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COAL

How long can it survive pressure to phase out?

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WELCOME

...to the 11th Issue of the freshly re-designed Green Business Gazette.

GREETINGS to all our readers! It is very clear that the pandemic is not going away anytime soon. We may have to live with it after all. Despite the fact that had to brace with the pandemic for the last two years, the environment remains key to our survival. It is easy to forget the fact that environmental sustainability is the cornerstone of human survival. In this edition - Issue 11 we enter into the coal debate.

Increasing pressure has arisen related to the banning and phase out of coal. Some pundits prefer a total ban whilst some prefer a phase down. We are all aware of the negative effects that coal has on the environment, including instilling the greenhouse effect. What happens to countries which have a high amount of coal deposits? This issue assesses whether a total ban is plausible or not. We wonder how long coal will survive given this renewed pressure and the emergence of clean energy solutions.

The ravaging effects of deforestation are explained in this issue as well as possible mitigation measures. Clearing forests for timber processing is a common phenomenon in many countries. Destruction of indigenous trees is a cause of a headache. Through conservation efforts, a lot of livelihoods can be salvaged. Some individuals survive on Non Forest Based Timber products such as mopane worms and honey.

Issue 11 zooms into the heat waves which are happening in the Hwange area and their impacts on underground thermodynamics. The process of deforestation is also explained in this issue, as well as the key solutions to solve this problem.

Environmentalists are increasing pressure and advocacy against the use of single-use plastic. The reality on the ground is that the toxicological effects of plastic usage are on the rise. Governments and stakeholders the world over, require alternatives of dealing with plastic as well as materials to use in packaging. How long can we continue, when animals are dying through suffocation from plastics? How long can we watch and wait? The writing is on the wall especially for single use plastic.

The Green Business Gazette welcomes key stakeholders with materials to share in the publication to come forward and be involved. Tell us your success stories and conquests in the area of sustainable development.

We have a special School's programme coming up to feature environmental initiatives of schools and academic institutions. Feel free to engage and tell us your stories. This programme is meant to strengthen relations between private sector and academia on environmental affairs.

Enjoy your reading experience.

Tawanda Collins Muzamwese
EDITOR-IN-CHIEF

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ON THE COVER

Coal Production and Transortation. This issue poses the question on the banning and phasing out of Coal.

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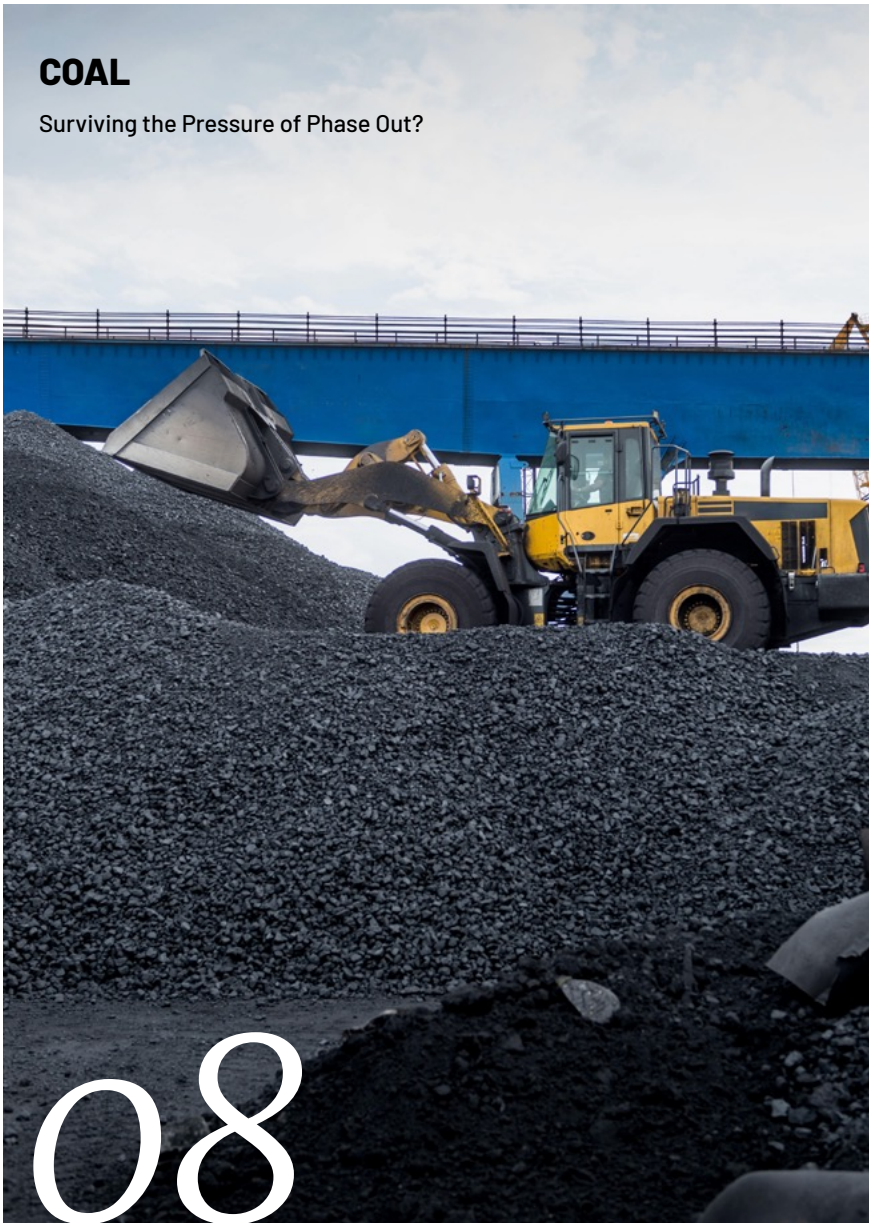
We wonder how long coal will survive given this renewed pressure and the emergence of clean energy solutions



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Deforestation

The Impact of Deforestation on Livelihoods

HOW LONG CAN COAL SURVIVE THE PRESSURE OF PHASE OUT?

■ Wadzanai D. Manyame

The corner stone now being cast away; the era of coal is coming to an end. Coal no longer has room in the sustainable low carbon future train that is about to take off. It is a source of energy that has contributed greatly to the industrial revolution. One that has seen the growth, development and prosperity of the world but has proven to be the dirtiest source of energy and it's time its use comes to a halt. It has served its purpose, a bittersweet one, that has contributed immensely to devastating repercussions which are currently posing a threat on humanity, climate change. According to the International Energy Agency (IEA), coal is responsible for more than 30% of the average world's temperature increase above pre-industrial levels.

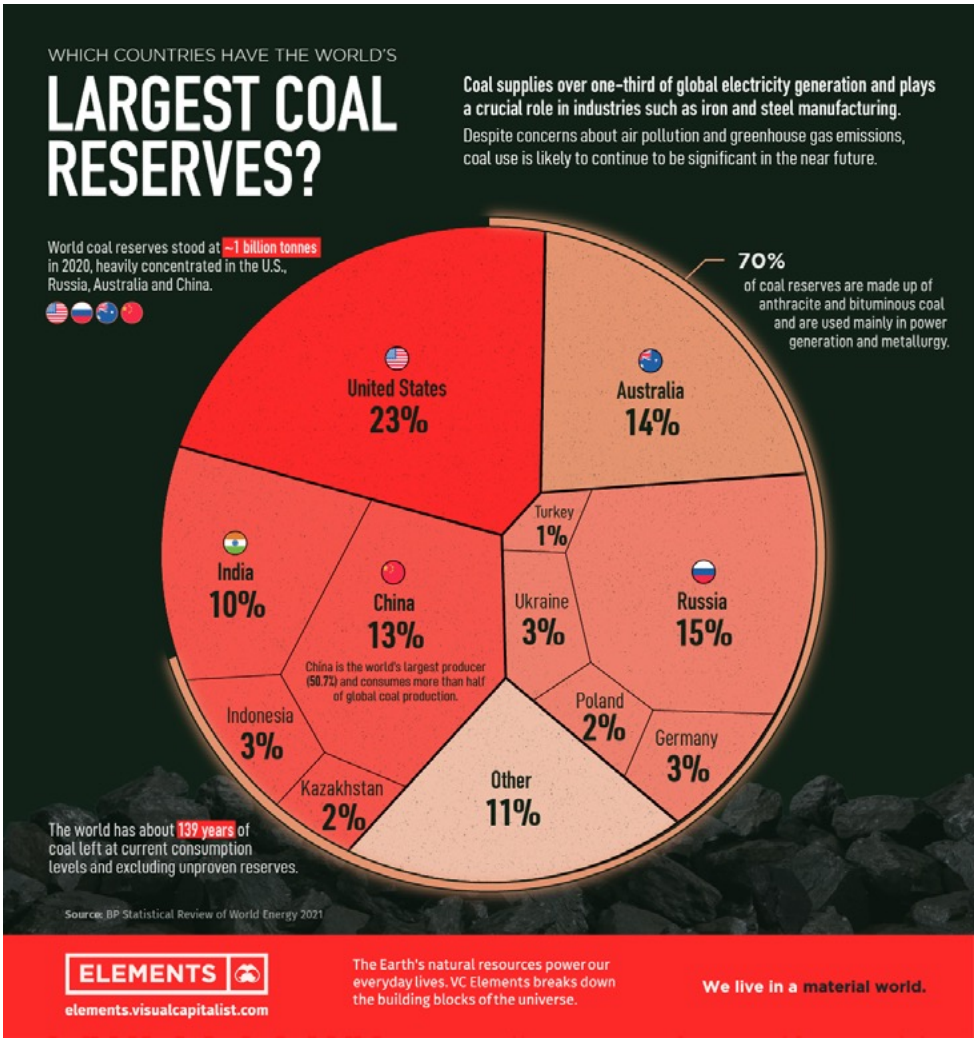
Cities and towns that stand tall and high today were initially build on energy from coal. Billion and multi-million-dollar industries dominating the world now began with nothing but coal as the main source of energy. Countries across the globe down right to Africa have known coal usage as form of energy to power transport systems, industries and provide electricity for the countries' citizens. Upon the realization of the reality of climate change and how devastating its impacts can be, countries have individually made resolutions to cut off on fossil fuels and embrace green energy. Parties under the United Nations Framework Convention on Climate Change (UNFCCC) convene every year to discuss matters pertaining to climate change and how the world can unite in the fight to combat climate change. Coal has been identified as one of the major culprits. A revolutionary agreement was made in Paris in 2015, termed the Paris Agreement. The Paris Agreement aims to strengthen the response to climate change and to manage the increase in global temperatures and to limit its increase to 20C above preindustrial levels and pursue limits to limit it further to 1.50C by the end of the century.

Parties to the UNFCCC have a mandate to work towards the Paris Agreement by ensuring the reduction in emissions at national level. Through the Nationally Determined Contributions (NDCs), parties have set out their intentions and plans to work towards emission reduction. Greenhouse gas inventories have been done across the globe and still fossil fuels, coal mainly have been identified as some of the major contributors to greenhouse gas emissions with 14.7GtCO2 released from coal in 2018, according to the IEA. If unabated the these will continue to rise. For hundreds of years, emissions were being released and accumulating steadily, a chronic effect is now being felt eventually and it is like a cancer. Drastic measures are being implored to achieve emission reduction needed to limit temperature increase by 1.50C. Hence the call to 'phase out' call or maybe how some would like to term it, 'phase down' the use of call because the emissions need to fall twice as fast if the 1.50C limit in temperature increase is to be achieved.

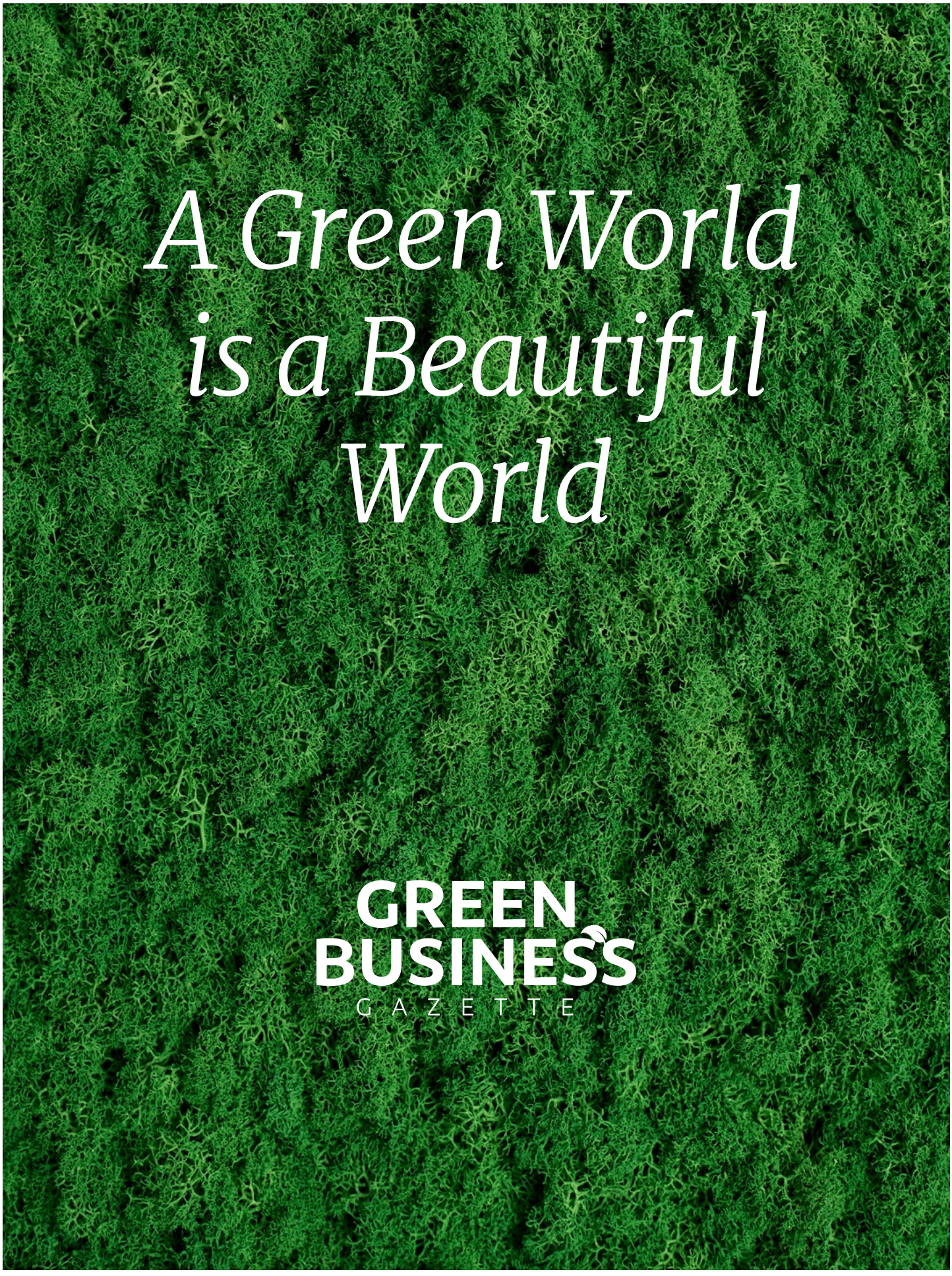
At COP 26 in November 2021 in Glasglow Scotland, a resolution was made at the to abandon the use of coal as it has proven to be a carbon intense fossil fuel. At least 23 countries adopted new commitments to phase out coal power and this included 5 of the world's top 20 coal power using countries. Major international banks, countries and public institutions have committed to ending public financing and support for unabated fossil fuel energy by 2022. No new coal power plants are being supported and this could shift approximately $17.8bn a year in public support out of fossil fuels to clean energy. Targets have also been sets and these state that there must be a fall in global coal usage in electricity generation by 80% below 2021 levels by 2030, Organization for Economic Corporation and Development (OECD) countries should have completely abandoned coal usage by 2030 and all coal fired stations must be shut down latest by 2040. The possibility of achieving these targets is yet to be determined as time progress. Currently, a 76% drop in the number of new coal plants planned globally since the Paris Agreement was adopted has been noted. This equally amounts to a loss of more than 1000GW renewable energy power plants would have to make up for.

Coal is a natural resource and is available in abundance in countries such as South Africa, Australia and Indonesia. It is one of the cheapest sources of energy and its export and business has earned developing countries like Zimbabwe some form of revenue. There are the G20 countries, those that have relied and benefited from coal exports and consumption for centuries. Examples of these are South Africa, Australia, China and India. China is one of the countries supporting the phase out of coal but just as what Nick Ferris stated in his report in January 2022, making a commitment is one thing and delivering on them is another. The question then arises, are they going to easily let go of coal and fully embrace renewable energy? Japan for example following the Fukushima case in 2011 has solely embraced the use of coal after neglecting nuclear power. With high population rates and increased demand for goods and services as well as the thirst for economic development, the demand for electricity keeps soaring and its surpassing that which can be provided by renewable energy only especially in developing countries. The use of coal then remains as the next available option to manage the situation. This is evidenced by a report by the IEA published in December 2021, which showed that coal was still substantially being used to generate electricity.

There are other factors that should not be overlooked that may affect the rapid phase out of coal usage by different parties in the world. The contradiction between factors that improve the quality of life of citizens in the developing world. The need to alleviate poverty, the need to develop economies and build adaptive capacity. A country like Zimbabwe is trying to build an upper middle-class economy for the benefit of its citizen by 2030. It cannot afford to readily invest in renewable energy and has to rely on donor funding. Instead, it can afford to utilize the large coal reserves, an estimate of about 30 billion tons in 21 known deposits which can last up to 100 years, it possesses to run its energy and manufacturing industry. Some of it can be exported to gain revenue and build its country which in turn will allow it to have some form of adaptive capacity. This means that for a few years or even decades the use of coal will thrive.



However, the world is a global village. Despite the local use in each country to meet its demands for electricity generation for the citizens and development there will come a time when a strain will be felt. Due to the fact that some parties have agreed to stop funding anything related to coal this will negatively affect those that will stubbornly remain in the coal industry, in the long run. International support in terms of funding, machinery for maintenance, consumers, expertise and skill will start receding and, in the end, coal will just be an abundant unexploited resource.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IS IT POSSIBLE TO COMPLETELY PHASE OUT COAL?

