

CITY OF BULAWAYO



BULAWAYO LOCAL ENVIRONMENTAL ACTION PLAN

2021 - 2025

City Hall Offices

Town Clerk's Department

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Acronyms

A 21	-	Agenda 21
AEI	-	Assessment of Environmental Issues.
BCC	-	Bulawayo City Council
BPO	-	Building Preservation Order
CBD	-	Central Business District
CS	-	Chamber Secretary
CBO	-	Community Based Organization
DES	-	Director of Engineering Services
DHS	-	Director of Health Services
DH &CS	-	Director of Housing & Community Services
EMA	-	Environmental Management Agency
FD	-	Financial Director
LA	-	Local Authority
LA 21	-	Local Agenda 21
LEAP	-	Local Environmental Action Plan
MDC	-	Maputo Development Corridor
M&E	-	Monitoring and Evaluation
MET	-	Ministry of Environment and Tourism
MLG	-	Ministry of Local Government, Rural and Urban Development

NAST - Northern Areas Sewerage Treatment
NRZ - National Railways of Zimbabwe
SAST - Southern Areas Sewerage Treatment
TC - Town Clerks

Acknowledgements

This Local Environmental Act Plan Document for the City of Bulawayo has been produced as a result of the consented efforts of the Bulawayo Residents Associations, Local Pressure Groups, Local Councilors, the Heads of Council Departments and the Environmental Management Agency, who attended a workshop to produce coin a draft for this document. The inter-departmental committee which comprised of N Ncube, P Mateza, H.N Sibanda, I Masina, S Ndhlovu, F Madzimure, S.S Sibanda, K Maphosa, O Ruzawe, I Mukhutshwa, K Dhliwayo, M. T Sibanda, T Mirion, S Bulle, S Dube, S Moyo, T. A Masuku and N. L Sibindi saw the production of the final LEAP document which is now a public document which can be accessed from the City Hall Offices.

Background

Local Environmental Action Plan is a process which addresses an area's environmental threats or problems. It also involves the relevant sectors (stakeholders) of the local community coming together, identifying their problems and concerns, and working together to solve the problem. Agenda 21 (A 21) is a Sustainable Development Action Plan for the 21st Century which urges national governments to work with their citizens to develop a local agenda. LEAP and Local Agenda 21 (LA 21) put more emphasis on public participation in the identification of key issues leading to the preparation of action plans, however LA 21 addresses all elements of sustainable development whereas LEAPS dwell more on Environmental issues. A LEAP is a document that outlines the strategies and measures for the protection, restoration, rehabilitation and for the general management of the environment. The purpose of the plan is to facilitate and co-ordinate strategies, measures, plans and activities relating to the environment. Section 95 of the EMA Act states that every local authority is expected to prepare its own environmental action plan for the area under its jurisdiction. LEAPs are actually a response to LA21. This document has been prepared as a fulfillment of the requirement of the EMA Act.

The above mentioned issues were initially identified by the participants (Bulawayo Residents Associations, Local Pressure Groups, Local Councilors, the Heads of Council Departments and the Environmental Management Agency) at the LEAP workshop which was held in June 2009 in Bulawayo. The workshop also managed to prioritize the issues in terms of their impact on the environment and their prevalence in Bulawayo. This was done using a method called **Pair Wise Ranking**. This is a simple and straight forward way of ranking issues in terms of their importance. It can be interpreted and also be easily understood by an ordinary man on the streets

1 Introduction and Background

1.1 Location

Bulawayo's geographical position within the southern African region is very central. Its location, occupying a midway position between the powerful economy of South Africa and the potentially strong economies of the Democratic Republic of Congo and Angola may prove to be a strategic and pivotal position in the long run. Bulawayo's strong communication and cultural linkage to South Africa is becoming a major advantage in terms of regional integration. Such areas include the North-South, the Trans-Limpopo and Maputo Development Corridors (MDC). Bulawayo has long been and is still regarded as the industrial and business capital of Zimbabwe and is home to the National Railways of Zimbabwe because of its strategic position near Botswana and South Africa. It is the gateway to Hwange National Park, Matopo National Park and Victoria Falls

Bulawayo lies at the hub of a national and regional transportation network and has potentially growing air links to other major countries such as South Africa, India, Russia, China, Malaysia, Australia and the greater Europe, and to most centers in Zimbabwe, other than Harare. It is the centre of the Matabeleland region, located 439 km Southwest of Harare.

Bulawayo, as Zimbabwe's second city exerts a strong influence over the western region of the country, with no challenge to that position, but the main hinterland consists of the dry and relatively under-developed provinces of Matabeleland North and South and significant parts of the Midlands province. Bulawayo functions as an important marketing and distribution centre for the primary produce of its region. The immediate peri-urban area of Bulawayo is closely tied to the city in terms of social and economic factors but is administered by five separate Rural District Councils and the Department of National Parks and Wildlife Management.

1.2 Population

The rate of population increase in Bulawayo has declined from the high levels of the 1970s (5.9% annual average growth) to an estimated 0.35% p.a. growth rate in the period 2012 - 2013. According to the latest population census of 2022 (preliminary report) which was done 10 years from the previous population census of 2012, population growth for the whole of Zimbabwe has been pegged at an average annual population growth rate of 3.17%. Currently population for Bulawayo stands at 665 940 which accounts for only 4.4% of the total population of Zimbabwe, though it is believed to stand at an average of 15 million. This actually shows an gradual increase in population of Bulawayo with a growth rate of 0.58%. Projecting the population forward to 2028 requires making a number of assumptions. The lack of good data on population migration makes such forecasts difficult, as does the impact of pandemics and diseases such as Covid 19 and phenomenon of the HIV/AIDS epidemic respectively.

