CHAPTER 8: ENVIRONMENT AND CLIMATE CHANGE

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ABSTRACT

This chapter critically explores and delve deep into the overall climate change scenario and environment in Zimbabwe as the country works towards the realisation of aspirations enshrined in its National Development Strategy 1 (NDS1). From the environment perspective, Zimbabwe is fighting tirelessly against the adverse effects of climate change which has had devastating effects over the past years, whilst restoring degraded areas through various ways in the form of environmental protection and sustainable natural resource management. This would result in the country's improved biodiversity protection and management of various environmental domains, including wetlands, national gazetted forests, national parks and other wildlife protected areas. In light of this, Zimbabwe has set several possible ways to be used to attain the NDS1 goals from the environmental and climate point of view. The most notable and priority areas of concern from the Government of Zimbabwe (GoZ) include improved forests research, coupled with forest inventories, thereby ensuring increase in forests production as well as working on maintaining the improved status of other protected areas. This chapter makes use of geographical information systems (GIS) to map current locations of major protected areas, including wetlands, forests and national parks, which are key in the implementation of intended key strategies towards the NDS1.

INTRODUCTION

Zimbabwe is a landlocked Southern African country located between the Zambezi and Limpopo Rivers and bordering Mozambique to the east, Zambia to the north, Botswana to the south-west and South Africa to the south. The country is steered up by its national agenda, the Zimbabwe NDS1. It is in this NDS that several the country's main goals in different sectors of the country are outlined and envisaged to be attained by the year 2025. Climatically, Zimbabwe lies within the sub-tropical climate made up of summer, winter, autumn and spring seasons. As such, these

climate variabilities vary, with some areas, especially in the lowveld, receiving less rainfall, usually about 350 to 400mm, than the highveld areas of the Eastern highlands which receives above 1 000mm per year (Dube, 2021). It is the same with average temperatures ranges in Zimbabwe, which are mainly influenced and controlled by altitude.
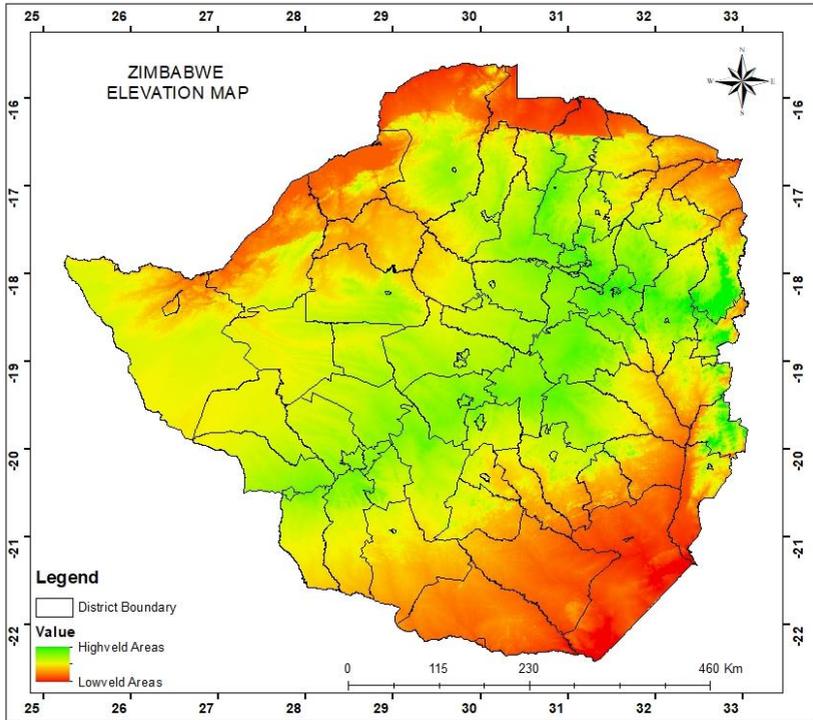
Figure 1: *Zimbabwe elevation variability*