Tendai Guvamombe

The question on whether Zimbabwe is yet to completely phase out coal or not, will largely depend on verifiable actions put in place as a way of determining the extent at which the country is honouring its pledge to reduce carbon emissions in line with the Paris Accord of 2015. In the same instant the systematic actions are expected to avert the likelihood of major setbacks associated with the just transition phase. This article seeks to unravel various scenarios and pathways that are associated with the subject matter, particularly on Zimbabwe's readiness to abandon coal in the context of 'Just Transition' mode.

The call to phase out coal became prominent and worthwhile to debate on, following the resolutions passed during the Paris Agreement, a 'historic agreement' of 2015 which is now binding all nations to urgently act towards reduction of greenhouse gas emissions. Essentially, coal is a carbon emitting substance and has been for decades categorized as a major source of energy in the developing worlds. Following the agreement, most Nexus 1 Nations (Developed Countries) quickly moved the motion to decelerate the demand for coal with European Union taking a lead role in stopping the financing of coal related projects. By doing so, the move sounded a bit more awkward to the developing world who are still in the futile stage of embracing the 'Just Transition'. This might be attributed to a number of factors ranging from lack of political will, the transition gap with the developed world, climate financing issues, green investment plans and economic doldrums among other factors. Zimbabwe's readiness to abandon coal has been a topical issue for the generality of citizens and relevant stakeholders in the climate change circles. This emanates from pieces of legislation put in place to the level of adherence with regards to walking the talk on policy implementation and adherence.

Currently, Zimbabwe gets much of its electricity supply from Kariba Hydro Power Station and Hwange Power Station and these two have been failing to proffer enough energy supply countrywide. Statistics flighted on Zimbabwe Power Company's online portal indicate that depending on water inflows into the Lake Kariba, the station can generate a maximum of 5000 GW with a load factor of 80 percent. Hwange Power Station, the largest coal-fired power station has 920MW installed capacity which comprises of 4x120MW and 2x220 MW units. The Hwange Colliery Company has a conveyor belt that measures 3.5 kilometres (2.2 mi) long and brings about 1,750 tonnes (1,750,000 kg) of coal per hour from the nearby Wankie Colliery open cast mine. 250,000 tonnes of coal are stockpiled on site.

This informs the amount of carbon emissions that are constantly emitted during energy generation processes. However, the energy production at the power station has seen more energy being lost during power generation as compared to the amount being consumed. The improper modus operandi has been referred to as energy inefficiency by energy experts in the country. This therefore, inevitably calls for a quick transition to cleaner and safer energies. Nevertheless, calling for an abrupt end of operations at the Hwange Power Station might create power deficit for the country, especially in the absence of green investments to further the highly anticipated 'Just Transition'. In an interview with Africa's revered Climate Change technical expert and Climate Negotiator to United Nations Framework Convention on Climate Change, Veronica Jakarasi Gundu said that the country has a lot of opportunities that might add value in ensuring a transition towards cleaner and safe energy such as hydro and other forms of renewable energy.

"The 'Just Transition' in developing countries might depend on climate finance issues, for instance in Zimbabwe we can talk of a successful transition looking at our ability to upscale hydro projects and maximum utilization of other forms of renewable energy in the country." However, the pace of green investments in the country started on a gradual pace thereby limiting the chances of a successful transition. The government at one point went at crossroads with environmentalists following the moves to expand the Hwange Power Station at a time when the globe is calling for an abrupt end to the use of coal and fossil fuels. However, the government's moves were informed with the justification that the expansion of the plant had less effects on country's emissions profile since it was reduced in size from the intended plan.

Lawrence Mashungu, a Climate Change Mitigation and Energy Finance Expert reiterated that the transition from coal to other forms of energy would require a smooth and gradual flow until all sectors are fully equipped with the latest recommended modes of energy. "We cannot abruptly switch off Hwange Power Station because our renewable energy plans have to mature first. When this happens, there will be a smooth switch from fossil fuels. It's a learning process for everyone involved, and we are hopeful we will get to a stage where we are fully utilizing renewable energy." The quest to ensure a successful transition is enshrined in the launch of popular documents such as the Low Emissions Development Strategy (LEDS), Renewable Energy Polices and Draft Energy Efficiency Policy among others. According to Tinashe Mangosho, the Country Director for Sustainable Climate Action Trust, pieces of legislation provide a path way towards a successful transition and might need a master plan backup in ensuring an adequate financing mechanism. "The polices are there, ranging from the Climate Change Response Strategy, the Low Emissions Development Strategy, the Renewable Energy Policy and many more. However, we cannot just abandon coal without having enough finances to make sure that we fully implement all these polices."

Recently, the local media newspapers published a story in which Zimbabwe and Zambia jointly started works on the Batoka Hydro Power Project. With the slow pace on the implementation of renewable projects, the chances for the country to effectively abandon coal might take a meandering pathway. This might also affect the country's reporting mechanisms and commitment on emissions reduction to the UNFCCC. The call to phase out coal has made headlines during COP 26 in Glasgow and is expected to be among top matters to be discussed during COP 27 to be held in Egypt Africa this year. The developing world is still at crossroads with regards to ensure transition from coal use against the anticipated timelines of phase out. The most probable move will have to see Africa's Climate Change Negotiators and Technical Experts interrogating issues of climate finance and support to the developing world in the upcoming Conference of Parties (COP 27). This will inevitably provide a way in striking a balance amid the "Transition Period".

IMPACT OF CLIMATE CHANGE INDUCED HEAT WAVES IN COAL MINING AREAS

■ Calvin Manika

The impact of climate change is affecting nations across the globe and it is naturally becoming part of the agenda for every conference. The situation is worse in the coal mining areas. Coal usage is being attributed to worsen climate change due to the increase in emission of greenhouses when burnt to coke or fueling power stations. The coal dust also affects the ozone layer. Hwange Colliery, the Zimbabwe largest coal mining company concession is bearing the brunt of climate change. The coal mining town for the past 3 years has been characterized by flash floods and heat waves which are some of the effects of climate change.

Hwange Colliery is the largest in the country, with proven reserves that are estimated to last over 1,000 years, at current production levels. This means the area is built on top of the black rock. The construction of infrastructure in Hwange demands expert technical advice and specialist structural engineering which puts the underground coal into consideration. This also calls for regular interval checks of the coal bed and rock mechanical analysis. Hwange is under agro-ecological region four of Zimbabwe. The region used to receive an average rainfall of 450mm-600mm per year during the 1980s but there had been notable changes due to the impacts of climate change and global warming. Seasonal dry spells are however rife in the region. According to the Hwange Sanyati Biodiversity Corridor (HSBC) Project Environment and Social Management Framework which the government of Zimbabwe is implementing together with the Global environmental Fund (GEF), seasonal droughts are also characteristic of this region due to the impact of the Botswana Upper High (BUH) from the Kalahari Desert. Rain received this region is mainly conventional since it comes as a result of the southern frontier of the Inter-Tropical Convergence Zone (ITCZ).

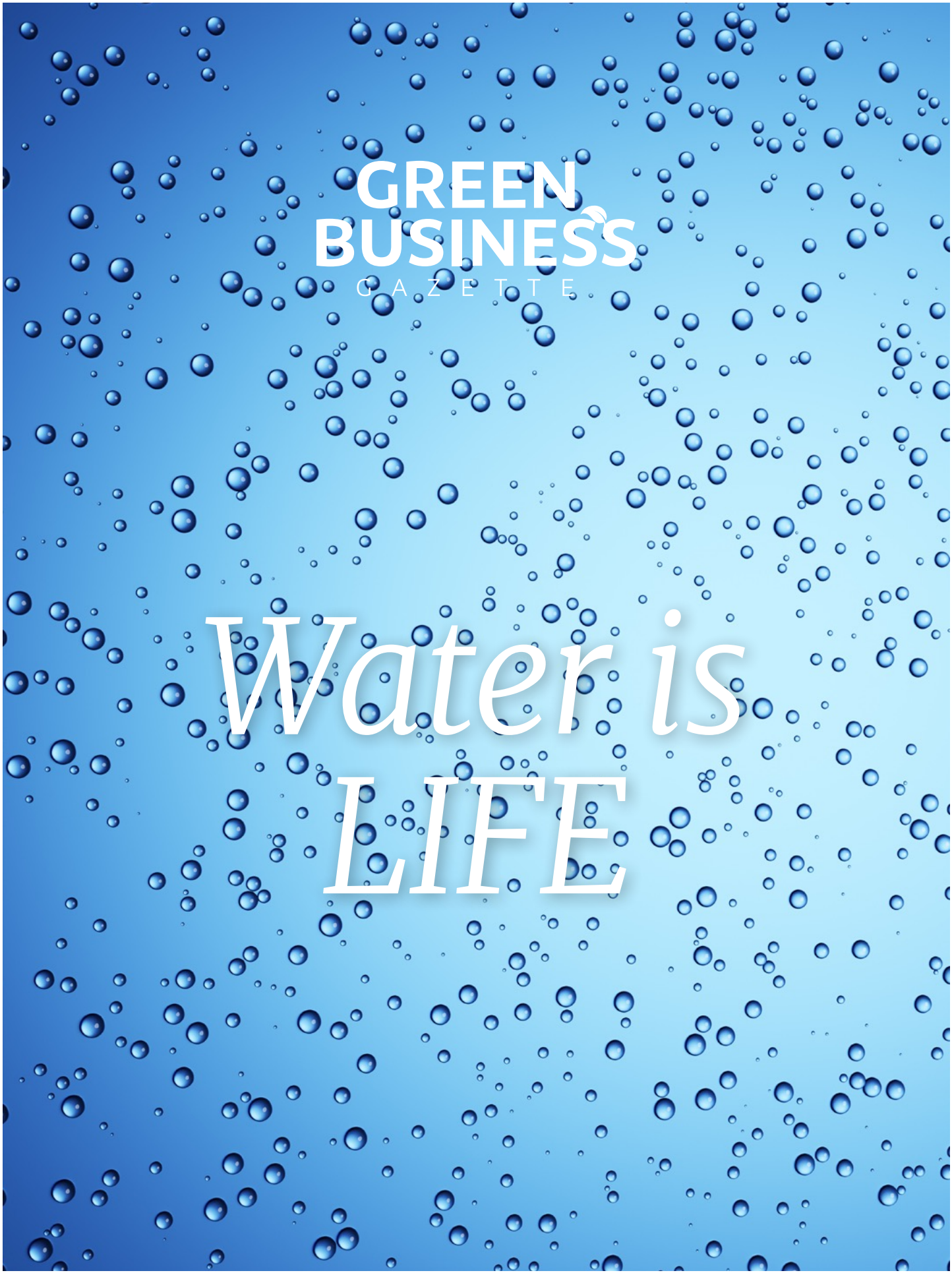
Temperatures have significantly increased over time in Hwange with heat waves being recorded since the 1990s. According to the Meteorological Department, Hwange receives on daily basis an average maximum temperature of 34.19˚C, minimum temperature of 33.96˚C. The high temperatures have often resulted in heat waves and heat stress in the region. The temperatures soar higher during the summer accompanied with steady winds, but sweltering effects. Worldwide severe heat waves have caused catastrophic crop failures, thousands of deaths from hyperthermia, and widespread power outages due to increased use of air conditioning.

A heat wave is an extreme weather condition that can be a natural disaster and a danger because heat and sunlight may overheat the human body. To be considered a heat wave such a temperature should last at least one day, but conventionally it lasts from several days to several weeks. The spell normally has the maximum shade temperature reaching or exceeding 90 °F (32.2 °C). But, it depends with the area. In the recent past, Hwange residents have alleged heat waves to be contributing to underground coal fires. Residents say nothing is amiss to them as temperatures they are experiencing during both day and night are extremely hot. "One cannot get used to the high temperature we are experiencing. It's now a double tragedy. When it rains it storms and flash floods are experienced, after that we return to our normal everyday life of heat waves. Underground coal is absorbing the heat, some infrastructure like roads are cracking and coal seam fires are seen beneath," said one resident.

In 2021, an 8-year-old child who had gone to relieve herself in a nearby bush was swallowed by the earth when the ground she was standing gave in. She was immediately rescued but was severely burnt by the coal seam fires. After a month she succumbed to the wounds. The incident caused tension between residents with the Hwange Colliery Company Limited (HCCL), with the later saying the area was private property and the victim was a trespasser. The concern of the stakeholders and residents was beyond the legal structure of Hwange Colliery and its properties. A proactive measure was set in place by the company to prevent coal seams fires in the face of severe heat waves and the reaping of roads and other public areas by coal fires. Coal-seam fires can be ignited by self-heating of low-temperature oxidation, lightning, wildfires and even arson. Coal-seam fires have been slowly shaping the lithosphere and changing atmosphere, but this pace has become fast and extensive in these modern times, triggered by enormous mining activities.

On December 24 2021, the Hwange Colliery Company Limited (HCCL) issued a press statement on underground fires. The company said it was alive to the underground fires in its concessions. The company said it will continue with awareness campaigns in schools and community. "Temporary measures such as road diversions to Number 3 village, barricading as well as placement of signage at the affected areas will be taken. In addition, HCCL has invested in a drone that has a thermal camera for security purposes and identification of underground fires. As part of a long-term plan Hwange Colliery engaged a German based specialist company to assist in the necessary interventions. DTM is the only company which offered its services for managing the fires using modern and cost effective methods among other companies which HCCL consulted, "said HCCL in a statement. The meteorological department always warns of dangerous temperatures in Hwange. Particularly high overnight temperatures have robbed many heat-struck regions of much-needed respite, and more sweltering forecasts always lie in store.

An environmental watchdog, Centre for Natural Resources Governance (CNRG) in its 2017 independent Environmental Impact Assessment (EIA) report noted that trees and plants are dying because of the underground heat emanating from coal burial, whilst mining-induced subsidence without adequate prevention or repair measures, often results in the abrupt sinking of the ground surface, destroying the ecosystem, roads and killing both humans and animals.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SINGLE-USE PLASTICS PRESSURE MOUNTS — AS TOXICOLOGY GROWS

Tawanda Collins Muzamwese

Organisations whose products and services are based on single-use plastic are increasingly getting under siege. This is due to the vociferous anthems of the environmental effects of plastic from the scientific and civil community. It is well known that plastic supports a great chunk of packaging, retail, manufacturing and other industries. Particularly the single-use plastic has been touted as an environmental nuisance

Some of the key attributes of single use plastics relate to being non-biodegradable, effects of biodiversity "flora and fauna". When some animals swallow plastics, they die painful deaths including through inflammation of their stomach. Entanglement, suffocation and obstruction are other causes of fatality. Responsible behaviour should spurn us towards alternative materials

It is essential to first take stock of some of the major sources of single use plastics. A plethora of uses include packaging materials in retail and clothes shops, containers in restaurants, straws, beverage containers which are made from plastic. However, it is not all of them which are toxic.

Promising rays of innovation are beginning to emerge in hospitality sector where glass is being preferred again in comparison to single use plastics.

Countries have responded differently to the problem of single use plastic. Others have gone for blanket bans of plastic bags and single use plastic. In the other stream of other countries economic instruments such as taxes on plastics, subsidies on alternative materials as well as instituting deposit refund systems. When burnt, plastics can release toxic fumes which can interact with human health and safety. In addition, the release of toxic furans, dioxins and benzofurans persists in most countries.

The main challenges related with actions to deal with single-use plastics is the lack of alternatives in many countries. Where they exist, the alternatives are expensive. Stakeholders must come with collaborative solutions to the problem.

According to the Worldwide Fund for Nature (WWF), plastics kill 100 000 aquatic animals every year. This is a very high number of fatalities. The reality of continuing with plastic for a lifetime is a dangerous plunge into ecosystem suicide. Society must begin to transform into environmentally friendly lifestyles.

Nanotechnology which studies small particles and materials science are touted as some of the major breakthroughs which should lead us into a new innovative trajectory for packaging material. Green packaging should be undertaken if we are to attain sustainability. How long should we wait whilst the damage is done.

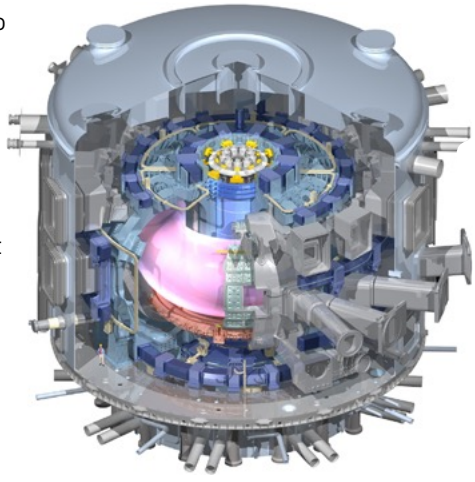
Restaurants too should encourage people to sit in, were it not for the COVID-19 pandemic. The future of humanity is in our hands and we need to begin to think about the future of single use plastic. The pressure from regulators continues to grow and pressure from civil society is also evident. Throughout this anxious time, the million-dollar question is how long plastic will survive?

COULD **FUSION ENERGY** BE THE SOLUTION TO LOW CARBON-LOW RADIATION ENERGY – AN INTRODUCTION?