It is assumed that over the next years the impact of a declining birth rate and an increasing death rate (largely caused by HIV/AIDS, Pandemic related casualties, Discovery of minerals in other cities and the ongoing migration to Diaspora will progressively reduce the natural population increase in the city. Whilst the birth rate will decline the actual number of births will continue to rise due to the increasing number of fertile women in the population. This will help to offset the rising number of deaths due to AIDS. It is assumed that rural to urban migration will continue to enhance Bulawayo's population. However the provision of a new water source and other positive long-term economic factors is expected to help fuel an overall growth rate for Bulawayo.

In terms of the characteristics of the population Bulawayo has a very young population and this is likely to remain a feature for a long time. It is estimated that Bulawayo currently has 178 717 households that is families living together.

1.3 Land Tenure

The City of Bulawayo occupies land measuring approximately 660km² in extent. One interesting phenomenon about municipal owned land is that some of it lies within the neighboring Rural District Council of Umguza (URDC). There is also some state land within the municipal boundary. Predominantly, land in Bulawayo is under freehold title and leasehold. It should be noted that there are some parcels of land which are privately owned within the operative Bulawayo Master Plan boundary and these are owned by various individual and companies. They are also zoned for various uses depending on their location and size in terms of the operative master plan and other relevant town planning statutes.

1.4 Status of Soils

The plan area is covered by the Bulawayo Greenstone Belt which originated from the region's oldest rocks known as the Basement Schists. These have been classified into the Lower and Upper Greenstones. The area has got a granitic- greenstone terrain which is mainly of felsites and quartz porphyry rocks. There is also some sand cover originating from the granite rocks. The most recent cover is the alluvium unit of thin deposits of muds, clays and fine sandy loams. Overlying these muds is a discontinuous layer of red sands derived from the Karoo and small ferruginous pebbles presumably from the Kalahari ironstone (Amm 194). There is also the Maitengwe Greenstone Belt in Botswana which is located to the south of Bulawayo and shares boundaries with Plumtree town hence influencing the type of soils found in Bulawayo and the neighbouring areas. The eastern part of the city is dominated by clay and grey loam soils. The western Part of the city is also dominated by red sandy loam soils. There are also some traces of clay soils dotted around this part of the city. The western part is also characterized by scattered rock out crops and hence some isolated gravel deposits towards khami dam

1.5 Topography

The city sits on the high plains of the Lowveld of Zimbabwe and is close to the watershed between the Zambezi and Limpopo drainage basins. The land slopes gently downwards to the north and northwest. The plan area consists of vast land which shares boundaries with Matabeleland south and Matabeleland North and it is dissected by a number of streams/rivers which include, Phekiwe, Matsheumhlope, Kwelameva and Umuza. The southern side is dominated by hills especially towards the direction of the Matobo Hills (Matopo National Park) to the south.

1.6 Climate

The City of Bulawayo is located on a relatively high altitude, and hence it has a subtropical climate despite lying within the tropics. Bulawayo features a humid subtropical climate though it is a drier version of the climate with the mean annual temperatures average around 19.16°C. Bulawayo is cooled by prevailing south easterly airflow most of the year, and experiences three broad seasons:

- a) Dry, cool winter season from May to August
- b) Hot dry period in early summer from late August to early November
- c) Warm wet period for the rest of summer from early November to April.

The hottest month is October; this month marks the peak of the dry season. The average maximum temperature ranges from 21°C in July to 30°C in October. During the rainy season, daytime maximum temperatures average around 26°C Nights are generally cooler, ranging from 8°C in July to 16°C in January. It enjoys long hours of sunshine extending for more than 12 hours during summer.

The city's average annual rainfall is 590mm, which supports a natural vegetation of open woodland, dominated by Combretum and Terminalia trees. The City experiences showers during the December to February period, while June to August is usually dry and cold. The City's location close to the Kalahari Desert, makes it vulnerable to droughts and rainfall tends to vary sharply from one year to another

1.7 Natural Resource Assessment

Bulawayo has a rich and unique history which is an important resource for the city. The modern city was originally developed / pegged on the instruction of Cecil John Rhodes in an open plain along the Matsheumhlophe River, south of the burnt remains of the Ndebele Capital. Scatters of stones tools and rock paintings found around Bulawayo are a great source of information as far as history and archaeology is concerned. As such there is need to retain and enhance urban features that have important historical associations that reflect the evolution and development of the city.

In terms of the built environment the city has a number of old buildings (i.e. Bulawayo Grand Hotel, Exchange Building(1920s), Cenotaph , (1920s), CBZ Bank (8th Avenue), Standard Bank, and Dolores Store Building(1894), Bulawayo Club, City Hall, Central Police Station(19050) and some of them have since been placed under the Building Preservation Order (B.P.O) for purposes of preserving the ancient architecture and general history of the city for future generations to tap into such great knowledge.

The city has a historical site where the last king of the Ndebele people (king Lobengula) used to meet with his soldiers before proceeding to the king's palace which used to be where the Bulawayo state house sits today. The site is popularly known as Inxwala Cultural site and it is along Masotsha Ndlovu Avenue between Main Street and Lobengula Street. The site has been left vacant for years and years just to owner the last King of the Ndebele People. That piece of land can only be developed into a feature which will reflect the culture of the Ndebele state and nothing other than that.