Lowveld areas, including areas like Chiredzi and Muzarabani, tend to have predominantly higher temperatures, reaching close to 35°C, than the highveld areas like the Eastern highlands which tend to maintain lower and cooler temperatures of a maximum of 18°C around October, the hottest month in Zimbabwe. In terms of vegetation distribution, the country is a mainly savanna type of an ecosystem that is heavily dominated by a variety of species including the *mopane*, the *miombo,* teak, acacia, the *combretum* and the *terminalia*. This distribution of

vegetation around the country is naturally based on elevation, soil type and rainfall variability. Soils type constitutes the main cause of the distribution of vegetation species in Matebeleland North and some parts of Midlands that tend to be heavily dominated by a hard wood called *Baikiaea plurijuga.* The same is associated with the *mopane* and the *combretum* species which are usually associated with poor shallow soils found mostly in areas around the south east lowveld of the country. It is from this vegetation distribution background that Zimbabwe is working as she drives towards the attainment of the NDS1 agenda from the environment perspective. The country's vegetation distribution is dominant in protected areas, including state gazetted forests, national parks and other wildlife areas like conservancies and safaris. However, due to the increasing population, deforestation is increasing daily with some people actually involved in charcoal-making by burning trees, thereby posing a major threat to the vegetation distribution and concentration. Agricultural practices are also among the major contributors of deforestation in Zimbabwe, especially in tobacco-growing areas as farmers use a lot of trees for tobacco-curing, posing a threat of climate change effects. In terms of agriculture, one of the sustaining sectors of the economy, Zimbabwe is divided into five farming regions based on the amount of rainfall received, from Region 1 that receives high rainfall, to Region 5 with little sporadic rainfall.

LITERATURE REVIEW

Like many other countries around the world, Zimbabwe is facing climate change-related extreme events and disasters like of very high temperatures which can be linked to heat waves, cyclones and drought (GoZ, 2019). These and other extreme events have been affecting the unprivileged within society and, unless urgent and continued support on fighting against climate change has been prioritised, society will continue to suffer from these extreme events. Kutyauripo *et al.* (2021) note that most Sub-Saharan countries tend to be affected much by climate change because of high their dependence on rain-fed crops that tend to yield less when there is little rainfall, hence are vulnerable to any changes in rainfall patterns. Drought in Zimbabwe does not affect only crop farming, but livestock farming also, as increase in drought levels has a significant effect on pastures and exposing large herds of livestock to various

diseases. The occurrence of these events has been a major threat to progress of various sectors of the economy, including, and most notably, tourism, forests and agriculture.

In December 2019, the famous Victoria Falls almost dried up after its average flow dropped by almost 50%, indicating a huge threat that climate change can pose to the tourism sector (Baynes, 2019). Such devastating effects can be felt in various sectors of the country, affecting its GDP. Prolonged dry spells associated with extreme high temperatures are among the factors that increase cases and occurrence of wild fires (Silveira *et al.*, 2021), which contribute to overall greenhouse gas (GHG) concentration in the atmosphere through carbon dioxide emissions. Consequently, climate change effects from wildfires and deforestation are severe and long-lasting not countered by afforestation programmes.

Climate change has also been posing threats to wildlife in protected areas and it is projected that these threats will continue, affecting wildlife population as they heavily depend on availability of grazing. Rotich (2021), in a study carried out in the Masai Mara Game Reserve, notes that climate change has substantively been affecting wildlife population due to drying of vegetation and several water spots in and around the game reserve. The Masai Mara Game Reserve's research also 'speaks" to Zimbabwe's wildlife in the present case of climate change that in some cases, there has been wildlife-human conflict as surrounding communities are now encroaching on protected areas in search of wood fuel and wild fruits as resilience methods at local level. As such, this calls for implementation of climate change mitigation and adaptation strategies like the bee-keeping projects that were implemented by the STINGZ-NDC project by the GoZ in partnership with UNDP-Zimbabwe in Bulilima District (Mhaka *et al*., 2020), within less privileged societies of Zimbabwe. Climate change has been a major cause of wildlife-human conflicts. Habakkuk Trust (2019) shows that the 2019 drought in Zimbabwe was a major contributor to increase in wildlife-human conflicts in the same district as grazing pastures are getting scarce and, in search of pasture, wildlife is invading surrounding small-scale farmers and causing serious problems. In the same report, (*ibid.*) is shown that only as recent as 2019, the Hwange National Park lost about 55 elephants which starved to death due