■ Wadzanai D. Manyame

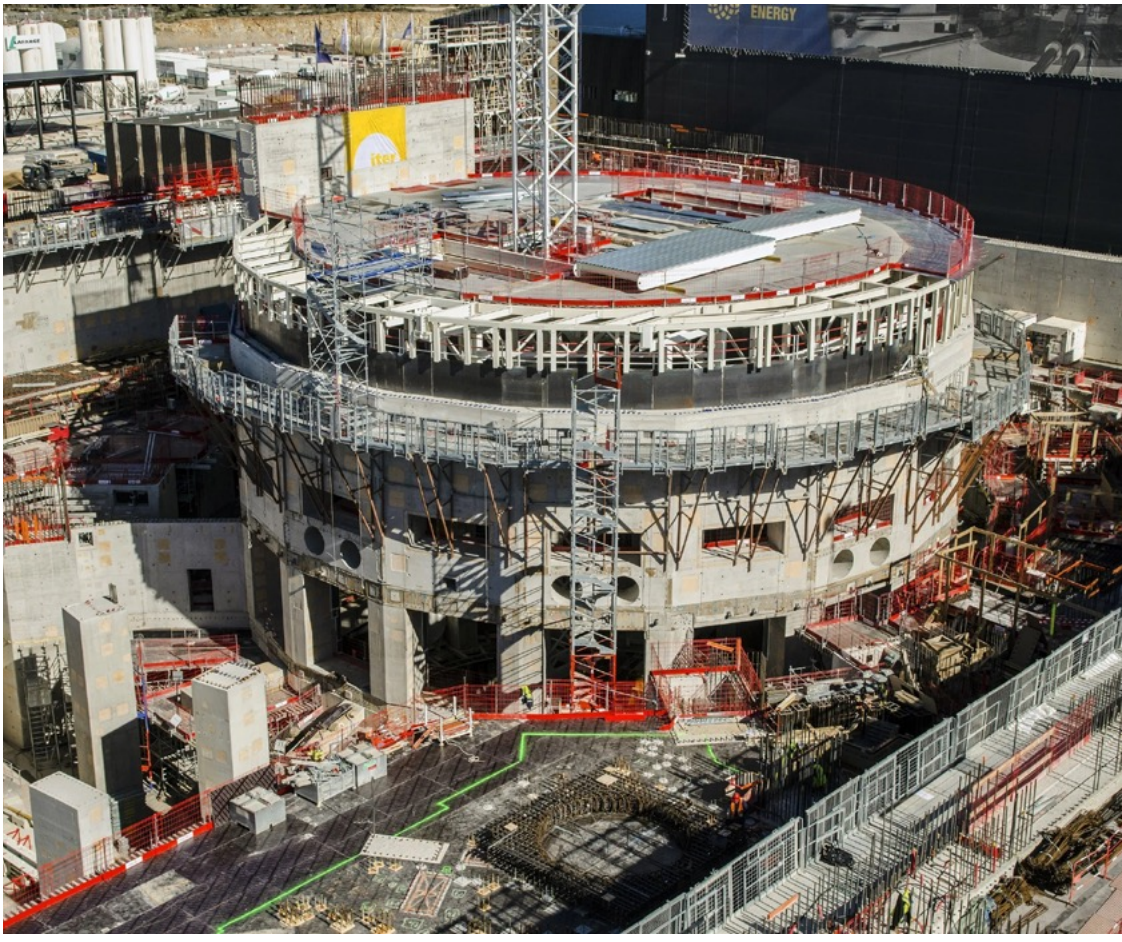
The say the best creation ever made on this earth is that of a human being. A creature born to take on a challenge endowed with the intellectual ability to think, calculate, analyze, reason and create. Just like any other creature when faced by a threat, human nature calls for a means to survive and safeguard its race. Climate change has left humanity with no choice but to ponder on ways to better the situation and make sure that the future is protected. As the world is working on ensuring net zero emissions by 2050, there is a form of energy that could be the absolute solution to carbon emissions. The creation of energy from fusion is no longer a pipeline dream. In fact, with each day that passes the physicists are getting closer to achieving the generation of what can be termed the cleanest form of energy which is low carbon and low radiation emitting.

Upon understanding how the sun is powered, physicists have taken to task to imitate the solar system in a laboratory. For decades, small scale experiments have been done to produce energy through fusion. The process forces together lighter atoms such as hydrogen to form heavier elements and release heat at very high temperatures. The fusion process occurs naturally at thousands of kilometers from the earth to power the sun and the stars. Millions of degrees Celsius are needed to make this process happen that is why nothing can get close to the sun before it melts. It is a universe's ubiquitous source of energy that is why efforts are being made to harness energy from it. The process is complex and daring but success stories are being written. Close to 5000 science and engineering experts from the EU, Switzerland and Ukraine are working on the difference technical challenges being faced in the designing and preparation of the equipment for fusion energy trials.



America and China too are building their own machinery to run tests and produce energy from fusion. Different material and technologies are being used but the concept remains the same.

The scientific principle of fusion is that large amounts of energy can be released by forcing atomic nuclei at temperatures above 100 million degrees Celsius. Two types are hydrogen isotopes namely deuterium and tritium are introduced into a doughnut shaped magnetic field where the fusion process takes place to form helium and release energy. The danger with fusion is the amount of heat introduced to trigger the reaction. No material can withstand such extremely high temperatures. This is where the magnetic field technique comes in to play, to prevent the heat from touching the vessel.
A devise called a 'tokamak' was designed to have a powerful magnetic field to contain the cloud of hydrogen gas. If a challenge is experienced in the fusion reactor the devise just stops and no astronomical heat will be released. Trials on the type of material to be used for the vessel are also underway. The approved metals to date are beryllium and tungsten which are 10 times less absorbent of tritium compared to those that had been initially used.



The first success story was written in 1997 by Joint European Torus (JET) where 22 megajoules of energy were produced. Lessons were learnt and many improvements were made and 25 years later a much promising result was obtained again by the UK based JET. 59 megajoules (11MW) of energy output were received from the fusion reactor after running for only 5 seconds. One can imagine the amount of energy that can be produced if the reactor is to run for at least 5 hours each day. Enough energy to power the whole world will be produced in just a matter of days. Scientists are optimistic that one day such a reactor which is resilient enough will be constructed and the energy production and supply puzzle will be solved. Decades of work need to be put in place and handed over from generation to generation.

Nations are investing billions of dollars in these projects. The world's largest magnetic fusion reactor is under construction south of France, the ITER. It has been envisaged that it will be ready for its first trial by 2025 and experts believe that it will have the scale needed to reach the net gain. The ITER is supported by a confederation of governments from the EU, the US, China and Russia. The challenge the physicists have to overcome with fusion energy is that, the reactor has to produce energy more than what has been introduced to cause the reaction. If this is achieved then the world would have made history never to be forgotten in the energy industry.

> The need for achieving net zero emissions is urgent hence the need for carbon free energy is also urgent.

Fusion seems to be the green card to a sufficient supply of clean energy but one the asks, will fusion energy be ready for use in time to slow down the progression of climate change?

IMPACTS OF DEFORESTATION ON LIVELIHOODS

Sipho Graham Ndebele

A new born baby has to draw its first breath to survive, a grandmother in the village needs herbs to make medicine to boost her grandchild's health and to be able to do this there need to be an adequate supply of oxygen, plants and trees. Trees and forests are a key component of our ecosystems. They provide us with oxygen, medicine, food, shelter and climate regulation. Our livelihoods are supported and sustained by natural resources that we obtained from the environment. The environment can be defined as surroundings in which an organism operates including air, water, land, natural resources, flora, fauna and their interrelationships. The environment is based on inter-related elements and systems. Any alterations or effects generated from one element or system have implications on the whole environment.

Trees and forests sustain livelihoods by providing natural resources and ecosystem services. To access shelter, timber is required in order to provide for building material and furniture. The health care and medical facilities make use of herbs and various vegetational resources to make different kinds of pharmaceuticals. Forests play a key role in the hydrological cycle through evapotranspiration. The rains that feed into our agricultural inputs and activities to produce food and ensure food security are facilitated by forests and trees. Through photosynthesis, forests are capable of capturing and sequestering carbon dioxide, a greenhouse gas that is contributing towards global warming and climate change. The ability of forests to capture and sequester carbon dioxide is a key solution towards withdrawing carbon dioxide from the atmosphere hence, combating climate change.

Our livelihoods' needs and demands are increasing daily due to population growth and unsustainable consumption patterns. These actions are exerting pressure on forests resources resulting in deforestation. Deforestation is the cutting down or clearance of trees and forests land without replacement of the extracted resources. According to the Food and Agriculture Organisation's (FAO) 2015 report, Zimbabwe loses about 330,000 hectares of forest land per year. This means that more than 60 million trees are lost per year. This figure is alarming and discomforting for future generation as they may fail to have a healthy ecosystem.

Deforestation is caused by a series of human activities. Expansion of arable land to advance agricultural activities results in the clearing of vast pieces of land. Demand for fuel-wood mostly in rural areas is also another factor which is pressuring forest resources. Urban expansion and population growth have also significantly contributed towards deforestation by clearing land for developing houses, roads and public infrastructure. Timber production for furniture, stationary, electrical poles and construction developments is also a serious threat to forest resources.

The earth is a system and its organisms and components are interdependent. Humans depend on forests for natural and organic resources whilst forests depend on our human activities for growth and development. Human activities are seriously contributing towards deforestation which threatens livelihoods especially the marginalised in rural areas including wild life and animals.

Deforestation affects the quality of livelihoods by contributing to land degradation through soil erosion which relatively reduces the outputs of agricultural products hence, resulting in hunger and food insecurity. People in rural areas depend on forests for fuel for cooking purposes, food for consumption and income generation by selling wood or breeding bees to sell honey. Deforestation erodes the resources that develop and sustain the livelihoods of local communities therefore, it results in malnutrition, poverty and conflicts.

Deforestation also reduces the biodiversity pool through habitat loss and disruption which push certain species towards extinction and causes ecosystem imbalance. According to the International Union for Conservation of Nature, the Formosan Clouded Leopard (Neofelis nebulosa brachyura), Paradise Parrot (Psephotellus pulcherrimus), Mount Glorious Torrent Frog (Taudactylus diurnus) and Javan Rhinoceros (Rhinoceros sondaicus) are some of the species that have been declared extinct over the past decades due to loss of habitat and food caused by deforestation. Farmers in Rusape, Zimbabwe depend on forest resources to dry and cure their tobacco produce. These actions reduced the forest land resources which made the area prone to external forces. Cyclone Idai greatly affected the Rusape region due to bare land and distorted forests which act as barriers towards strong winds and floods.

Deforestation is a global problem and in Zimbabwe it is of great concern because forests and land are key natural resources in terms of fuelling the economy and livelihoods. To curb and solve deforestation, communities need to practice afforestation on land which is bare and reforestation whenever one cuts down a tree. An important point to note is to shift towards sustainable and clean energy such as biogas and solar and managing consumption levels of paper and agricultural products, because the future of our livelihoods depend on the actions we take today.

ECO- FRIENDLY FUNERALS - THE READINESS OF ZIMBABWE FOR GREEN BURIALS

Calvin Manika

In the deep forests of Chitete, a village in Nyaminyami, Kariba, at a crowded homestead 6 pall bearers carry the body of the deceased on freshly cut logs from a Msasa tree, wrapped in a cotton blanket as they lead mourners to a village graveyard. Women ululate while sweeping the path with fresh tree branches cut from a nearby bush. Just behind the grave soil heap, a pile of fresh tree big branches is on standby to be used again as they fill in the grave. To visitors and strangers in the village the family is poor that it cannot afford a coffin. The truth is they can afford, but the deceased instructed an eco-friendly funeral – a green burial.

Zimbabweans and most Africans have customs they follow after the death of a loved one. With the increase and continued deaths of human beings more coffins are being used with most of them made from wood. The coffins are supplied by both registered and self-employed carpenters who make it difficult for government regulators like the Environmental Management Agency (EMA) and Forestry Commission to properly account for activities like deforestation. The mass production of coffins in Zimbabwe directly translates to the increase on the depletion of trees which is detrimental to the environment. Many countries mainly in the global North are embracing green burials to save the environment and mitigate the effects of climate change. In Zimbabwe and other African countries no eco-plans for green burials have been suggested so far.

Last year's COP 26 in Glasgow, Scotland was an opportunity for countries to map the way forward in reducing and combating climate change. Zimbabwe had the same opportunity to share their plans; conversely no proposal on green burials was heard. This is any activity which has not been seriously considered by Zimbabwe in the wake of increased deforestation, wood poaching and destruction of natural habitats in its forests. COP summits provide a forum which includes countries that are already reaping the benefits of 'living green and burying green', that Zimbabwe should learn and adopt. The majority of Zimbabweans conduct conventional burials in which mostly wooden and metal coffins are used. Few indigenous people and foreign residents in Zimbabwe opt for cremation. With cremation touted as an alternative, environmental experts say it is also a contributor to environmental pollution and is worse than the traditional form of burial. Conventional burial refers to the actual burial process. This means the opening and closing of the grave, the preparation of the remains, and the laying of those remains in the burial plot. Green burial refers to this process but also to the cemetery site in which the burial takes place.

Burials remain part of the funeral traditions but in a planet under threat of climate change where people are trying to find solutions to the protection of environment, new measures are being suggested including doing away with traditional coffins. According to the Green Burial Council, a green burial due diligence must be done in establishing the cemetery site after investigating aquifer and known water sources. The council says one body will decompose over a period of 4 to 6 weeks, realising about 12 gallons of moisture. In a typical green burial, the body is not cremated, prepared with chemicals, or buried in a concrete vault. It is simply placed in biodegradable container and interred in grave to decompose fully and return to nature. As a general rule, the ideal burial depth for optimal decomposition conditions is 3.5 – 4 feet

from the bottom of the grave to the soil horizon, which also guarantees an 18 – 24inch smell barrier that prevents animals, two and four legged both, from being able to smell anything.

During the conventional burial people usually dig six feet to inter the body. The six feet under rule for burial may have come from a plague in London in 1665. It is reported that, the Lord Mayor of London ordered all the "graves shall be at least six-foot deep." Gravesites reaching six feet helped prevent farmers from accidentally ploughing up bodies. The underdevelopment of rural areas and effects of economic depression coupled with Covid -19 in Zimbabwe has made many people to be not environmentally responsible. Electricity black outs in town and various rural activities make people wantonly waste natural resources such as tress for wood and other uses. In such an environment people will be not ready for the green change. Lack of proper education and advocacy by the environmental watchdogs is a fertile foundation for resistance by people on green burials, given than funerals are culturally conserved occasions which many Africans cannot temper with. In many countries burying a body without a coffin is a taboo.

Currently, there is no clear legislation in Zimbabwe to demystify myths and values attached to the burial rites. Some think that a sound environmentally aligned law and the involvement of traditional leaders and key stakeholders in communities can change the Zimbabwean and African perception on the burials. In countries which have started practising green burials, in the cemeteries, one will not find rows of headstones, manicured lawns or pathways to a loved one's final resting place. Instead, they stroll through forests set within more than a thousand acres of wilderness.

Speaking to the Stateline in the United States of America (USA) Jodie Buller, the White Eagle's cemetery's manager narrated how the burial is handled. "Bodies are placed in shallow graves among the trees, often wrapped in biodegradable shrouds, surrounded with leaves and pine needle mulch, and allowed to decompose naturally, returning nutrients to the soil. Grave markers are natural stones," said Buller. Conservation cemeteries like White Eagle, officially recognized by the Green Burial Council, the industry's certification body are still few and far between very few cemeteries. In Zimbabwe, there is need to learn how to handle the dead in eco-friendly ways. Cemeteries like Warren Hills have set aside a designated burial area for the Muslims as their policy respects cultural diversity. Muslim or Islam traditions use similar practices, burying the dead in a shroud or coffin of untreated wood without cremating or embalming.

According to the California-based Green Burial Council, cemeteries in the United States put more than 4 million gallons of embalming fluid and 64,000 tons of steel into the ground each year, along with 1.6 million tons of concrete. However, the council estimates that cremation which involves heating a furnace to close to 2,000 degrees Fahrenheit for up to two hours produces about the same emissions as driving 500 miles in a car. Alex Brown of the US Stateline says that burial also is a land-use issue, as cemeteries must claim ever-increasing acres to accommodate new arrivals. "Conservation cemeteries, on the other hand, are designed to preserve and expand existing wilderness areas while using the burials as a funding mechanism for the environmental work," says Brown.

ZIMBABWEAN AUTHORITIES URGED TO ESTABLISH WILDLAND FIRE-FIGHTING STATIONS TO MINIMISE BLACK CARBON EMISSIONS AFFECTING CLIMATE

Wallace Mawire

Zimbabwean authorities have been urged to establish wildland fire-fighting stations in order to respond to, monitor and rehabilitate the environment from sporadic fire incidents throughout the country which are contributing to severe black carbon emissions with negative impacts to climate and health.

According to Wilson Chimwedzi the Director of Firefight Trust, Zimbabwe has no wildland fire-fighting stations throughout its 63 districts, despite the country being ranked 30th when it comes to burnt area on the globe. Chimwedzi said that disaster management is critical including early warning systems. He has also emphasised the need for citizens to plant trees at least on a daily basis and saving trees and the environment from continued destruction. 'Other actions which need to be initiated include the separation and re-use of waste and prevent the starting of fires,' Chimwedzi said. According to Chimwedzi, at least 3 to 4 million hectares of trees are being burnt in Zimbabwe, despite the lack of wildland firefighting stations. He said that this is contributing to severe black carbon emissions which are contributing to global warming, climate change and have negative impacts on human health and the climate.

Black carbon is a component of fine particulate matter and consists of pure carbon in several linked forms. 'It is formed through the incomplete combustion of fossil fuels, biofuels and biomass and is one of the main types of particles in both anthropogenic and naturally occurring soot,' Chimwedzi said. It is also reported that black carbon has a diameter of less than 2½ microns (PM2.5) and is the most solar energy-absorbing component of particulate matter and can absorb one million times more energy than CO2. Commenting on the contribution of black carbon to global warming, Chimwedzi said that per unit of mass, black carbon has a warming impact on climate that is 460-1,500 times stronger than CO2. He says that unlike greenhouse gases, black carbon is a climate forcer which can be seen and felt. 'Not only does it warm the atmosphere by absorbing sunlight, also dark soot that is deposited onto ice and snow speeds up melting. Black carbon stays in the atmosphere for days to weeks, but it can do a lot of lasting damage,' he said.

He also revealed that black carbon emissions come mainly from four sources namely transport from diesel engines used for transportation and industrial use, in the residential sector from solid fuels such as wood and coal, in agriculture from open forests and savanna burning. He says that this happens both naturally and, in most cases, it is initiated by people for land clearing. The other source is from industrial processes, usually from small boilers. Explaining the effects of black carbon, Chimwedzi said that black carbon is a global environmental problem that has negative implications for both human health and our climate. He explained that inhalation of black carbon is associated with health problems including respiratory and cardiovascular diseases, cancers and even birth defects.

He added that black carbon contributes to warming by converting incoming solar radiation to heat and that its co-pollutants are key components of fine particulate matter (PM2. 5) contributing to air pollution which is reported to be the leading environmental cause of poor health and premature deaths. It is also reported that the amount of carbon emissions trapped in the atmosphere causes melting of the polar ice caps, the rising of sea levels, the disturbance of animals' natural habitats, extreme weather events and many more negative side effects. If black carbon heats up the layer of the atmosphere where clouds are forming, they will evaporate.

'They will no longer reflect sunlight back into space and so the soot-laced clouds end up warming the atmosphere. The clouds will act like shields, blocking incoming sunlight. Black carbon also influences cloud formation and impacts regional circulation and rainfall patterns,' Chimwedzi said.

