



An Educational Perspective on an Integrated Approach in Mitigating Climate Change in Mufulira

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Abstract: This paper explores an Educational Perspective on an Integrated Approach in Mitigating Climate Change in Mufulira. The study employed the qualitative approach and utilised questionnaires, digital audio recorders, Focus Group Discussion (FDG) and interviews with a purposively chosen sample in Butondo, Kankoyo, and Kantanshi townships. The findings revealed that the interdisciplinary nature of climate change mitigation demands funding, multi-sectoral approach, incorporation across curricula at all levels, quality Mathematics and Science Education (MSE) and re-orientation of teacher training. Furthermore, traditional pedagogies and rote-learning methodologies must be replaced with problem-solving, inquiry-based and future-oriented learning approaches anchored in the local community. Communities should shift to alternative sources of energy such as solar, practice the 3R (Reduce, Reuse, & Recycle), tree-planting, and minimising the use of artificial fertilisers and pesticides on farms. In view of the findings above, the study recommended that: funds be adequately allocated to enable the education sector produce teaching and learning materials and train teachers on climate change; networking among implementers be enhanced; policy on integration be put in place; people develop a positive attitude to the environment; traditional pedagogies/methodologies be replaced by innovative ones and everyone participate in mitigating climate change.

Keywords: Integrated Approach, Climate Change, Climate Change Mitigation

1. INTRODUCTION

The majority of climate scientists agree that human activities, especially the burning of fossil fuels (coal, oil, and gas) are responsible for most of the climate change currently being observed, (National Academy of Sciences, 2012; United Nations Educational, Scientific and Cultural Organisation [UNESCO], 2012).

The human population and particularly children living in poverty in underdeveloped countries with weak governance and poor education systems are the hardest hit by climate change (Reduce Deforestation and Forest Degradation [REDD], 2016). However, Anderson (2010) observed that the education sector offers an opportunity to combat climate change through contributing to mitigation efforts thereby reducing vulnerabilities and building resilient societies. The UNFCCC and the Kyoto Protocol contain articles calling on governments to support education for climate change.

1.1. Statement of the Problem

The ministry responsible for education in Zambia has done little to raise awareness on mitigating climate change among pupils apart from the recent inclusion of Environmental Issues in the Junior Engineers Technicians and Scientists (JETS). Hence, this study sought to explore an Educational Perspective on an Integrated Approach in Mitigating Climate Change in Mufulira.

1.2. Purpose of the Study

The main purpose of the study was to explore an Educational Perspective on an Integrated Approach in Mitigating Climate Change in Mufulira.

1.3. Research Objectives

The objectives of the study were;

- To explore educational activities on mitigating climate change in Mufulira.

- To establish how the relevant stakeholders are collaborated in the implementation of climate change mitigation in Mufulira.
- To determine the challenges and opportunities faced by the ministry responsible for education in implementing climate change mitigation activities in Mufulira.

1.4. Research Questions

- What educational activities are carried out in mitigating climate change in Mufulira?
- How are relevant stakeholders collaborated in the implementation of climate change mitigation in Mufulira?
- What are the main challenges and opportunities faced by the ministry responsible for education in implementing climate change mitigation activities in Mufulira?

1.5. Significance of the Study

There are no studies to the researcher's knowledge which have been undertaken to explore an Educational Perspective on an Integrated Approach in Mitigating Climate Change in Mufulira. It is against this background that this study is, first and foremost, crucial for the pupils, parents, teachers, NGOs, policy makers and other stakeholders to realise that education is a significant tool for mitigating climate change. As such, it is hoped that the study will contribute to the existing body of knowledge on educational policies in Zambia. Secondly, the results of the findings may also be valuable to educational practitioners, curriculum developers, policy makers in education, and other stakeholders interested in the understanding of the need to promote an integrated approach and improve efforts aimed at mitigating climate change in Mufulira. Furthermore, they may also help in drawing recommendations for future improvements on educational activities in mitigating climate change in secondary schools.

1.6. Theoretical Framework

The study was guided by two theories, namely; Environmental Determinism and Environmental Possibilism. The theory of environmental determinism was coined by Aristotle and dates back to the 15th century. Whereas the theory of Environmental Possibilism was ideated by Strabo in 64BC. Doyle (2011) says determinism is a theory based on the occurrences in nature, or education or psychological phenomena causally determined by preceding events or natural laws. On the other hand, possibilism is the view that the physical environment provides the opportunity for a range of possible educational responses and that people have considerable discretion to choose among them (Dictionary of Human Geography, 1994). In other words, 'determinists' argue that education is not free of the influence of environment - people and their environment are inseparable. The counter writers to the determinists view termed 'possibilists' commonly argue that the physical environment influences education, and that, education also influences the physical environment. Figure 1.1 Summarises the Environmental Determinism and Possibilism Theories.