The City of Bulawayo has a number of museums of national importance, including the Natural History Museum of Zimbabwe (NHMZ), and the Bulawayo Railway Museum, with the N.H.M.Z being one of the finest museums in the whole of Zimbabwe. This is situated within the centenary park which is located on the eastern part of the city, just on the periphery of the Central Business District (CBD) along Leopold Takawira Avenue. This is the largest park within the city and it has a, water fountain, Caravan Park (lodge), variety of vegetation and birds. The museum has a lot on display which include activities which were prevalent in the city i.e. mining and hunting, flora and fauna i.e. animals, birds, rocks, trees, grasses and a lot other historical artefacts.

There is Khami Ruins on the North Western part of the city, Old Bulawayo which is located to the South, just outside the city's current master plan boundary along Old Gwanda Road. The city also hosts the Tshabalala game sanctuary which is few minutes' drive from the city on wide tarred road. The city has the Chipangali Wild Life Orphanage Home located within the vicinity, thus to the South East of the City along Gwanda Road.

The city of Bulawayo has some mineral deposits dotted around the city, mainly gold deposits. The city is rich and increased with gold mineral hence it is prone to a number of illegal gold panning activities by the local communities. Illegal gold panning is affecting productive land which could be utilised for various land uses such as farming, residential, commercial, industrial and recreational. Local rivers have been heavily affected by the activities and some of the city's infrastructure has not been spared from such.

1.8 Ecologically Sensitive Areas

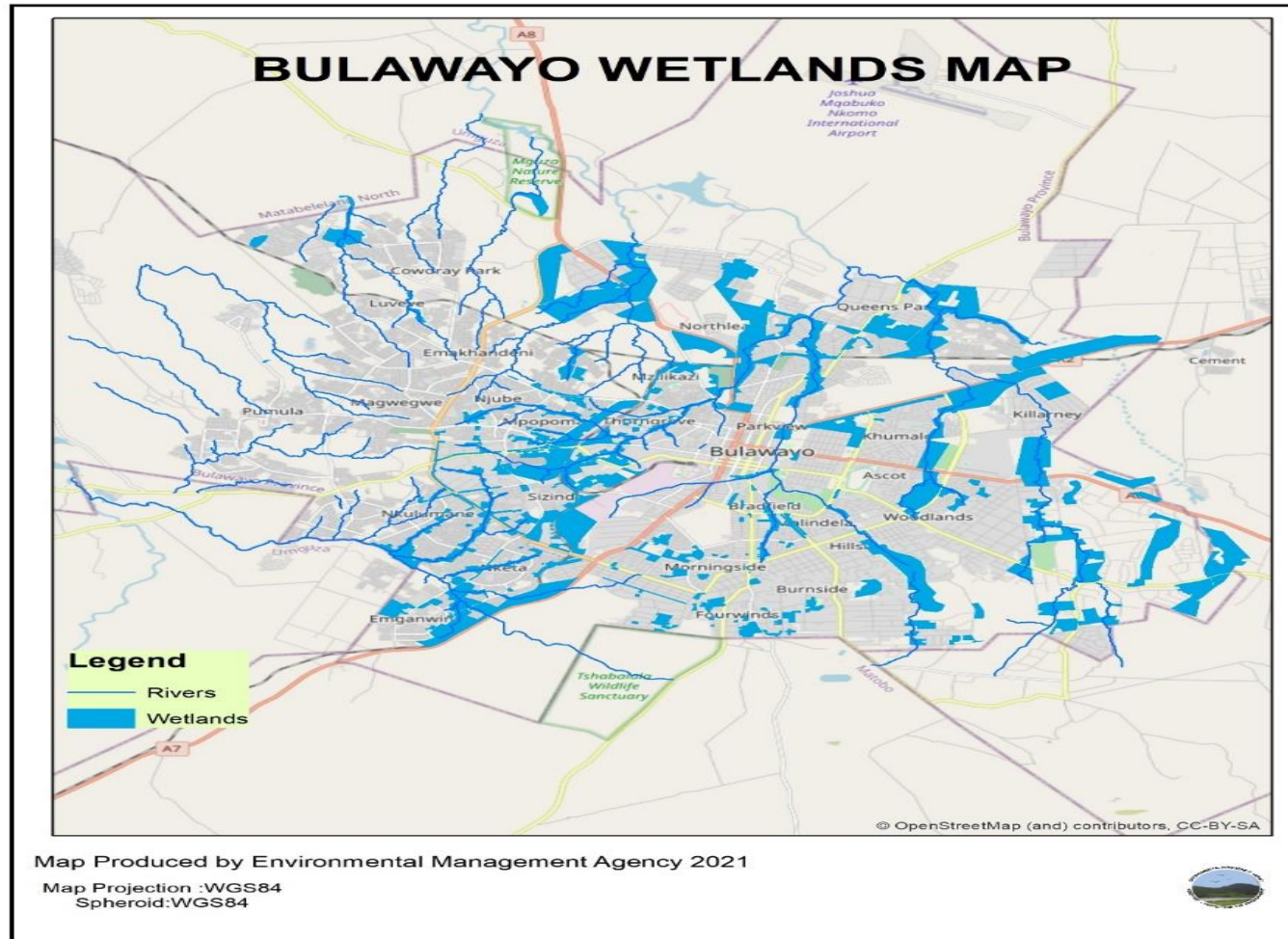
An exercise was carried out to map the wetlands in Bulawayo. The purpose of the exercise was to identify and map all wetlands and sensitive ecosystems within Bulawayo. The operation entailed the use of GIS to identify and buffer all Bulawayo rivers and streams,

mapping of identified wetlands and establishing the types of activities being undertaken within the wetlands as well as identifying infrastructure within wetlands/ecologically sensitive ecosystems. The Departments that participated in the mapping exercise were Bulawayo City Council, Environmental Management Agency, Agritex and Physical Planning.

