College of Science, Engineering and Technology

CSET Learner Research Summit

Learner Research Summit Publications

Volume 3 Issue 1 2017

UNISA | college of science, engineering and technology

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Dean's Message

Acting Executive Dean, Prof I Alderton

Promoting interest in science through research is one of the ways that the College of Science, Engineering and Technology (CSET) has been engaging with school learners. For the college, this initiative is important to not only encourage a sense of interest in science, but to also expose students to proper ways of "doing" science. What is equally important is to make learners aware that research in science, engineering and technology is something that happens every day, throughout South Africa, and not just in Europe or in the United States of America.

The learners work under the mentorship of a member of the academic staff on a predetermined topic and present their results at an annual summit. Thus far, the college has hosted four summits. The summit is hosted in collaboration with the College of Law as an attempt to infuse multi-disciplinarity into this initiative. This edition contains the result of presentations from the 2016 summit. The learners focused on several topics, but mainly on light as the core theme. The college sees the publications as steps towards a periodical that will promote a science discourse amongst learners; a publication that will showcase the fact that it can never be too early to engage in research.

LRS Chairperson's Message

LRS chairperson, Prof A Coleman

Scientific research is one of the fundamental activities of humanity, and having an inquisitive mind is what has enabled humankind to evolve to its present level of ability.

To ask questions is to be human. Thus scientific research is not the prerogative of 'developed countries' nor of those states rich enough to afford it. It is also for developing countries. It is based upon this ideology that high school learners are to be trained to become researcher right at their tender age in Africa.

The college of Science Engineering and Technology (CSET) at the University of South Africa (Unisa), engages with many communities as part of its community engagement initiatives to promote Science, Engineering, and Technology (SET) as a possible career choice for learners. The college does this in a variety of ways ranging from outreach initiatives to activities promoting engaged scholarship. The Learner Research Summit (LRS) is one such endeavour. The summit is not only aimed at promoting SET as a possible career choice to learners but focuses largely on nurturing research skills of learners. Every year the learners are given research topics to work on in collaboration with CSET academics who guide them through the research process. This is done in partnership with the educators from the schools. This initiative targets learners in grades 8 up to 11. Learners in collaboration with their educators showcase their innovative research projects/findings during a scheduled Learner Research Summit (LRS) which is held every year. During the LRS meetings, the learners display their findings either through an oral presentation or through a poster presentation. The LRS project, since its inception from 2013 has equipped many high school learners become active researcher in many communities and improve their research skills in higher institutions

CSET Community Engagement Chairperson's Message

CSET Community Engagement Chairperson, Prof S Dube

The Learner Research Summit is a Community Engagement initiative from the College of Science Engineering and Technology (CSET) that in a way affirms the vision of UNISA, which is "The African University Shaping Futures in the Service of Humanity". In shaping futures, the initiative is designed with the purpose of enabling young minds to think creatively and critically and also to have a desire to solve problems within their communities. As a college we have realised and acknowledge that the inquisitive mind that is inherent in all children and young people should be nurtured and channelled towards solving African problems within our communities. LRS is therefore a platform where young learners from high school, are drawn into the excitement of the world of research and discovery. In 2016 LRS celebrated its fourth year with yet another successful event where we saw a great improvement in the type of research work delivered as well as in the presentations that the learners articulated very well and confidently to peers and academics from UNISA. Learners researched, under the mentorship of CSET academics and educators, within very critical and challenging topics of "Global Understanding". Despite the complexity of the themes, the learners gave very interesting views on the topics and delivered some excellent presentations. Such a platform is encouraged as it creates an exciting space of learning where the students are exposed to knowledge in an exciting way and they own the learning process as they view themselves as problem solvers. We believe that such an initiative will assist learners with their research work in their curriculum since they would have covered research methodology. Our goal is to form partnerships with even more schools in the Gauteng region. This LRS publication serves as a confirmation of UNISA's commitment to engage with communities in studying natural sciences, and discovering and explaining fascinating phenomena.

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Effects of climate change on humans and their surroundings in South Africa

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Abstract

The International Year of Global Understanding (IYGU 2016) is a global initiative adopted by the International Council for Science (ICSU), the International Social Science Council (ISSC) and International Council for Philosophy and Human Sciences (CIPSH) [4]. The aim of IYGU is to promote better understanding of how the local impacts the global in order to foster smart policies to tackle critical global challenges such as climate change, food security and migration [1]. Due to the negative global impact of climate change, we embarked on investigating the various challenges of climate change on the lives of South Africans. In this research study we carry out this investigation using questionnaires. From the literature review and findings of the questionnaire, we will evaluate the impact of climate change on humans and surroundings in South Africa, and also suggest possible solutions to reduce the negative effects.

Keywords: Globalisation, climate change, economy, health, social impact, natural disaster.

1 Introduction

As South Africa is being faced with the negative effects of climate change, we wish to investigate the various challenges of climate change on the lives of South Africans.

In this research study we carried out this investigation using questionnaires. From the data analysis we evaluated the impact of climate change on humans and their surroundings, and suggested possible solutions to reduce the negative effects of climate change.

As can be seen from Figures 1 and 2, climate change could affect our society through impacts on a number of different social, cultural, and natural resources. For example, climate change could affect human health, infrastructure, and transportation systems, as well as energy, food, and water supplies.

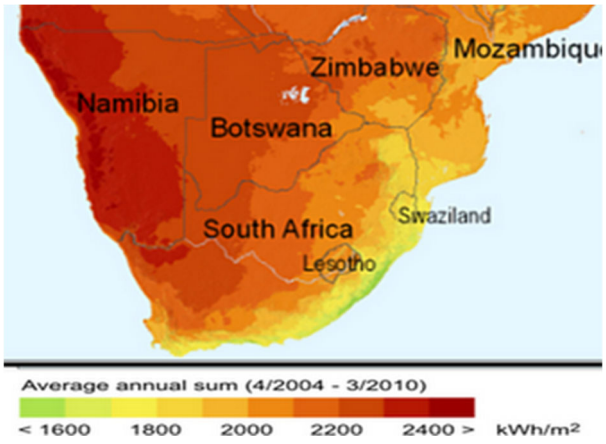

Figure 1: Sunshine intensity in South Africa

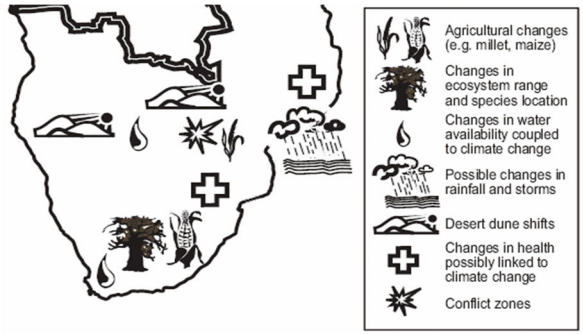

Figure 2: Socioeconomic factors [6].

2 Literature review

Climate change is defined as "a change in the statistical distribution of weather patterns when that change lasts for an extended period of time. Climate change may refer to a change in average weather conditions, or in the time variation of weather around a longer-term average conditions" [2]. In 1966, the World Meteorological Organisation (WMO) proposed the term climate change to encompass all forms of climatic variability on a time-scale longer than 10 years, whether the cause was natural or anthropogenic, when it was realised that human activities had a potential to drastically alter the climate [5].

In February 2007, the United Nations released a scientific report that concludes that global warming is happening and will continue to happen for centuries. The report also stated with 90% certainty that the

activity of humans has been the primary cause of increasing temperatures over the past few decades [3].

The Star newspaper (07/09/2016) reported that South Africa is the world's 30th driest country. The Southern Hemisphere, due to the effects of the El Niño climate cycle in the Pacific Ocean, has gone through two seasons of drought - the worst in decades. In addition, the water levels in the integrated Vaal River system have dropped below the threshold level of 60%.

The Mail & Guardian (09/09/2016) reported that the impact of water scarcity on crop farming will soon be one of SA's biggest problems and that we may need to look beyond our borders for a solution. Eye Witness News reporting on food security said that at least 27 million people, about 9% of the region's population, are food insecure as a result of the poor 2015/6 farming season.

3 Health

The health of human beings is affected by climate change, either directly through changing weather patterns, or indirectly through changes in water, air, food, ecosystems, livelihoods and infrastructure. Generally, these direct and indirect exposures can cause death, disability and suffering. Ill-health increases vulnerability and reduces the capacity of individuals and groups to adapt to climate change.

The rise in the average temperature of the earth due to global warming has been mainly attributed to the increasing phenomenon of the greenhouse effect. It is believed that global warming can have several harmful effects on human health, both directly and indirectly. Since malaria is greatly influenced by climatic conditions because of its direct relationship with the mosquito population, it is widely assumed that its incidence is likely to increase in a future warmer world.

4 Aims and Rationale

Aim: To investigate the effects that climate change has on the South African population.
Rationale: Currently climate change is having a significant negative impact on the socioeconomic and geographical conditions in South Africa.

5 Objectives

- To inform people about the impact of climate change.
- To determine which socioeconomic factors are affected by climate change.
- To determine solutions on how climate change could be reduced.

The following was the main research question:
How does climate change affect humans and their surroundings in South Africa?

6 Hypothesis

Global climate change affects humans locally in South Africa through impacts on a number of different social, economic, cultural and natural resources.

7 Methodology

We used a questionnaire for the quantitative research methodology.

In the questionnaire, 30 interviewees were asked to reflect on the following socioeconomic factors related to climate change:

- Social
- Health
- Transport
- Food
- Economic
- Living conditions
- Population
- Others

The following 9 questions were included in the questionnaire:

1) Have you been negatively affected by climate change?
2) How do natural disasters, such as drought, floods, tornados, hail etc. affect peoples' lives in South Africa?
3) What negative effects does climate change have on the health of South Africans?
4) What negative effects does climate change have on the production of food in South Africa?
5) Does climate change have a positive or a negative impact on our environment and our society?
6) Suggest solutions on how to reduce climate change.
7) How does the climate change affect the economy of the country?
8) How has climate change affected your life?
9) Why do you think it is important to inform people about climate change?

Table 1: Data collection

DATES	COLLECTING DATA
26 July 2016	Brainstorming with our mentors concerning our research topic; went to the library to look for books and used the internet
09 August 2016	We met as a group to interpret our data
10 August 2016	We met as a group to conduct the questionnaires, We analysed our research
23 August 2016	We met with our mentors
08 September 2016	We met as a group to do PowerPoint
09 September 2016	We met our mentors to do mock presentations

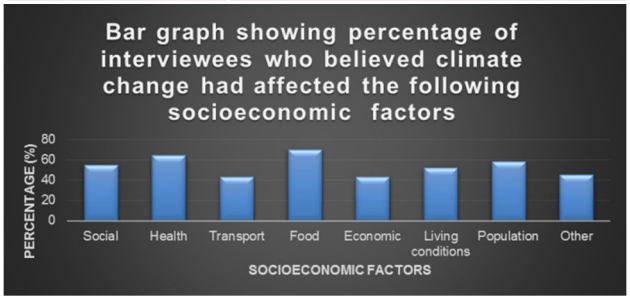

Figure 3: Results

8 Discussion

From the bar graph we deduce that for this population sample:

- Food is the greatest factor affected by climate change;
- Transport and economic factors are least affected by climate change;
- Health is the second highest socioeconomic factor affected by climate change;
- 45% of the interviewees were not aware of the effects of climate change on their lives (other).

9 Mathematical Relationships

- Direct Proportion
  - ❖ Example

Increasing human activity ⇒ increase in pollution

- Indirect Proportion
  - ❖ Example

Increasing human activity ⇒ decrease in ozone layer

10 Advantages and Disadvantages

Advantages

- Lower energy costs in warmer temperatures
- Possible richer biodiversity, especially in the frozen regions
- Fewer deaths or injuries due to cold weather

Disadvantages

- Weaker economy
- Changes to agricultural production that leads to food shortages.
- Starvation, malnutrition and increased deaths due to food and crop shortages.
- Increased disease in humans and animals.
- Flooding and droughts
- Increased air pollution
- Additional use of energy resources for cooling needs
- Loss of plant and animal habitats

11 Recommendations and Solutions

- More scientific farming is needed
- More education to create greater awareness of global understanding
- Reduce pollution
- Stop burning and chopping down trees
- Stop using aerosol cans
- Plant more trees
- Scientists should try to change the chemicals used that harm the environment.
- Travel wisely
- Consume and waste less
- Consider food choices

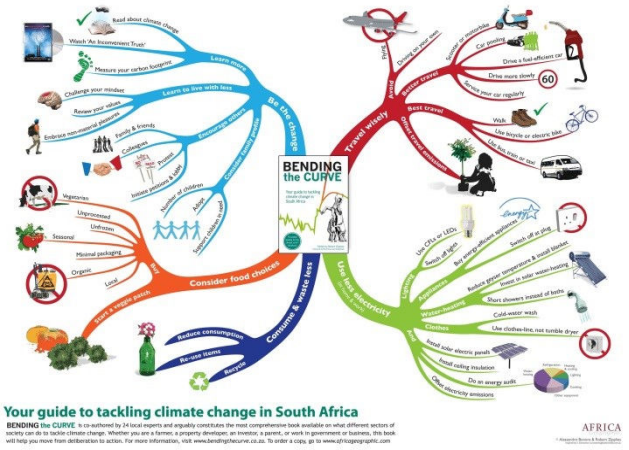

Figure 4: Solutions to climate change [1]

12 Conclusion

Most of the negative climatic events are caused by human activities. Since some people could not answer the questionnaire, it proved that humans are not even aware that they are causing climate change. We also discovered that each year deaths, health risks and loss of money occur because of climate change. Human actions cause challenges, but individual actions can have a corrective effect. Societies need global understanding of their impact on climate change in order to modify their behaviour and actions, and come up with sustainable solutions.