Other effects of black carbon outlined include affecting the health of ecosystems in several ways such as by depositing on plant leaves and increasing their temperature, dimming sunlight that reaches the earth and modifying rainfall patterns. It is reported that changing rain patterns can have far-reaching consequences for both ecosystems and human livelihoods. Notable examples include changing rain patterns which disrupted monsoons, which are critical for agriculture in large parts of Asia and Africa. The economic impacts of black carbon are also reported to be very significant. 'The economic costs of public health stemming from black carbon are also significant. In Europe, deaths from air pollution cost the economy more than US$1.4 trillion, which amounts to almost 2% of the global economy. For the entire OECD (Organisation for Economic Cooperation Development) region, this figure is estimated to be US$3.5 trillion,' he said.

It is also reported that currently the majority of black carbon emissions are from developing countries and the trend is expected to increase. Chimwedzi said that the largest sources of black carbon are Asia, Latin America and Africa. China and India together are reported to account for 25 to 35% of global black carbon emissions. Africa is estimated to contribute approximately 1,690 Kilo Tonnes (KT) of black carbon emissions annually. It is reported that the largest source of black carbon emissions in Africa are grassland fires, residential solid fuel use for cooking and heating according to the United States Environmental Protection Agency US-EPA in 2012. Other sources include high per-vehicle emissions from aged diesel vehicle fleets and lack of engine maintenance and poor fuel quality. Estimating radioactive forcing impacts of black carbon in Africa is challenging due to complex meteorology such as the interactions with the South Asian monsoon, errors in atmospheric model parameterization and poor understanding of emissions from the African region. 'As a result, the weather and climate impacts of black carbon and benefits of reducing emissions in Africa are uncertain,' Chimwedzi said. Kerosene lighting for example paraffin is also emerging as a potentially important source of black carbon. It is said that as a result, air pollution-related premature mortality is expected to increase.

Solutions lie in adoption of cleaner fuels and lower vehicle emissions and replacing the oldest and dirtiest vehicles with newer, efficient ones. 'Governments can help millions of people breathe easier and simultaneously help combat climate change,' he said. There is need for standards for the reduction of pollutants from diesel vehicles (including adding particle filters to exhausts) equivalent to those included in Euro-6/VI standards, for on- and off-road vehicles; replacing lump coal with coal briquettes in cooking and heating stoves; replacing traditional fuel wood combustion technologies in the residential sector in industrialized countries with wood pellet stoves that use dry fuel produced from recycled wood waste or sawdust and other transitioning to using greener fuels.

DEMYSTIFYING AN ENVIRONMENTAL IMPACT ASSESSMENT; WHAT IS IN IT?

Sipho Graham Ndebele

SUSTAINABLE DEVELOPMENT is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. To implement a project, various resources are required; which undergo a series of activities and transformation to deliver the project's objectives. For instance, to establish an irrigation scheme in light of food security; soil, land and water are the prerequisite requirements. To meet these needs, natural resources are exploited including human capita.

Activities that transform the environment have both social and environmental, negative and positive impacts such as habitat and biodiversity loss, displacement of settlements, employment creation, pollution and depletion of resources. There is need to evaluate impacts associated with a project in order to prevent, mitigate or compensate related negative effects while enhancing the positive effects for ideal public and ecological health. To attain this balance, an Environmental Impact Assessment (EIA) is a tool which can be applied to effect sustainable development and growth.

An EIA is a process that identifies and evaluates the potential environmental and social impacts, related to the implementation of a project. In Zimbabwe, an EIA is a legal requirement in terms of the Environmental Management Act (EMAct) Chapter 20:27 of 2002 read together with Statutory Instrument (SI) number 7 of 2007 on Environmental Impact Assessment and Ecosystem Regulations. These regulations provide a framework for social, environmental and ecosystems protection including enhancing sustainable socio-economic transformation.

The EMAct details environmental impacts assessment requirements under sections 97 to 108 whilst SI 7 of 2007 regulates the extraction of clay and sand deposits, environmental impact assessments, prevent of fires, sleighs and protection of wetlands, public streams and other certain lands. Under the first schedule of the EMAct Chapter 20:27, all projects with significant social and environmental impacts subject environmental impact assessment are described. These projects include dam construction, power generation, farming and mining activities. SI 7 of 2007 provides a procedure for undertaking an EIA, where a developer is required to submit a prospectus report to the Environmental Management Agency, which is reviewed under 20 working days or less.

For any prescribed project to take place in Zimbabwe, a prospectus report is the prerequisite requirement. The purpose of this report is to provide a baseline environmental setting of the project site, including its key information such as the project location, description, area size and the potential social and environmental impacts. This information provides evidence to the Environmental Management Agency as basis for decision making on whether an Environmental Management Plan should be done or a full EIA, based on its scope and possible impacts.

Upon approval of the prospectus report by the Agency, the developer is required to engage an eligible and registered consultant to undertake a full EIA in line with the set EIA requirements. The EIA report is reviewed and approved within 60 working days or less. An EIA certificate is then issued upon a satisfactory of the regulatory agency by the EIA findings. If the project requires a full EIA, it is expected to conduct a public consultation process which informs relevant stakeholders and the public on the project objectives and the related impacts. This motion highlights social inclusion within the project implementation scope in order to prevent, mitigate or compensate any social and environmental impacts. The EIA requirements also expect the project to identify, assess and evaluate significant environmental impacts and address them through an Environmental Management Plan. After the Environmental Management Agency issues an EIA certificate; valid for 2 years, the project is subject to quarterly environmental audits. The reports for the quarterly environmental audits are submitted to the Agency for monitoring compliance and renewal of the EIA certificate is done annually thereafter.

In addition, licenses and permits are required first before extraction of natural resources of disposing of waste. An example is that of SI 7 of 2007 which stipulates that a license is required before extraction of clay and sand deposits for commercial purposes. The license is valid for one year and it is not transferable. The Statutory Instrument also prohibits lighting up fire outside residential and commercial areas during the 31st July to 31st October of each year. It also encourages land owners or users to establish fire prevention measures by designing and erecting at least a 9-meter fire guard.

In regards to sleighs, the regulations prohibit the use or license of sleighs on any land. Wetlands are an essential part of our ecosystem as they facilitate water purification, act as a carbon sink and are habitat to diverse organisms. To protect wetlands, the SI prohibits any operation on a wetland, unless a license has been issued to a developer by the agency. The regulation also prohibits development activities on land that is within 30 meters of naturally defined banks or public streams.

CHRONICLES OF CYCLONE IDAI, ZIMBABWE'S FIRST DOCUMENTARY ON CLIMATE CHANGE VAGARIES

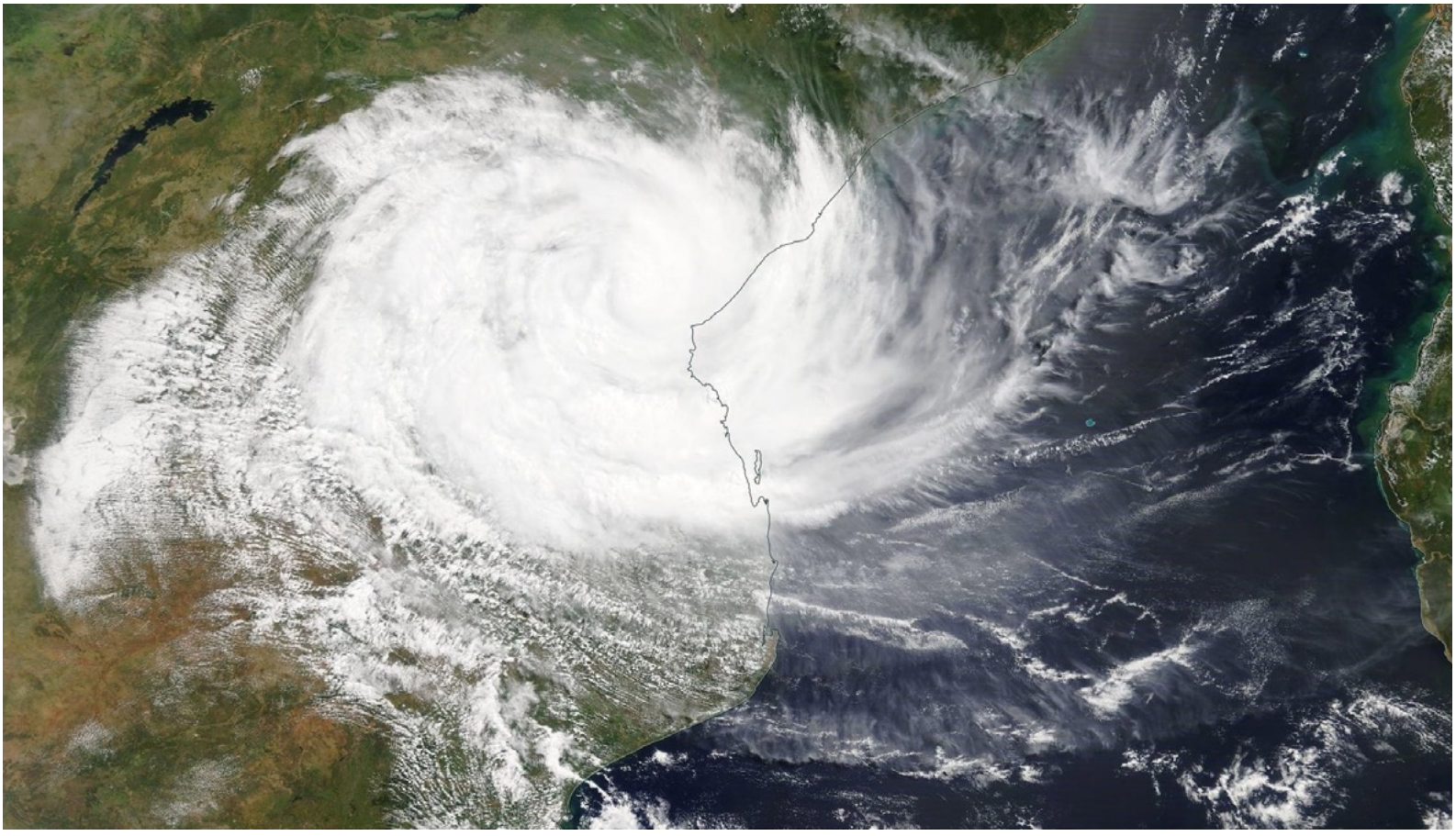
Tendai Guvamombe

Zimbabwe premiered the first ever documentary since the unfolding of the unprecedented climatic weather pattern which ravaged lives and infrastructure in Chimanimani and parts of Chipinge. A documentary titled "Chronicles of Cyclone Idai," gives a preview of the escalation of the weather phenomenon to the unforgettable moments that took place during the night of 15 March 2019 in the Eastern Highlands.

The documentary was premiered on the 23rd of March 2020 at Monomotapa Hotel in Harare and Its production was developed by Savanna Trust with the support of its partners. The footage in the production contains a series of events being narrated by the survivors of Cyclone Idai. It then depicts the way local communities were caught unaware despite a short notice from the country's Meteorological Department issuing an early warning prior to the beginning of the tragedy. As the survivors explain their ordeal in battling the traumatic incident, the footage reveals rubbles of the once erected houses, scattered bones of animals, mass graves of human beings and a completely deformed geographical terrain of Chimanimani.

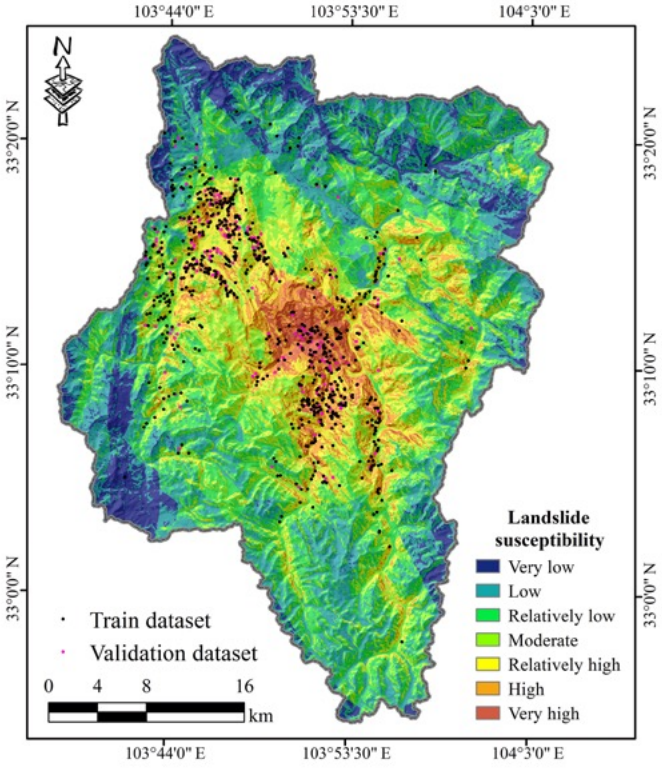
Speaking during the launch of the documentary, Veronica Jakarasi a Climate Change Negotiator and Forest Commission Board Chairperson commended the documentary saying that it presents the evidence needed by negotiators at international forums on Climate Change. The documentary can also assist the government in upscaling its actions on climate disaster preparedness. "I commend the work done by Savanna Trust in producing a Climate Change documentary on Cyclone Idai in Chimanimani. The documentary comes with originality and is authentic to what transpired in Chimanimani. it brings the evidence that we use as Climate Change Negotiators during the international forums on Climate Change. Basing on the events, it is high time we work more on preparedness rather than waiting to respond after a catastrophe," she said. Daniel Maphosa, Director of Savanna Trust echoed similar sentiments saying the documentary tries to give a preview of what happened in Chimanimani and informs the actions the country needs to take in curbing impacts of Climate Change. He said that Zimbabwe is not immune to climate change.

"Climate Change has become a global phenomenon and Zimbabwe is not immune to its challenges. Against this background, we decided to come up with the documentary that effectively gives the magnitude of the effects of Climate Change in Chimanimani. These effects have come to a point that they can no longer be ignored. In this view we say Climate Change should now be a natural discussion so that communities are well informed on climate change mitigation and adaptation," Daniel Maphosa reiterated. Amid all this, calls have been made to channel resources towards upscaling the work of environmental and climate change journalists so that climate change matters are well captured and communicated in the most appropriate ways visible and accessible to different international communities. These include funding for capacity building and media equipment such as drones, cameras among other digital devices.



GIS IN HAZARD MAPPING

Bright Chituu



Many regions in the world are exposed to a number of natural hazards which cost billions of dollars annually. The growing impact of disasters in the past decades is mainly as a result of climate change. Out of 50 fastest growing cities in the world 40 of them are located in earthquake zones. More than 10 million people in developing countries live under constant threats of floods. To minimize disaster losses more efforts should be put in place on Disaster Risk Management, with a focus on hazard assessment, elements-at-risk mapping, vulnerability assessment and risk assessment, which all have an important spatial component.

Spatial information has a big role to play in impelling the decisions we make every day by giving a clear picture of the space around us. It allows us to identify the relationships and trends that were not apparent otherwise. GIS users are discovering increased use in risk analysis due to its capabilities in linking location with the associated information. It helps to efficiently capture, manipulate, store, and analyze information about geographic locations. One of the basic principles of risk assessment is that risks that happen due to natural catastrophes such as hurricanes, earthquakes, and floods are dependent on the location and can be assessed if reliable location intelligence is available. Considering this aspect, many institutions use GIS to assess the risk of life and property due to natural hazards.

GIS software companies such as Esri have developed methods that can help public safety agencies who respond to Natural Disasters through reducing their impact, providing first responders with the best information to make optimized safety decisions under stressful conditions, recovering from emergencies quickly and providing business continuity.

Forest fire is one of the natural hazards causing a huge life, property and ecology losses. These fires occur frequently and there is a need for supranational methods that analyse wide scenarios of aspects involved and global fire effects. Satellite data has been widely used to detect forest fires in different parts of the world and the Geographical Information System (GIS) and remote sensing techniques have been useful in assessing and predicting the fire frequency. It is impossible to control nature, but is possible to map forest fire risk zone and in that way reducing the frequency of fires. GIS can deliver tools to work with tactical, location-based information such as floor plans, utility control points, pre-fire plans, hazardous material contents and locations, surrounding exposures, aerial imagery, and hydrant locations. Access to this information allows firefighters to deploy more quickly, effectively, and, most important, safely.

GIS has proved useful in managing natural hazards such as floods. Flooding can be very perilous and can totally disturb public and personal transport by cutting off roads and communication channels when telephone lines are damaged. Several GIS models have been utilized in flood simulation, including the use of specialised GIS software like SOBEK, HEC-RAS, MIKE II, LISFLOOD, one-dimensional two-dimensional (1D2D) hydraulic and TUFLOW to mention just a few. Flood hazard assessment and mapping is used to identify areas at risk of flooding, and consequently to improve flood risk management and disaster preparedness. Flood hazard assessments and maps typically look at the expected extent and depth of flooding in a given location, based on various scenarios for example 100-year events or 50-year events. In Zimbabwe, the Civil Protection Unit has taken advantage of using GIS technologies to monitor flooding in areas such as Muzarabani, Zimbabwe Low Veld, Save and areas in Hwange District. Flood mapping exercises have been carried out to identify flood prone areas and evacuation centres. This makes the exercise an integral part of a flood early warning system and for emergency preparedness plan.

GIS provides an opportunity to civilian authorities and international agencies to boost their alertness for coping with natural disasters. GIS can help to manage the impact of earthquakes, hurricanes, avalanches and volcanoes. It also helps in assessing risk and hazard locations in relation to populations, property and natural resources, integrating data and enabling understanding of the scope of an emergency to manage the hazard, recommending preventive and mitigating solutions, determining how and where scarce resources should be assigned as well as prioritizing search and rescue tasks.

AN OVERVIEW OF CORPORATE AND SOCIAL RESPONSIBILITY

■ Simbarashe Machisa

Today's business organizations whether large or small are expected to exhibit ethical behaviour and moral management. No corporations can operate only with traditional economic role. Now, not only are firms expected to be virtuous; they are being called to practice "social responsibility" or "corporate citizenship" that is, accepting some accountability for societal welfare. Businesses can sustain their growth only if society is generally satisfied with their overall contribution to societal well-being. Michael E. Porter, a Harvard strategy guru, believes there is a "symbiotic relationship" between social progress and competitive advancement (Porter and Kramer, 2006).

Modern CSR was born during the 1992 Earth Summit in Rio de Janeiro, as an explicit endorsement of voluntary approaches rather than mandatory regulation (Christian Aid. 2004). CSR can be defined as "situations where the firm goes beyond compliance and engages in actions that appear to further some social good, beyond the interests of the firm and that which is required by law"(McWilliams, A et al, 2006). CSR is regarded as voluntary corporate commitment to exceed the explicit and implicit obligations imposed on a company by society's expectations of conventional corporate behaviour. Hence, CSR is a way of promoting social trends to enhance society's basic order, which can be defined as consistency of obligations that cover both the legal framework and social conventions (Falck et al, 2007).