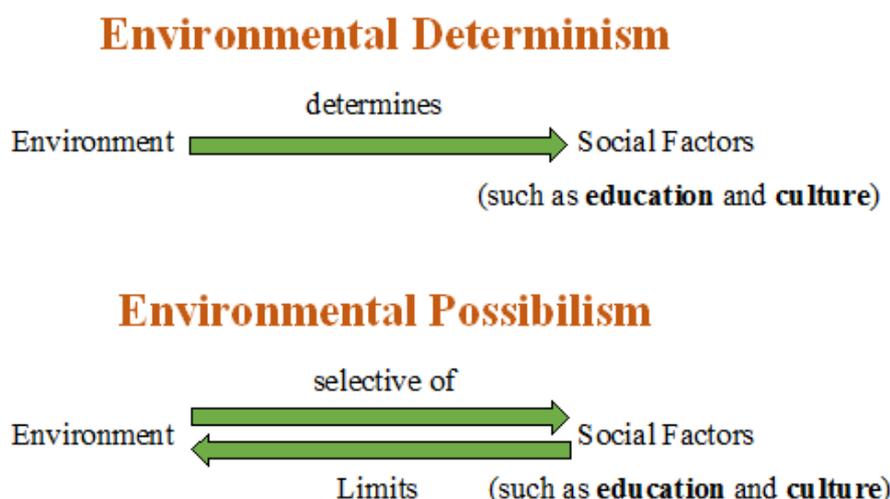


Figure1. Environmental Determinism and Possibilism Theories

Furthermore, environmental determinism and possibilism are theories put forth not only to comprehend and understand climate change mitigation and adaptation but also the role played by the physical environmental conditions in the emergence and progress of education in a particular location.

2. METHODOLOGY

The research design was primarily qualitative in that it aimed at an in-depth understanding of the problem at hand from the point of view of the respondents.

The study concentrated on three townships, namely; Butondo, Kankoyo, and Kantanshi in Mufulira District on the Copperbelt Province of Zambia. The study population comprised pupils selectively chosen from Butondo, Kankoyo, and Kantanshi Secondary School, teachers, parents and officers from NGOs.

The study sample included 24 pupils, 12 teachers, 12 parents and 4 officers from NGOs. The researcher selected a total of 52 elements. The choice of this number agrees with Creswell (1998) and Strauss and Corbin (1998) who argued that for the studies following the grounded theory approach, sample sizes ranging between 11 and 30 respondents are adequate.

The study used purposive sampling. Thus, the population was divided into secondary school pupils, teachers, parents and officers from NGOs to ensure a fair representation of the stakeholders (White, 2005) because their principle operations are significantly different. The pupils were randomly picked from grade eight to grade twelve classes for FGD and responding to questionnaires, respectively. The selection of parents was based on their availability and readiness to participate in the research.

The data was collected using the following instruments namely; structured questionnaires, focus group discussion guides, semi-structured interview guides, digital audio recorder and an observation schedule. In addition, document analysis was also used.

To conduct this research, authority was sought from the District Education Board Secretary (DEBS) office. Then the head teachers were approached to seek permission to interview pupils and teachers in secondary schools in Butondo, Kankoyo and Kantanshi Townships of Mufulira District. The directors for the NGOs were approached to interview their officers. Data was collected using structured questionnaires, focus group discussion guides, semi-structured interview guides, digital audio recorder and an observation schedule. In addition, document analysis was used.

The researcher analysed data in three stages. Firstly, the researcher transcribed data from interviews and questionnaires manually. Secondly, the data was eyeballed to identify emerging themes and in order to create initial categories. Thirdly, the researcher compared data with existing literature. The data obtained through interviews and FGD was analysed by coding and categorisation of the emerging themes. Consequently, a central phenomenon emerged and data was categorised into more specific sub-themes. This process of categorising data is referred to as axial coding, (Cresswell, 1998; Cresswell, 1994; Charmaz, 2006). Quantitative data was analysed using excel. Then, the researcher used colour codes to further analyse data from the questionnaires. By coding the text, the researcher identified phenomena and linkages and grouped different codes into larger, more meaningful categories (Charmaz, 2006). Some qualitative data was converted manually and summarised in order to obtain concise measures of the data by using descriptive statistics. The data was then presented quantitatively in frequency tables using a hand calculator.

3. RESULTS

3.1. Understanding Climate Change: Meaning and Causes

From the findings, most of the respondents had heard about the term “climate change”. However, when asked about what they understood by the term, they gave varied responses. It was discovered that 25 of the respondents stated that climate change means pollution while 11 stated that it was loss of biodiversity. However, 8 respondents interpreted climate change as signifying high temperature while others knew it as drought and heavy rainfall, respectively.

The researcher observed that respondents interpreted the term climate change according to the activities and particular climatic event they normally faced in the areas where they lived. For example, the respondents close to the mine area interpreted climate change as pollution or loss of biodiversity. Also, respondents who engaged themselves into farming activities said that climate change means drought and/or heavy rainfall.

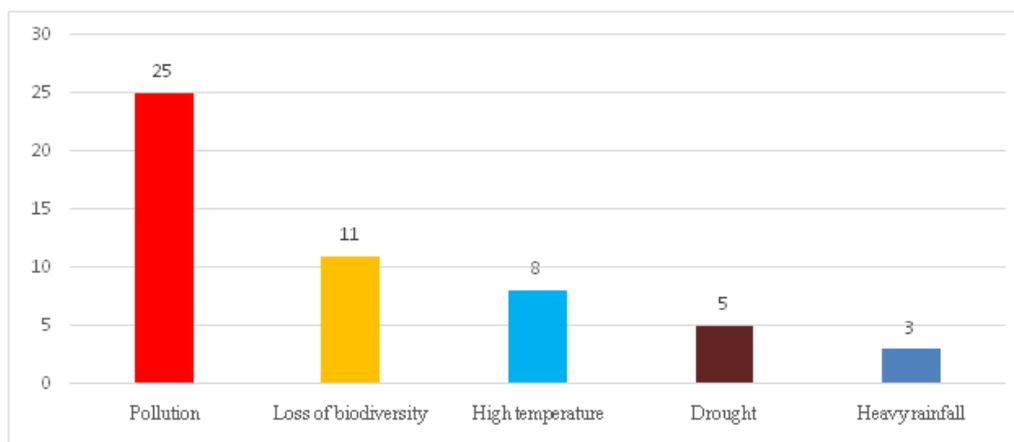


Figure2. Understanding climate change: meaning and causes

3.2. Objective One: What Educational Activities are Carried out in Mitigating Climate Change in Mufulira?

The following were the responses from selected pupils on the activities they participated in with regard to climate change:

L1: *I have been participating in quizzes on climate change. It's an interesting topic and I have really enjoyed searching for information on TV, radio, newspapers, magazines and the internet whenever I have bundles in my phone.*

From the responses, pupils had a wide range of sources of information on climate change. Therefore, access to information gave them confidence to develop projects on the measures to mitigate climate change because they could compare, make inferences and provide solutions to environmental challenges. However, pupils placed the concept of climate change in a context that was meaningful to them as observed in the following response:

L2: *I mean even the army worms that ravaged crops in some parts of Zambia were as a result of climate change. As a prefect in charge of the school environment and sanitation, I am working with my fellow pupils in promoting best practices such as recycling garbage for use at the school Production Unit (PU) instead of burning it.*

From the response stated already, it was also observed that pupil's ideas and knowledge about climate change mitigation depended on their role in school and the subjects they took. Pupils who studied Agriculture Science, for example, described climate change in line with what they learnt on conservation farming as L3 responds:

L3: *With the knowledge I have received through sensitisation from stakeholders that visit our school, I am working on a project that will assist farmers to use organic pesticides made from crops and plants such as tephrosia, chilly and tobacco which are cheap and environmental friendly.*

Furthermore, L3 explained the advantages of using organic pesticides, thus:

Other benefits of using these organic pesticides include the fact that they do not require technical knowledge and expertise to prepare them, as long as someone has the materials to use. At the moment I am getting information from textbooks, experts in the field of agriculture and the internet to enable me contribute positively to mitigating climate change in the field of agriculture, especially in crop production.

On the other hand, a pupil who was working on a project on 'waste management' under the chemistry category in JETS described climate change in line with the content of the subject:

L4: *The earth is hotter than before due to climate change caused by human activities such as mining which emit sulphur dioxide into the atmosphere, burning fossil fuels and incorrect disposal of garbage, to mention but a few. Surface temperatures are rising to extreme levels. Through my project, I advise people in my community to avoid burning waste and promote recycling.*

In the same way, the ministry responsible for education encouraged pupils to work on innovations that would bring about Sustainable Human Development. Such projects served as a cornerstone for future developments to be implemented on a large scale for the betterment of society as illustrated by L5.

L5: The low levels of water in rivers and lakes is caused by climate change. There is rapid evaporation of water due to rising temperatures. Climate change is affecting our livelihood negatively. I am working on a project aimed at harvesting rain water instead of allowing it to waste.

One of the advantages for the ministry responsible for education lies in its ability to train a huge population of learners. Therefore, the utilization of events such as what used to be known as the 'Planting Day' where each pupil was expected to plant and nurture a tree could serve the Earth from global warming as alluded to by a pupil at Butondo Secondary School who responded that:

L6: Currently the rate at which carbon dioxide is being emitted into the atmosphere is higher than its uptake by green plants. This causes global warming. There is rampant indiscriminate cutting down of trees without replanting. I advocate for "Cut one, plant two campaign" in my school. This is aimed at maintaining the ecosystem.

Although the ministry responsible for education has a big role to play in providing knowledge and information to pupils in schools, it requires the collaboration of other stakeholders such as NGOs, churches and other like-minded organisations. Other line ministries such as the Ministry of Health and the ministry responsible for local governance should work with the ministry responsible for education to reach out to pupils in schools through sensitisation campaigns. In Mufulira, the sector collaborated with the church and an NGO called Green and Justice. Pupils were sensitised on the impacts of climate change on the environment and ways to mitigate it as explained by L7:

L7: In our school, we are sensitised on the measures to reduce the impact of climate change. Usually we receive officers from churches and Non-governmental Organisations who sensitise us take action towards mitigation. We are also sensitised on how to keep our school environment clean and recycle garbage especially biodegradable materials. We participate in singing songs, dancing and presenting poems on climate change. In addition, photographs are taken and videos of activities conducted are produced so that they can be used as resource materials in future.

From the findings, it can be inferred that pupils understood climate change in a context that was meaningful to them. UNESCO (2015) contends that pupils participated actively in activities that were in line with what they perceived in their environment. Although pupils did not have enough resource materials such as books, encyclopaedias and magazines on climate change, they were gathering a lot of information about the impacts of climate change through television channels like the Zambia National Broadcasting Corporation (ZNBC), British Broadcasting Corporation (BBC) and Aljazeera.

L8: I get a lot of information about climate change through Aljazeera and the British Broadcasting Corporation.

In Asia, the media and publishing houses produce educational materials and disseminate information about climate change through the print, audio and visual programmes. The continent uses the media to reach out to the grassroots.