to shortages of grazing pasture, forcing them to encroach onto surrounding villages. In the Mbire District of Mashonaland Central, there are also reported cases of escalation of conflicts between humans and – wildlife, with elephants, being the major cause of the conflict with surrounding communities (Zamasiya, 2021) .As way of fighting the elephants, local people use strings dipped in used oil and chilli to deter the elephants from encroaching on their fields.

Furthermore, climate change has not been friendly with local wetlands in Zimbabwe. Several wetlands are disappearing by being easily converted to cropland. In study carried out in Marambanyika *et al.* (2021) note that in Driefontein, one of the largest wetlands by area in Zimbabwe and part of the Ramsar Sites, climate change effects are already being felt by the local community who were heavily depend on the resource. To local community used to access clean water and at times drew water for irrigation from the wetland, but with the current climate change scenario, the water table has seriously declined owing to drying of some parts of the wetland. Disappearance of wetlands does not only a cause lack of adequate supply of clean water to surrounding area, but also loss of biodiversity. For example, the Driefontein is known to be home to Grey Crowned and Wattled range birds, listed as endangered species on the International Union for Conservation of Nature (IUCN) red list (AEWA, 2019). The drying and disappearance of this wetland contributes to the distribution of these birds.

APPRAISAL OF PLANNING

In its efforts to sustainably use natural resource, the GoZ has proposed various key areas of concern that shall help the use of natural resources. Among the major notable areas of concern are fostering the sustainable management of wetlands across the country. In so doing, the protection and sustainable use of wetlands guarantees availability of clean water for human consumption and also for livestock and wild animals. Unsustainable farming practices by the majority of small-scale farmers is one of the major activities targeted as potential threats to proper functioning of wetlands. This is the case, especially with farmers along the Harare-Beitbridge Road in Chirumhanzu District. As such the GoZ is focusing more on increasing wetland area under proper and sustainable

use to approximately 1 051 650 hectares. This hectarage is a major milestone in the wetland restoration agenda for Zimbabwe (GoZ, 2020).

Furthermore, as a way of rehabilitation and restoration of degraded areas, the GoZ has decided to make it one of its goals over the period of NDS1 implementation to restore all previously mined areas that were abandoned when the mining operations ceased. These areas are currently a threat to local people, wild animals as well livestock. This is true in many areas in Zimbabwe, including the greater part of the Midlands Province which is dominated by Chinese mining operations. Mavhudzi, (2021) expresses deep regret and fear for the people of Mberengwa in the province where White ASB Gold Mine, a Chinese mining company, is heavily involved in alluvial mining along the Dowe River. Mavhudzi, (2021) indicates that there is evidence of death when a minor fell into a disused mining pit. It is the same in Shurugwi. This calls for the intensification of the call for the GoZ to prioritise rehabilitation of previously used mining areas and mining dumps. This guarantees the provision of safe drinking water to the community, thereby fighting land pollution and diseases. Mining operations in the Hwange District have also become a major cause of land degradation over the past three years with several Chinese mining companies involved in coal extraction within the Hwange National Park (Dube, 2021). This has become a major threat to the survival of wild animals within the park.

APPRAISAL OF IMPLEMENTATION OF NDS1
In a bid to achieve the outlined and documented road map for the NDS1, Zimbabwe has stipulated various implementation strategies and policies that will guide the progress and ensure the success of all outlined plans. These strategies have been designed to cut across all sectors of the economy. However, this chapter stresses the implementation strategies outlined to boost the climate and environment sector. To ensure sustainable use, management and restoration of wetlands and other sensitive ecosystems, various policies have been reviewed to cater for the present changing climate. Muleya (2021) narrates the idea of a national wetland master plan brought by the GoZ which is a key enabler in wetland monitoring and protection to ensure sustained provision of ecosystem goods and services to enhance livelihoods of surrounding communities.