A total of twenty six (26) wetlands were identified and mapped. Forty two percent (42%) of the wetlands identified are rivers and streams, twenty seven percent (27%) are waterways, nineteen percent (19%) are marshes and vleis and twelve percent (12%) are dams. Four (4) of the wetlands are in a pristine state and rest are moderately degraded. Thirteen (13) of these wetlands have different infrastructure within them such as industrial premises and residential properties. A total of four hundred and sixty (460) houses and ninety (96) stands were affected. Ninety three percent (93%) of the houses and ninety two percent (92%) of the stands are from Cowdray Park. The major activities observed within wetlands/ecologically sensitive areas were streambank cultivation, solid waste dumping and sewer discharge.

The main recommendations are for the City of Bulawayo to designate the wetlands and incorporate them in the Bulawayo master and local plans. Bulawayo City Council to produce a mitigation plan to correct the anomalies that were identified.

1.9 BULAWAYO WETLANDS MAP



A total of twenty six (26) wetlands and ecologically sensitive ecosystems were mapped in the industrial sites as well as in peri-urban, low, medium and high density residential suburbs as depicted in Figure 1. Of the twenty six (26) wetlands and ecologically sensitive ecosystems mapped, rivers/streams (11) were the most predominant followed by waterways (7) and vleis/dambos/marshes (5) with dams occurring the least (3). The mapped wetlands are, Njube Dam, Reigate, Woodlands, Mahatshula, Glengary, Kelvin , Nkulumane (along Mqamulazwe Road), Hillcrest, Hillside Dams, Newton West, Pumula South, Luveve 5, Buena Vista Dam, Burnside, Matsheumhlophe, Selbourne Brooke, Cowdray Park Hlalanikuhle Phase 4, Cowdray Park Hlalanikuhle, Cowdray Park Esigodweni, Methodist Village, Richmond, Hopeville, Sauerstown, Neddicky, Richmond Glenville and Norwood.

2 Existing Infrastructure

2.1 Infrastructure

Bulawayo City Council like most of the country's urban centers has sound basic infrastructure though with isolated pockets of old and limited infrastructure which cannot stand the pressure exerted by the ever growing Zimbabwean population. The LA is currently making some frantic efforts to replace and rehabilitate some of the dilapidated infrastructure (water and sewerage pipe work).

2.2 Roads

The City in general is serviced by a standard hierarchy of roads ranging from national roads to the access roads. The total length of the road network of the city averages at about 2065km, of this figure 1471.8km are of tarred road, 495.2km are of gravel roads and 98km are of earth roads. The above figures are in terms of the draft report on Road Condition Survey by CNM- YBJ Consulting Engineers (2012). The Roads Condition Survey articulates the potential areas of rehabilitation as well as upgrading requirements. The government is in the process of repairing national roads. The City Council though with limited resources is also patching some pot holes and rehabilitating selected roads and intersections.

2.3 Water Works

The City of Bulawayo is currently serviced by three water works, namely Ncema, Criterion and Nyamandlovu Aquifer. At the Nyamandlovu aquifer the water treatment process is basically chlorination since it is ground water. Criterion water works has a design capacity of 180 000m³ of water but currently it has a capacity of 120 000m³ of water. Nyamandlovu aquifer had 77 boreholes initially, only 56 boreholes were rehabilitated. Out of a total of 56 boreholes only 40 boreholes are operational.

Currently there is an average of 23-40 functional boreholes per day. These had a combined design capacity of pumping 8000m³ of water. The Ncemawater works has a design capacity of 40 000m³ of water but it is currently operating at half the design capacity. The water works infrastructure is long overdue for rehabilitation and also upgrading to match the growing demand. Some maintenance work was done within the last two years at Nyamandlovu Aquifer, Ncema and Criterion water works.