Based on the data analysis, we can confirm the hypothesis that global climate change affects humans locally in South Africa through impacts on a number of different social, economic, cultural and natural resources.

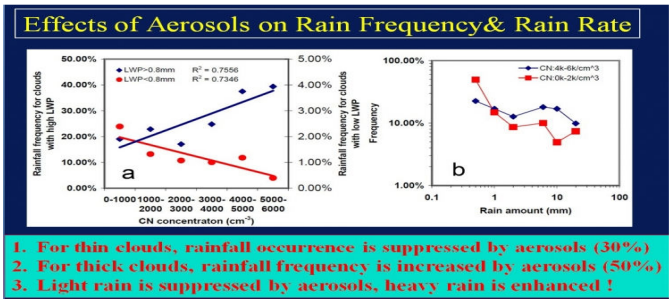

Figure 5: Effects of aerosols on rain frequency[6]

13 Acknowledgements

The authors would like to thank the following for their support during the research:

- Dr Belinda Huntley
- Dr Oghenetega Ighedo

Department of Mathematical Sciences,
Science Campus,
Unisa

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[3] UNESCO.IYGU 2016_Fact_Sheet.pdf

[4] www.global-understanding.info/

[5] www.wmo.int

[6] https://biomimicry.org/planetary-thinking/

Environmental pollution in Atteridgeville - South Africa

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Abstract - *Environmental pollution is a wide-reaching problem and it is likely to influence the health of human population greatly. This paper gives information about the effects of environmental pollution in the perspective of air pollution, water pollution, soil pollution, noise pollution, radioactive pollution, thermal pollution, personal pollution and light pollution. Studies find that these kinds of pollutions are not only seriously affecting humans but also animals and trees/plants.*

Keywords: Pollution, Environment, Living Organisms

1 Introduction

Environmental pollution is the main cause of disease and death in the developing world. In 2012, exposures to pollution soil, water and air resulted in an estimated 8.4 million deaths worldwide. By comparison, HIV/AIDS is responsible for 1.5 million deaths annually and malaria and tuberculosis less than 1 million each. More than one in seven deaths globally is the result of environmental pollution. (WHO, 2014)

South Africa has an urbanising population, many of whom live in the high-density townships that surround the major centres. In these areas both industries and households are responsible for air emissions that may be locally severe (Leman et al 2007).

Environmental pollution is the introduction of contaminate into natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Survey questions will be asked to the community of Atteridgeville to find out if they are aware about pollution in their area. Holy Trinity Secondary Catholic School will survey some environmental pollution questions to the community and students in their area. Do you know that you might be polluting but you are not aware that you are? Well that's why we conducted this research, to inform you about all types of environmental pollution and also suggest some solution on how to reduce pollution.

2 Aims of the research

The aim of this research project is to provide an over view of environmental health challenges facing Atteridgeville and try to come up with the way to reduce environmental pollution.

2.1 Types of environmental pollution, description and example

2.1.1 Air Pollution

The introduction of particulates, biosphere molecules, or other harmful materials into Earth's atmosphere causing diseases, allergies, and death to humans, damage to other living organisms such as animals and food crops, or the natural or built environment, e.g. Vehicle and manufacturing exhaust, forest fires.

2.1.2 Water Pollution

The contamination of water bodies, E.g. (lakes, rivers, oceans, aquifers and ground water). This form of environmental deration occurs when pollution are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds, e.g. Some waste water fertilizers and sewage contain high levels of nutrients. Littering organic materials decay in water.

2.1.3 Soil Pollution

Soil contamination as part of land degradation is caused by the presence of xenobiotic (human-made) chemicals or other alteration in the natural soil environment. It is typically caused by industrial activity, agricultural chemicals or improper disposal of waste, e.g. Hazardous waste, sewage spills. Non-sustainable forming strip mining, deforestation littering.

2.1.4 Noise Pollution

Noise pollution is a form and level of environmental sound that is generally considered likely to annoy or even harm other people, e.g. Parties, manufacturing plants and traffic.

2.1.5 Radioactive pollution

Radioactive pollution is the deposition of or the presence of radioactive substance on surfaces or within solid, liquids or gasses (including the human body), where their presence is unintended or undesirable, e.g. nuclear power accidents or leakage, nuclear waste disposals.

2.1.6 Thermal pollution

Thermal is the deration of water quality by any process that changes ambient water temperature, e.g. Power plant, urban sprawl.

2.1.7 Light pollution

Light pollution is excessive, misdirected, or obstructive artificial (usually outdoors), e.g. Large cities, billboards, events, night outdoors.

Figure 2: Air Pollution in atteridgeville community

2.2 Diseases caused by environmental pollution.

2.2.1 Air pollution

Asthma is a chronic, occasionally debilitating inflammatory disease of airways that is caused by pollution from cars, factories or power plants.

2.2.2 Water pollution

Diarrhea is one of the most common diseases caused by water pollution. It causes frequent passage of loose, water stools that can cause dehydration (Mimba, 2016).

2.2.3 Land Pollution

Factories should start recycling and separate non-biodegradable from biodegradable materials. Recycle your waste instead of dumping.

2.2.3.1.1 Noise Pollution

People should be encouraged to lower the level of noise they make in our community.

3 Methodology

A survey was done on environmental pollution as a task to find out how many Atteridgeville community members and Holy Trinity Secondary Catholic School learners know about environmental pollution and how it has an impact on their daily lives.

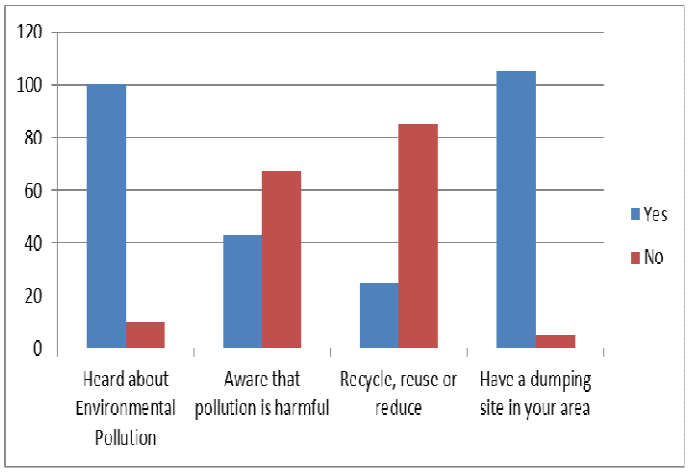
4 Survey questions and results

The following questions were asked to the community members of Atteridgeville and learners from Holy Trinity Secondary Catholic School:

4.1 Have they heard about environmental pollution?
4.2 Are they aware pollution can be harmful to their health?
4.3 Do they recycle, reuse or reduce?
4.4 Is there any dumping site in their area?

5 Research findings

5.1 Community survey results



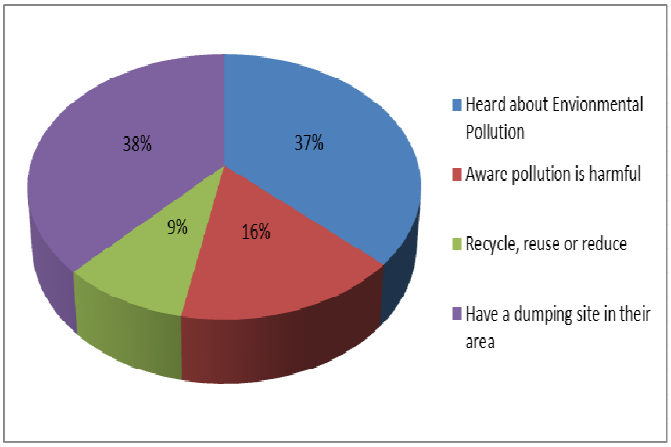


Figure 5: Community survey results

5.2 School survey results

Table 1: Holy trinity secondary catholic school survey results

Questions	Yes	No
Have they heard about environmental pollution?	100	10
Are they aware pollution can be harmful to their health?	43	67
Do they recycle, reduce and reuse?	25	85
Is there any dumping site in their area?	105	5

6 Conclusions

We live in an ecosystem where the action of one has the potential to affect many. This means that we share everything on Earth with every living organism on the planet, so what happens in one area affects other areas too, no matter how far away.

Our mistakes and careless actions have polluted the environment we live in, because of that, we should try to reverse the damage. As individuals, we would never willingly contaminate our own bodies by consuming toxicants, therefore why do we see it fit to do so to our environment?

The good news is that every positive action counts. The small efforts everyone makes towards a greener environment can start healing the effects. Those small efforts in three words are: REDUCE, REUSE & RECYCLE. We may still save what is left of our natural resources and make the world a better place to live in for the our future generation. So save the earth, if not for you, do it for generations to come.

7 Acknowledgements

Holy trinity secondary catholic school grade 10 learners would like to acknowledge the following people for the assistance during the research project. Thanks to UNISA, College of Science Engineering and Technology for inviting us to be part of the summit. Special thanks to the mentors Mr. S Ramuhaheli and Mr. T.E Mulaudzi from UNISA for giving us some background on our research. Our school Principal Mr. A. Castelyn and educator.

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Weather and Climate Change Constantly Change

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Abstract - *The international year of Global Understanding due to the situation in south Africa regarding weather and climate to constantly change. In this research study we focus on finding the causes, gases in the atmosphere and as well as finding few solutions that are already been proposed on the issue of weather and climate change. Our research also raises awareness to power stations as they contribute to the release of gases to the atmosphere.*

1 Introduction

We decided to do research study on exactly why weather and climate is constantly changing: motivated by the mere fact that climate change has been of the most prevailing issue we have had since the dawn on the creation of the earth.

2 Literature Review

1. Who discovered climate change? According to spencer R weart climate was discovered by Johannes Mayor.

2. What is climate change? Spencer R Weart said the Harvard University Press that climate change is the rise in average surface temperature.

3. Climate provides the following:

- Higher temperature
- Rising seas
- Increased rise of storm, droughts & floods.

3 Aims and Objectives

- To create awereness to power stations the contribution they make for whether and climate to constantly change.
- To find solution that have already been implement to reduce the amount of carbon dioxide being released to the atmosphere
- To find out what kind of gases are in the atmosphere

4 Methodology

1) Age Group

2) Do you notice critical constant change in weather and climate?

3) Do you think there could be solution that can possibly reduce the amount of carbon dioxide being released to the atmosphere.

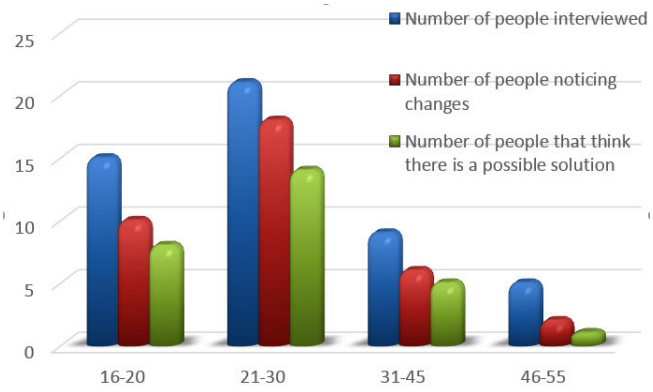
5 Advantages and Disadvantages

Advantage

- Safety

Disadvantage

- Climatic Conditions



DATES	COLLECTING DATA
02 August 2016	We had a brainstorming session on the study of our research and went to the library to look for books .
09 August 2016	We came together as a group to interpret our data .
16 August 2016	We had a session with our mentors and discussed our findings with them.
24 August 2016	We carefully analysed and concluded with our study .
05 September 2016	We typed our research on a power point.

6 Conclusion

The result we analysed showed that the majority of people realise constant change of weather and climate .But do know that it might affect the human life if it continues to prevail at the constant rate We notice that industries have much bigger Impact on the gases released to the atmosphere hence it contributes to the constant change of wheather and climate.