Teachers at Butondo, Chankwa and Kantanshi Secondary Schools were asked to state the educational activities they participated in with regard to climate change mitigation because of the role they played in facilitating the learning process and as agents of change. Some of the selected teachers responded that:

T1: We are promoting quality learning through environmental and Climate Change Education. This is aimed at enhancing mitigation and adaptation through components such as imparting relevant content knowledge and critical thinking skills in the pupils.

As already explained in Chapter 2, quality Climate Change Education should be anchored on a link between the relevance of content and the knowledge imparted in the pupils as well as its application to the immediate environment. For example, Japan is one of the countries that has since the 1970s embarked on building eco-schools to serve as a resource for research on EI as stated by T2.

T2: Some countries are coming up with what they are calling safe and adaptive as well as green schools, respectively, where the school structures and environment serve a resource for pupils and educators.

In Zambia, school-based environmental projects that encourage full child participation are a good starting point. Pupils should be allowed to invent their own projects on the prevailing environmental

challenges so that they could work on them not only while they were in school but also when they join the world of employment. In other words, projects must arouse curiosity and critical thinking in the pupils. T3 adds that:

T3: Pupil-led, participatory activities empower them and make them feel part of the solution, above and beyond returning to school. The more schools allow them to choose their priorities and the issues that are important for them, the greater the chances for true pupil participation.

The ministry responsible for education in Zambia has taken a bold stance in ensuring that schools foster activities aimed at improving the capacity of pupils to comprehend, participate in and become better at resolving the contentious clash of ecological, social and economic interests in our environments (MESVTEE, 2013). Examples of such activities include:

T4: JETS activities based on problems that pupils identify in their area to come up with solutions. For example, Kankoyo Secondary School is located near the mine. Therefore, some pupils are working on projects on the effects of mining activities on the environment. It's interesting to observe the high levels of interest in pupils. We are always available for them whenever they need our guidance.

Furthermore, it was also observed that humble beginnings were important in advancing the Climate Change Education agenda. For example, the Green and Justice in Mufulira was making constant appeals for communities to practice safe ways of disposing garbage such as recycling as opposed to burning. The organisation collaborated with other like-minded organisations such as the Young Women Christian Association (YWCA) in rolling out programmes to schools, colleges, universities and work places with a view to changing people's mindset. The action taken by different organisations corresponded to the response from one of the teachers, thus:

T5: Programmes such as the "Keep Zambia Clean and Healthy Campaign" have been localised in both private and public institutions such as schools, colleges, universities and work places to raise awareness on the importance of keeping our environment clean and healthy thus providing a solid foundation for action against the impact of climate change.

It was further observed that pupils-participation in climate change activities was overwhelming despite the challenges the education sector faced in integrating it into the curriculum. According to UNESCO (2012), Seychelles has introduced compulsory Environmental Education modules for all teacher trainees and units on climate change to teach both primary and secondary school pupils. Furthermore, the University of Seychelles offers, among other programmes, the ESD BSc degrees in line with the needs of the country's unique, coastal and terrestrial environments. This has provided a solid foundation for pupils with an education pathway towards coping with climate change. Similarly, the University of Zambia has established the Department of Philosophy and Applied in the School of Humanities and Social Sciences to place a special emphasis on ethics which is a core dimension of philosophy and is applied to a wide range of social life such as business, public affairs, environment, and health. Research shows that ethics encompass judgement on whether an action is right or wrong, good or bad – either in general or with respect to specific walks of life such as the environment including climate change, (Liche, 2014; Lee & Williams, 2001). Therefore, schools also have also taken up the challenge by putting in place a number of activities aimed at behaviour change among the pupils with a view to reducing the impact of climate change as observed in the response from T6:

T6: We promote activities such as recycling, use of clean energy such as wind and solar as well as good farming practices to provide opportunities for true participation because these are directly related to the pupil's everyday lives. Although the integration of the concept of climate change into the existing school curriculum has been difficult because of its uncertainty, the ministry responsible for education still remains the best tool for promoting behaviour change.

UNESCO (2012) recommends the integration of Climate Change Education into different forms of arts, such as, photography, music, dance, painting, poetry and video production. According to Worrall (2015), Germany has taken steps to integrate the concept of climate change across subject areas and into every class. UNESCO (2015) adds that teachers should put in context the educational goals sought when delivering climate content and be able to mention it in any subject being taught while keeping in mind pupil's viewpoint. This agrees with the response given by T7, that:

T7: We facilitate critical thinking, open-mindedness and problem solving across all subjects in order to develop and sustain pupil's capacity to comprehend, analyse and act on the knowledge they received.

Despite the climate change mitigation activities taking place in schools, Kotecha (2010) argues that the education curriculum provides very crude incentives for pupils to make meaningful contribution to their communities. The MESVTEE (2015), suggests that good education should promote pupil's adaptation to their society and equip them to alter their environment for the improvement of their lives. Furthermore, MESVTEE (2013) contends that Climate Change Education requires the incorporation of relevant content knowledge by creating a safe environment anchored on sustainable infrastructure as the best resource for teaching and learning. For example, the Sandwatch programme recognises the beach environment as an outdoor classroom for pupil-led participatory activities (UNESCO, 2012). Pupil-led participatory activities foster critical thinking, open mindedness, problem solving, (MESVTEE, 2015), thereby equipping them with the requisite skills, knowledge and attitudes to deal with future uncertainties and challenges, including climate change. In addition, they enhance teacher's own knowledge and capacity thereby strengthening those of the pupil's. However, UNESCO (2010) proposed that it is important to incorporate other stakeholders such as NGOs, the church and other faith-based organisations into the ministry responsible for education in order to attain the educational goals set.