In Zimbabwe, companies should take advantage of the initiative programs being implemented by CSR Network Zimbabwe. CSR Network Zimbabwe (CSRNZ) is a professional multi-stakeholder organization established in Zimbabwe in 2016 with the aim to advance the principles and practices of Corporate Social Responsibility within the private sector. Its ultimate goal is to support sustainable businesses which in turn contributes to sustainable economic growth leading to the achievement of some Sustainable Development Goals. CSRNZ facilitates networking, learning, sharing experiences and knowledge in matters of CSR.

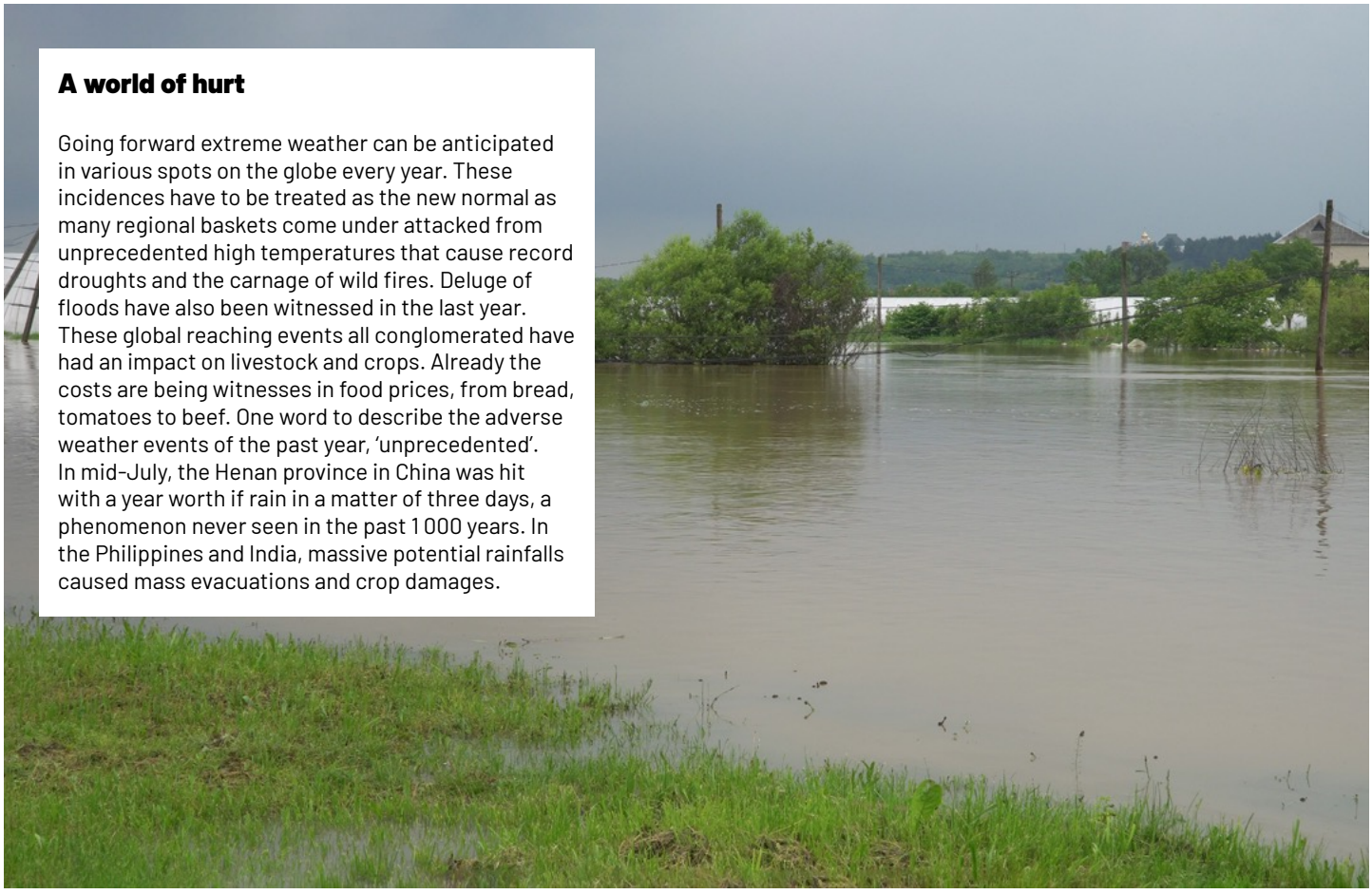
Businesses can have a positive impact on society and development through three main avenues which are employment benefits, community development and philanthropy and lastly core business CSR strategy. The first two avenues can be broadly grouped together as traditional CSR. Traditional CSR activities that encompass community development and philanthropy are usually seen as distinct and unrelated to core business operations. Business could have a CSR programme of education and healthcare while polluting the environment and treating workers poorly. Strategic CSR is meant to address this problem by addressing any negative value-chain impacts while supporting the business strategy and the needs of the community. Therefore, traditional CSR is differentiated in motivation, implementation, and impact from Strategic CSR (Werner, 2009).

CSR should be a win-win situation where companies make profits and society benefits. Having identified social issues, Porter and Kramer made a bold claim that, the essential test that should guide CSR is not whether a cause is worthy but whether it presents an opportunity to create shared value, a meaningful benefit for society that is also valuable to the business. As a result, they show how a company can create a corporate social agenda, composed of "strategic CSR," (Porter and Kramer, 2006). When properly designed and implemented to fit the needs of the community and corporation, CSR can become a source of opportunity, innovation, and competitive advantage. Strategic CSR also ensures that a business is focused on minimizing potential negative impacts of its operations (Werner, 2009).

A DOUBLE WHAMMY: GLOBAL CRISES OF CLIMATE CHANGE AND FOOD SECURITY

■ Innocent Nhire

At this alarming rate, that imagined dystopian enclave might become a reality and nothing suggests we are not getting there. One unfortunate impact of climate change is food security, which has always been a key concern for sustainable development. COVID 19 has had some adverse impact on the cost of food and could worsen with climate change. Extreme weather conditions, a shift in consumption habits have converged to raise foods prices globally by 28 percent, according to FAO Food price index. There is no expectation that this trend will reverse anytime soon. Climate experts have warned that this trend could lead to trade restrictions and stock piling and ultimately food insecurities.



A world of hurt

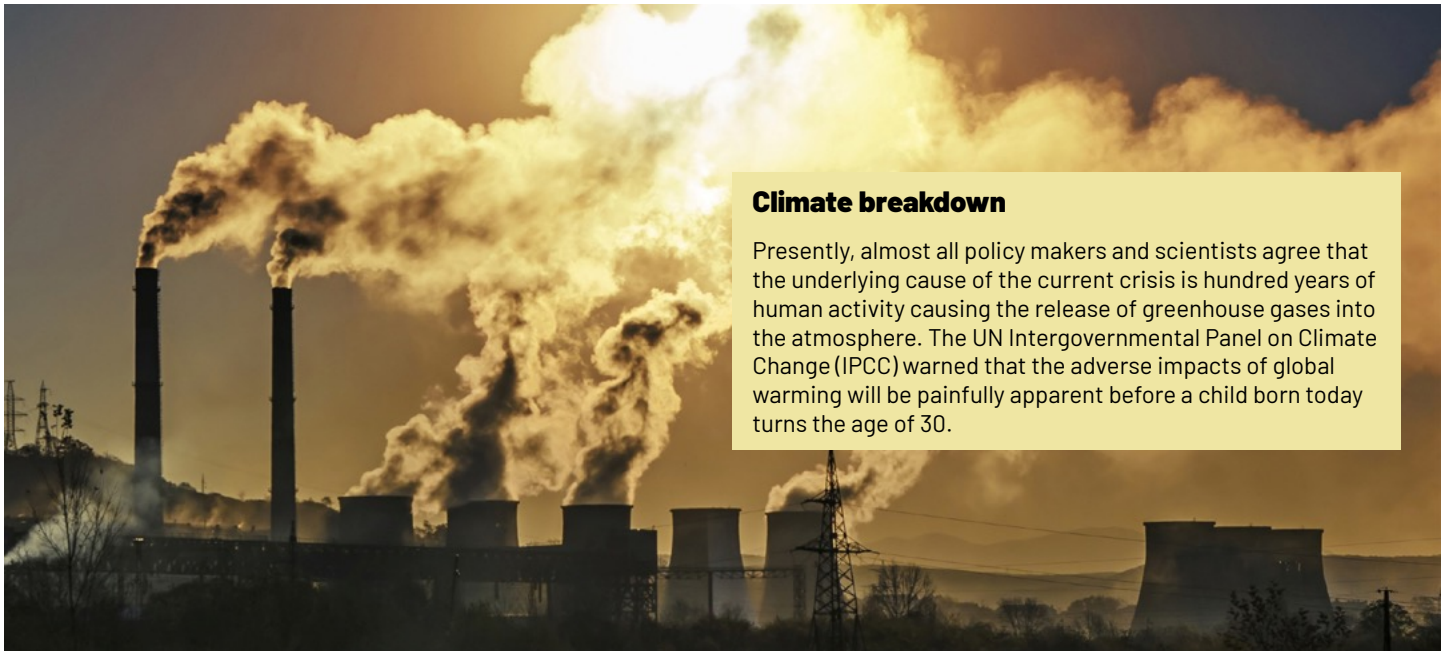
Going forward extreme weather can be anticipated in various spots on the globe every year. These incidences have to be treated as the new normal as many regional baskets come under attacked from unprecedented high temperatures that cause record droughts and the carnage of wild fires. Deluge of floods have also been witnessed in the last year. These global reaching events all conglomerated have had an impact on livestock and crops. Already the costs are being witnesses in food prices, from bread, tomatoes to beef. One word to describe the adverse weather events of the past year, 'unprecedented'. In mid-July, the Henan province in China was hit with a year worth if rain in a matter of three days, a phenomenon never seen in the past 1 000 years. In the Philippines and India, massive potential rainfalls caused mass evacuations and crop damages.

Global hunger stares at its citizens

Drought has exacerbated hunger in some of the poorest countries in the world. There comes Africa! Southern Madagascar is in the throes of the worst drought in 4 years. People and children are living on cactus leaves and whatever they can scrounge around. World Food Programme Executive Director David Beasley stated that there have been back-to-back droughts which have pushed communities right to the very edge of starvation. At this particular moment, 1 million Madagascans are food insecure with no access to safe, sufficient nutritious food. There is a consensus about the cause of this crisis, climate change. With disaster following disaster, even the biblical tale of God sending 10 plagues to punish humanity for its evil is being replayed. Over a year ago, the Greater Horn of Africa and Yemen experienced the world desert locust outbreak, triggered by record remains. In Ethiopia only, 356 000 tons of cereal were lost, leaving millions of people food insecure.

Climate chaos breeds food insecurity and political instability

A downside to the current malaise of food insecurities is now apparent for many global citizens. Food inflation is now real for many governments. Higher food prices tend to result in political unrest, even in those countries where such actions are constrained. In the past year Kuwait recorded temperatures of 53.2° Celsius (127.7° Fahrenheit). The same record-breaking temperatures were observed in neighbouring Iraq and Japan. These heat waves are a threat for global food prices and supplies. Iran saw protests over the rising cost of food, with the protests now political, calling on the removal of the government. All this is over food insecurities.



Climate breakdown

Presently, almost all policy makers and scientists agree that the underlying cause of the current crisis is hundred years of human activity causing the release of greenhouse gases into the atmosphere. The UN Intergovernmental Panel on Climate Change (IPCC) warned that the adverse impacts of global warming will be painfully apparent before a child born today turns the age of 30.

An urgent need for 'transformational change'

The need for transformational change has never been so urgent. Transformational change has to be started at all levels; individual, communities, business, institutions and governments. We must redefine our way of life and consumption. A recent paper by Ortiz-Bobea has shown that climate change has erased seven years of improvements in agricultural productivity in the last 60 years. Climate smart agriculture could hold the key.

THE ENVIRONMENTAL **DOWNSIDES TO CORRUPTION**

■ Innocent Nhire

Corruption is as old as the society itself. In a way, you could say it is inevitable in all societies. The World Bank has put the annual value of corruption to a staggering USD$ 1.5 trillion, around 2 percent of the global GDP. In addition to misuse of public funds dedicated to infrastructure projects, corrupt activity has been linked to wasteful use of natural resources, higher CO2 emissions and improper land use. In the current era of where nations are trying to combat climate change, the intelligent, efficient utilisation of financial resources assumes more importance. With a move towards a low carbon economy and diversification of energy source, if not nipped in the bud, corruption can negatively contribute to greenhouse emissions and deforestation. This is a subject which has not always been given prominence over the years.

The environmental perspective of corruption

Academic evidence establishing a nexus between corruption and CO2 emissions, environmental degradation and improper land use has only begun to emerge. This link between corruption and lower environmental quality is more pronounced in developing countries and some evidence has even indicated that corruption could be the main driver of environmental problems being experienced is some developing societies. The impacts of corruption on the environment are twofold and multifaceted. Research indicates that society has both direct and indirect effects on the environment and the economy. Overall, corruption has a net negative effect on GDP growth. In the same breath, high level corruption has an impact on energy use due to the decrease in stringent measures on energy use. This in turn leads to an increase in CO2 emission through increased energy production. In addition, there is some evidence that bribes to people in positions of authority, have in the past, resulted in economically and environmentally costly projects.

Corruption and CO2 emissions

Research has also indicated that there is a relationship between corruption and the level of CO2 emissions. While this relationship exists in both developed and developing countries, it appears stronger in developing countries. What this means is that the more corruption there is in a country, the less likely that environmental policies will be adhered to and implemented. As previously touched on, though corruption has modest increases in the GDP, through increases in energy consumption and public budgets, the negative impacts are higher. These come through as lower quality of life, lower growth, higher costs and lower efficiency. Estimates made show that a percent increase in corruption can lower growth rate of businesses by 3 percent.

With the world aiming to transition to low carbon economy, the negative impact of corruption can hinder these noble efforts. Deforestation and warming climate are therefore creating a self-feeding negative loop where deforestation causes the climate to warm further and the warming climate potentially destroys more and more forest and biodiversity. Some projections even go as far as to imply that the Amazon is in serious danger of drying out during the 21st century. Corruption is contributing to this negative feedback loop in two ways. Firstly, by increasing energy consumption and therefore GHG emissions. Secondly, research confirms the link between corruption and decrease in ecological quality and wasteful use of natural resources such as forests.

Corruption and deforestation

Deforestation is creating a self-negative loop where deforestation is causing the warming of the climate which results in more and more devastation of biodiversity and forests. Predictions made in the Amazon for example have asserted that it could dry out in the 21st century. Corruption contributes to this negative loop in two important ways. In the first instance, corruption leads to increased energy consumption and therefore GHG emissions. Scientific research has confirmed that the nexus between corruption and a decrease in ecological quality, including wasteful use of natural resources like forests.

Against this backdrop fighting corruption is one way towards environmental protection. Robust measures to fighting corruption have to streamline environmental issues in their approaches to give the environment a chance. Good governance is one way of ensuring that countries can offset environmental degradation and attain sustainable development. More robust approaches from a governance point of view have to be taken by government and all relevant stakeholders to ensure that corruption is reduced and its impact on the environment is minimised.


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

ENVIRONMENTAL AND SOCIAL GOVERNANCE (ESG) THE FUTURE OF BUSINESS

■ Simbarashe Machisa

It is imperative that organisations observe Environmental and Social Governance as a way of attracting investors to their businesses. Nowadays investors are shunning organisations that lack integrity, hence companies should ensure sustainability for business growth. This should be built on a solid foundation of corporate values and culture. ESG is the future. African governments and policy makers must work towards adopting ESG and join the world in ensuring best practise.

What is ESG Investing ?

ESG investing is sustainable investing that evaluates the financial returns considering the environmental, social and governance factors and their overall impact. The ESG scores of investments measure the sustainability of investments in three areas: Environmental and Social Governance (ESG). The concept of ESG investing is driven by the ideology that large investors can pressure the corporate world to behave in an environmentally friendly, socially responsible and governance perspective. Let me illustrate factors to be considered when being reported by organisation under ESG.

Environmental

Environmental factors address the impact of the company on nature through:

- Waste and pollution management
- Resources depletion
- Greenhouse gas emission
- Deforestation
- Climate change policies
- Water usage and conservation
- Green energy initiatives
- Recycling practices

Social

Social components that affect employees, consumers, customers, suppliers and the community as a whole, such as:

- Employee's relations and diversity
- Working conditions
- Local communities
- Health and safety
- Conflict
- Fair labour practices
- Customer satisfaction

Governance

The governance factors are related to the management of the company by the top executives towards the interest of stakeholders of the company. These include:

- **Tax strategy**
- **Executive remuneration**
- **Donations and political lobbying**
- **Corruption and bribery**
- **Board diversity and structure**
- **Ethical business practices.**
- **The voting process of the board directors**
- **Shareholder's power to nominate board members**

Environmental and Social Governance (ESG) programs will assist the organisation to increase employee engagement, customer retention and reduce reputational risk while decreasing impacts through operational efficiencies. The good news here for organisation is that they do not have to reinvert the wheel because the information is at their disposal. On the other hand, the organisation should consider lifecycle of products from raw material extraction, production, use and disposal. In the process the organisation should evaluate their potential environmental impacts and opportunities within the value chain.

During implementation of Environmental and Social Governance (ESG), there are systems that must be put in place. These include ISO 45001:2018 on Occupational Health and Safety Management Systems, ISO 14001:2015 on Environmental Management Systems and other sustainability and compliance systems. Business leader of today must be ready to demonstrate that they are meeting Environmental Social Governance (ESG) requirements through their actions and results. Lastly, it is important to note that ESG design and system of thinking should be applicable to how the economy will be shaped in the future.

GREEN SCHOOLS – PATHWAY TO SUSTAINABLE DEVELOPMENT

Tawanda Collins Muzamwese

Academic excellence is the cornerstone of the development of every country worldwide. Schools continue to churn out gifted individuals, who occupy influential positions in society. There are many environmental initiatives which schools can do in order to promote sustainable development and protect the planet. Green schools require the leadership including School Heads, School Development Committees (SDCs), parents and students to value environmental sustainability. When you look at your school - whether current or former school, do you consider it to be a green school?