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The impact of global warming on the global village

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[2]Department of Physics, CSET, University of South Africa, Johannesburg, 1710, South Africa

Abstract - *If the global warming trend continues, the results could be depressing indeed: melting polar ice along with thermal expansion of the oceans could raise the sea level, flooding coastal cities, and many agricultural landscapes could dry out and become deserts. As we investigate the issue further, we learned that the news is not all bad. The nations of the world have already taken collective action to solve one global atmospheric problem: depletion of the ozone layer. Global warming, as we will discuss it in details in this paper, is a different and a bigger problem, but scientists have already come together to measure, understand the causes of, and set goals for reducing the rate at which it occurs.*

Keywords: ozone layer; global village; depletion; greenhouse effect; fossil fuel

1 Introduction

1.1 Global warming

Global warming and ozone layer depletion are two different problems. Global warming is caused by the greenhouse effect which is essential to life as we know it on planet earth [1]. Electromagnetic energy coming from the sun is absorbed by the Earth, which radiates some of this energy outward as infrared energy (heat). Some of this infrared energy escapes into space, but much of it is absorbed by greenhouse gases in the lower atmosphere (the troposphere) and is radiated back to the Earth as heat energy.

The greenhouse effect, then, is a warming of the Earth's surface that makes it hospitable to life. Without the greenhouse effect, the surface of the Earth would be a frigid -100°F. Alternatively, a runaway greenhouse effect, like that found on the planet Venus, would result in a surface temperature of 900°F or more. Greenhouse gases, including water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), are produced as part of the natural system (for example, CO_2 and H_2O are by-products of respiration and combustion). These gases act much like the glass roof of a greenhouse, letting sunlight through, but keeping heat locked in [2].

Since the Industrial Revolution, humans have developed technologies (for example, motor vehicles) that produce large quantities of greenhouse gases. Also, humans have invented new molecules that are greenhouse gases, for example, chlorofluorocarbons (CFCs) and some CFC-substitutes that are used as coolants and solvents. Increased amounts of all types of man-made greenhouse gases released into the atmosphere enhance the greenhouse effect. The gas that is most responsible for enhancing the greenhouse effect is CO_2, because human activities create so much of it and it has a long lifetime in the atmosphere (meaning that molecules are present in the air for a long time before being used by plants or being bound or broken down in other chemical events) [3].

1.2 Depletion of the ozone layer

An ozone molecule (O_3) is composed of three atoms of oxygen. Ozone in the upper atmosphere (the stratosphere) is referred to as the "ozone layer" and protects life on Earth by absorbing most of the ultraviolet (UV) radiation emitted by the sun. Exposure to too much UV radiation is linked to skin cancer, cataracts, and depression of the immune system, and may reduce the productivity of certain crops. Accordingly, stratospheric ozone is known as "good ozone." In contrast, human industry creates ozone pollution at the ground level. This "bad ozone" is a principal component of smog. The ozone layer is reduced when man-made CFC molecules (comprised of chlorine, fluorine, and carbon) reach the stratosphere and are broken apart by short-wave energy from the sun. Free chlorine atoms then break apart molecules of ozone, creating a hole in the ozone layer. The hole in the ozone layer over the Antarctic in 1998 was "the largest observed since annual holes first appeared in the late 1970s [4].

CFCs were once used in aerosol sprays and as foam blowing agents. Their manufacture is now banned by an international treaty, the Montreal Protocol, signed by 160 nations. But because CFCs have a long atmospheric lifetime (about 50 years), those manufactured in the 1970s continue to damage the ozone layer today. The amount of CFCs in the stratosphere is now peaking. The good news is that

scientists forecast that the ozone layer will return to its earlier, stable size by the middle of the 21st century—assuming that nations continue to comply with the treaty [4].

1.3 Why discuss global climate change in the field of science?

Global warming and ozone layer depletion will doubtless receive continuing attention from the media and professionals in the fields of science, economics, and social studies. People in developing countries stand to suffer disproportionately greater problems than those living in wealthier countries [5] If so, developed countries need to seriously consider the ethics of the status quo, in which the have nots must endure the consequences of lavish energy consumption by the haves. Citizens of the wealthy nations may be called upon to help achieve a more equitable system by, for example, reducing personal energy consumption, paying a carbon tax for the environmental costs of global warming, subsidizing energy-efficient technologies being brought into the marketplace, or subsidizing the transfer of such technologies to Third World countries [6]. Applying scientific knowledge and taking citizen actions toward solving societal problems are integral to social studies education.

2 Our study hypothesis

In this paper, we demonstrate the global climate change, by modelling the "the greenhouse effect" phenomenon, which helps us to visualize and measure the fluxes (i.e. rise and fall) of atmospheric temperature. Figure 1, shows the "Greenhouse effect" phenomenon. The gases in our atmosphere help control the earth's temperature. Greenhouse gases like CO_2 trap heat in the atmosphere and keep the earth warm. This is called the "Greenhouse effect". It all starts with sunlight, which is a form of energy. Land and water absorb most of the sunlight that reaches the earth. The rest is reflected back to space. The earth's surface warms up and then gives off energy in a different form, called infrared radiation. This energy travels back towards outer space then greenhouse gases trap some of this energy in the atmosphere before it can escape, making the earth warmer. We need some greenhouse gases and without them our planet would be too cold for plants and animals to live. But people are adding extra carbon dioxide and other greenhouse gases to the atmosphere. Whenever we drive a car, use electricity or make a product in a factory, we use energy. A lot of this energy comes from burning fossil fuels like oil, gas and coal, which produces carbon dioxide. Therefore, extra greenhouse gasses trap more heat, which makes the whole planet warmer. The warmer temperatures lead to effects like changing rain, snow patterns, rising sea level melting glaciers, ice sheets and much more. It's a big problem and it's all happening because we are overloading the atmosphere with greenhouse gases. By making the greenhouse effect stronger, we are upsetting the earth's natural balance and warming our planet.

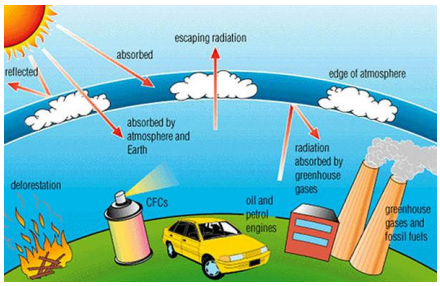

Figure 1: Greenhouse effect [7].

3 Methodology and Experiment

The learners will observe the greenhouse effect using 2-liter plastic bottles, damp soil and water. Temperature changes was measured and compared in two different conditions, i.e. the effect of the damps soil versus the cold water.

3.1 Materials list

- Two clear plastic 2-liter bottles
- Plastic wrap or clear plastic bag to cover the greenhouses
- Two thermometers
- Soil
- Water and ice cubes
- Tape
- Utility knife for cutting the plastic bottles
- The sun or clip-on light source with at least 100 Watt bulb (if the experiment is performed indoors)

3.2 Procedure

The experiment requires a location where there's direct sun light for a sustainable period of time. We used two models to represent the earth's surface and atmosphere (i.e. a bottle with damp soil and the other with water). In both conditions, the one bottle was covered with plastic wrap and the other bottle was not covered (act as the control of the experiment). The Figure 2 and Figure 3, shows our experimental set-up.

The control bottle represents the earth's atmosphere as it would be without greenhouse gases to trap energy from the sun and the plastic cover on the covered bottle acts like greenhouse gases in earth's atmosphere and helps to capture energy from the sun.

A laboratory thermometer is placed inside a plastic bottle which is covered and the one uncovered. Tape it to the wall of the plastic bottle. Read and record the temperature of each thermometer immediately. Repeat the measurements after every minute to monitor temperature changes.

Figure 2: Experiment 1-Damp-soil condition

Figure 3: Experiment 2-Cold water condition

4 Results and discussion

Our temperature measurements results are summarized in Table 1, Table 2, Figure 4 and Figure 5, for conditions, damp-soil (Experiment 1) and cold water (Experiment 2), respectively. In both experiments, the temperatures rose with an increase of time. However, it is important to note that temperatures measured in damp-soil condition were higher than that measured in cold-water conditions. In addition, the covered bottles indicated that higher temperatures are possible at the earth's atmosphere. As we have indicated that the plastic cover represent the trapping of greenhouse gases, our experiment supports our hypothesis because we expected temperatures to rise due to trapping of greenhouse gases in the atmosphere, thereby showing the greenhouse effect. We also established in our experiments that, solar radiation from the damp-soil makes the earth's surface warmer than if the radiation is from the cold-water.

Table 1

Time (in minutes)	Temperature (ºC) Uncovered bottle	Temperature (ºC) Covered bottle
0	21	21
1	25	30
2	31	39
3	31	40
4	32	41
5	33	42

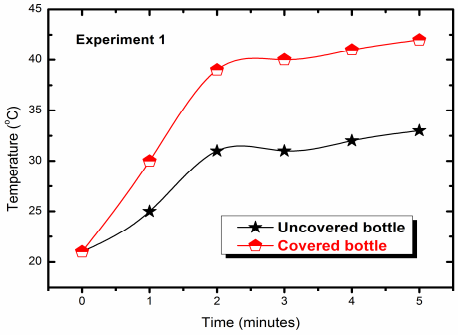

Figure 4: Plot of Temperature vs time, Experiment 1

Table 2

Time(in minutes)	Temperature (ºC) Uncovered bottle	Temperature (ºC) Covered bottle
0	20	20
1	21	26
2	21	27
3	22	27
4	22	28
5	23	28

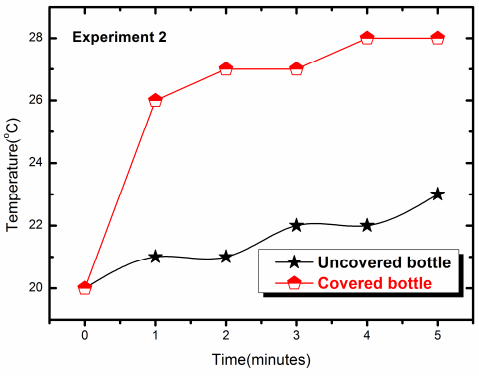

Figure 5: Plot of Temperature vs time, Experiment 2

5 Conclusion

In conclusion, we have successfully demonstrated the greenhouse effect using two different conditions at the earth's surface. Our results showed that due to trapping of greenhouse gases, the rise of temperature is evident and slightly higher in damp-soil conditions than in cold-water conditions.

6 Acknowledgements

The authors would like to thank UNISA's college of Science, Engineering and Technology for inviting them to be part of the learner's research summit 2016 and are also grateful to their mentors, P.Mbule, N. Mosia and S. Moloi, for fruitful discussions. Special thanks to their educators, Ms E.L. Shiburi and Ms K. Mokgopja, for a valuable time and learning experience.

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The factors affecting the inefficient management and disposal of waste in SNS (community), Mamelodi

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Abstract - *This study examines the potential factors affecting the collection and disposal of waste in the heavily littered SNS community in Mamelodi township set up by the then apartheid government northeast of Pretoria, Gauteng, South Africa. A survey using questionnaire was conducted. The questionnaires were given to sample of 50 individuals living in SNS. It was found that the majority of the respondent are not satisfied with the collection and disposal of waste. Therefore it is hoped that this study will go a long way in assisting the Thswane municipality in undertaking intervention strategies and activities.*

Keywords: A Maximum of 6 Keywords

Waste, disposal, SNS, survey

1 Introduction

In recent years the phenomenon of service delivey protests has become endemic in South africa. At the core of these delivery protests is the inefficient management of the collection and disposal of waste. The collection of waste disposal is one of the main concerns for communities and governements worldwide. As such inefficience and delay on waste collection and disposal of waste may lead to pollution and health problems and a considerable contribution to the carbon footprint. This research is aimed at looking at the factors affecting the collection and disposal of waste in the SNS community in Mamelodi township set up by the then apartheid government northeast of Pretoria, Gauteng, South Africa. Therefore it is hoped that this study will go a long way in assisting the Thswane municipality in undertaking intervention strategies and activities.

We chose SNS because the area is heavily littered along the roads and there are a lot of dumping sites.

2 Objectives

The objective of this study are:

1. To analyse the inefficience of waste management and disposal in SNS.

2. To identify whether or not the people in SNS are satisfied with waste collection of waste by the Thswane municipality.

3. To quantify the health problems caused by the inhygienic situation caused by ineffecient waste management.

4. To quantify the time it takes for households to fill up their rubbish bins and the rate of rubbish bins collection.

5. To identify why the municipality is failing to meet its obligations with regards to the collection and disposal of waste.

3 Procedures and methods

For this study a questionnaire was administrated to a random sample of individuals living in SNS Mamelody. A quantitative research in the form of a survey where 50 people we interviewed was carried out. The data was captured and analysed in Excel and then summarised.

3.1 Questions in the questionnaire

1. What sort of problems does the uncollected waste create for you?
2. How often is your waste collected
3. How often do you have your waste bin full/in need of collection?
4. Do you have problems with waste storage?
5. Does the rate of waste collection satisfy/match the generation of your waste?
6. Does the municipality waste collection company have enough capacity for waste collection?
7. Do you know the immediate time at which your waste is being collected?

4 Results

The study findings indicate that 51% of the households fill up their bins weekly, 22% daily and 27% monthly; 80% of the people in SNS have their bins collected weekly and 30% is monthly and 64% of the households in SNS are not satisfied with the management of waste and disposal. As a consequence 30% of the respondents complained of the

inhygienic situation while 70% of them complained health related conditions.