3.3. Objective Two: How are the Relevant Stakeholders Collaborated in Mitigating Climate Change in Mufulira?

The findings showed that the ministry responsible for education created synergies with other ministries, departments and organisations. Schools involved various stakeholders to address pupils on the causes and effects of climate change and shared mitigation and adaptation measures. The following were some of the responses from selected parents:

P1: *We participate in sensitisation programmes whenever visitors from NGOs and other organisations come to our area. We also share knowledge and information about climate change with our children when they come back home from school.*

The knowledge parents shared with their children resulted in a better understanding of the subject matter. One parent further responded that:

P2: *As an environmental specialist, I give pupils information about the environment, especially on the causes, effects and ways of mitigating climate change.*

However, pupils were often looked down upon because of the misconception that they lack information. It is important to note that when knowledgeable and confident, pupils are more likely to participate actively in mitigation. An environmental specialist explained that the problem of climate change requires constant curriculum review because of its dynamic nature so that pupils keep abreast with the latest information. This aspect can be amplified by intertwining it with sensitisation programmes in order to bridge the gap between school and community as stated by P3, thus:

P3: *We ensure that pupil participate in sensitisation programmes and advocate for the integration of climate change in all the subjects in school.*

However, available literature reveals that the Asian and European countries have successfully integrated the topic into mainstream education system at primary, secondary as well as university levels in order to ensure learning through their academic progression (Chang & Pascua, 2017; Worrall, 2015). In Zambia and North America, most educational institutions use the infusion strategy in which teachers incorporate the subject into their classes and are able to mention it in any subject being taught while keeping in mind pupil's viewpoint (UNESCO, 2015). Through the infusion strategy, teachers enrich their activities by adding content on climate change and sustainability to their daily planning.

P5: *We advocate for the integration of climate change content into materials such as books, encyclopedias, brochures and magazines for pupils to read in order to enhance knowledge on mitigation. In addition, educational programmes about climate change and measures to reduce its impact should be presented through the media such as television, radio and newspaper to raise awareness.*

Parent X (pseudo name), an employee in the Forestry Department under the Ministry of Lands and Natural Resources responded that:

P6: *We have taken a bold stance to sensitise pupils on the importance of planting trees by identifying the causes of deforestation in their areas, its effect and ways to prevent it.*

However, the Forestry Department was facing a number of challenges in carrying out its mandate of sensitising pupils in schools and encouraging community members to plant trees:

P7: *As a department we are reaching out to schools and communities although the major challenge has been lack of funds to send officers into the field regularly but always try our best to reach out to learners in school..*

Stapp (1969) recommended that teachers should undergo in-service training for them to contribute effectively to Climate Change Education because the ministry responsible for education has the ability to train a multiple of learners. This was echoed by P8:

P8: *We advocate for teachers to undergo in-service training so that they collaborate effectively with climate researchers.*

Literature suggest that pupils needed to acquire knowledge from various stakeholders and experts in other fields thus:

P9: *I help pupils with projects on EI such as pollution and global warming.*

The MSVTEE (2015) recommends active and participatory learning and calls for the entire institution, thus; pupils, educators, administrators and communities to take action. The Director for Green and Justice, (D. Mulila, personal communication, March 3, 2017) added that:

As an NGO we roll out climate change mitigation programmes in schools through drama, sketches, songs and posters. We are also targeting communities where pupils come from. Schools, colleges and universities have also taken up various initiatives to sensitise communities. For instance, we are working with schools in putting up posters as a way of reminding pupils to ensure a safe and sustainable environment.

From the responses given by the officers from NGOs, it was observed that pupils participated actively in climate change mitigation activities. For example, the Green and Justice conducted drama titled 'Our Planet, Our Future,' at Butondo, Chankwa and Kantanshi Secondary School. The organisation also presented sketches and sang songs in line with the circumstances prevailing in areas where pupils lived as explained by N2.

N2: *We roll out programmes to communities targeting women and children. From the campaigns, we have observed that individuals are now participating voluntarily by taking specific actions such as recycling garbage. We have also witnessed remarkable improvements in behaviour change in relation to the way our surrounding communities dispose garbage.*

On the other hand, teachers mentioned the climate change activities they participated in from the education and profession point of view as T8 added that:

T8: *We educate pupils on the effects of climate change and provide information on ways to minimise it such as practicing afforestation, recycling garbage and using natural pesticides extracted from locally grown products like chilly. We also include passages on climate change in teaching comprehension, summary and use conditional sentences that emphasise on climate change mitigation and adaptation in grammar lessons.*

Teachers also promoted various forms of art as a means of teaching pupils about climate change in secondary schools, thus:

T9: *We promote drama, sketches, songs, make and put posters round the school on climate change mitigation to raise awareness among our pupils.*

Arts provide a platform for disseminating information to bigger group of pupils than can be accommodated under the classroom situation. Performance in drama, sketches and songs enables pupils to express themselves freely even in community sensitisation programmes. Citing the 1996 policy document, *Educating Our Future*, Teacher Y (pseudo name), noted that the document had elaborated on the need for holistic development of pupils. However, the value dimension had not been expanded enough to highlight moral responsibilities to the environment. She explained that:

T10: *We involve our pupils and teachers in community programmes aimed at reducing the adverse effects of climate change. They attend various awareness programmes on waste disposal and recycling. We are also lobbying the government and the corporate world to provide schools with brochures and books as well as financial assistance for teachers to undergo in-service training in the field of climate change as a way of increasing human resource.*

Zhao, Yan, Wang, Tang, Wu, Ding, and Song, (2018) stated that one of the main challenges in addressing climate change lies in fact that mitigation and adaptation measures are handled separately - complementarity due to differences in priorities for the measures and segregated planning and implementation policies at international and national levels. However, there is a growing trend that synergistic approaches to adaptation and mitigation could bring substantial benefits to combating climate change, (Daguma, Minang, & van Noordwijk, 2014). "Mitigation is devoted to the reduction of rate of increase, and scale of changes in greenhouse gas (GHG). Adaptation aims to improve the capacity of defense and resilience, which reduces the passive influence of climate change," (Ge, Qu, Zeng, & Fang, 2009). Although they have different objectives, the integration of mitigation and adaptation could indeed make significant contribution to combating climate change. Therefore, the ministry responsible for education collaborates with various stakeholders to educate pupils on both mitigation and adaptation, thus:

T11: *We collaborate with NGOs, churches and climate scientists. NGOs and churches help in the fight against notable resistance from pupils to change their habits and negative attitude to reducing the effects of climate change. Climate scientists provide technical knowledge and information to our pupils.*

T12: *We only take part in sensitization programmes. The ministry responsible for education cannot single-handedly carry out activities on climate change mitigation in schools other than the sensitisation effect.*

Sensitisation programmes have helped improve pupil's understanding of climate change resulting in behaviour change. The sensitisation effect has led to the widespread of information about climate change because it addresses a large population at a time. In addition, pupils expressed themselves and shared ideas freely. However, sensitisation is not the only way through which the ministry responsible for education participated in mitigating climate change. Some of the ways already discussed in this study include advocating for in-service training programmes for teachers on climate change, providing guidance to pupils working on projects under Environmental Issues, incorporating content into every class and creating synergies with other ministries, departments and organisations. This involves bringing together individuals, departments and organisations to share their knowledge and expertise to the problem. For example, the school can invite an Environmental Technician from the Ministry of Health to address pupils on the effects of climate change and share with them mitigation as well as adaptation measures.

3.4. Objective Three: What are the Main Challenges and Opportunities Faced by the Ministry Responsible for Education in Implementing Climate Change Mitigation Activities in Mufulira?

The findings revealed that the ministry responsible for education remains key to providing solutions to the changing climate despite the many challenges that it faces. Firstly, respondents observed that the knowledge given to pupils in schools was more of theory than practical. As a result pupils did not fully put into practice what they learnt. Furthermore, some teachers did not deliver the climate change content in a confident manner and had a negative attitude towards promoting climate change mitigation activities in school. Secondly, the ministry responsible for education lacked the financial muscle to take climate change activities head-on and did not collaborate fully with organisations that raised awareness among the pupils leaving a lot of gaps in sharing ideas with Non-governmental and faith-based organisations. Thirdly, there were few resource materials such as books, encyclopaedias and magazines which contained information on climate change for pupils to read. This negatively affected pupil's efforts to develop the necessary scientific skills needed for them to contribute to mitigating climate change. The respondents added that the delivery of climate change content was incapacitated due to lack of policy on integration. The provision of adequate finances to the ministry responsible for education would help in putting in place tools that facilitate information sharing. The tools should include resource guides, training workshops, competitions in projects and quizzes among schools and a national media campaign. One respondent stated that:

P8: *It is difficult to provide climate change education in schools due to lack of financial resources.*

Consequently, some parents did not fully understand the concept of integration of climate change into the curriculum at primary, secondary and tertiary levels as explained by P9.

P9: *Climate change is only taught in Geography and Civic Education and this has limited the extent to which information is disseminated particularly to our boys and girls in school.*

Participants from the Butondo, Kankoyo and Kantanshi Townships used similar phrases on integration:

P10: *Climate change issues should be taught across curricula. We can rely on pupils who are already in school to share knowledge and disseminate information to our communities.*

P11: *Climate change should be taught at all levels so that pupils as future leaders acquire appropriate knowledge and skills to safeguard our environment.*

P12: *Climate change is a pressing issue, therefore, it should be integrated into every class and in all the subjects.*

The ministry responsible for education integrate Climate Change Education into teacher training programmes and organise in-service training for teachers so that they can be taught about climate change issues and how they can involve the pupils in the design and implementation of programmes. I feel at the moment we cannot blame the teachers because most of them did not have climate change as a component in their study programme.