A simplified flow diagram of portable water

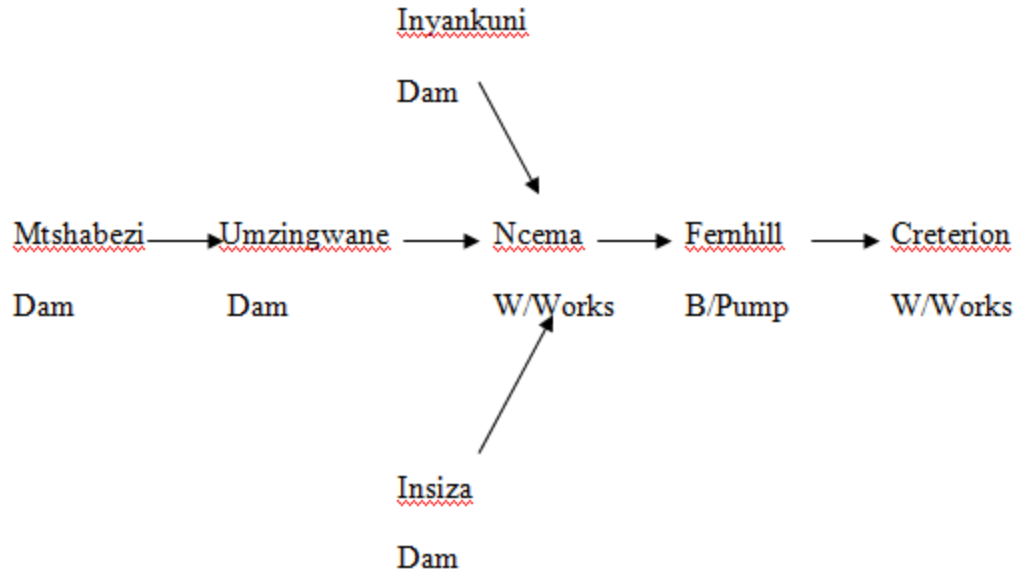


Figure 1

2.4 Sewerage Works (Waste Water Treatment Plants)

In general Bulawayo drains from South to North into Umguza River catchment with the exception of the South-west corner and part of the western side that drains into the Khami River catchment. The city has 8 main sewer catchment areas and these are Waterford, Thorngrove, Luveve, Aiselby 1, 2&3, and the Southern Areas Sewerage Treatment (SAST). SAST is located on the upstream of Khami dam. These waste water treatment plants are also supported by sewerage ponds, namely Magwegwe

sewerage ponds and Cowdray Park sewerage ponds. Most of these plants are not operating at full capacity i.e. for Aiselby only 1 & 3 are functional at the moment. There is also a proposed additional prime sewer catchment area (waste water treatment facility), the Northern Areas Sewage treatment (NAST) which is to be located along old Victoria Falls road. This plant is still at design stage. The aged reticulation system feeding these sewage works is in the process of being rehabilitated. The overall length of outfall sewers is approximately 208 km and that of sewer reticulation is 1257 km. The city has a total length of outfall sewers and sewer reticulation network of approximately 1 465 km. The City has a proposal for the upgrading the outfall sewer pipes and it is tabulated below

Table 1 Proposed Outfall Sewer Pipeline Upgrading

Outfall Sewer Pipe Line	Length of the pipeline(km)
Aiselby 1 &2	26.8 km
Aiselby 3	11.3 km
Magwegwe	1.4 km
Thorngrove	1.2 km
SAST	15.4 km
Cowdray Park	10 km
Waterford	8 km

From the table above the Luveve Outfall Sewer Pipe Line has been left out because the hydraulic capacity analysis results for Luveve indicated that the outfall sewers are adequately sized for both present and future demands and hence minimal upgrading is required.

2.5 Water Sources

The City of Bulawayo has a perennial water challenge due to the location of the supply dams and the only perceived long term solution is the construction of the Zambezi water pipeline. The city has a total of 5 supply dams and one aquifer with a total of at least 40 functional boreholes. These are as follows; Umzingwane Dam, Inyankuni Dam, Upper & lower Ncema Dams, Insiza Dam, Mtshabezi Dam and Nyamandlovu Aquifer. These dams were all constructed before the 1980s, meaning for the past 30 years no dams were built in Bulawayo. Despite the water shortages, the city has sound water management practices.

2.6 Industry

Bulawayo is the second largest city in Zimbabwe and it has been an industrial hub of Zimbabwe over the years. This is evidenced by wide streets that can accommodate high traffic volumes, a very sound railway network system which also influenced the location of the National Railways of Zimbabwe (NRZ) in Bulawayo. Most of the industrial areas are serviced by a railway and road to facilitate the movement of goods in bulk. Over the last decade the status quo has been taking a down turn owing to economic melt-down, and also the most recent deindustrialization of the city.

2.7 Traffic Flow

The city has wide roads with a grid iron pattern within the Central Business District (CBD) mainly which is meant to facilitate free flow of traffic within the CBD. This also promotes visibility and permeability within the CBD. Most of the intersections are controlled by traffic lights save for a few plain intersections which are meant to promote fast and free flow of traffic during off peak periods.

The city has a well-developed network of ring roads which also facilitated a free flow of traffic; these include Bulawayo Drive, Circular Drive, Masiyepambili Drive, Cecil Avenue and Cowdray Park Corridor. In addition to the physical infrastructure

that the city has put in place to facilitate smooth flow of traffic, the city went a step further and implemented a Public Transport Policy improve on the management of traffic within the city.

2.8 Schools

There are more than 174 registered primary schools in Bulawayo, of this 55% are government operated and managed, 24% under the Bulawayo City Council and the remainder is distributed between trust, church, Zimbabwe Republic Police, Army and Social Welfare. There is potential for more schools to be developed. The development of secondary schools also follows the same trend as the primary schools and they total to more than 40 Schools currently. There are a number crèches and pre-schools within the city.

3 THEMATIC ISSUES

3.0 POLLUTION

3.1 Background

Bulawayo is set to undergo major social and economic transformation over the next few years as its population continues to grow and consumer purchasing habits change. However, these changes are going to exacerbate pollution challenges. The goal of this LEAP document is to create a plan that addresses the social, economic and environment challenges experienced now and also those anticipated in the future of the city. In 1992 Bulawayo was a global finalist in a competition that considered cities that actively tackled environmental and developmental issues in modern times and in 1996 Bulawayo was awarded the 2nd healthiest city in the world by World Health Organization (WHO). Bulawayo was once recognised by the UK as Africa's first responsible city, this stemmed from Bulawayo's solid environmental sustainability frameworks.