On the other hand, the municipality experiences difficulties in training their staff and supplying enough vehicles

5 Conclusions

The research has shown that a lot of the households in SNS are experiencing problems relating to delay in waste collection. As a result it is negatively affecting their health and the lack of capacity in the municipality was identified as the main reason

6 Recommendations

1. Increase capacity building

2. Frequent collection of waste

3. Recycle , Re-use and renew

4. Workshop the residence on how to treat the uncollected waste

5. Offer residence access to landfills

Investigation of the Types of Pollution Affecting Saulsville Area in Atteridgeville

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Abstract - *This research investigates the types of pollution affecting the Saulsville area located in the township of Atteridgeville. A qualitative research approach was followed where randomly administered questionnaires were distributed to the target population. This research was able to uncover that pollution in Saulsville is distributed in to a 41% air pollution, 37% Land Pollution and 22% Air Pollution split, and it also went on to give a breakdown of the specific pollution sources within each pollution distribution. It further went on to find that about 79% of all pollution in Saulsville is largely due to pipe leakages and some or other type of trash pollution, with a split pollution contribution of 61% trash based pollution and 18% leakage based pollution. The remaining 21% of pollution could be attributed to miscellaneous types of polluting agents.*

Keywords: Saulsville pollution, Atteridgeville pollution, Township pollution, South African pollution

1 Research Purpose

The purpose of this research is to investigate, characterise and categorise the types of pollution affecting the residents of the Saulsville area located in the Atteridgeville township

2 Research Questions

The research parameters for this study were framed by the following research questions:

- What is pollution and how is it categorised?
- What categories of types of pollution do we find in Saulsville?
- How do the different types so pollution affect Saulsville?
- To What degree or extent to the respective types of pollution affect Saulsville?

2.1 Research Objectives

The following research objectives were formulated to guide the answering of the research question:

- To find out what is pollution and types thereof
- To find out what specific types of pollution affect Saulsville
- To Identify the most prominent types of pollution affecting Saulsville
- To propose solutions to reduce the types of pollution affecting Saulsville

3 Literature Review

Encyclodedia Britannica defines pollution as an instance where a foreign substance introduced to an environment causes adverse effects to that environment and its habitants. The substance can be solid matter, liquid, gases, energetic, or frequency based; A pollutant can be of natural origin or man-made [1]. Websteronline also describes pollution as any activity that contaminates or compromises the natural and healthy state of man, other living organisms, and/or the environment, it further goes on to define “compromise” to mean the introduction of a foreign agent into a medium that results in the compromising of the purity of that medium [2]. Greenliving organisation has classed types of pollution in to nine different categories, namely; Air, land, water, Soil, Noise, Radioactive, Light, Thermal, and the controversial Visual Pollution [3].

4 Research Methodology

4.1 Research Methodology

This research followed a qualitative approach and relied on randomly administered questionnaires to the target population of Saulsville following a convenience sampling approach to collect data.

4.2 Research Design

A questionnaire comprising 4 questions was designed that sought to capture the pollution challenges faced by the Saulsville residents. Each of the 10 research team members then took ten copies of the questionnaire and went out to their respective Saulsville sections and individually asked their surrounding Saulsville community members to answer the questionnaire. A total of 310 responses were able

to be collected and data analysis of the responses was performed to arrive at the research findings.

5 Findings

5.1

The Research findings are presented in the below series of graphs:

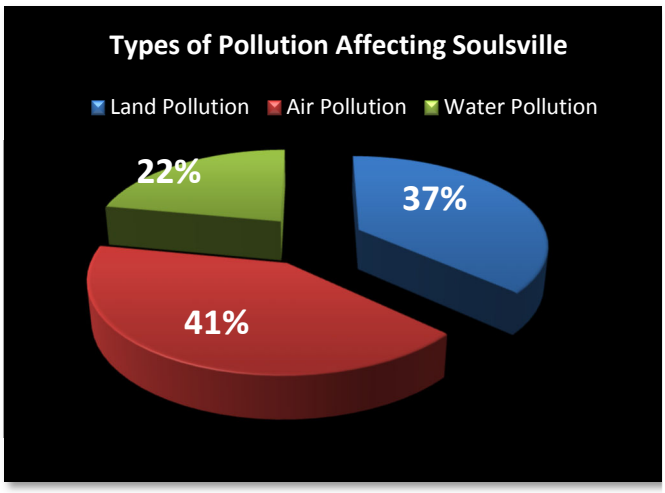

Table 1: Pie Graph of Types of Pollution Affecting Saulsville

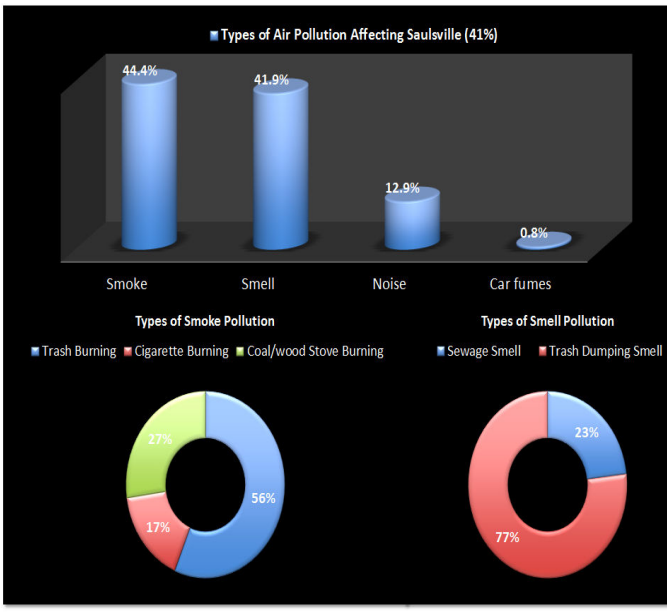

Table 2: Graph of Types of Air Pollution Affecting Saulsville

As Table 1 indicates, this research has uncovered that pollution in Saulsville is distributed in to 41% air pollution, 37% Land Pollution and 22% Air Pollution. Tables 3, 4, and 5 gives the breakdown of the exact types of pollution that were found under air, land, and water respectively. Furthermore Table 6 shows that if the pollution found in Saulsville is analysed by the polluting agent or pollution source, then a rather revealing picture emerged where it was discovered that about 79% of all pollution in Saulsville is largely attributed to pipe leakages and some or other type of trash, with a split pollution contribution of 61% trash based pollution and 18% leakage based pollution. The remaining 21% of pollution could be attributed to miscellaneous types of polluting agents as per Table 5.

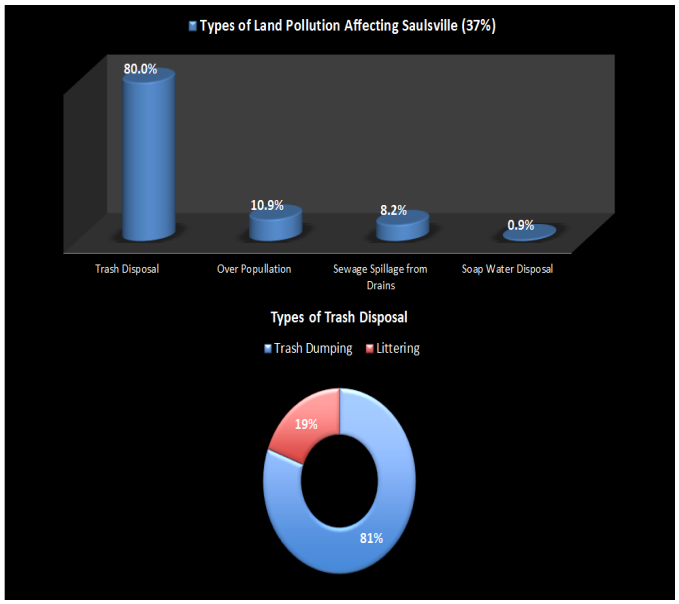

Table 3: Graph of Types of Land Pollution Affecting Saulsville

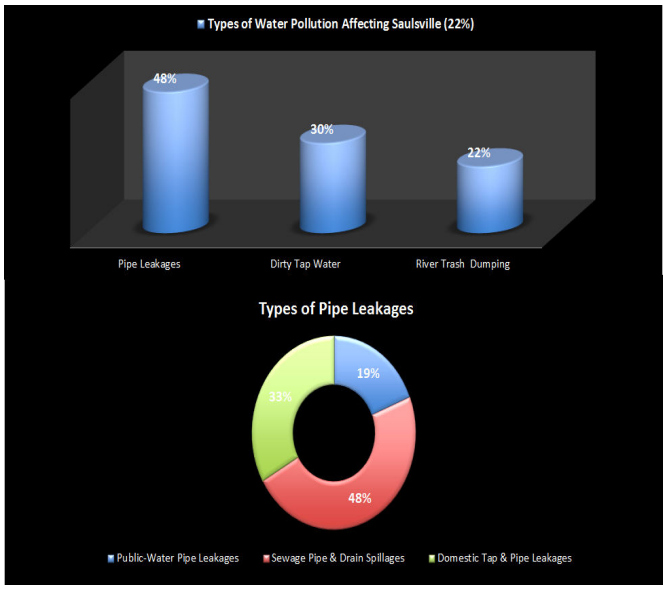

Table 4: Graph of Types of Water Pollution Saulsville

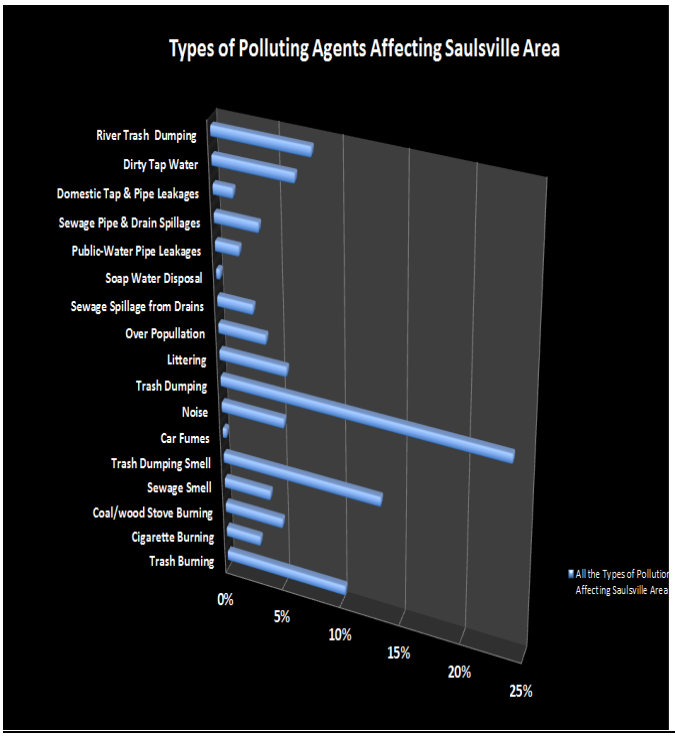

Table 5: Graph of Summery of the Types of Polluting Agents Affecting Saulville

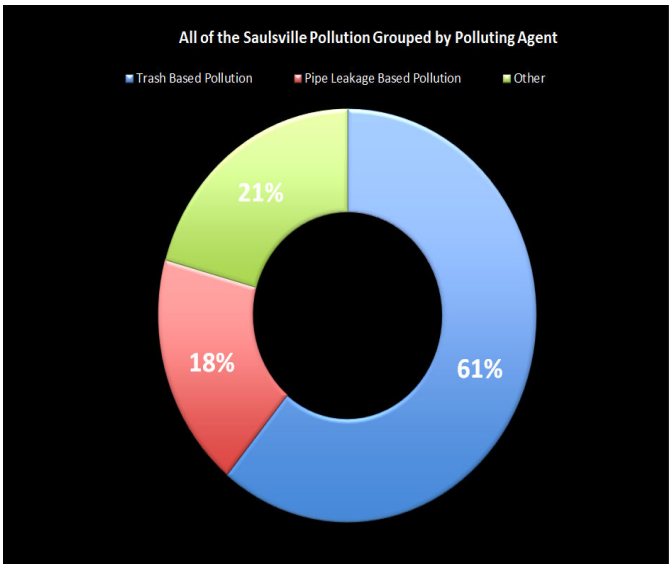

Table 6: Graph of Summery Of Soulsville Pollution Grouped By Polluting Agent

6 Recommendations

The recommendations based on the research findings would be for Saulsville municipality to implement a rigorous and formal trash disposals system such as regular domestic garbage collection trucks and readily accessible garbage bins in public spaces as well as to fix all the leaking pipes as this could see the pollution affecting Saulsville reduced by up to 79%.