This recently published national wetland master plan is meant to reinforce the sustainable management agenda towards the attainment of NDS1 goals and this is to be reinforced through wetland identification and mapping from local ward-level to national level. Other sensitive ecosystems, including forests and national parks area are also under sustainable and controlled management to protect and conserve various animal and plant species.

Furthermore, besides coming up and adopting new policies for conservation and protection of sensitive ecosystems, the GoZ has taken a major step in its implementation of strategies towards the attainment of the NDS1. Implementation strategies, including mapping, gazetting, adoption and protection of sensitive ecosystems, have already been lined up to ensure their sound management (GoZ, 2020). Mapping and gazetting of more sensitive areas in the country is a key enabler in biodiversity conservation to a greater extent, as mapping will review the real extent and other natural features, including what exists within those protected areas. This will enable policy-makers and funders to know how much resources to use and invest in each of the areas as a way of achieving sustainable utilisation of resources For example, mapping the location of the present known wetlands will enable policy-makers, decision-makers and regulatory bodies to put substantive measures in place to fight against any form of unsustainable use of resources, thereby restricting any further encroachment of people into the gazetted areas. Also, mapping of national forests and other private protected areas, including conservancies, will enable management and the government to quantify and model the likely existing biomass stock that is key in fighting against climate change as forests are valuable for carbon sequestration.

Moreover, there is the on-going capacitation of environmental protection institutions to work on restoration and protection of sensitive ecosystems and protection of ground water. The capacitation is meant for both private and government organisations to take the lead in ecosystem protection and restoration. To fight against water pollution of underground water, authorities from the local catchments and sub-catchments are heavily involved as key players in combating the spread of polluted water into

other water sources like rivers and dams. Capacitated environmental institutions will work strongly with communities on the ground in the restoration of degraded ecosystems. This means that all areas that were degraded through various activities like brick-moulding and stream bank cultivation are restored. Currently the GoZ, through the Forestry Commission, is working on a project called Tobacco Wood Energy Programme which is meant to ensure that degraded areas are reforested by communities. The programme has been successfully implemented in all provinces that grow tobacco (Lupande-Mwenebitu *et al.*, 2020). There are also other initiatives running to reforest deforested environments in the country and this is done as the country is rallying against changing climate, thereby mitigating GHG emissions. For example, under the Bon Challenge, Zimbabwe has pledged to plant about two million trees by 2030, a major milestone in fighting climate change.

Early warning systems have also formed part of the implementation strategy of the NDS1 of Zimbabwe as the country has been haunted by uncompromising natural disasters that have led to loss of lives and destruction of infrastructure in the past few years. This means that strengthening the early warning systems will help greatly in the overall fight against climate change as the country attempts to minimise losses associated with the occurrence of natural disasters. In Zimbabwe, the government is on track towards building and strengthening early warning systems as the country is on its way to the launch of the country's first satellite mission called ZIMSAT-1 (Adetola, 2021). This is because the use of geospatial technologies and earth observing satellites has gained momentum around the world as one of the most proper ways of providing early warning systems service as they provide near-real-time data in the event of a possible occurrence of a disaster.

Strengthening of capacity-building and awareness on climate change mitigation and adaptation have also been adopted as implementation strategies that will drive the climate change mitigation agenda towards attainment of the NDS1. Currently, the GoZ is on its toes through the Department of Climate Change Management (CCMD) in Ministry of Environment, Tourism and Hospitality, through the delivering capacity-

building training programmes to various stakeholders as a way of fighting climate change. In light of that, various programmes were conducted by the CCMD, in partnership with United Nations Development Programme (UNDP) throughout 2021 with youths taking the lead in spreading the news on climate change mitigation and adaptation. All these programmes were key in preparation of the country's Nationally Determined Contribution, a requirement for reporting to the United Nations Framework Convention on Climate Change of the Paris Agreement (UNFCCC). Therefore, the CCMD is working tirelessly on capacity-building of other ministries within the government, thereby making sure that the four key sectors of GHG emissions are covered, so promoting reduction of GHGs.