Urban expansion is expected to lead to significant growth in waste generation, which will put considerable strain on already constrained public and private sector waste services and infrastructure. The goal for this LEAP is to create a robust environmental plan that not only solves water, air and land pollution but also leads to economic activity and prosperity by leveraging on new clean technology and adopting new circular economy principles. The plan aims to create an enabling local macroeconomic environment that leverages green innovation and entrepreneurship to become the most sustainable city in the SADC region, adopting new green technology, services and products. The plan focuses in 4 pillars;

- **Capacity & awareness** Improved awareness, strengthened capacity and active partnerships to solve waste management challenges

- **Evidence** compiled through research for better quality evidence to inform decision making and implementation of solutions
- **Legislation & enforcement** Strengthened policies that are harmonized, monitored and enforced for action
- **Services & technologies** A vibrant green tech ecosystem of waste services, green technologies and circular economy products that attracts external investment

3.1.1 Goals

- Identify types of prevalent air, water and land pollutants and quantify the levels of pollution.
- Determine suitable long-term solutions for environmental pollution challenges including plastic pollution, waste dumping, littering, water pollution and bursting of sewage pipes.
- Capacitate key stakeholders to actively address the environmental challenges with city council.

3.1.2 Outcomes

- Improved waste management systems leading to Bulawayo regaining its cleanest city status and a prosperous clean environment.
- Improved knowledge on best waste management practices amongst the Bulawayo residents Increase in the number of economic players in the green economy and sustainable technology space with new private sector players including international investors and startups bringing new environment technology for water purification, waste treatment and sustainable products.

- Favorable environmental policies that make it easier for green businesses and provide environmental services to thrive and attract international investments.
- Improved waste reticulation system.
- Improved data management systems for detecting, motoring and preventing pollution.

3.1.3 Key Targets

- Increase in the amount of recycled waste, improved ownership and environment stewardship amongst Bulawayo residents.
- Upgraded and better Sewer Reticulation System
- A vibrant environment services ecosystem

PP-Plastic pollution

IWD – Illegal Waste Duping

EW-e-waste

CS-collapsed sewers

ILWM- Industrial liquid waste management

HM - heavy metals

	HM	ILWM	CS	EW	IWD	PP	Score	Rank
PP	PP	PP	CS	PP	IWD	X	3	2
IWD	IWD	ILWM	CS	IWD	X	-	3	3
EW	HM	ILWM	CS	X	-	-	0	6
CS	CS	CS	X	-	-	-	5	1

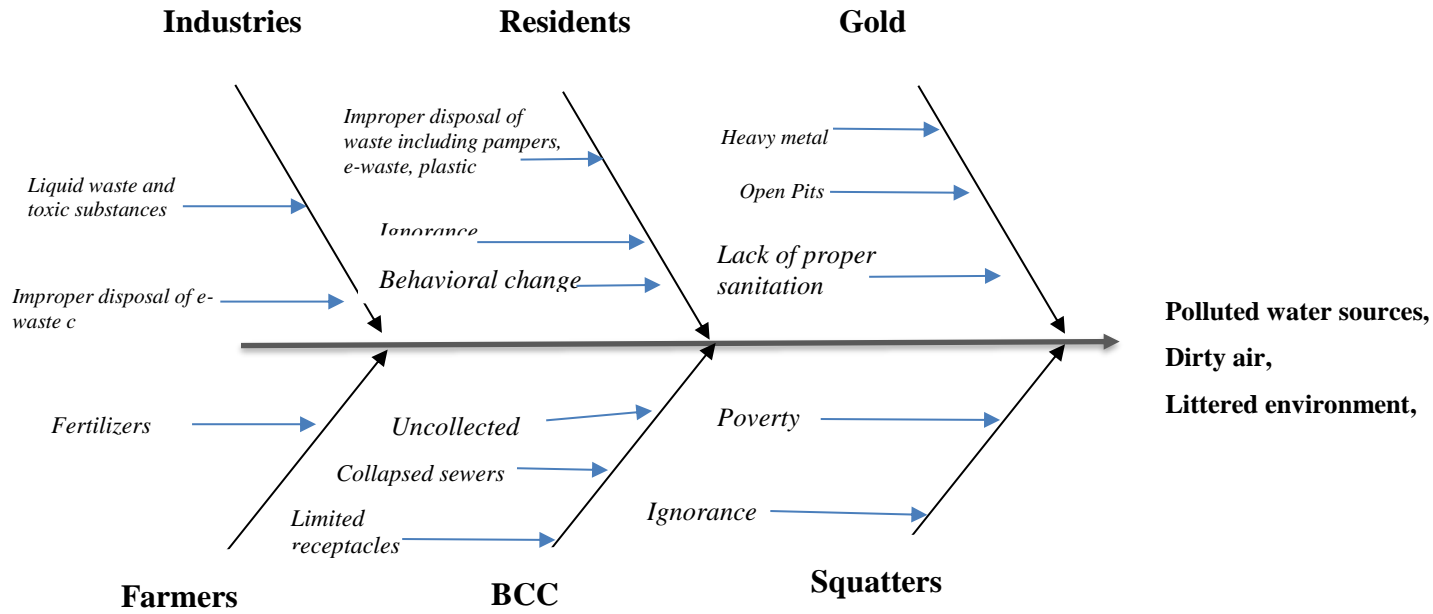
ILWM	ILWM	X	-	-	-	-	3	4
HM	X	-	-	-	-	-	1	5

From the pair wise ranking above it is clear that collapsed sewers pose an imminent environment threat in the city of Bulawayo. Illegal waste dumping, Industrial Liquid Waste Management and Plastic pollution are also ranking high and can be detrimental to the environment as a whole (biotic and abiotic), hence the urgent need for the city of Bulawayo to craft this document which will clearly state how. Handling and management of electronic waste is a low priority area that should be taken note of.