7 Conclusions

This research sought to investigate the types of pollution affecting the Saulsville area located in the township of atteridgeville. A qualitative research approach was followed and data was collected via a randomly administered questionnaire to the target population using a convenience sampling approach. This research was able to uncover that pollution in Saulsville is distributed in to 41% air pollution, 37% Land Pollution and 22% Air Pollution and it also went on to give a breakdown of the specific pollution sources within each pollution distribution. The research further went on to find that about 79% of all pollution in Saulsville is largely attributed to pipe leakages and some or other type of trash, with a split pollution contribution of 61% trash based pollution and 18% leakage based pollution. The remaining 21% of pollution was found to be due to miscellaneous types of polluting agents.

8 Acknowledgements

Great gratitude and appreciation goes out to the University of South Africa's (UNISA) Collage of Science, Engineering, and Technology (CSET) for providing the platform and opportunity for the learners to participate in the UNISA Learner Research Summit (LRS), and a token of appreciation is also extended to the LRS organising committee. To the two Flavius Mareka High School teachers responsible for supporting the learners from the school front, Mrs Ncube and Mrs Mokhohlwa, a heart-felt vote of thanks is extended to you for your steadfast stewardship, and lastly but certainly not least to the UNISA learner mentor, Mr Sombane, who has been responsible for holding the learners' hands and guiding them into budding researchers, a special note of thanks is given for your tireless and selfless espousal.

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Recycling waste

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Abstract - *Decomposition of waste matter can be recycled into valuable products that can be reused in various forms. This is especially true for all products that we use and eventually dispose. This research evaluates waste from a perspective of the development of methane gass.*

Keywords: waste; recycling; gass; methane

1 Compost waste

The process of composting simply requires making a heap of wetted organic matter known as green waste (leaves, food, and waste) and waiting for the materials to break down into humus after period of weeks or months.

Worms and fungi further break up the material. Bacteria requiring oxygen to function and fungi manage the chemical process by converting the inputs into heat, CO2, NH4 is the form of nitrogen used in plants when available ammonium is not used by plants is further converted by bacteria into nitrates (NO3) (process of nitrification).

Organic ingredient intended for composting can alternatively use to generate biogas through anaerobic digestion.

Ingredients

- Carbon – The oxidation of carbon provides heat.
  High carbon materials tend to be brown and dry.
- Nitrogen- Reproduce more organisms to oxidize the carbon.
  High nitrogen materials tend to be green (fruits and vegies).
- Oxygen- Decomposition process.
- Water.

Certain ratios of these materials will provide beneficial bacteria with the nutrient to work at a rubber that will heat up the pile. The hotter the pile, the more air and water is needed. The air and water is used for bacteria or for high temperatures until the materials are broken down. At the same time the air or water slows the process down.

2 Pros and cons of composting

The table that follows summarises the benefits of composting.

PROS	CONS
➢ Good way to recycle.	➢ Little effort required.
➢ Environmental benefits.	➢ Only works in certain weather.

2.1 Development of Methane

The micro-organisms in the compost generate a lot of heat trying to break down that matter and running water through the system will keep the temperature low enough for the "methane-producers" to be happy.

Compost produces methane which can provide combustion energy for cooking and space heating but it can also run matters.

Examples: compost and charge battened in prevails lab replication it has been found that it is possible to charge batteries using the waste energy from a compost pile using thermoelectric modules. The use of a copper slab insulated with extruded polystyrene would transform 86% 290 from the center of a pile, where it is the hottest, where a charge would be. This is a significant percentage, that a larger percentage is desired because a large temperature difference across the module increases with increasing temperature at a 60+ C temperature difference one on damaged module can produce 463mw, 56mw at matched load. This amount of power is able to charge a battery slowly, but more modules or a bigger module would be needed for faster changing [1].

2.2 How to use methane

One can use methane in different ways like to burn it for cooking, or lightning, compressed like natural gas and for heating.

2.2.1 Methane generator

It is a generator that harnesses methane from organic waste material and converts it into electricity.

- Once the methane is extracted via a pipe connected to a digester it is then burnt and heats up water in a boiler.

- The steam allows the turbines to move that generates electricity.

Advantages and disadvantages of methane gas.
(Natural gas)

Advantages

- The use of methane is becoming very popular as it can be used with commercial, industrial, electric power generation and residential applications.
- It's used because its property of instant heating and thus commercially used in hostels, restaurants, school, cooking etc., can be used as vehicle fuel, burns cleaner.
- Methane is cheaper and cleaner than gasoline and produces less greenhouse emissions them its counterparts.
- It burns completely and can be safely stored.
- It's less harmful then coal or oil to environment and results in less carbon emissions.
- Easier to preserve and easy to transport and can be used for residential use, versatile, neater.

Disadvantages

- It is toxic and flammable which could lead to damage to environment and very complex processing (it has to be extracted) and it is non-renewable.
- It is not a long term solution to our energy problems and the installation is expensive, production and distribution is fairly expensive, inefficiency in transportation, when inhaled can be highly toxic.
- Instant energy, precision in kitchen, abundant, safer, used to produce electricity [2].

2.3 What is methane used for?

Methane is utilized as fuel and in chemical reaction to produce commercially used chemicals such as carbon tetrachloride, carbon back and as a source of hydrogen. Methane reacts at high temperatures with steam to yield the hydrogen used in the manufacturing of explosives and Ammonia based fertilizers.

Methane is extremely flammable and used for fuel to produce light and warmth. When levels of the invisible gas are as low as five percent, the compound is explosive. If odourless, this compound is hazardous due to difficulty in detecting it.

2.4 How is methane produced?

Methane is produced in natural environment by decomposition processes in marshes. Natural pockets of methane exist underground, where it remains for many years, unless disturbed. When released methane evaporates quickly.

2.5 Source of methane energy (where does methane energy come from?)

Methane id the principal constituent of natural gas (typically natural gas is 87%methane). It is therefore commonly produced by purifying gas. Pure methane may also be obtained from the crackling of petroleum fractions.

2.6 Does the production of methane have harmful impact on the environment?

The problems start when unburned gas is in the atmosphere and if it is not better mitigated, methane leaks and releases could undermine the greenhouse gas. Advantage and spell major trouble for the climate.

2.7 Generation of methane from manure

- Life stock manure contains a portion of volatile (organic solids) which are fatty acids, carbohydrates and other nutrients that are available as food on for the growth and reproduction of anaerobic bacteria.

- The anaerobic process depends on methane farmers because they are environmentally sensitive than acid farmers. Methane bacteria are strict anaerobia and cannot tolerate oxygen in their environment. They function best at 95 degrees fohr; therefore to obtain maximum gas production, heat must usually be added to a digester.

- Researchers in Australia are planning to harness electricity through the fermentation of vast quantities of bananas in giant steel vats. The idea is that after left to ferment the bananas are will rot and produce methane that will be used to drive turbines and create electricity. Because

- Farmers who contribute bananas to the power plants will receive a percentage of electricity produced based on the size of their contribution [3].

2.8 Anaerobic biodigester

Anaerobic digester is like composting but with oxygen-free container. It is a biological process whereby naturally occurring micro-organisms break down organic waste and produce mostly methane gas with carbon dioxide. After it is treated it can be burnt and used together electricity.

Four key stages of anaerobic digestion involves:

- Hydrolysis
- Acidogensis
- Acetogensis
- Methanogenesis

2.9 Chemical reaction

- Glucose is biochemically digested into carbon dioxide and methane [4]

$C6H12O6 \rightarrow 3CO2+3CH4$

2.10 Temperature

There are two conventional operational temperature levels for anaerobic digesters determine the species of methanogens in the digesters.

Mesospheric digestion takes place optimally around 30°C-38°C or at ambient temperatures between 20°C and 40°C, primary micro-organisms are present.

Themophilic digestion takes place optimally around 49°C-57°C, or at elevated temperatures up to 70°C, primary micro-organisms are present.

2.11 Inhibition

Several compounds affecting one or more of the bacterial groups responsible for the different organic matter degradation steps.

The degree of the inhibition depends on the factors that take place on the concentration of the inhibitor in the digger.

Potential inhibitors are ammonia, sulfide, light metal ions (Na, K, Ca, and Al), heavy metals, some organics (chlrophenols, halogenated alphatics, N-substituted aromatics, long chain fatty acids) and many more.

Using anaerobic digesters can help to reduce the emission of greenhouse gases by:

- replacement of fossil fuels
- eliminating the energy footprint of waste treatment plants
- Reducing CH_4 emission from landfills.
- displacing industrial produced chemical fertilizers
- Reducing vehicle movements
- Reducing electrical grid transportation losses.
- Reducing usage of LP gas for cooking.

2.12 Eco friendly methane

Scientists Annie Alitalo &Mareko Niskanen at the natural resources institute Finland (Luke) has succeeded in developing a methane bioreactor which produces energy & water power. Moreover, the reactor can convert wood gas (synthesis gas) into very pure methane, which after pressurization is readily available for transportation fuel.

Methane was discovered by a Lessandro Volta, Mon & scientist. In October of the same year (1775) Count Firmian put Volta in change of experimental physics at the state grammar school in Cana.

*While on his summer holidays in 1776 on Lake Maggaione, his boat went alongside the needs near Angera. Volta began to poke the muddy bottom of the water with a stick& saw lots of gassy bubbler floating up to burst on the surface. He called it inflammable air from marshlands. It was called what we nowadays call methane Convert waste to energy with methane. There are several basic factors which must be considered in constructing or purchasing a digester installation. These are:

1. Climate
2. Single or multiple family instalments
3. Amount of waste available
4. Gas production
5. Number & size of digesters
6. Location of digesters
7. Gas requirements & storage
8. Material &costs

2.13 Sources of methane

Methane is emitted by natural sources such as wetlands, as well as human activities such as leakage from natural gas systems and the raising of livestock. Natural process in soil and chemical reactions in the atmosphere help remove CH4 from the atmosphere.

2.14 Main sources of methane emissions

There are natural and human sources of methane emissions. The main natural sources create 36%of methane emissions. Humane sources include landfills and livestock farming important sources being the production, transportation and use of fossils fuels. Human-related sources create the majority of methane emissions, accounting for 64% of the total .Methane levels have more than doubled over the last 150 years. This is because of human activities like fossils fuel use and intensive farming before the industrial Revolution, natural sinks kept methane levels in a safe range. Humans are creating methane emissions a lot faster than the Earth can remove them which has increased global methane levels. During the last 800.000 years ppb since the industrial Revolution, methane levels have become much higher [4].

2.15 Methane emissions human sources

When the industrial Revolution, human sources of methane emissions have been growing, fossils fuel production and intensive livestock farming have caused the current increase methane levels, together this two sources cause are responsible for 60% of all human methane emission .Other sources include landfills and waste (16%), biomass burning (11%) rice agriculture (9%) as well as befouls (4%).

1. Fossils fuel production, distribution& use

The largest human sources is from the production and combustion of fossils fuels. This creates 33% of human methane emissions. Methane emissions get produced whenever there are fossils fuels as it gets related whenever fossils fuels get extracted from the Earth. Whether it is natural gas which is in most part of methane, coal or

petroleum more methane gets released during any type of handling transportation (e.g. pipeline, truck delivery) or refinement of fossil fuels .Methane produced during fossil fuel combustion by using fossil fuels, we contribute to the most important source of methane emissions. According, to C.Tyler, et.al 2006 fossil fuels production, distribution and use creates 110million tones of methane per year. A large part of methane emission gets caused by natural gas, leakage throughout this industry release methane straight into the atmosphere. This includes the extraction, processing and transportation of natural source.

2. Coal is important source or methane emissions.

Coal formation, pockets of methane get trapped around and within the rock. Coal mining related activities release some of this trapped methane e.g. extraction, crushing distribution. Methane gets emitted from active underground and surface mines as well as abandoned ones.

3. Oils wells can have methane deposits that get released during drilling and extraction. The refined transportation and storage of oils is a source methane emissions, incomplete combustion process is 100% efficient. When fossils fuels get used to make electricity, heat or power cars these all produce methane.

4. Livestock

Sources of methane emissions is from enteric fermentation emissions in farm animals .Cows, sheep and goats are examples of ruminant animals .During normal digestion process they create large amounts methane .Enteric fermentation occurs because of micro organisms in the stomach of these animals. This creates methane as by products that is exhaled by the animal or released via flatus, because humans raise these animals for food , their meat that we eat everyday has a huge impact on total methane emissions. Livestock creates 90 millions of methane per year.

5. Landfills and waste

Methane gets generated by decomposition of solid waste in landfills .Landfills and open garbage damps are full of organic matter .Garbage contain food scraps, newspaper, cut grass and leaves. Organic matter in garbage get trapped in conditions where there is no oxygen, this produces methane producing microbes.

6. Biomass burning

Biomass burning causes methane emissions. It is material from living or dead organic matter, incomplete burning of biomass creates methane emissions. Huge amounts can get during large scale burning.

7. Rice agriculture

Paddy fields for rice production are manmade wetlands they have high moisture content, are oxygen depletion and have amole organic material. This creates environment for methane producing microbes that decompose the organic matter.

8. Biofuels

Any biomass used to produce energy for domestic or purposes counts as a biofuel, incomplete biofuels combustion leads to the production of methane.