On the other hand, the Ward Development Committee Secretary for Butondo, Mr. Mushili Laurent stated that climate change was mainly caused by human activities. He explained that:

P4: *Climate change is mainly caused by human activities. Our hunger for survival through the advancement of technology has brought about a number of environmental challenges of which climate change is one of them. There is need to work together to mitigate it.*

Following the unplanned dumpsites in Kankoyo Township, one respondent said:

P5: *One of the major challenges is lack of commitment to maintaining good practices such as recycling as opposed to burning garbage and creating unplanned dumpsites that pollute our environment.*

The ministry responsible for education needed to collaborate with other stakeholders such as faith-based organisations and other organisations in the planning, design and implementation of programmes pertaining to climate change. However, Mulila explained that:

N1: *The ministry responsible for education usually leaves us behind in the planning, design and implementation of its policies and programmes despite the sensitisation programmes that we roll out and the teaching and learning materials we distribute to schools.*

On the other hand, Mr. Mulila added NGOs were doing everything possible to reach out to pupils in schools as well as the wider community through sensitisation despite the challenges of financial resources:

N2: *Donors have their own areas of interest where they would want to spend their resources and this had a negative impact on addressing Environmental Issues such as climate change in line with the prevailing situation in the country.*

Pupils from all schools used similar phrases to describe the situation on the availability of teaching and learning materials:

P9: *The lack of books to use in schools makes it difficult to read about climate change as most of us have limited access to the internet.*

P10: *Teaching and learning materials in the form of books, magazines and brochures are scarce in schools.*

P11: *Text books contain little information on climate change mitigation and adaptation.*

P12: *There are limited sources of information on the measures to offset or reduce the effects of climate change.*

A respondent from an NGO echoed the same concern as he responded that:

N3: *The concept of climate change has not been well understood by pupils because of lack of literature in the form of books, magazines and so on.*

According to research, (UNESCO, 2010; 2015; MESVTEE, 2013, MoGE, 2016), the provision of information on climate change to pupils in schools is important not only in raising awareness but also critical and systematic thinking in relation to the subject matter and giving them the desire to take action, thus;

T3: *Lack of trained personnel in climate change mitigation and adaptation has been the biggest problem in raising awareness in our communities. However, if knowledge of climate change is passed to all the pupils through the curriculum at all levels, information can be disseminated throughout our communities easily.*

T3: *Climate change is a global issue and pupils are striving hard to search for information about it especially those who are working on projects in line with Environmental Issues under JETS.*

T4 responded that pupils participated in projects despite difficulties in accessing information.

T4: *They are participating favourably despite lacking individuals who are conversant with the climate change content, even amongst ourselves teachers.*

T4: *I am the patron for JETS in my school and I refer to the internet, consult from environmental groups and other researchers for me to respond and guide the pupils in their projects. I arrange for pupils to meet experts in environmental issues.*

Parents had put a lot of trust in the ministry responsible for education as a tool to foster activities aimed at mitigating climate change. P5 responded that:

P5: *The ministry responsible for education has a big role to play regarding climate change. If pupils are taught about climate change, it is easy to sensitise communities because information is spread fast and easily especially to their communities.*

However, JETS patrons in schools expressed worry on lack of capacity by some schools to procure materials for pupils in their projects and this had a negative effect on innovation. Mr. Chikamba, explained that:

T7: *Pupils in our school take part in Environmental Issues. However, schools have little capacity to finance projects aimed at the invention of new technologies. For example, pupils have brilliant ideas to transform the energy sector but their projects are side-lined due to financial constraints in our schools. Pupils need materials but even with the little amount of money required, schools have no capacity.*

The pupils expressed concern on the availability of materials on climate change in schools through phrases like “lack of books,” “scarce,” “little information,” “limited sources.” They seemed to derive their participation in climate change activities from the observable impacts that it had on their environment. Generally, the theme of change of attitude and mind set was a major underlying force behind their participation. Other research studies (Jenkins, 1997; Brock, 1996) indicated that when the citizens are scientifically literate, they contribute to decision making about issues that had a scientific dimension whether such issues were personal or more broadly political.

They also used words like ‘fear,’ ‘tough,’ ‘challenge,’ to describe the process of participation in climate change mitigation activities as difficult but rewarding. Various pupils described their participation thus:

L1: *It feels nice and terrifying to participate at the same time.*

L2: *It is kind of tough because we have to depend on limited sources to work on a project or participate in quizzes. So it is real hard and needs hard work.*

L3: *It is a challenge. We consult from officers who operate in various disciplines. This gives us the confidence to work on our projects.*

3.5 Summary

The findings revealed that countries around the world have embarked on an agenda to support various educational activities that promote awareness and the development of knowledge among pupils so that

they participate fully in the design and implementation of measures to contain the impact of climate change. Consequently, pupils in secondary schools participated in sensitisation programmes. In Mufulira, educational and awareness-raising activities such as JETS quizzes and projects were conducted. Other activities in which pupils participated include the different forms of arts such as photography, music, dance, painting, poetry, video production to express their knowledge about climate change.

Pupils derived activities on the causes, effects and measures to mitigate climate change from topics that contained information about the management of EI in the school curriculum. They also came up with JETS projects from the prevailing environmental problems in their townships which they used to sensitise communities and suggested measures to ensure Environmental Sustainability. However, such projects were not presented by pupils who were JETS members only but also those who participate in other disciplines like Social Sciences. During the Social Sciences Teachers Association of Zambia (SOSTAZ) fair, pupils presented projects on the MDG 7 Ensuring Environmental Sustainability under the topic called Global Issues in Civic Education. In addition, document analysis of the revised curriculum corresponded with responses from the pupils that topics such as chemical reactions, metals and non-metals, organic chemistry and acids, bases and salts contained information for pupils to develop their projects on climate change.

In geography, pupils developed and presented projects centred on the extracting industry and explained the effects of particulate matter such sulphur dioxide on the environment. Pupils also participated in different forms of arts such as taking photos of the environment surrounding the mining area and that which was at a distance. They compared the pictures they took and used them as a point of research on the impact of human activities on the environment. They expressed themselves through singing, drama, dancing, paintings, poetry and video production to sensitise communities on the impact of climate change and measures to mitigate it. The arts improved pupil's knowledge and information sharing about climate change expressed in simple terms that were easily understood by everyone at all levels of education provision.