The sectors affected by pollution include;

- Industry and business community
- Recycling sector
- Health sector

3.2 Pollution



E 1: SAFEGUARD THE ENVIRONMENT

ENVIRONMENTAL CHALLENGE	TASKS	BY WHOM	WHEN	DURATION	OUTPUTS	OUTCOMES	INDICATORS	RESOURCES	BUDGET
Industrial Liquid Waste Management	<ul style="list-style-type: none"> - Revise By-Laws to ensure and strengthen effluent quality monitoring programmes by - Levying industries for materials that overload treatment plants and also damage sewer infrastructure - Trade Effluent - Tariffs/Polluter pays 	<p>B.C.C</p> <p>Industrial Establishments</p> <p>EMA</p> <p>NSSA</p> <p>NUST and other Institutions of Higher Learning</p>		January 2022 to December 2023	<ul style="list-style-type: none"> - Spot fining system in place - Industrial waste management system in place - Compliant wastewater from WTPs 	<ul style="list-style-type: none"> - Improved compliance to sewer discharge standards - Fewer incidences of discharges to water courses - Improved quality performance of municipal wastewater plants - Improved quality of reclaimed water 		<ul style="list-style-type: none"> 1. Auto Samplers 2. Trade Waste Insp. Chemist, Technician, Sampler 3. Instruments (potable pH, DO, conductivity etc) 4. Testing Reagents 5. Protective 	

ENVIRONMENTAL CHALLENGE	TASKS	BY WHOM	WHEN	DURATION	OUTPUTS	OUTCOMES	INDICATORS	RESOURCES	BUDGET
	Build capacity for water treatment technology					from WTPs Clean and safe environment		Gear	
	<p>- Enforce regulations governing pre-treatment and proper disposal of industrial waster</p> <p>-Commence/Strengthen education programs on abuse of sewer system by industry to promote sound and effective industrial</p>	<p>1. B.C.C 2. EMA 3. Industrial Establishments 4. Z.R.P.</p> <p>1. B.C.C 2. NGOs/Donors 3. NUST 4. NSSA 5. EMA 6. Representatives</p>			<p>- Draft plans for new industries incorporating pre-treatment plants</p> <p>- Increase in number of functional ETPs put up</p> <p>- Increase in number of draft ETP plans submitted</p>	<p>- Improved effluent quality discharged to sewers</p> <p>- Sound and effective industrial waste management practices</p>		<p>1. Vehicle 2. Stationery</p> <p>1. Resource material e.g. fliers 2. Resource persons for conducting</p>	

ENVIRONMENTAL CHALLENGE	TASKS	BY WHOM	WHEN	DURATION	OUTPUTS	OUTCOMES	INDICATORS	RESOURCES	BUDGET
	waste management practices	of industry						workshops	
	<ul style="list-style-type: none"> - Negotiate and enter into agreements with those industries that require special/alternative methods of liquid waste disposal - Research into cleaner waste production technologies 	<ul style="list-style-type: none"> 1. B.C.C 2. GOs/Donors 3. NUST 4. NSSA 5. EMA 6. Representatives of industry 7. Independent consultants 			<ul style="list-style-type: none"> - Negotiated effluent disposal sites in place - High cost and energy savings obtained - Less amount of waste produced - Inter-company re-use of the waste produced 	<ul style="list-style-type: none"> - Sound and effective industrial waste management practices - Cleaner production practices - Cleaner and healthier operating environment - Better economic 		<ul style="list-style-type: none"> 1. Vehicles 2. Computers and printers 	

ENVIRONMENTAL CHALLENGE	TASKS	BY WHOM	WHEN	DURATION	OUTPUTS	OUTCOMES	INDICATORS	RESOURCES	BUDGET
		other institutions of Higher Learning 4. NGOs				returns			
Cross City canal/ stream and river pollution	- Repair collapsed sewers to prevent raw sewage flowing into streams.	1. B.C.C 2. Donors/NGOs 3. Contractors			- Minimal flow in streams/canals during dry weather	- Reduced mosquito menace for residents living along these streams - Reduced stench problems		1. Field instruments (portable Laboratory) 2. Vehicle 3. Stationery	
	- Rehabilitate treatment works to improve quality of reclaimed sewage	1. B.C.C 2. Donors/NGOs 3. Contractors			- Reclaimed water meets E.M.A. standards	- Reduced discharge licence costs to regulating authorities			

ENVIRONMENTAL CHALLENGE	TASKS	BY WHOM	WHEN	DURATION	OUTPUTS	OUTCOMES	INDICATORS	RESOURCES	BUDGET
	- Revise By-Laws for effective policing of industry	B.C.C			- Spot fining system for stream polluters - Less illegal dumping in streams	e.g. EMA. - Cleaner and healthier streams			
	- Clean streams to allow free flow of water	B.C.C	On-going			- Reduced mosquitoes menace - Less stench problems			
	- Educate industry and residents on dangers of discharging effluent and dumping waste into streams	1. B.C.C 2. NUST 3. Captains of Industry 4. Residents	Ongoing		- Environmental Protection Task Force for clean streams	- Restoration of Loch-Lion and Umguza Yacht Club - Restoration of Khami Dam as source of potable water			