2.16 Methane emissions: natural sources

Methane released into the atmosphere by natural processes wetlands, termites and the oceans are natural sources of methane emissions. Methane produced by natural Sources are offset by natural methane sinks.

1. WETLANDS

Are the largest natural sources of methane, this produces78% of natural methane emissions the c water logged conditions of wetlands are good for microbes. They need environments with no oxygen and abundant organic matter; part of wetland related emissions gets absorbed by methane consuming microbes.

2. TERMITES

Are significant natural source of methane during the normal digestion process of a termite, methane gets produced. Terminates eat cellulose but rely on microorganisms produce methane during the process. This creates 12% of natural methane emissions each termite produces small amounts of methane on daily basis, but when it gets multiplied by the world population of termites their emissions add up creating a total of 23 million tons of methane per year.

3. OCEANS

Natural source of methane comes from the oceans, methane producing microbes living in the oceans creates these emissions .This creates 10% of natural methane emissions globally, oceans methane emissions. Methane created by these mixed with the surrounding water after some time it gets emitted to the atmosphere from the ocean surface.

2.17 Greenhouse gas

Are group of compounds that are able to trap heat in the atmosphere, keeping the earth`s surface warmer than it would be if they were not present. The gases are the causes of the greenhouse effect. (2) Increases in the amount of greenhouse gases in the atmosphere enhances the greenhouse effect which is creating global warming and climate change. Greenhouses allow sunlight (shortwave radiation) to pass through the atmosphere frecly, where it is partially absorbed by the surface of the earth but some of this energy bounces back out towards space as heat of the heat emitted back to space some is intercepted and absorbed by greenhouse gases in the atmosphere. This is because these compounds are made of three or more atmosphere. This molecular structure allows them to absorb some of the escaping heat and re-emit it towards the Earth which increases global temperatures. The ability of these gases to trap heat is what causes the greenhouses gases you have in the atmosphere the more heat stays on Earth. This process, which is very similar to the ways a greenhouse works is why the gases that can produce this effect are known as greenhouse gases. There are 2 ways that a greenhouse gas

can enter our atmosphere one of them is through human activities. The main human sources of GHG emission are fossil fuel use, deforestation, livestock farming, use of synthetic fertilizers and industrial process, natural processes. The other is through natural processes like animal and plant respiration.

The principal forcing greenhouse gases are:

- Carbon dioxide (CO2)
- Methane (CH4))
- Nitrous oxide (N20)
- Fluorinated gases
- The main feedback greenhouse gas is:
- Water vapor.

Forcing greenhouse gases take many years to leave the atmosphere C02, CH4, N20 AND THE FLUORINATED gases are well-mixed gases in the atmosphere 4. They do not react to changes in their temperature or air pressure and do not get removed easily water that condenses to become rain or snow. Their long atmosphere lifetimes allows them to have a lasting effect on global warming and climate change water vapor is active component of the climate system that responds rapidly to charges in conditions either condensing into rain or snow or evaporating to return to the atmosphere. C02 and the other forcing greenhouse gases are the key gases within the Earth's atmosphere that keep greenhouse effect can control strength.

C02, CH4 and N20 are emitted to the atmosphere through natural processes as well as human activities use of fossil fuels, industrial production. Fluorinated gases on the other hand are created and emitted through human activities.

2.18 Overview of greenhouse gases

Gases that tap heat in the atmosphere are called greenhouse gases. This section provide information an emissions and removes of the main greenhouse gases to and from the atmosphere. The science of climate change and other climate forcers, such as black carbon.

Carbon dioxide (C02): enters the atmosphere through burning fossil fuels (e.g. coal, natural gas and oil) solid, waste, trees and wood products, and also as a results of certain chemical reactions (e.g. manufacturing of cement).

Methane (CH4): Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by decay of organic waste in municipal solid waste landfills.

Nitrous oxide (N20): Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste.

Fluorinated gas: hydrofluoric carbons, perfluoro carbon, sulfur hexafluoride, and nitrogen trifluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gas are sometimes used as substitutes (e.g. chlorofluora carbons, hydrochlorofluora carbons and haloes). These gases are emitted in smaller quantities, but they are potent greenhouse gases they are referred to as high global warming potential gases (High GWP Gases).

Each gas's effect on climate change depend on 3 main factors.

1. How much of these gases are in the atmosphere?

Concentration is the amount of a particular gas in the air. Larger emissions of greenhouse gases lead to higher concentrations in the atmosphere. Greenhouse gas concentrations are measured in parts per millions, parts per billion.

2. How long do they stay in the atmosphere?

Each of these gases can remain in the atmosphere for different amounts of time ranging from a few years to thousands of years. All gases remain in the atmosphere long enough to become well mixed meaning that the amount that is measured in the atmosphere is roughly the same all over the world, regardless of the source of emissions

3. How strongly do they impact global atmosphere.

Some gases are more effective than others at making the planet warmer and thickening the earth`s blanket global warming potential has been calculated to reflect how long it remains in the atmosphere, on average, and how strongly it absorbs energy .Gases with a high GWP absorb more energy, per pound, than gases with a lower GWP, and thus contribute more to warming Earth [5].

2.19 Ethanoic (acetic) acid also applies to methanoic (formic) acid

Substance

1 Ethanoic acid (acetic acid) - it causes severe burns and irritates the lungs for 15 minute exposure the concentration of the vapour in the atmosphere should not exceed 37mg m_3

2. Pure liquid glacial also methanoic (formic) acid

3. Concentrate ethanoic acid (solution in water): it causes burns. It is methamoic acid

4. Moderately concentrated ethanoic acid: it is irritating to the eyes and skin.

5. Dilute ethanoic acid: includes vinegar it cause harm in the eyes or in the cut.

2.20 Typical control measure s to reduce risk

- Use the lowest concentration possible.
- Use smallest volume possible.
- Wear eye protection for all but the most_ dilute solutions.
- Wear protective gloves if anything more than tiny amounts of concentrated acid are handled.
- Avoid breathing gas or fumes from concentrated solutions, e.g. By use of a fume a cupboard.

2.21 Emergency action

- I
  In the eye: Flood the eye with running tap water for 10 minutes.
- Vapour breathed in: Remove to fresh air. Call a doctor if breathing is difficult.
- Swallowed: Do no more than wash out the mouth with water. Do not induce vomiting sips of water may help cool the throat and help keep the airway open. See the doctor
- Split on the skin or clothing: Remove contaminated clothing then drench the skin with plenty of water if a large area is affected or blistering occurs, see a doctor.
- Split on the floor, bench: Wipe up small amounts with a damp cloth and rinse it well.

3 Conclusions

This research has enlightened us on how methane can be formed and used in South Africa. The group and I would like to thank Unisa and the LRS team for this endeavor.

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The Impact of Global Environmental Change

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Abstract - *Our environment is constantly changing and there is no denying that. However, as our environment changes, so does the need to be increasingly aware of the problem that surrounds it. With a massive influx of natural disasters, warming and cooling periods, different types of weather patterns and much more, people need to be aware of what types of environmental problems our planet is facing.*

Keywords: Global environmental change, Food security, Food approaches, Climate change, Extinction, Solutions.

1 Introduction

The aggregate environmental impact of humankind has begun to change some of the world's greatest biophysical systems. Such large-scale systemic environmental change is unprecedented. It includes;

- •Biodiversity
- •Land degradation
- •Depletion of fisheries
- •Global dispersion of non-biodegradable chemical pollutants.

According to climatologists, the former has begun to cause global climate change. Meanwhile, the latter is increasing the amount of UV irradiation at the Earth's surface. There is a connection between the natural world and the human economy; there can be no sustained economic development without an intact natural environment. Still, human well-being depends upon the 'goods and services' provided by supporting systems.

2 Global Environmental Change

This includes changes in the physical and biogeochemical environment, either caused naturally or influenced by human activities, such as;

- Deforestation
- Fossil fuel consumption
- Urbanization
- Land reclamation
- Agricultural intensification
- Freshwater extract
- Fisheries over-exploitation
- Waste production

Global warming has become an undisputed fact about our livelihood, our planet is warming up and we are definitely part of the problem. All over the world, people are facing a wealth of new problems every day. Some of them are small and affect the ecosystem but others are drastically changing the landscape of what we already know.

Our planet is poised at the brink of severe environmental crisis. The current ones make us vulnerable to disasters and tragedies, now and in the future. We are in the state of planetary emergency and unless we address the issues we are surely doomed for disaster. Current environmental problems require urgent attention.

3 Food security

Food security:

- •Exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preference for an active and healthy life
- •Is based on stability of food availability, food access and food utilization
- •Is underpinned by food systems, not just food production
- •Is diminished when any component of the food system is stressed

The world has more than enough food for everyone, yet- even today- over one billion people do not have access to sufficient food.

Factors which contribute to food security are:

- •social
- •cultural
- •political
- •economic
- •environmental

In the short term, social and economic determinants are the main factors.

4 Risks of conflict

Three contrasting, dominant discourse about food which needs to be resolved;

1. Food as a global commodity
2. Food as a product of environmental services
3. Food security as a basic human right

5 Food system approaches

A food system can help improve our understanding of the interaction between GEC and food security. It thus can help identify a wider range of technical, management and policy options available to address these interactions.

Region- specific approaches can help identify and raise awareness among policy makers and resource managers of regional food security strategies that may not be apparent at local or national levels.

6 Climate Change

The world's climate is changing and it will continue to change. Rising temperatures, new precipitation, and other changes are already affecting many aspects of the human society and the natural world.

Climate change is happening at a global scale but vary from place to place.

Human activities have been a primary cause of climate change. How we approach other human activities that affect the ecosystem will influence the way and the extent in which climate change will alter the natural world and the ecosystem in which we depend.

7 What do we know about climate change?

1. THE EARTH IS GETTING WARMER; there is a rapid increase in the earth's temperature, both on the earth's surface and in the oceans.
2. HUMAN ACTIVITIES ARE CONTRIBUTING TO CLIMATE CHANGE; greenhouse gases has increase increased. Carbon dioxide increased by 35%, methane by 150% and nitrous oxide by 205% since 1850.
3. SEA LEVELS ARE RISING; warmer temperatures not only cause glaciers and land ice to melt, but also cause seawater to expand in volume as it warms.
4. CHANGES ARE RIPPLING THE WATER CYCLE; predictions indicates that wet areas will get wetter and dry areas will get drier.
5. THE OCEAN IS ACIDIFYING; oceans acidification will likely cause serious harm to treasured marines as corals, lobsters and sea urchins.
6. CLIMATE CHANGE IS REFLECTED IN EXTREME WEATHER; increasing temperatures

will lead to higher maximum temperatures, more heat waves and fewer cold days.

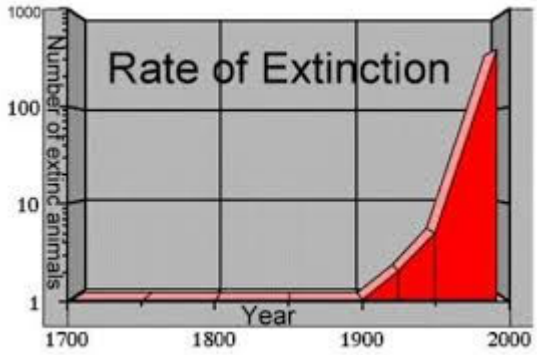
8 Ecological impacts

Two important impacts which have been observed are;

- Shifts in species range; location in which we survive and reproduce
- Shifts in phenology; timing of biological activities that happen seasonally
- Species extinction

9 Global warming

Global warming is likely to be the greatest cause of species extinction. The Intergovernmental Panel on Climate Change says '15C average rise may put 20-30% of species at risk. If the planet warms by more than 3C, most of the ecosystem will suffer.'



10 Polar regions

Artic summer sea ice is melting faster than predicted. If more ice melts, the sea level will rise and flood all the continents causing them to be under water if we don't do something.

11 Solutions

Despite uncertainties about what the future holds, decisions can be made now. Strategies will need to pay special attention to the issues of uncertainty. It will be important to make decisions based on current information and implement them in a way that preserves the ability to make adjustments in the future as more information becomes available.

12 Acknowledgements

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- And many more we could not mention

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Solar water pump: the solution for rural areas

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Abstract - *Various South African rural areas, farms and/or villages are currently facing electricity shortage. Implementation of solar water pumps is vital in the development of rural villages of South Africa. South Africa finds it expensive to provide electricity to all parts of the country especially the rural villages. South Africa uses non-renewable energy such as coal to produce electricity. This has implications especially greenhouse gases produced from burning coal. Therefore it will be non-economical to energise small electric pumps all over rural areas. Consequently, there is a need to find an alternative way of energising water pumps. This paper presents an alternative way of providing power to water pumps using renewable energy which is the solar energy. To solve these challenges, the water pumps that utilizes solar energy was designed. It was found that these design may be utilized in the rural areas with no need for electricity supply. It is concluded that solar water pumps are suitable and sustainable for use in the rural villages of South Africa.*

Keywords: Solar energy, water pump, renewable energy,

1 Introduction

Our world has been hit by global warming resulting in strange weather patterns. According to science direct website, there has been an increase in CO_2 in our atmosphere due to cars emitting a lot of CO_2 in the atmosphere and also factories. Also, an increase in factories has been observed and they produce a lot of CO_2 and is trapped in our atmosphere. Instead of the harmful radiation from the sun being blocked by the Ozone layer, these harmful radiation is coming to the earth and cause global warming. Therefore, unusually weather patterns are observed globally. The effects of global warming are most felt in rural areas where there is scarcity of water.