Waste Management

Schools host many students from all walks of life. Therefore, waste can be generated from food packaging, food leftovers, paper, plastics, cans and other waste streams. The best mechanism of dealing with waste is prevention. Inculcating a waste prevention culture is necessary to ensure that every child cares for the environment.

Schools should promote waste segregation and promote disposing of waste in bins. It should be taboo to see a piece of paper in school grounds. Good environmental stewardship in schools should include measures to manage waste during sports festivals, events, parent's day, prize giving day and consultation days. School rules should discourage littering and promote a sense of environmental stewardship. There is also a very big potential for composting if there is organic material.

Advanced schools with high sense of environmental stewardship can also generate biogas from their canteen waste especially in the case of boarding schools where students reside at the facility. Biogas digesters can greatly reduce the costs of energy within the school as the gas can be used for cooking. Waste paper, stationery and packaging materials can easily pile up if not properly managed by the school.

Energy efficiency and renewable energy

Energy efficient lighting presents opportunities for many schools to green their future. Running solar systems in schools is also considered as a quick win in the quest towards fighting climate change. Energy efficient bulbs save schools high energy bills. Form the conception of the school, there must be a consideration of the potential for energy efficient buildings.

Water

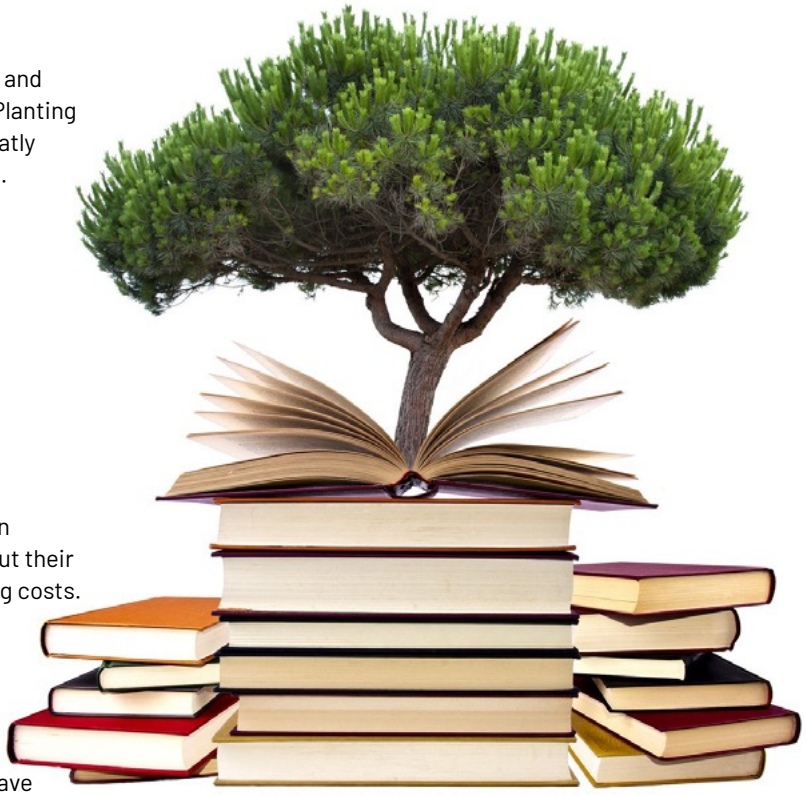
Water consumption should be managed in order to conserve environmental resources. Schools should ensure that water is used in a manner that is not wasteful. Design of taps should ensure that they can be closed when not in use. The irrigation of school grounds should be managed with proper irrigation scheduling.

Greening the classroom through ICT learning

Schools can greatly reduce carbon footprint and paper usage through implementation of ICT. The computerisation of education and the digital age allows individuals to use less paper. Less paper translates into fewer trees cut down.

Tree planting and ecosystems protection

Schools can do a lot of endeavour in tree planting and ecosystems protection. Tree planting should be promoted amongst the students and the teachers throughout the year, not only during the National Tree Planting Days. For schools which are located in areas with vegetation, we greatly discourage the destruction of forests for purposes such as firewood.



Benefits of Greening Schools

Benefits of greening schools include:

- reduced carbon footprint
- low energy consumption
- less impacts of water and energy resources
- improved image of the school
- cost savings due to resource efficiency

According to the Green Schools Alliance, 87% of students from green schools carry forward environmentally friendly behaviours throughout their lifetime. The greening school initiative can result in a school reducing costs.

Shifting mind-set through green curricula

The curricula of education should include the need to care for the environment. It is easier to foster the behaviour of children to be sustainable at a very young age than to deal with older people who have their own way of thinking and are a bit hardened. Any form of sustainable lifestyle promotion should start with children because at this stage they can easily grasp concepts and are receptive to new ideas. Starting at Early Childhood Development (ECD) up until high school, the need for greening the mind-set is inevitable.

School Environmental Clubs

A number of schools have started formulating school environmental clubs where new environmental initiatives are promoted and implemented. A teacher or group of teachers in charge of the environmental club can offer guidance and students can become members voluntarily. Through such clubs, ethos of environmental consciousness are promoted. The longevity and sustainability of the clubs is upon the schools and the students but needs support by the specific school. The club can come up with activities related to environmental protection.

Auditing the school for environmental excellence

Auditing the school on environmental performance has become common practice. This can be used as a means of identifying opportunities and challenges related to the environment. If improvement is required, the audits will reveal information that the school can take advantage of. Without monitoring and measurement, it is difficult to assess performance. Audits can cover waste, water, energy, resource usage including monitoring behaviours such as littering. Corrective measures can then be implemented.

Greening the future through schools

The future will be determined by the lifestyles of young people. The way we dispose waste, travel, access energy and utilise water resources will define who we shall be in the years to come. The planet is in a crisis which needs us to act. The starting point could be schools.

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ENERGY EFFICIENCY AND THE ENVIRONMENT
A RECIPROCAL NATURE

■ Sipho Graham Ndebele

Energy is the ability of doing work. It exists in the following but not limited forms; thermal, electrical, chemical and nuclear. There are two sources of energy, non-renewable energy and renewable energy. Non-renewable energy includes coal, oil and natural gas, while renewable energy includes solar, wind and biomass energy.

Over the past years, the world has heavily depended on non-renewable energy for industrialization and livelihood development. During the past century, our energy needs have been met by using non-renewable energy. This application has released greenhouse gas (GHG) emissions, which are causing air pollution and related human ill-health such as respiratory diseases. At large, GHG emissions have and are contributing towards global warming and climate change which is one of the planet's critical environmental challenges among water pollution, land degradation and biodiversity loss. The pressing issue is that, climate change enhances the above-mentioned environmental challenges including other ecosystems disfunctions.

The structure of Zimbabwe's energy consumption by source illustrates that 17%, 37% and 45.7% of the country's energy emanates from petroleum, renewables and coal respectively. In 2015, electricity production was 762 ktoe, with 32.9% sourced from fossil fuels and 66.2% obtained from hydro sources. Every citizen has a right to a clean environment as enshrined by the Constitution of Zimbabwe of 2013, under section 73. Hence, pollution must be abated. Production of electricity using coal and fossil fuels release GHG emissions which have both public health and environmental impacts. The extraction of coal releases methane, a toxic gas that directly chokes if inhaled, including clearance of land, vegetation and forests. Clearing of land and vegetation disrupts habitats and causes biodiversity loss. Use of water to produce electricity increases flood risks due to dam construction and water channelling. Water abstraction for power generation competes with water needs for aquatic life. This disturbs the optimal functions of the ecosystem. These environmental effects emanating from energy applications pose hazards and risks on the life, health, habitats and infrastructure of both humans, wildlife and ecosystems at large.

The world including is scaling down fossil fuel usage as an option due to its inefficiency. The environmental impacts that stem from human activities, are now visible and clearer and the well-being of human nature is at risk. Mother Nature is gradually dying due to pollution coming from energy use required in activities such as agriculture, manufacturing, mining and construction. The chance to better the situation and save the planet is available and requires urgent change of behaviour and policies. All GHG emitting processes and machinery need to be substituted or made more efficient to reduce the amount of gases released. The world is well aware of its contribution to environmental challenges. Hence, it has developed and adopted strategies to phase out the use of coal and fossil fuels. Efficient energy sources are being adopted which offer viable options for the planet's future.

Energy efficiency is the use of less energy to perform a similar task. Availability of technology is related to efficiency of energy. Light emitting diode (LED) lights are a specific type of lights which are designed to produce light using less energy as compared to incandescent light bulbs. Incandescent light bulbs generate heat due to high energy consumption. In summer, this generated heat tends to be a problem in buildings and our homes by increasing room temperature. LEDs curb this problem by using less energy and preventing heat generation from light production. Electrical appliances marked "energy star", are built up of mechanisms that conserve energy. Solar and wind technologies are clean sources of energy which are on the cards for use compared to coal powered energy. This is well advised by Sustainable Development Goal number 7 on affordable and clean energy.

The technology uses electromagnetic waves which are absorbed by solar panels (electrochemical-photo cells) to generate electricity. No gas or waste substance is generated from this process. Automobiles need petrol and diesel to power their engines. The combustion of fuel releases GHG emissions. To prevent this case, electrical and hybrid automobiles are being adopted. Electrical automobiles absolutely depend on electricity to function based on a rechargeable battery. Hybrid automobiles apply two or more distinct types of power (battery and fuel). The hybrid mechanism alternates power source based on speed. When speed is low, it uses a battery and when speed is high, it uses fuel. Either stopping on a traffic light or in congestion, the hybrid engine hibernates. The goal of these technologies is to cut down and, in the latter, eliminate GHG emissions attributed to human activity, while conserving natural resources and the environment. Not only do these new technologies conserve the environment, they also boost economic activities through job creation and eliminating environmental incidents.

ECONOMIC INDEPENDENCE THROUGH WASTE MANAGEMENT

■ Dr. Anthony Phiri

THE INTERNATIONAL current challenges of resource scarcity can only be busted by the implementation of the circular economy concept. Through implementation of the circular economy concept, economic aspirations such as scaling to higher economic status can be achieved. The thread can be in waste management. The implementation of sustainable integrated waste management plans is very vital in resource conservation and generation.

The Harare Institute of Technology is one of the few institutions in Africa which are focused on solving the greatest challenges through innovative science and technology. This includes ensuring that the country has a resilient and valuable environment and are moving towards clean energy and resources as well as supporting the growth of future industries. One of the recent COP 26 conference outcomes was that, developing countries should upscale their climate change mitigation activities. It is estimated that each year, 90 billion tonnes of primary materials are extracted and used globally, with only nine per cent recycled. Evidently, this shows how extravagant we are being with the resources which are meant for future generations.

Worse still, this is commercially unsustainable and there are significant detrimental impacts to human health and the environment that could emanate from such. By leveraging circular economy on waste management, a lot can be achieved such as a cleaner environment, new raw materials, import substitutions as well as up scaling Nationally Determined Contributions (NDC).

As Harare Institute of Technology, the thrust is on design for sustainability which makes each waste material a resource. This supports a circular economy model, which shows that through responsible manufacturing, development of new industries and jobs can be supported, emission reduction can be achieved and increased efficient use of natural resources. Under an appropriate waste management system, a landfill is of very limited importance as it reflects the loss of resources unless it is meant to enable the generation of energy from methane. It is therefore imperative that future disposal sites be made smaller and tailor made for accommodation of organic material.

Organic material degrades fast and this generates high volumes of compost whilst also generating energy. It is clear that by designing for recyclability, maximization of resource utilization can be achieved. The benefits can be several times larger through the incorporation of the concept of circularity during production and consumption. A circular economy is critical in ensuring future prosperity and economic security. Zimbabwe's economic independence lies within the circular economy concept.

ENVIRONMENTAL IMPACTS OF ABATTOIRS AND MEAT PROCESSING

Tawanda Collins Muzamwese

IN MOST CULTURES, meat is considered a delicacy. Whether cooked, roasted or done through a barbeque – meat has stood the hands of time since the time of nomadic pastroralism, hunting and gathering. With the growth in human civilization, greater focus is being placed on rearing animals at a commercial scale in order to process meat in a sanitary manner.

Several abattoirs have been established at district, town, city and national level. Meat processing giants have been born and continue to flourish immensely. However, beyond the rasher of bacon, T-bone steak and pork chops – there are a number of environmental impacts which need mitigation and control in order to achieve environmental sustainability.

The first environmental impact associated with abattoirs and meat processing firms is the waste fecal matter from the animals. This could be generated upon arrival or when the animals are waiting for slaughter. After evisceration, some material from the stomach of the animals becomes waste. Offensive smells can be generated if no effective odour management system is in place.

In addition, there is high water usage at abattoirs due to the need for cleanliness and very high hygienic requirements. Some water is also used for scalding processes. Associated with high water usage, is the generation of wastewater. Effluent from abattoirs is very high in organic matter and Biological Oxygen Demand (BOD)

Blood remains a key waste generated from abattoirs especially during processes of slaughtering the animals. Many abattoirs have no effective plans of managing blood. This is a significant source of pollution and wastewater.

Other environmental challenges are related to the high consumption of energy especially related to the refrigeration processes for preservation of the animal carcasses before cutting the meat into specific cuts. Energy is also used for stunning animals.

Hides can easily be channeled to shoe-making and processing of leather. The tanning process is greatly interrelated to abattoir operations.

Nowadays, there is increased pressure over companies which undertake meat processing and abattoir activities to adopt resource efficient and cleaner production measures in order to attain sustainable development. It is possible to make meat processing more sustainable. The work begins now.

INDIGENOUS KNOWLEDGE SYSTEMS AND THE ENVIRONMENT

Bright Chituu

The word 'indigenous' can be traced back to French (indigène) and Latin (indigena). In both languages, the word means 'sprung from the land', a native or literally 'in-born'. Thus, it can be comprehended that indigenous knowledge refers to the way of knowing and application of the resultant knowledge connected with a particular group of people in their native socio-geographical location. Indigenous knowledge can be referred to in several terms such as indigenous knowledge of knowing, traditional knowledge, rural knowledge as well as ethno science. Indigenous knowledge is generated by a particular society within a geographical area and transmitted from one generation to another in order to have history of an area or phenomenon, understand the background and offer solutions to the existing problems of that time.

Indigenous knowledge is part of Africa's heritage, which dates back to the pre-colonial era. It's a knowledge system that was designed to keep the people knowledgeable of what happened in and around them. The system was also developed in order to address various survival challenges. Unfortunately, the knowledge system has suffered a great deal from colonial racism. When the natives were removed from their indigenous communities, this resulted in the detachment from their familiar ecology and a loss of environmentally linked indigenous knowledge.

Indigenous knowledge systems manifest themselves through different dimensions. Among these are agriculture, medicine, security, botany, zoology, craft skills and linguistics. In Zimbabwe indigenous knowledge such as taboos, use of totems and respecting sacred places have been used to protect and preserve the environment.

One of the most popular traditions in Zimbabwe is totemism, which has been described as the practice of symbolically classifying people with non-human objects such as animals or plants. The classic case of totemism is when a clan claims an animal as a mythological ancestor. From an ecological point of view, this practice can be cherished for its role in the conservation of biodiversity in a given area.

In the case of hunting and gathering societies, it moderates competition for some edible animals, birds, reptiles, insects or plants. This is for the reason that it is considered a taboo for one to eat his or her totem animal; one risked losing teeth or some catastrophe would happen to him or her for violating this taboo. An example is that, during hunting, members of the zebra clan would not kill zebras as they were considered as sacred to them. The same applied to those who valued the buffalo, eland, lion, elephant, baboon, kudu, birds, snakes and ants. Therefore, totemism reinvigorated selective rather than indiscriminate hunting, in this manner preserving any endangered species from extinction.

Some of the misfortunes, which were believed to befall transgressors included: bad luck, tooth decay or loss, madness, sickness and disease, infertility, death and the loss of ancestral protection. Offenders would also be disciplined through the payment of fines to the head of the clan or chief. In some cases, they would be expelled from their communities. Punishments such as these were effective in the conservation of various natural resources and species.

Indigenous knowledge has also been associated with maintaining clean surroundings. In an attempt to maintain clean surroundings, human waste was disposed in bushes or else buried in the grounds adjacent to homesteads. This reduced the spread of diseases through vectors such as flies. Burial places for human corpses were situated either close to homes or far away while strict rules on safeguarding sources of drinking water such as wells and springs were prescribed. Wooden fences were developed around them in order to prevent water pollution from children and livestock.

Water bodies were considered as sacred in that way preventing swimming, bathing and other activities, which could contaminate them. Fishing was forbidden in some rivers whereas veld fires were controlled using water or tree branches. Even if veld fire was intermittently used during hunting missions, it was controlled in order to safeguard pastures and the environment as a whole.

Respect for the natural environment and its conservation was reflected by some practices. Overstocking and overgrazing were managed through strategies such as loaning some cattle to friends and relatives, transhumance and swapping out surplus cattle. Woodlands were conserved in several ways including designating some as sacred places thereby protecting them from human activities like deforestation, settlement erection and cultivation.

Other pieces of traditional knowledge in Zimbabwe were geared at stimulating environmentally friendly ways of life.

Examples include land management practices, natural resource conservation methods and environmentally sustainable traditions such as totemism, which protected and preserved biological diversity. However, colonialism, which brought capitalism and materialism, encourages greed thereby undermining sustainable development at both local and national levels. Today, Zimbabwe like any other African country is plagued with several environmental problems such as overpopulation, land degradation, deforestation, overgrazing, massive biodiversity loss, increased air and water pollution, and waste disposal problems in towns and cities. There are no easy solutions to most of these problems, but one thing is certain is that, there is need for societies to change their lifestyles from consumerism to environmentally friendly habits that are more sustainable. Zimbabweans can benefit from the combination of indigenous knowledge and modern methods in the country's quest for environmental sustainability.

COSMETICS AND THE ENVIRONMENT

■ Tendai Kaneta

While some people assume that cosmetic products are a recent invention, the use of cosmetics can be traced back to thousands of years. Cosmetics are substances or products applied to the body for the purpose of beautifying or altering the appearance. Designed to enhance one's appearance, cosmetics can also be used to conceal blemishes. Cosmetics can also be used during performances to change the appearance of the face entirely and resemble a different person.

Currently, the beauty industry in Africa is fast growing with several makeup and skincare lines being opened. In Zimbabwe, there has been a significant increase in beauty spas and saloons and this shows an increased recognition of makeup use by society. However, only a few know about the negative impacts that come from the production and use of cosmetic products on the environment and human health.

