that is farmed is sensitive to climate, and hence, more needs to be done to ensure that more land in Namibia becomes good for cultivation of crops. The southern part of Namibia is drier, and less farming activities are possible there. With new advancements in technology and innovation, farming in the desert can be possible. This can be one of the techniques that can help farming in Namibia be successful. In Namibia, it is not that the country is unable to produce maize, but the need of seeds that are able to adapt to the climate of the country. Farmers in Namibia are also more likely to plant fruits and vegetables that require less water and can also adapt to the dry climate. Potential for irrigation systems could increase in terms both of the quantity of land that would be available and its quality, hence allowing more production. Climate change has shown that probably there will not be any improvement in the potential for extended irrigation but rather the potential benefits of such projects will be reduced.

5. CONCLUSIONS

It is obvious and evident that global warming is the major challenge for our society's development. There is vividly very little uncertainty that global warming will change our climate in the following century. Hence, what should we employ to be the solutions to global warming? Primarily, there must be a global radical or political solution that should employ no manipulative strategies against the poorest. Second, there must be an increase in extensive funding for developing an inexpensive and clean energy production. This is because all economic development is based on increasing energy usage around the globe. Yet, we must not put all our expectations and hopes on global politics and clean energy technologies only. There is a great call for us to prepare for the worst and adapt by understanding and then become innovative in many other ways of doing things differently or accordingly. If implemented now, a lot of the costs and damages that could be caused by climate change can be averted, and thus, we might improve and raise economic growth

in most developing countries that find themselves in economic crisis due to climate change and global warming.

There are many future impacts of the current situation. It indicates the major and widespread effects of global warming on the natural environment. There are effects on human societies and our economies as well. Life-threatening, dangerous, and extreme climate events will increase as a result of global warming. These events include, for example, droughts, erosions, floods, storms, and heatwaves. Food security, farm productions, public health, and water security will become the most central problems facing all countries. Many societies in Namibia survive on farming, and thus, many other areas, such as education, will as well face challenges in the long run. Global warming also threatens global biodiversity and the well-being of billions of people not just in Namibia but worldwide.

There are some solutions that can be drawn from the problems faced, projected, and experienced. Two types of solutions are examined to combat climate change and global warming. First is adaptation, as we already know that there will be climate change even if we reduce our emissions back to 1990s' levels. Second is mitigation, which is concerned with reversing this trend and cutting greenhouse gas emissions. This is basically about modifying and justifying our current practices and aligning them with what works best. Experts believe a cutoff between 60 and 80% in carbon dioxide emissions is required to prevent the worst effects of global warming. The ubiquitous concern is does everyone around the world understand the link between their practices and the consequences thereof? To curb this gap should involve extensive awareness campaigns, committed society, environmentally knowledgeable leaders, or an influential group of people. These all might be realized through economic, regulatory, and technological solutions. In Namibia, there are so many activities that community members are carrying out unaware of the damages caused by these to the environment. Humans impacting environment is the biggest cause of global warming and climate change, be it consciously or unconsciously.

Human activity can be openly ascribed to the cause of millions of destructions and extinctions in the last three decades versus the millions of years that extinctions naturally occurred. Humans have drastically changed the world in exceptional ways as we have progressed through the 21st century. Human impact on the environment has become one of the main topics for sustainable development experts and university officials all over the world. While they search for the answers to this life-threatening problem, the public needs to do their part as well. Minimally, you need to be aware of all the issues and factors that contribute to this state and share the knowledge. It is for a good cause.

We should not overlook the integration of gender-related issues that could assist in the fight against climate change and global warming. Gender mainstreaming is defined by the United Nations as the process of assessing the implications for women and men of any planned action in all areas and at all levels. That means making both the concerns and experiences of women and men an integral dimension of all agriculture and rural development efforts.

5.1. Recommendations for Future Research

It is needed to research on the level of societies' understanding of the causes of global warming and climate change.

1. Climate change and household decisions
2. Climate change and individual decisions

Contemporary social issue module at the university, to what extent the content can be put in practice, and how do we test whether such knowledge is used outside the classroom settings or not. This would as well relate to life skills classes at elementary and secondary school.

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