Teachers promoted school-based environmental projects and allowed full pupil-participation. They guided pupils in their projects so that the latter could continue working on them not only while they were in school but also when they were out of school. Through the subjects they taught, teachers provided a link between the relevance of Climate Change Education content and the knowledge imparted in the pupils as well as its application to the immediate environment. On the other hand, parents participated in sensitisation campaigns organised by NGOs, CSOs, churches and other like-minded organisations. In Mufulira, organisations rolled out sensitisation programmes on measures to mitigate climate change such as; practicing the 3R (Reduce, Reuse or Recycle), using solar energy and applying natural pesticides. Parents also played a big role in advocating for policy on integration of climate change into the curriculum basing on the prevailing environmental challenges especially that our country depended highly on the extraction industry which constantly added toxic substances to the environment. Being professionals in their areas of expertise, parents also provided guidance to pupils in addressing Environmental Issues.

It was unearthed from the findings that the major challenges faced by the ministry responsible for education in fostering Climate Change Education include lack of financial resources, donor-dependency, lack of proper co-ordination among implementers, lack of policy on integration, inconsistencies in peoples' attitudes, lack of literature and lack of human resource. Therefore, the findings revealed that education is meant not only to adapt pupils to their society but to equip them to take action of their environment.

4. DISCUSSION

The study set out to explore an Educational Perspective on an Integrated Approach in Mitigating Climate Change in Mufulira. The findings revealed that temperatures recorded at various locations on the surface of the Earth indicate that the climate is changing. Human activities, especially those that involve the release of toxic fumes from fossil fuels and methane gas from rotting garbage are a major contributing factor to climate change. Various treaties have been signed by countries world over to find ways of mitigation yet it has been realised that the ministry responsible for education remains an untapped resource in minimising the effects of climate change.

Consequently, pupils are engaged in mitigation activities such as the *"keep Zambia clean and green campaign"*, quizzes and JETS projects in Environmental Issues. Pupils also participated in

sensitisation campaigns, design of Climate Change Education activities, suggesting on areas of research and participating in clubs such as JETS. Zambia, like Asian countries has incorporated the concept of “Learning by doing” through quizzes, projects and class activities as an effective method of capacity building. Teachers at Butondo, Chankwa and Kantanshi Secondary Schools guided and encouraged participation in pupil-led projects derived from a number of topics on the management of Environmental Issues contained in the revised curriculum for pupils to present during JETS fair and other academic platforms.

The ministry responsible for education has created synergies with other ministries and various stakeholders such as NGOs, churches and other like-minded organisations. In Mufulira, for example, the ministry responsible for education collaborated with climate researchers and like-minded NGOs such as the Green and Justice (GJ) and faith-based organisations like the Young Women Christian Association (YWCA), Churches Health Association of Zambia (CHAZ). In addition, specialists in different fields such as agriculture, mining, forestry and the corporate world sensitised pupils in schools on the causes, effects as well as measures to mitigate and adapt to climate change.

However, the ministry responsible for education faced a number of challenges in implementing climate change mitigation activities in secondary. These include lack of financial resources, donor dependency, lack of co-ordination among implementers, lack of policy on integration, inconsistencies in people’s attitudes, lack of literature and lack of human resource. In order to overcome these challenges, the study revealed that there was need to allocate adequate funds to the ministry responsible for education, promote self-reliance and enhance collaboration among implementers. It was further suggested that a well-elaborate policy document on the need for holistic development of pupils with an expanded value dimension to highlight moral responsibilities to the environment should be put in place.

The study further advocated for communities to develop a positive attitude towards the environment, providing literature and human resource. The ministry responsible for education can easily disseminate information about climate change because schools have the capacity to train masses and bring about behaviour change. The Environmental Determinism Theory postulates that environmental problems do constrain education whereas the Environmental Possibilism Theory argues that educational responses to the environment also make a difference. In other words, the Environmental Determinism Theory fosters adaptation to climate change while the Environmental Possibilism Theory encourages mitigation. Although the dualism in Environmental Determinism and Possibilism is considered as an irreconcilable paradox (Fekadu, 2014), this study considers both theories equally important in the provision of Climate Change Education in secondary schools.

5. CONCLUSION

The findings showed that the ministry responsible for education has taken a multi-sectoral approach in mitigating climate change but lacks policy for integration into the school curriculum resulting in little climate change content being taught in schools. Secondly little emphasis was put on methodological shift from the traditional rote learning to pupil-centred, activity-based approaches. However, literature has stated clearly the role of education as a tool in mitigation. Last but not the least, available literature promotes sustainable technological inventions among pupils, especially through such activities as JETS projects on Environmental Issues to build their knowledge on recycling; increased use of solar panels and other renewable sources of energy; consuming food grown locally and better education in Environmental Issues and more efficient lifestyles. In order to minimise these challenges, schools needed to come up with some strategies like encouraging pupils to come up with projects in Environmental Issues according to the availability of natural resources. Teachers were also encouraged to search for information on Climate Change Education for them to guide the pupils in their projects. Although the challenges seem to outweigh possible solutions, Zambia in general and Mufulira in particular has the potential for effective implementation of mitigation strategies through education.

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