APPRAISAL OF MONITORING AND EVALUATION

Various monitoring strategies have been implemented to keep track of outlined plans during the period of NDS1 to make sure that the 2025 agenda for environment and climate change is attained. In terms of forestry resources, the GoZ, through the Forestry Commission, is actively involved in community engagement in areas under the Tobacco Wood Energy Programme (TWEP) as it consistently monitors forestry resources. This is being done by villagers in rural areas who were supplied with tablets by the Forestry Commission, and they record information on cases of deforestation, wood poaching and charcoal production and upload the information on a server that can be accessed only at Forestry Commission. Such information is key as it helps in making informed decisions on either organising an urgent field trip to the area or organising field ambush surveys in selected areas, especially those areas facing high levels of timber harvesting to charcoal production, for example, in Mudzi and Muzarabani. However, the success of this initiative has been limited by the unavailability of sufficient resources in terms of tablets and, more importantly, lack consistent capacity-building of communities in the use of these mobile phones in data collection. As this calls for sufficient, capacity-building that is consistent by availing more financial resources to the initiative.

Through the mapping and inventory unit of the Forestry Commission, vegetation mapping and monitoring in Zimbabwe is being carried out with

Zimbabwe national 2020 land cover map currently being worked on. Results of the map are key in detailing land use changes that have been occurring over time and, in this case, from 2017 when another national land cover map was produced. Land use changes over time are key in showing the causes associated with given land use change and as such deforestation rates can be estimated from district to national levels. Furthermore, land use change information, especially the area extent, is key input data into the Intergovernmental Panel on Climate Change (IPCC) software when carrying out the nation's greenhouse gas (GHG} inventories. This means that, through data produced from a national land cover, GHG experts and compilers can easily calculate the amount, in tonnes of carbon stocks, that could have been lost through deforestation or that could have been gained. Such information on GHG is a key enabler in reporting requirements of national communications and Biennial Update Report as required by the UNFCC. However, the process of mapping and carrying out inventories required for proper mapping takes much time and financial resources have proven to be a major setback along the way. With the support from the UNDP-Zimbabwe, the national land use land cover map for 2020 has been greatly worked on. This calls for the need for GoZ to fulfil its strategies outlined in the NDS1 for forestry inventories in which they pledged to strengthen funding and carrying of forest surveys and inventories around the country.

Climate-change related workshops and capacity-building engagements with various sectors of the economy, including the four main sectors required for national GHG accounting, are carried out followed, by some reporting on what each sector is doing towards the attainment of set strategies. Among other key sectors to be monitored in response to fighting climate change are the energy, agriculture, forestry and waste management sectors. As such, monitoring strategies are mainstreamed along these key sectors that are pre-requisites in national GHG accounting for reporting of the climate change position of the country. However, these kinds of engagements require substantial financial resources, hence calling for financial support from the government and other non-governmental organisations actively involved in fighting climate change.

This calls for more massive actions on engagements in sustainable climate finance.