Rural areas depend on underground water using non-renewable energy such as electric supply (which is dependent on coal) petrol or diesel engines which emit CO_2 harmful to the atmosphere. The other alternatives is to use renewable energy such as wind and/or solar to energise the water pump.

The purpose of is project is to design water pump that uses solar energy instead of water pump that uses electricity from coal, petrol diesel or manual operated water pump.

2 Literature review

The world is facing challenges to maintain electric flow to the cities, industries and the demand of electricity to the population that is increasing. The challenges the world is facing of using non-renewable energy which will be depleted overtime. This can be threating because the demand for electricity is increasing. Therefore there is a need of finding alternative way to provide electricity to the communities without using non-renewable energy. The is a need to research more to use renewable energy such as wind, water and sun to produce electricity and reduce the use of non-renewable energy. Also the renewable energy source will provide solutions to the problems ‘”as they are inexhaustible and have less adverse impacts on the environment than fossil fuels” (Koroneos, Spachos & Moussiopoulos: 2003).

The solar panel consists of photovoltaic cells. Research still continues to optimise output of photovoltaic cells. One of the strategy is to “the development of solar cells that are based on sensitization of mesoscopic oxide films by dye to quantum dots”(Grattzel:2005). This system has proven that it reached conversion efficiencies exceeding 11% and thus shows that it.

Photovoltaic cell (PV cell) is a specialized semiconductor diode that converts visible light into direct current (DC) (whatis.techtarget.com)”. This current is the one used to run electric mottor, provide houses with electricity etc.

2.1 Different types of water pump

With **manual operated water pumps** a human being has to operate it by hand when water is needed. A **windmill water pumps** use wind to run. **Electric water pumps** use ectricity from supplier such as Eskom. **Diesel or petrol water pumps** use deisel or petrol. **Solar water pumps** use solar energy.

Figure 1: Manual water pump

Figure 2: Well

Figure 3: Windmill water pump

3 Comparison of water pumps

With **manual operated water pumps** a human being has to operate it by a hand when water is needed. The **manual operated water pumps** have less expensive parts and are less expensive to repair When ever a human being is ill then it means the will be no water supply. Again elderly people cannot access the pump because they don't have enough strength and muscles to pump water. Mind you water is needed so support life.

A **windmill water pumps** use wind to run. But it is not every where in South African where we have enough wind to run these pumps. Even in those areas where we have enough wind, such wind is seanal not throughou the year.

Electric water pumps use ectricity from supplier such as Eskom (which needs coal to generate electricity). **Diesel or petrol water pumps** use deisel or petrol. Coal, petrol and diesel produce harmful gasses which are causing global warming. And because of global warming we are experiencing drought which is causung shortage of water.

Solar water pumps use solar energy. **Solar water pumps** have solution to the problems which we are experiencing with **manual operated water pumps, windmill water pumps, electric water pumps** and **diesel or petrol water pumps.**

4 Prototype

Solar water pump solution 1 (see Figure 1)

This water pump is a reflection of a well water pump which is more upgraded and user friendly.

This solar water pump consists of the following upgraded part:

- Mounting plates
- Electric motor
- Solar panel
- Switch control
- Winch system
- Conducting wire system

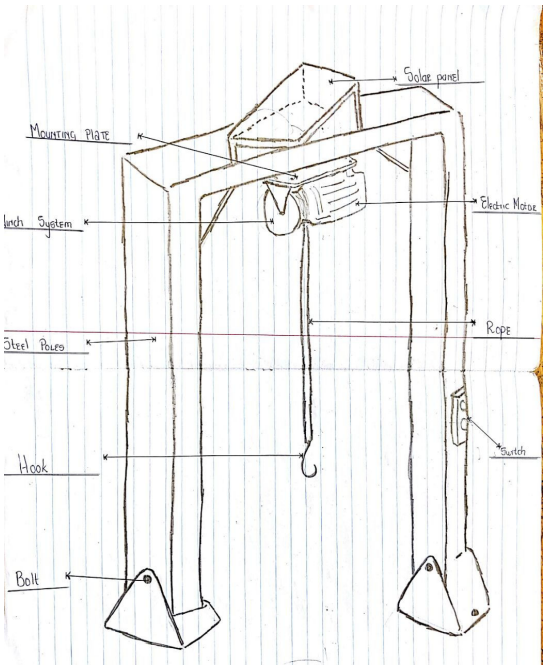

Figure 4: Conceptual design of solar water pump

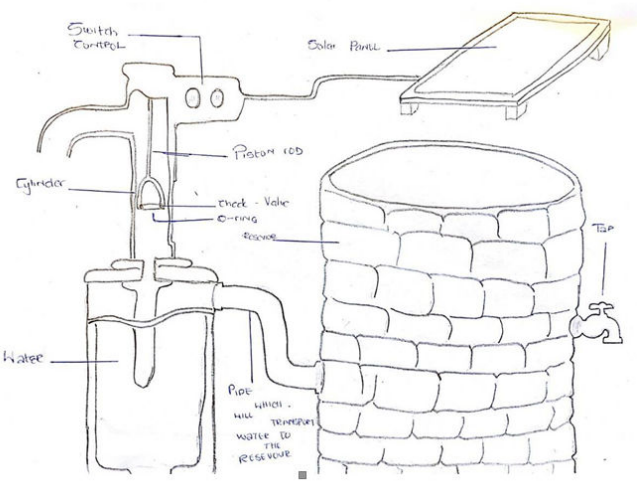

Figure 5: Concept of solar water pump

How the water pump will function?

- The solar panel is automatically charged by the sun and it will supply energy to the battery. The current from the battery will flow through conducting wires that are placed inside the steel poles.
- First switch on the switch control to activate the flow of energy inside the circuit
- When the energy is activated it flows straight to the electric motor which will spin the winch system that will be holding the rope so that it can take it downward and upward.

Uses of each component in the water pump

The structure of the solar water pump will be made of made steel poles and have cross bracing to make it rigid and to last long. The structure will be bolted to the ground by large strong bolts and cemented to the ground to make it stay there for a long period of time and make it harder to be removed by criminals. Inside the steel poles there will be conducting wires that will carry the flow current from the battery to the conducting wires inside the steel poles. The battery will be charged by the solar panel that will be charged by the sun. For the current to flow the switch control must be switched on so that the current can flow to the electric motor to generate it to function. The electric motor will be mounted to the upper part of the structure by the mounting plate. The winch system will be combined with the electric motor. The function of the winch system is to hold the rope that will be merged with a hook to carry the bucket and take the rope upwards and downwards to fetch water.

For in terms of security and the safety panels the panels will be placed at the chiefs yard and the structure will be surrounded by a fence that will have a gate for people to enter. This kind of pump is a user friendly pump that does not need any human power for it to function it only needs the switch control to be switched on.

Solar water pump solution 2

This water pump is the reflection of a hand water pump that is used the rural areas.

This solar pump consists of the following parts that make it easier to use:

- Switch control
- Buzzer
- Sensor
- Battery
- Solar panel
- Check valve
- Cylinder
- Piston rod
- O-ring

How will the water pump function?

Firstly switch on the switch control allow flow of current to flow around the circuit to pressurise the piston which is combined with the piston rod, check valve and O-ring. The moment the piston rod is pressurized, it compresses the water to come up. Then water will go to two separate places. Firstly the water will flow to the reservoir through the pipe that is connected to the water pump tank and the reservoir and the other water flow to the tap.

The reservoir will have a sense to sense the water limit. Once the water is full, the buzzer will go on, alerting people that are near the pump to disconnect the pipe. The reason for the reservoir is to save water for the time where there is no sun to charge the panel which gives the battery energy to make the pump to function.

5 Cost implementing the solar pump

Solar Water Pump & Manual operated Water Pump costs are as follow:

Table 1: Cost of solar water pump system

Type of the pump	INITIAL AMOUNT	OPERATING COST PER YEAR
SOLAR WATER PUMP	R11 043.48	R4 874.25
MANUAL-OPERATED WATER PUMP	R11 000.00	This will depend on how much lubricant is used for the components and how many times are certain components replaced or fixed.

As shown in Table 1, comparing the solar and manual operated water pump, there is a slight difference in term of the cost. The benefits of using solar energy pump are: easy to install, safe and operates quietly comparing to Manual operated water pump.

Maintenance can be expensive for the manual operated water pump and for electric water pump are expensive because one need to pay for electric usage.

Even though the solar water pump may seem to be expensive to install, it also has different parts which are more upgraded and advanced than the manual operated water pump. The solar water pumps lasts longer than the manual operated water pump which is easier to install but the parts are not reliable and don't last longer. Every time they replace or fix parts that are broken in manual operated pump, it costs more money and villagers will find it expensive to maintain.

Lastly, the solar panel may be expensive for now since it's a new thing but with time it will be less expensive.

6 Recommendation

Security in rural villages is concerning due to high level of crime in our country. Therefore necessary precautions need to be taken into account when implementing this project successfully. The following issues were suggested:

- The project needs to be owned by the community. This will ensure that the community protects the water pump systems. This will ensure that water pump components are not stolen by thieves. It is further suggested that during the building of the project, majority of people from the community need to be involved or employed.
- The solar panel will be placed in the chiefs or elders of that community. The main reason for this is that people respects the yards of the chiefs or elders and the components of the solar panel will be safe. The other issue is that if there are any problems with the panel, the chiefs will be able to contact the project management team. This will ensure that the panels are safe.

7 Conclusion

The increase in our economy resulting in more factories being built and also increase in demand of cars has result in increase of emission of CO_2. Therefore ,"the continued increase in the atmospheric concentration of carbon dioxide due to anthropogenic emission is predicted to lead to significant changes in climate change" (Cox, Betts, Jones, Spall&Totterdell:2000). Climate changes have drought which is causing shortage of water in South Africa.

Rural areas depend on underground water and the use of water pumps which are labour intensive. The manual operated pump is not user friendly because it needs people who have a lot of strength. This reason makes it not to be user friendly for elderly people.

The main reason for the project is find how we can we use Solar energy to run the water pump and make it easier for people to have access of water in the most efficient way and also to have reservoirs of water for the people in rural areas.

Two ways to use the solar panel: one using solar panel to operate the lifting of water bucket in well. It will make it easier for elderly people since the Sun will charge the cell in the solar panel and it will charge the battery. The battery will provide current to the electric motor which will spin the winch system that will be holding the rope so that it can take it downward and upward. The alternative way is using water pump that is similar to hand-water pump currently used in rural areas. Instead of using human effort, this water pump will be automatically operated powered by solar energy.

The cost components of solar water pump are more expensive than that of manual operated water pump. However the components of solar water pump last long and they make pump easier to use. As compared to manual water pumps components that are cheap, replaced after short period of time and they make pump difficult to use.

To secure or protect panel from being stolen, it was suggested that the panel be placed at the chief's house and wires to be deeply hidden underground. The other way of making sure that the solar pump is protected is to place the community in charge of it.

In conclusion; it is recommended to use solar energy water pump than the manual operated water pump because it is user friendly, more upgraded parts, labour free and ozone friendly.

8 Acknowledgements

The authors will like to thank Unisa College of Science, Engineering and Technology for inviting them to be part of the summit. Special thanks to the mentors from Unisa for a great time and learning experience. Lastly, a special thanks to Mr R. Moledi from Daliwonga Secondary school for coaching, teaching and building us for the past two years.

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Electricity Generation form Microbial Fuel Cells

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Abstract -*In this paper we will highlight the challenge we are facing in terms of alternate energy sources. Also the problems we face as a nation in current energy sources. We investigate microbial fuel cells as a renewable and eco-friendly energy source. By making our own cell, we show that it is possible to generate electricity from mud.*

Keywords: Microbial furl cells, electricity

1 Introduction and background

As we all know South Africa uses coal and nuclear reactions to produce electricity. Coal and uranium are none renewable resources and it will run out. The use of Coal has many disadvantages like air pollution, and produces carbon dioxide that is a greenhouse gas that causes global warming and that is partially why we have been experiencing these extreme weather conditions. Nuclear reactions puts us at risk to dangerous radiation, when natural disasters threatens the conditions in these power stations. South Africa has also been experiencing water shortage. When electricity is produced water is heated to produce steam .This steam turn turbines that are connected to the generator. Although water is recycled there is still water loss.

Microbial fuel cells is a reliable source of energy which is eco-friendly which does not deplete natural resources such as water It does not consist of chemicals that are harmful and poisonous to our environment, but small microbes that exits naturally in soil/mud.