Cosmetic products are composed of different materials including heavy metals such as mercury copper, nickel, chromium and other elements. Constant exposure to these heavy metals may result in numerous health problems including skin allergies, DNA damage and memory loss.

These elements become part of the product intentionally as they are used for pigmentation, preservation. Ultra Violet filters are important in cosmetics because human exposure to UV radiation can cause chronic health effects. However, the elements can be circulated in the blood after they bind with plasma proteins which can cause health issues in the long run.

Cosmetics come in different packaging materials. Packaging is usually made from plastics which take hundreds of years to break down in landfills while leaching toxins into the soil and waterways. While it may be tempting to get into bed with makeup on, completely removing it before bed is advised by the specialists. Makeup removing wipes are mostly flushed out into the sewer system. These clog up sewage systems as they are not biodegrade. They persist in the environment and by the time they get to the lakes, oceans or any other water bodies, they get ingested by different creatures which eventually die. Despite the method of disposal used, all toxic chemicals eventually find their way into water ways and soils destroying natural habitats.

In the making of beauty products, palm oil is sometimes used. The farming of palm oil has been argued by environmentalists as harmful to the environment as it requires the clearing of large pieces of land. Palm oil production is said to have been responsible for about 8% of world's deforestation through burning of forests to clear farmlands. With cosmetic products being increasingly used around the globe, more land is being cleared to meet palm oil demand, therefore worsening the already existing deforestation. This has significant impacts on the local ecosystems leading to biodiversity loss.

It is important to consider organic make up products and cosmetics packaged in biodegradable or recyclable material, as this will silently advocate for the production of environmentally safe products.

CAN ELECTRIC VEHICLES WORK IN ZIMBABWE?

■ Tawanda Collins Muzamwese

The global craze towards electric mobility has gripped many countries around the world. At present more than 10 million vehicles are on the roads in different parts of the world. Zimbabwe is beginning to have discussions along the lines of e-mobility. We delve into some of the realities and enabling conditions for this initiative to work. There are a number of issues which are required if the driving of electric vehicles is to materialise in Zimbabwe.

Firstly, we need to address the power access challenges and ensure that the grid is expanded as well as the generation capacity. Due to the fact that we have not yet managed to generate enough energy, adding electric vehicles will need to be coupled with investments in power generation.

Some electric vehicles use battery technology mainly made from lithium. Zimbabwe should harness lithium resources and produce batteries locally rather than importing them. The range of electric cars is limited with some of the best brands going for distances of around 400km or less on a full charge. This scenario means that there is need to deploy charging stations to cater for the needs of any motorist who chooses electric mobility. It will be unsavoury to drive an electric vehicle and end up being stuck on the road after running out of power without charging stations nearby.

Charging time remains a limiting factor with some electric vehicles taking about an hour to charge. Some advanced quick charging stations can achieve full charge in 15 to 30 minutes. Choice of technology must ensure that the time factor does not become a bottleneck.

The increased silence due to limited generation of sound, should call for more safety precautions on the roads to minimise accidents. Revamping the road infrastructure is going in earnest and is considered as one of the key strategies towards efficient functioning of these emerging toys. Without effective feasibility analysis of electric mobility, gasoline will be here to stay at least for powering the transport sector.

A robust means of security for the electric charging infrastructure is necessary if at all the electric mobility framework is to achieve significant results. Our people need to be reminded to take care of infrastructure and avoid vandalism of infrastructure meant to benefit them.

The cost of electric cars remains prohibitive to many, with the cheapest vehicles in the range of USD $30 000. Without subsidies, electric vehicles will not flourish in Zimbabwe. Prospective electric car owners should be waived from paying expensive duties due to the emission reduction contribution they make. Making electric cars affordable to ordinary people is a key step needed to facilitate their viability at national scale.

A multi-stakeholder approach is also needed in developing frameworks for e-mobility and this will need input from commuters, transporters, government, development partners, power utilities and other key stakeholders with interest. Pilots already exist in the taxi cabs which are deploying e-mobility in Zimbabwe. A demonstration vehicle has also been procured. As we progress as a country, scaling up electric mobility will be essential for it to be viable. Raving ourselves into a green future will need careful planning and consultation. Ladies and Gentlemen – Start your engines but in quieter electric mode.

AFRICA`S GREEN MANUFACTURING: OPPORTUNITIES FOR THE DETERMINED

■ Innocent Nhire

THE AFRICAN CONTINENT remains at cross roads. It is the most vulnerable to climate change and climate variability. The incentive is strong for African countries to join global efforts to reduce greenhouse emissions while also increasing its adaptive capacity. In the same vein, African countries have committed to industrialising their economies to meet the challenges of poverty, growing populations and unemployment. If Africa is to realise these, using the same road to economic development that developed countries took, it would be disastrous to the environment. Globally, countries have been setting out plans to reduce greenhouse gas (GHG) emissions by the middle of the century so as to limit the increase in global average temperatures. The increase in global temperatures is being noted as a cause of concern as it increase the chances of extreme weather events occurring, rising of sea levels which lead to hunger and migration. Unrestrained growth of emissions in Africa gets in the way of economic development, and would pose economic impacts which include export linked penalties and reduced financing. In this article, the continent`s manufacturing trajectories as well as potential reduction approaches for the long term are explored.

At a global level, the manufacturing industry has been regarded as a major GHG emission contributor based on its power demand. It is very important to take note of this in pushing to realise the 1.5 °C pathway. Though Africa's contribution through manufacturing is negligible, it will inevitably increase as the continent industrialises its economy. According to the 2020 World Bank data, Africa's manufacturing sector presently emits around 440 megatons of carbon dioxide, which is around 30 to 40 percent of total African emissions. If this growth trajectory continues in the absence of any decarbonisation efforts, emissions could double to about 850 megatons by 2050. This would be a major setback to the global efforts of emission reduction. More importantly it would also put Africa at an economic disadvantage. Africa would run a risk that it might not be able to export to international markets and with many countries passing environmental legislation and implementing taxes on GHG emissions of imported goods, there is a risk of a dire situation for Africa to rely more on international development, if no action is taken.

Robust efforts to decarbonise the manufacturing and power sectors will have fundamental implications for the African continent which can enable the manufacturing sector in Africa to grow and create clean jobs, while remaining globally competitive. In reality, to achieve this a lot of funds are needed. Estimates by African Development Bank show that approximately US$2 trillion is required in additional investment in manufacturing and power industries in the next 30 years. Around US$600 billion would also be required to decarbonise the current industries operating, to turn them into green facilities. The rest of the US$1.4

bullion would be needed to assist in the creation of new, low emitting businesses which would replace or supplement high emitting legacy sectors. Michael Turner, Director of Actis, a leading market investor stated that, "As African economies industrialize and energy demand increases, the availability of affordable green energy will be vital. Without green power, it will not be possible to realize Africa's green manufacturing potential." It is important to note that millions of jobs can be created from decarbonisation led growth, despite having about 2 million jobs being lost from legacy industries as consumers make the switch to greener options. Predictions are being made that about 6 million new jobs could be created in the new green businesses by 2050, mainly in cross laminated timber and electric vehicle charging infrastructure and with strong performances in the solar and wind industries.

Already there are many promising sectors which are being explored in the continent. In the renewable energy sector, there are some good examples of excellent work being done. In Nigeria, a country which is not exactly abundant in solar and wind, Auxano is running its own solar photovoltaic manufacturing company, alongside Nayo Tropical Technology which has been operating in Nigeria as well, providing solar invertor solutions and manufacturing solar panels and other important components for solar home systems and mini grid systems. There are real prospects for a scale up and growth throughout the continent. A good example is the East African electric motor cycle start-up, Ammpersand, which is a leading electric vehicle operation in the region. It leases or sells purpose-built electric two-wheelers to motorcycle taxi drivers, assembles all motorcycles and batteries on site, helping to ensure that the next generation of African developers and engineers are being nurtured in Africa.

The road towards net zero emissions for Africa is not an easy one but the risks of not realising this goal, do outweigh the sacrifices and costs that would have been made to get there. The need for action has never been greater, as the window for containing global warming below 1.5° continues to narrow. In many sectors green technology and production processes are available, with additional low carbon technologies developed and should reach economic viability and maturity by 2030 and this should close the gap to decarbonisation by 2050. At the same time businesses and investors have an opportunity to quickly seize on green manufacturing opportunities. At this important juncture as African countries grapple with the fallout from COVID 19, there is an opportunity to step back and reimagine Africa`s growth on a more sustainable path. Considering that Africa`s manufacturing sector remains negligible, there is an opportunity to build its innovation, greener jobs and technologies which are geared towards a suitable development which has remained elusive for Africa.

UNDERSTANDING USED OIL CHALLENGES AND SUSTAINABLE DISPOSAL OPTIONS

■ **Simbarashe Machisa**

It has been noted that environmental pollution is a global challenge as it results in damaged ecosystems, economic loss and tourism disruption. It occurs as a result of careless incidents such as industrial wastes discharge and oil spillages. Waste oil is produced across industries, from mining, manufacturing, construction, catering and agriculture. Waste oil is defined as any petroleum-based or synthetic oil that has become unsuitable for its original purpose due to the presence of impurities or loss of original properties. The discharge of used oil pollutes the land, air, and water thereby, damaging the entire ecosystem.

Common causes of oil spillages

- Carelessness
- Equipment failure
- Leakages
- Natural disasters
- Acts of vanderlism
- Poor equiment maintanance

Organisations whether big or small should come up with sustainable methods on handling and disposing of used oil from equipment maintenance operations, process procedures and any other activities where used oils are generated.

Sources of used oil

- Fuels oil
- Lubricating oil
- Transformer oil
- Cooking oil and grease

Disposal of used oil should be done as per instructions defined in the Safety Data Sheets (SDS). Recycling of waste oil is the preferred disposal method. Only licensed operators are allowed to collect used oil for disposal. The National Oil Recyclers Association (NORA) was founded in 1985 to promote the safe recycling of used oil. Today, the organization recommends different types of recycling methods for waste oil.

Used Oil Re-Refining - The process of re-refining used oil removes impurities so that it can be used again as the base of new, lubricating oil.

Used Oil Processing - Processing used oil converts it into a fuel. This used oil can be converted into gasoline or another refinery fuel or burned directly as fuel. The latter is how our clean burn waste oil furnaces and boilers operate.

Reconditioning - This process filters used oil to extend the usable lifespan. This is the ideal waste oil disposal option for large volumes of industrial oil.

There are certain precautions that should be taken to ensure safe waste oil disposal. Waste oil is hazardous. If one is storing waste oil, they should make sure it is done properly and clearly labeled so as not to put employees or customers at risk. When handling waste oil, be sure to use protective equipment to keep the body safe. On the other hand, it is important to develop and implement a holistic waste management plan which is in line with the concepts and principles of sustainable development and growth, especially sustainable development goal 8 on decent work and economic growth, Goal 9 industry on innovation and infrastructure as well as Goal 12 on responsible consumption and production.

HARARE CITY DEVELOPING AN INTEGRATED SOLID WASTE MANAGEMENT PLAN TO ADDRESS GROWING WASTE CHALLENGES

Wallace Mawire

The City of Harare has developed its integrated solid waste management strategic draft plan running from 2021 to 2036 to address challenges related to solid waste management. Various stakeholders met in Harare in September 2021, to review and finalise the plan. The plan has been developed at a time the city of Harare is facing serious challenges in solid waste management.

According to a document presented by Donald Sakupwanya, Harare City Council Cleansing Superintendent, the council is operating with an inadequate set of waste management equipment and provisions. Only 16 out of 32 trucks are operational against a rise in demand for refuse collection necessitated by rapid urban development. The existing refuse collection and transportation fleet is inadequate and old, meaning increased repairs and down time, which is also reported to contribute to the challenges. Harare has 15 compactors instead of the 40 compactors needed. It has no weigh bridge to establish waste quantities. The report says that Harare City's incapacity is leading to irregular refuse collection. In addition, the city council is reported to be unable to adequately cover the whole city in its refuse collection services. Harare is still using a dumpsite in Pomona as its final waste disposal facility and there are frequent fire outbreaks at the site. A major fire outbreak was experienced in 2020 and it triggered the processes that led into the development of this integrated solid waste management plan.

It was also added that the current pricing model for refuse collection is such that ratepayers are not meeting the full cost of refuse collection services, creating a deficit and hampering effective and efficient refuse collection.

Other factors that are reported to work against efficient and effective waste management in Harare include the city predominantly using the refuse collection and disposal model where all the waste is collected, transported and disposed of. There is no fully fledged waste management department or vision in the council structures and therefore the council's capacity to make informed decisions around solid waste management is limited. The report also states that there are no plans and systems to help the city council account for the waste generated within Harare and this undermines its ability to make informed decisions on waste management.

Waste management is being done by the Department of Works whose mandate goes beyond refuse collection, transport and disposal. Efforts have been made to set up two waste to energy plants utilising organic waste. Some material recovery is also taking place within Harare, but Harare City Council does not have a systematic account of waste management activities being undertaken by other stakeholders. This represents an opportunity for the council to improve the overall waste management within Harare through combined effort, synchronising activities and maximising the overall effectiveness of overall waste management efforts within Harare.

Traditional waste management systems consist of a simple process whereby the local authorities collect, transport and dispose of waste at selected waste disposal sites such as disused pits or on open ground. This method is not financially and environmentally sustainable. Many cities and towns especially in high-income countries, are reported to have since abandoned this model and have shifted to more efficient integrated solid waste management models. These models comprises of a set of waste treatment methods and strategies whose main objectives are to prevent, or reduce as much as possible, the generation of solid waste, diverting as much waste as possible from landfills and improving the efficiency in solid waste management.

Prevention and reduction of waste is primarily done at source. This is mainly at the production, packaging and consumption stages and can be achieved through sustainable production, packaging and consumption policies, strategies and activities. Continual monitoring and evaluation of policies and strategies implemented is key in ensuring achievement of an effective Integrated Solid Waste Management System (ISWM).

In Zimbabwe, the resort town of Kariba has developed a functional integrated solid waste management plan which the city of Harare is trying to emulate.

DIAPERS HAVE BECOME A MENACE

Wadzanai Diana Manyame

Since their introduction in the 1950s production, demand and use of diapers globally has increased, feeding directly into the increase of solid waste. In the first 2 years of a child's life, approximately 3796 diapers are used on them. This creates 391.4kg to 537.6kg of excrement waste and 3kg of packaging waste, that is plastics and boxes per child. Diapers contribute 4% of the total solid waste globally and they are the third largest single use product which can be found dominating landfills and dumpsites. Diapers are made of mainly from wood pulp and polyethylene plastics and polyethylene plastic is non-biodegradable, therefore it remains in the environment unless if burnt. The continued use of diapers has over the years led to the accumulation of diaper waste in the environment. Heaps of used diapers populate road sides and dumpsites in communities and towns around the world especially in less economically developed counties where robust waste management principles have not yet been fully implemented. Zimbabwe is one country to mention where diaper waste has become a menace. There is relatively a poor waste collection and disposal system in the country and in most cases waste is dumped on any open space available.

Indiscriminate disposal of diapers being done by mothers and caregivers in different communities across the world contributes to waste generation and pollution. The aesthetics and outlook of the environment are also affected. Most communities are an eye sore.

Flies and other disease carrying vectors find themselves a playground and contribute to the spread of diseases such as cholera and typhoid. Some residents with access to latrine toilets tend to dump their diapers in the pit. According to them, they would have done justice to the environment. However, dumping it somewhere one cannot see it does not make it the best option, though it might seem so temporality. The fact still remains, diapers are non-biodegradable and will still remain in the environment.

Exposure to chemicals and toxins is also a cause for concern. As mentioned above diapers are made from wood pulp and polyethylene plastics. The plastics are made from crude oil whilst the wood pulp comes from trees. The processing into diapers utilizes gasoline, chemicals such as chlorine, lime, polyacrylic acid and this leads to release of toxins and air emissions with special mention to greenhouse gases. Dioxins are formed during paper bleaching and diapers contain traces of dioxins. Dioxins are highly toxic and carcinogenic as listed by the Environmental Protection Agency (EPA). Diapers also contain traces of Phthalates, an Endocrine Disrupting Compound (EDC) and Tributyl Tin, a heavy metal which impairs the immune system as well as the hormonal system. TBT has been reported to cause sterility in boys and men after exposure. Constant exposure to these chemicals can be dire to those at risk.

The lifecycle of disposable diapers has also been seen to contribute to climate change. The cutting of trees to make wood pulp contributes immensely to climate change through reduction of carbon sinks. The production process release greenhouse gases which contribute to climate change through global warming and lastly the burning of diaper waste in areas where it has largely accumulated contribute as well to the release of greenhouse gases. The environmental quality and health of humans are therefore being compromised by diaper production and indiscriminate diaper waste disposal. There is increased waste generation and pollution and populations run the risk of exposure to chemicals and disease-causing pathogens. As the world is working towards a circular economy, deliberations need to be made on the fate of disposable diapers.

TITAKU Environmental Engineers P/L

'Sustainable Business Frontiers'

Titaku/ Envirosmat Consultancy is a growing firm in the line of business and environmental sustainability running under the Titaku Environmental Engineers (Pvt) Ltd group. The firm specialises in environmental impact assessments (EIAs), industrial hygiene surveys, environmental monitoring exercises, environmental engineering designs, pegging of mine claim boundaries, siting of works plans drawings, mapping and most recently NORM radiological surveys.

The consultancy is made up of a team of experts in environmental science, safety and health, environmental health, geology, hydrology, social sciences, engineering and cartography. Through its pool of professionals, the consultancy has managed to diversify its field and has integrated information and results for the best of the clients to which it offers its services to.

The consultancy focuses on quality service delivery in a professional and timely manner to aid in the smooth flowing of business and investment. It offers its services in the mining, manufacturing, construction, energy and fuels, recreation, agriculture and services sectors. The Envirosmat Consultancy – Titaku brand has a wide client base of over 200 organisations within the private and public sector, large corporates, SMEs as well as individuals.

The consultancy firm has taken strides by offering professional services to big corporates such as ALROSA Zimbabwe, Prospect Lithium Zimbabwe, ZUVA Energy, PRObrands, ZIMPARKS, POTRAZ to mention just but a few and also pioneering EIA studies for medicinal cannabis projects in Zimbabwe.

The firm is open to navigating new ground and projects within the field of business and environmental sustainability.