DISCUSSION

Under the NDS1, the country is on high alert to fight climate change through working tirelessly towards the attainment of the set 2025 NDS1 agenda. In so doing, Zimbabwe is not only fighting climate change effects and environmental protection, but is also working towards the set global agenda on sustainable development goals mainly numbers 11, 12, 13, 14 and 15 (GoZ, 2020). Pursuant to that, as part of main aspects meant to ensure the attainment of sustainable use of natural resources, the GoZ has outlined the key environmental enablers for protection and conservation of forests, national parks, wetlands and other sensitive ecosystems. Under the NDS1, the GoZ is working on increasing forest research coupled with forest inventories across major state forests in Zimbabwe. This is key in quantifying the biomass stock contained within a given forest which is used to estimate the level of carbon that can be sequestrated by that particular forest. This information is very useful in making informed climate change decisions on GHG emission reduction. This is important as the inventory information is also used in coming up with reporting requirements necessary for the compilation of the country's national communications and update reports of the forestry sector, one of the important GHG emission sectors. Furthermore, to increase area under forest which had greatly decreased due to various anthropogenic activities, the GoZ, supported by private organisations like the Sustainable Afforestation Association (SAA), has started strengthening massive afforestation programmes. The Forestry Commission Zimbabwe and the SAA have already started working on massive afforestation programmes under the TWEP programme in which new woodlots are being established across tobacco growing areas, hence increasing the country's capacity to absorb GHG emissions.
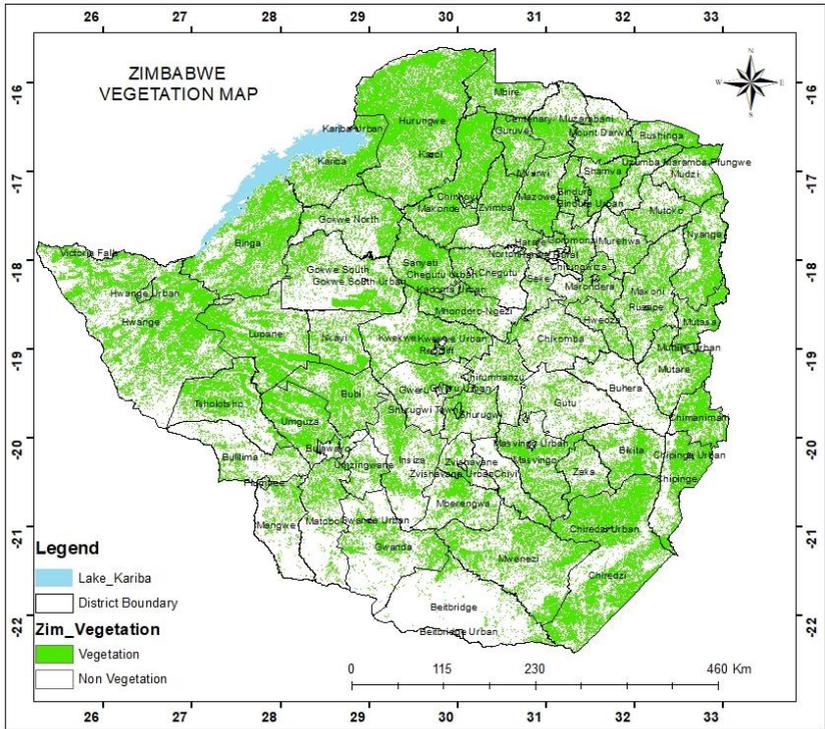
Figure 2: *Vegetation distribution of Zimbabwe*

Currently, wetlands around the country are under threat as they are under serious mismanagement by local people who are involved in unsustainable farming practices right in the wetlands. For example, the Monavale Vlei in Harare is under serious threat from local people who are encroaching through urban farming and housing development projects (Sharai *et al.,* 2020). Such unsustainable activities pose negative impacts to the provision of ecosystem goods and services, including provision of clean water and sustaining biodiversity. Among other threatened wetlands, include the Driefontein wetland, which borders Mashonaland East and Masvingo Provinces. This wetland forms part of the catchment for major rivers Shashe, Sebakwe, Devure and Mutirikwi, which are major sources of water for Masvingo City (Marambanyika *et al.*, 2021). Such increasing levels of agriculture are a threat to the survival of the wetland as it is

losing its real extent to cropland every day, and will likely dry up, hence posing a major threat to the present animal habitat.