A microbial fuel cell (MFC) is a devise that converts chemical energy by the action of microorganisms. Electricity is produced by microbes which decomposes organic matter [1]. This organic matter can be plant or animal material that are present in soil, Most MFCs contain a membrane to separate the compartment of the anode (where oxidation takes place) and the cathode (where reduction takes place). The electrons produced during oxidation are transferred directly to an electrode or to a redox mediator species. The electron flux is moved to the cathode. The charge balance of the system is compensated by ionic movement inside the cell, usually across an ionic membrane. The organic matter is a source of energy to the microbes. Electrons, CO_2 and protons are produced at the anode. Other electron donors have been reported, such as sulpur compounds or hydrogen. The cathode reaction uses a variety of electron acceptors that includes that reduction of oxygen as the most studied process. However, other electron acceptors have been studied, including metal recovery by reduction, water to hydrogen, nitrate reduction and sulfate reduction [2]. In our case we used zinc and copper.

2 Methodology

Investigative question: Can mud produce electricity?

2.1 Materials

- Galvanometer
- LED
- Wire
- Copper Electrode
- Zinc Electrode
- Soil
- Foam cups
- Hand gloves

The soil which we used was collected from the bank of a pond. It was evident that the pond contained sewage water. Making sure there is a supply of microbial food (fuel) will sustain the cell, as well as putting the electrodes closer to each other improves the efficiency of the cell.

Zinc is more reactive then copper and it is oxidised

$Zn \rightarrow Zn^{2+} + 2e^-$

The zinc electrode is the anode.

At the copper electrode hydrogen ions are reduced to hydrogen gas: $2H^+ + 2e^- \rightarrow H_2$

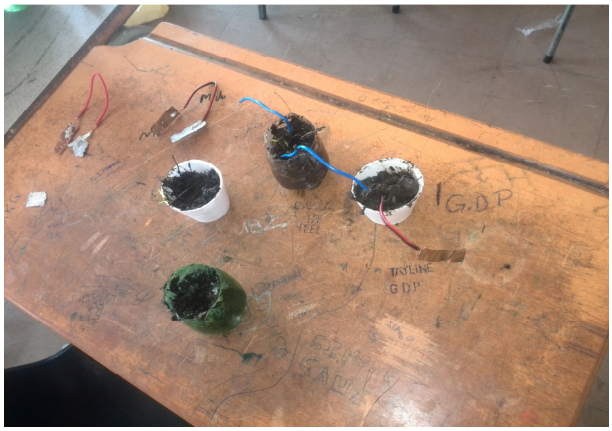

Figure 1 : Experimental set-up of microbial fuel cell

2.2 Method

- Fill containers with mud using gloves
- Connect wires to electrodes
- Insert a copper and zinc into one container
- Connect circuit : zinc to copper just like a battery

Safety precaution: Wash hands with soap after investigation. E-coli and other microbes causes diarrhea.

3 Results

pH of soil: 3

Voltmeter: no reading
Galvanometer: small reading

The current produced by the cell was enough for the LED to light up.

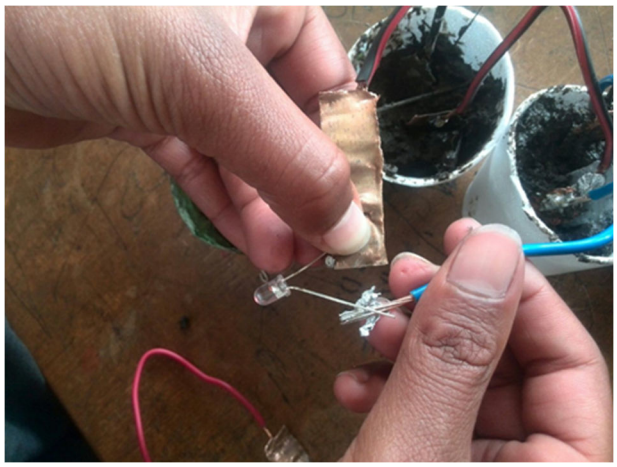

Figure 2 : Current produced from microbial fuel cell could light up an LED

The low pH of the soil proves the high concentration of H^+ due to the following possible reaction.

$$C_{12}H_{22}O_{11} + 13H_2O \rightarrow 12CO_2 + 48H^+ + 48e^-$$

4 Conclusion

Based on our experimental findings, we can conclude that microbial mud can produce an electric current.

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1. Nosipho Nqweliso [1]
2. Mercy Jacobs[1]
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The Utilization of Social Media Amongst Teenagers and the Impact it has on their Studying Hours

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Abstract – *We collected data on the use of social media from seventy randomly selected learners from Vukani Mawethu secondary school. This was to investigate how the learners use the social media to their benefits.*

Keywords: Social media, teenagers, school work

1 Introduction

New developments in the technological world have made the social media an innovative way for individuals to communicate. School learners are the most frequent users of the social media. They use different social sites such as WhatsApp , Facebook etc. We investigate how the use of social media benefits the students and how much time is spend on issues with no direct use to educational needs.

2 Objectives

The purpose of the study was to investigate the usage of these social sites, the average time spent on the sites, and the effects of these social sites on study hours.

3 Methodology

The data was collected by interviewing seventy learners randomly selected from our school. The decision to collect data from our school was based on the fact that time and cost was of essence. The knowledge of the school enabled us to conduct the interviews with ease. The questionnaires were distributed to the seventy learners who completed and returned them on time. This was done to allow for confidentiality of interviewees. Questions on age and gender were included in the questionnaire.

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4 Results

4.1 The usage of social sites

The findings indicate the use of social sites falls into two categories. One, the learners use the social media to discuss about School based information, which means that learners communicate about their schoolwork. They create group chats to remind each other about upcoming class tests, homework, motivating one another and being a helping hand to their friends. The fore mentioned indeed implies productive utilization of the social media, which should be encouraged. The second use of social media is where the Learners participate in programmes such as learn Xtra on Facebook.

In this category, the learners use the social media for activities that are mainly about fashion trends, latest updates on music, celebrities and gadgets. As for girls, they talk about 'Umgosi' gossip and about love life. Though these activities are encouraged, the concern would be the time spent on them to the detrimental of school activities.

4.2 The effect of social media

The findings indicate that 69% of the learners admitted that the frequent usage of social sites affects their academic performance.
"A problem identified is a problem half-solved"- Braimoh Bello. This is a worrying trend and interventions on how to reduce time spent on social media, which does not involve the academic activities is required. It was encouraging to find that 31% of the learners showed a positive response, indicating to have discipline on the use of social media. In addition, they involved their parents in the schoolwork and this gives them more time to spend on social media.

Fewer learners, 16%, relied on Facebook and WhatsApp because it is cheap, safe and saves time to travel. The level of communication among the learners is significantly as 84% of learners indicated. The form of communication being through calls, SMS and verbal (meeting their friends).

4.3 Data analysis

The data from the seventy learners surveyed was subjected to the analysis. Figure 1 presents findings on the chats and discussions among learners in grade 8 to 11 and the matrics, communicated via Facebook and WhatApps. It is surprising to

find that the matrics spent most of their time on social activities instead of school-based activities. This does have effect on their performance in the matric examination. It was only in grade 10 that use of social media on school-based activities surpassed the social activities. The habit of using social media more on social activities than on school based activities begin early once the pupils join the high school as indicated in grade 8. Combined effort involving the teachers, parents and learners is required to address this unproductive trend.

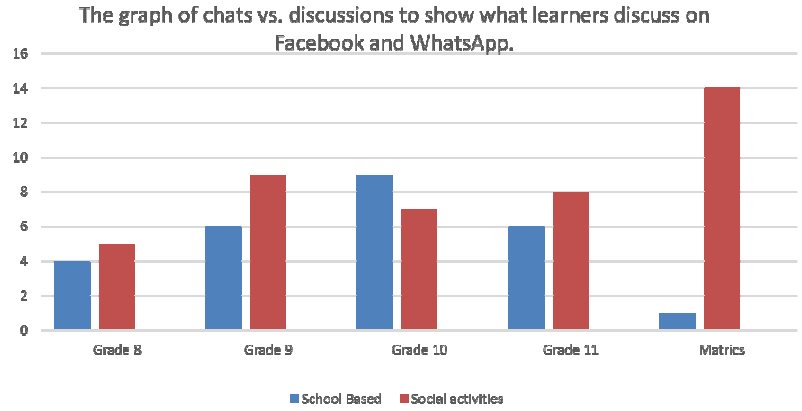

Figure 1: Chats versus discussions via Facebook and WhatsApp.

Questions on how learners communicated and effects such communications affected the school activities were analysed. Figure 2 (a) presents the alternative ways of communication whereas figure 2(b) presents the effect of such communication. The findings suggest that not many learners use the social media for communication as only 16 % indicated so. However, 31% admitted their academic work to have been affected by the use of social media. Further investigation is suggested to find if it is true that 69 % did not have their academic activities affected by the use of social media.

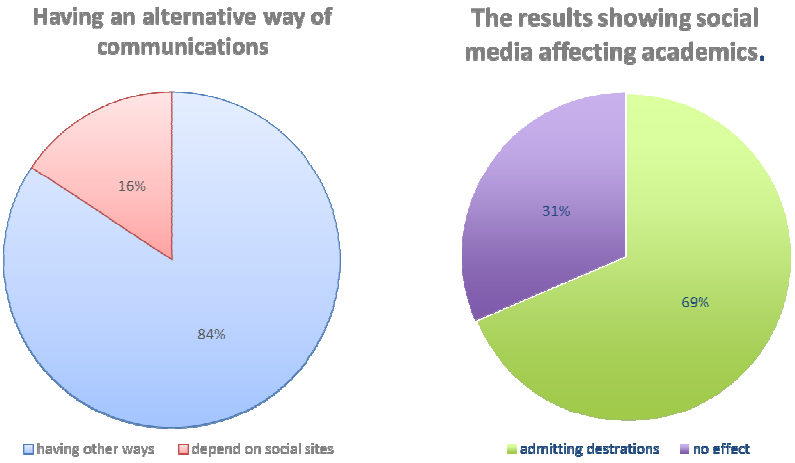

Figure 2 (a): An alternative way of communication; (b): Effect of social media on school activities

Investigation on time spends on social sites provided results presented in figure 3. The finding indicates that most learners are on social media from 8pm -10pm and 3pm – 7pm. A few carry on to the night upto 12pm. This definitely has effect on the learners' health and productivity. The time when they are supposed to be doing their homework and also sleep is wasted on social media activities.

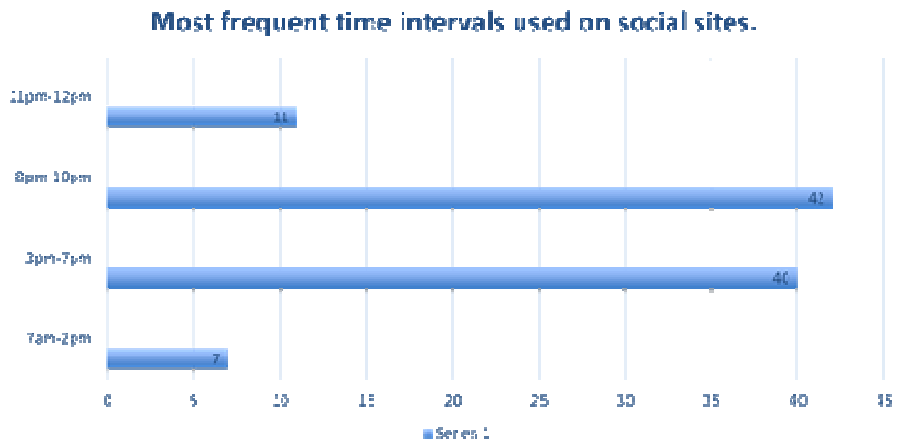

Figure 3: Time spent on social media

4.4 Frequent time interval usage

We summarise on time spent on social media activities that have effect on the academic below:

- 7am-2pm
  7% of the learners use Facebook and WhatsApp during school hours.This shows that teaching and learning to these learners is not effective, and this affect their academic performance.
- 3pm-7pm
  40% of the learners use social media at these hours. This reflects that learners do not give time to their home works, do not participate in any sporting activities. This narrows down the sporting development of our country.
- 8pm-10pm
  42% of the learners use social media at these hours. This is an appropriate interval, as you are done with your school work or you are from the gym, practice etc. just checking up on your friends.
- 11pm-12-pm
  Surely these learners do not get the average sleep of 8hours and this will affect their concentration at school.

5 Conclusions

The effect of social media on schoolwork is of great concern as the findings indicated. It is clear that learners spend more time on social activities rather than school based activities. In addition, the time spent on social media does affect both the health and performance of the learners. Interventions from the education ministry, teachers and parent are urgently required if the performance of the learners has to be improved. The ripple effect is the universities well continue to receive undisciplined students who are not well prepared academically.

Recommendations

Parents are advised to set strict parental guidance on the use of social media for social activities for their wards. The education department should also set guidelines to enable learners use the social media for academic activities.

6 Acknowledgements

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7 References

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Event photographs


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