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THE TIGER PHOTOIONIZATION DETECTOR (PID) (left)
AND KANE 905 HANDHELD COMBUSTION ANALYSER (right)

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ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR
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Alrosa Zimbabwe – Malipati Project

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Zimbabwe Parks and Wildlife Management Authority

THE MOVEMENT DRIVE-IN-CINEMA AND RECREATIONAL PARK PROJECT

KATOMBORA ISLAND RESORT CENTRE PROJECT

According to the United Nations, by 2050, two-thirds of all humanity, that is close to 6.5 billion people, will be living in urban set ups. Cities in developing countries including Zimbabwe are recording high levels of rural to urban migration as people look for employment, better educational opportunities and being attracted by the bright lights of the city. This has created an immediate need for using urban natural resources at hand for survival.

Urban agriculture also referred to as guerrilla farming, is defined as food production within the confines of cities and towns, at the backyard, on rooftops, on the rural urban interface, on unused spaces and in greenhouses. Advocates have argued that, policy-makers should recognize the opportunities provided by urban agriculture as we counter increasing urbanization and food demand. There is some benefit as it earns income to families, employment of low-skilled unemployed residents, improved air quality and hydrology, provides a place for disposal of organic solid waste (manure) and reduction of urban blight. World over farming in plots near cities and within individual properties are recognised and supported with the potential to sustainably and significantly contribute to food security. A resident in Harare had to say, "My yard sprouts with, tomatoes, vegetables, garlic and onions. I see benefit; We always meet with my neighbours at the garden fence and exchange for money. My street and backyard have grass, trees, lawn and flowers. I always see beauty".

While we cherish the benefits of urban agriculture, the fact remains "if things are done wrong then things will go wrong" and this brings attention to the commonly practiced form of urban agriculture - Illegal Urban farming - . with impacts ranging from environmental, social, health to infrastructural risks. This is a critical subject that requires increased attention and response, raising concern over Sustainable Development Goal (SDG) 11 on Sustainable cities and communities. The SDG endeavours to make cities inclusive, safe, resilient and sustainable. Sustainable development cannot be achieved without significantly transforming the way we build and manage our urban spaces. When we utilise every 'available' piece of land without much regard to anything else. Any 'unused' piece of land is a target, be it on hill slopes, on wetlands, along urban stream banks, near

GUERRILLA FARMING — PROS AND CONS

Jairos Nzvimba

dumpsites, near electricity, water and sewer infrastructure and along road sides. These are likely to cause significant long term damage to the urban ecological and economic systems. While providing food security in the short term, can consequently hinder the ability of urban residents to secure food as it is likely to become the leading cause of distress in relation to SDG 11 thereby putting Zimbabwe in stark contrast to national, regional, and international commitments towards attaining sustainability.

Citizens should be aware of the impacts of their actions and other risks as secondary to meeting their food requirements. Use of fire as we clear land poses a great risk on the environment, as an agent of pollution and fragmentation of urban species habitats. Tilling itself particularly on hill slopes and road sides triggers soil erosion resulting in gullies, one of the most prominent characteristics of degraded land and an eyesore. Land clearing also interferes with green spaces and threatens biodiversity by replacing natural environments causing disturbance and draining of wetlands and vleis which impede their ability to carry out their ecological services that include renewing ground water supply, water filtration of excessive nutrients among others. The use of chemicals for pest control, use of inorganic fertilisers worsens the situation as these chemicals end up contaminating water sources and endangering aquatic life. Proximity of fields to potentially precarious land uses such as industries which produce pollutants in solid, liquid or gaseous state result in absorption of heavy metals that endanger pregnant women, the elderly and children. Crops can also be hazardous to public safety by harbouring criminals as they create crime generation from hideouts; muggings and robberies are known to be on the rise during the cropping season as people plant crops along footpaths used by residents to go to the bus ranks, shops, clinics and adjacent suburbs.

Tilling under electricity poles can weaken the pole or accidental exposure to naked wires. High health risks on drinking-water contamination through potential groundwater contamination. Flooding, damage to property, transport routes and infrastructure; lowering of the land surface; logging of city drains, algal blooms and water hyacinth, high costs of water purification, loss of scenery and diversity of the environment, loss of recreational spaces; water for domestic use being diverted to irrigation causing shortages municipal supply.

IRRIGATING HORTICULTURE PRODUCTS WITH EFFLUENT IN AFRICA - **PROS AND CONS**

Simbarashe Machisa

Life is strange, ones stomach has the power to determine their fate, although Henley wrote, " I am the master of my fate, I am the captain of my soul. I believe this wisdom by Henley shows that we have the power to control our thoughts and are able to understand and trace the sources of products that we consume for our safety.

Wetlands in urban areas are increasingly becoming cultivation lands for horticulture products. Although the local bylaws prohibit the use of effluent to irrigate crops. Most of the aging and dilapidated sewer pipelines are the ones which open the flood gates of effluent into the environment, and these find way to plants being grown.

Horticulture is the science and art of the development, sustainable production, marketing and use of high-value, intensively cultivated food and ornamental plants.

Horticultural crops are diverse and these include:

- Annual and perennial species
- Fruits and vegetables
- Decorative indoor plants
- Landscaping plants

PROS

- Wastewater has high nutrient content mainly phosphates, nitrates
- Reliable waste-water supply allows farmers to grow short-cycle cash crop
- This form of production has great importance as a source of income

CONS

- Health risk to consumers due to heavy metals and microbial contaminants
- Crop contamination

Waste water used for irrigation has often been proven to contain microbiological contaminates exceeding the WHO guidelines (WHO 2006). There is overwhelming information that consuming these products can be fatal to humans. Reference can be given to the cholera and typhoid cases that have been experienced in Zimbabwe.

WILDLIFE FEATURE: SOUTHERN GROUND-HORNBILL

Jairos Nzvimba

Bucorvus Leadbeateri
Southern Ground-Hornbill (English Name)
DENDERA (Shona name)

International Union for Conservation of Nature (IUCN) classifies Southern Ground Hornbill as vulnerable to extinction. Their distribution range has hugely decreased recently, due to persecution and habitat alteration through extensive farming, pollution, deforestation as it often results in the destruction of nesting habitats. Flooding and severe weather due to climate change has wreaked further damage. Mostly common in Southern and Northern Zimbabwe, it generally prefers grassland and savanna woodland habitats, ranging from montane grassland to extensive, tall stands of Zambezi teak (Baikiaea plurijaga), Mopane (Colospermum mopane) and Musasa (Brachystegia spiciformis) woodlands with sparse understorey. It is recognizable by its jet-black feathers, yellow eyes, and bright red throat. The fleshy part of the bird's throat, called a wattle, identifies its sex: The throat of a male hornbill is completely red, whereas in females, a patch of violet blue. It feeds on a wide range of food, including small animals, locusts, frogs, snakes, lizards, chameleons, tortoises, squirrels, hares, snails, plants and birds. It forages in groups so that when one bird locates a prey it can signal the rest of the flock with a low bark. It often finds prey by digging, especially in dung heaps. The birds move in pairs, sing together and hunt together. When the sun is about to rise, they are heard making the booming call that is loud and roaring like a lion's roar "Hu Hu Hu Huhuhuhuhuhu; Hu Hu Hu Huhuhuhuhu" and the elderly would say "Today the sun will be hotter, hear the Dendera singing". The song signals a sunny scorching day. The group roosts in trees on rock faces, descending to the ground just before dawn and foraging for a lot of the day. The bird can fly up to 18 miles an hour and has an impressive wingspan that reaches about four feet across.. It is a monogamous, cooperative breeder, with a group consisting of a dominant breeding pair and 0-9 helpers, who are usually either adult males, or juveniles from previous breeding seasons. It lays 1-2 eggs, which hatch in the sequence laid, meaning that the one chick is 3-14 days older than the other chick. The younger chick is unable to compete for food with its older sibling, and dies of starvation when it is barely 3-4 weeks old.

GREEN BUSINESS GAZETTE

BIODEGRADABLE PACKAGING

TO PREVENT POLLUTION FROM PLASTIC WASTE

Tendai Kaneta

Individuals feel good and comfortable when handling packed commodities but are not ready to solve the problems of plastic waste. Packaging is more than just material used to carry products. It is the art and technology of enclosing and protecting products for distribution, use and storage. Packaging is meant to contain, protect and preserve a product. It also meant to inform the consumer about the product and thereby attracting the customer. It can also be used to reduce security risks on transportation by deterring manipulation of the product.

Plastic is one of the most commonly used packaging material in the world. High Density Polyethylene is the most widely used plastic type. It makes many types of bottles and containers as well as shopping bags. This is mainly because of its stable form, chemical resistant properties, non-interactive abilities and also the fact that it is of light weight and is cheaper to manufacture. In Africa, plastic packaging has reported high growth rates as demands for its uses increases. Despite the fact that plastics are useful in packaging of goods, they have a negative impact on the environment.

Statistics show that in the period between 1950 to 2018, about 6.3 billion tonnes of plastics have been produced worldwide. One can imagine how much has been produced to date considering the increased demand in cheaper packaging material. Of the billions of tonnes produced only 9% has been recycled and 12% incinerated. Zimbabwe alone produces about 300 million tonnes of plastic waste every year. This is mainly attributed to the increase in human population and consistent demand for cheaper packaging thereby resulting in continuous generation of plastic waste and its accompanied environmental pollution.

Indiscriminate disposal of waste from plastics can pose detrimental effects to the environment as well as human health. The evidence of the effects of environmental pollution due to plastic waste is manifesting itself in several ways. These include reduction in the aesthetic value of the environment, entanglement and death of aquatic organisms, sewage system blockages in towns and cities of most developing countries, creation of a habitable and conducive environment for breeding mosquitoes and other disease causing vectors, production of foul smells as well as reduction in water percolation and normal agricultural soils aeration.

In today's world, biodegradable plastic is becoming the best and an integral part of the solution to plastic waste pollution. Biodegradable plastics are plastics that can be decomposed by the action of living organisms, usually microbes, into water, carbon dioxide, and biomass. These are being made by extracting sugar from plants like corn and sugarcane to convert into polylactic acids (PLAs), or can be made from polyhydroxyalkanoates (PHAs) engineered from microorganisms. Biodegradable plastics are considered to be eco-friendly, because they are commonly produced with renewable raw materials, micro-organisms, petrochemicals, or combinations of all three. The acquisition of knowledge of biodegradable plastics is a noble idea as it plays an important component in the implementation of the circular economy model in Zimbabwe.

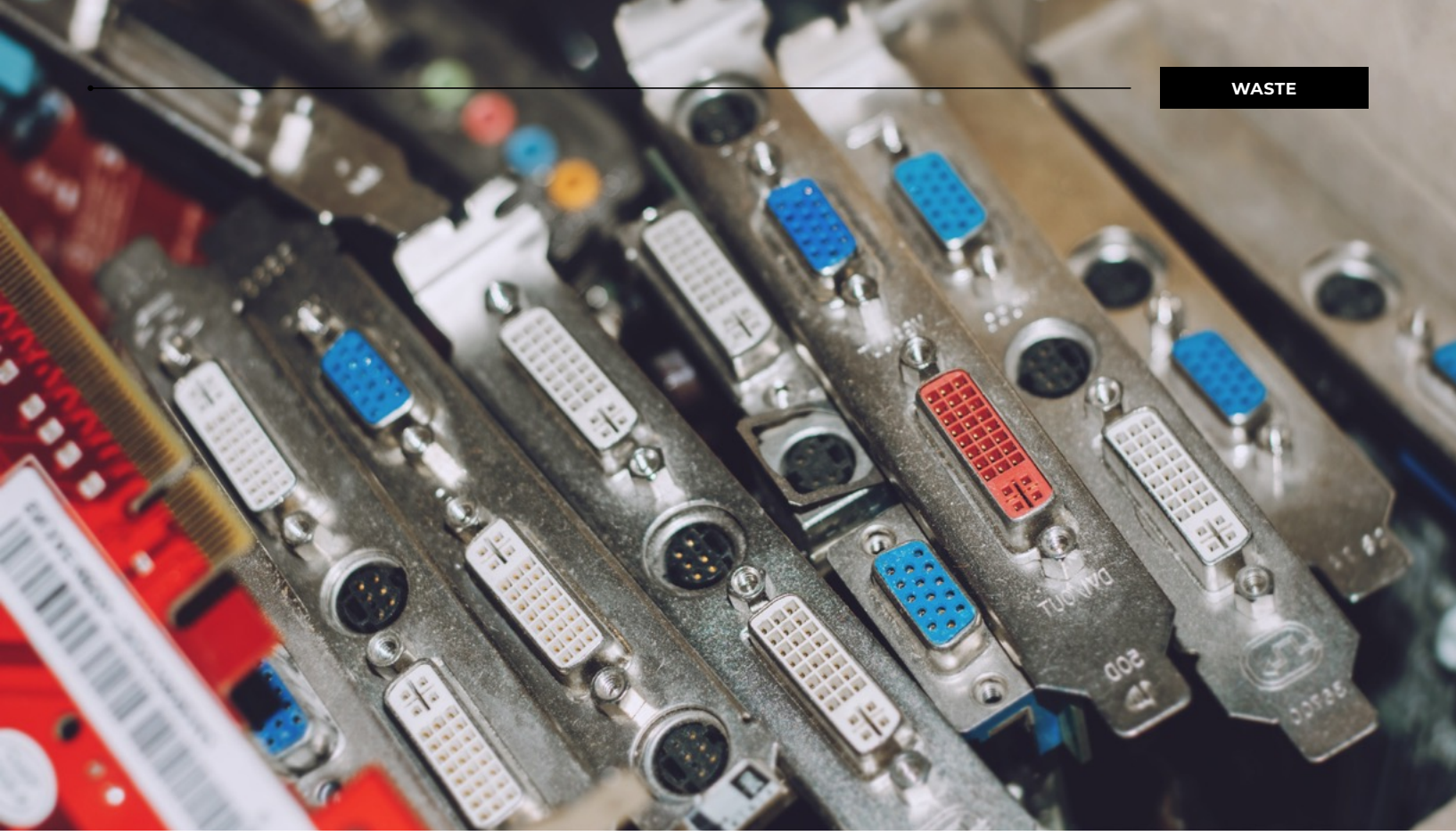
Important environmental value of biodegradable plastics is in the areas of packaging, single-use items, and agricultural plastic mulches. Biodegradable plastics are gaining popularity worldwide, however, attention needs to be paid to additives used in biodegradable plastics to ensure that the additives do not pose an environmental hazard.

USED COMPUTERS – BLESSING OR CURSE IN ELECTRONIC WASTE

■ Wadzanai Diana Manyame

The first computing or rather calculating machine was invented in the 1820s by a man called Charles Babbage. In 1936, Alan Turing developed an idea that influenced computers, a universal machine which could compute anything computable. Fast forward to 1976, Steve Jobs and Steve Wozniak introduced the first single circuit board computer, Apple 1. IBM, in 1981 released the Arcon characterized by an intel chip, a colour monitor and an intel chip. The Apple 1 had a system monitor and its Central Processing Unit (CPU) was a MOS 6502 at 1MHz with a memory of 4KB of RAM, 256B of ROM and a storage of 456KB. 45 years later, I am writing this article from a MacBook Air laptop running on a 2.2GHz Intel Core i7, a memory of 8GB 1600MHz DDR3 and a flash storage of 500GB. One can imagine what has happened to all the machines dating back to the 1800s.

Each year computers are being produced in masses from different companies. It has ceased to be a process of simplifying tasks but a profit-making business, where key players such as Apple, Hewlett-Packard, Dell and many other need to remain relevant and bringing forth the latest technology and most advanced machines. The consumers themselves especially those with rich backgrounds wait anxiously for the latest laptop release, so as to acquire it and get rid of the one they had been using even though it is still new and is in perfect condition. Software engineers on the other side are playing the devil's advocate. There are constant upgrades in operating software as well as applications. There comes a time where the old laptop or computer can no longer host the updated and latest software and applications. Thereby forcing people to move on with the times. These processes have led



to the accumulation or rather generation of used computers.

The used computers are either redundant and dead machines where nothing can be salvaged from them or functional computers which are still usable. Africa has found itself being the dumping ground for such computers. Due to the fact that 90% of the African population cannot afford brand new electrical gadgets including computers, used computers have found their way into the shops of most African men. Demand for these is high because they are affordable and one can still say, "I am using the latest Apple laptop, and I am no different from someone who bought it brand new right out of Apple Incorporation." There is more to consider than just the hype of being in touch with technology at a lesser cost. It could seem like a blessing, it might be to some extent but there are repercussions that come with that. As some would say, "Cheap is expensive."

Importation of used electronic gadgets such as computer for sale, as much beneficial as it might seem has made Africa to become one the dumping sites for electronic waste. This is being done with the knowledge of the perpetrators and sometimes of those receiving. However, some have been duped where a whole cargo will only be possessing a few machines that work. The rest becomes waste with nothing to salvage from it. By the mere fact that electronic material is non-biodegradable countries in the most developed world protect their environment by sending off used gadgets to Africa and other less economically developed areas. This has led to the accumulation of electronic waste in countries that do not have the capacity to reprocess the material into upgraded laptop versions or any other usable products. Waste collectors and crafts man have found themselves picking pieces of these computers to use for other crafting ideas, running the risk of exposure to chemical toxins. It is important to note that E-waste has both environmental and health effects.

Computers contain heavy metals such as lead, zinc, barium, lithium and nickel. When left lying on dumpsites and landfills the chemical toxins seep out into the ground and find their way into the underground water bodies. The chemicals can also be washed away into nearby water bodies leading to contamination of surface water. Fruits and vegetables also get contaminated if exposed to contaminated water. The chemicals especially lead bioaccumulate and when ingested by human beings, it accumulates in the human body and pose damage to key body parts and systems such as the kidneys and the central nervous system.

Electronic waste also releases toxins such as dioxins, a carcinogenic. This release is exacerbated by the burning of computers that also takes place when waste pickers are trying to retrieve valuable metals such as copper for their small businesses. Constant exposure to these toxins lead to cancer cells development in one's body. In order to protect the environment and safeguard the health of the people a limit and standards should be applied when it comes to the acquisition of used computers.

DID YOU KNOW?

There are over 30 000 known species of fish in the world

Hwange receives on daily basis an average maximum **temperature of 34.19˚C,** minimum **temperature of 33.96˚C**

More than 100 000 chemicals are in use in different parts of the world.

EVERY ZEBRA HAS A UNIQUE PATTERN OF BLACK AND WHITE STRIPES.

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Climate change will cause sea level to rise by 90cm by the year 2099 to the detriment of the world and cause flooding in certain countries.

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