Furthermore, increasing levels of climate change in the country have greatly affected wildlife survival around major national parks and safari areas. This has intensified human-wildlife conflicts as animals are now moving out of parks into neighbouring communities in search of pastures, thereby posing threats to humans. Such scenarios have been witnessed in communities close to wildlife areas, for example, in Bulilima District, where cases of elephants ravaging small-scale farmers' crops have been reported. The same is being experienced in the South East Lowveld of Zimbabwe, with large herbivores, including elephants, in some instances reported to be encroaching local communities especially those around the Save Valley Conservancy (Mashapa *et al.*, 2020) as graphically shown below.
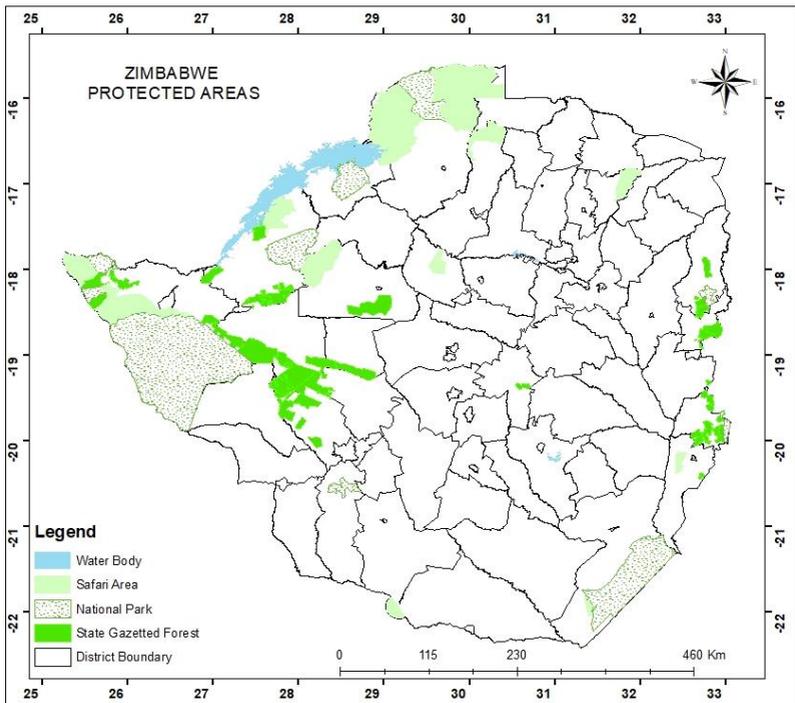

Figure 3: *Zimbabwe protected areas*

During the NDS1 period, the GoZ is also fighting any form of environmental degradation, especially that caused by mining operations around the country. Most mining companies are responsible for massive environmental degradation associated with high levels of water pollution and unclaimed mining pits. In the Midlands, several reports of abandoned mining pits have been reported to be a threat to human lives and livestock. The same has also been reported in Penhalonga in Manicaland at Redwing Gold Mine who are also leaving behind open pits causing much environmental degradation and water pollution in the Mutare River (Mlevu, 2020).

CONCLUSIONS AND OPTIONS

In conclusion, the GoZ is working intensively across all environmental sectors to make sure that the detailed NDS1 goals are achieved by 2025. As such, various programmes have been set up and some have already been implemented to guarantee the outlined results. More robust monitoring and evaluation programmes have been set up to make sure the attainment of set goals is a reality. However, in fighting natural disasters associated climate change, the GoZ can now, through the Zimbabwe National Geospatial and Space Agency (ZINGSA), come up with intensive geospatial technology applications to help in early warning systems. This is now easier as the country has already taken great strides in embracing geospatial technology by investing in the soon-to-come national earth observing satellite called ZIMSAT-1. Geo-fencing is another way of preventing human-wildlife conflicts, which can be adopted during this NDS1 period. This can be implemented through the Zimbabwe National Parks, thereby making use of the global positioning system (GPS) tool that works by sending near-real time alert messages to people in surrounding communities whenever elephants are reaching set buffer zones. This minimises cases of human attacks by elephants and other wild animals, as people are notified via their cell phones whenever elephants come closer to their community and villages. Strengthening capacity building on smart agriculture techniques in most areas of the country can be intensified, making sure a guaranteed increased output.