ENVIRONMENTAL CHALLENGE	TASKS	BY WHOM	WHEN	DURATION	OUTPUTS	OUTCOMES	INDICATORS	RESOURCES	BUDGET
	- Rehabilitate sewage pump stations to ensure that sewage is conveyed into treatment works	1. B.C.C 2. Donors/NGOs 3. Contractors			- Minimal flow in streams during dry weather				
	- Attend sewer chokes and bursts to minimise raw sewage inflows into streams	B.C.C.	On-going		- Minimal flow in streams during dry weather				
Solid Waste Management	Monitor quality of leachate generated from land-filling 2. 2. Ensure that leachate generated collects into clay lined ponds. 3. Monitor quality of water in streams or water courses near the landfill.	1.BCC 2. EMA BCC Cleansing Section BCC EMA			Compliant Landfill	Clean and safe environment	Number of samples collected % compliant results.	Portable lab instruments pH meter DO meter 2. Human Resources. Principal Chemist	

ENVIRONMENTAL CHALLENGE	TASKS	BY WHOM	WHEN	DURATION	OUTPUTS	OUTCOMES	INDICATORS	RESOURCES	BUDGET
		BCC EMA						Chemist Trade waste Inspector 3. Technicians Testing Reagents 4. Protective Clothing 5. Motor Vehicle 6. Earth moving equipment.	
Environment services and technology	Set up a green innovation Hub to support green enterprises, SMEs, startups and eco innovators. Green Technology Needs Assessment G-	Vital Recycling, Kudakwashe Dhliwayo, City Council			A database of environment service providers and suppliers of eco products. Increase in number of green technology enterprises, SMEs	Reduced pollution by industry. Increase in sustainable and	Numbers of SMEs incubated. Number of businesses trained.	Training Center to set up innovation Hub.	\$100 000,00

ENVIRONMENTAL CHALLENGE	TASKS	BY WHOM	WHEN	DURATION	OUTPUTS	OUTCOMES	INDICATORS	RESOURCES	BUDGET
	<p>TNA</p> <p>Training of Industrial players on sustainable business practices, compliance with local legislation and other issues</p>	<p>Kudakwashe Dhiwayo, Vital Recycling, City Council</p> <p>City Council, Vital Recycling</p>			<p>and startups. Increase in number of service providers for eco services and eco-innovations.</p> <p>Detailed report indicating green technology gaps. Outline of a robust investment strategy to cater for sustainable technology needs of the city.</p> <p>Increase in adoption of sustainable business practices by industry and businesses</p>	<p>green economy players.</p>			

3.2.1 Environment Legislation

1. By-law: Bulawayo (sewage, drainage and water bylaws) SI 390 of 1980

EMA ACT

2. Environmental management (effluent and solid waste disposal) SI 6 of 2007

3. Environmental management (hazardous substances, pesticides and other toxic substances) SI 12 of 2007

4. Environmental Management (hazardous waste management) regulations SI 10 of 2007

5. Urban Councils Act Chapter 29: 15

3.3 LAND DEGRADATION

3.4 Background

The city has been expanded by soils that were extracted illegally from undesignated sites. This has led to the destruction of city environs and has been going on for decades unnoticed.

This has come into light when illegal excavators were now digging at residents' door steps. Some of the reserved residential areas have been left with holes which need reclamation. These pits have made it difficult for those given stands in those areas as they will have to resuscitate and cover the openings.

Council has been doing cat and mouse with illegal excavators and the war has been going on for many years now. As Council realised that it cannot win the hide and seek game with these culprits, the pitsand sites were established in August 2015. The two pitsand sites were established at Khami St Mary's area along Khami Prison road about 21km from city centre, the second pit was established after Luveve new cemetery towards Mazwi nature reserve. The price of the pitsand is at a subsidised price. Even though all these efforts were done, the illegal activities are at upward trajectory and the pits are now a white elephant as they remain unutilised. This means war between criminals and rangers.

3.4.1 Goal: Protect, restore and promote sustainable use of local ecosystems, sustainably manage local forests, combat deforestation, halt and reverse land degradation and halt biodiversity loss within the greater Bulawayo environs.

3.4.2 Objectives

1. By 2028, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and dry lands, in line with obligations under national laws and international agreements.
2. By 2028, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded land and substantially increase afforestation and reforestation within the greater Bulawayo boundaries.
3. By 2028, introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems and control or eradicate the priority species.
4. Promote fair and equitable sharing of the benefits arising from the utilization of forest and land resources and promote appropriate access to such resources, as nationally and internationally agreed.

Environmenta l Challenge	Specific Task	Actions	Time frame	Implementation responsibility	Outputs	Outcomes	Performanc e indicators	Resources required	Budge t
Sand and game animals Poaching	Move towards creation formal sand abstraction groups with specific sites -stricter monitoring of hotspots - Advocate for	Daily patrols and operations around the Greater Bulawayo	January to December 2023	BCC Rangers And Security, EMA, ZRP	- sand sold in the city -unsafe meat sold in the open market -more of unregiste red trucks on the road.	-less unregistered vehicles and increased movement of rangers and other security personnel - impounding of vehicles -reduction in pits	-Increase in number of vehicles impounded -complaints of deterrent fee by offenders -increase in payments done in revenue offices	Rangers Uniforms and salaries. 2 vehicles (van)	\$30 000 \$16 800 \$30 000

	environmental fines retention scheme						-reduction of tree stumps in the urban -presence of wild animals		
Illegal artisanal mining	Stricter monitoring of hotspots using conventional methods and new technologies (e.g. drones) - Lobby for an environmental court	BCC Rangers And Security, ZRP, EMA and Forestry Commission.	Daily inclusive of weekends and holidays around water catchment areas.	January to December 2023	Arrest of gold panners Confiscation of items/tools.	Reduction in new mine shafts and increase in prosecution of illegal panners.	-Increase in number of arrests and tools/items confiscated - Reduction in pits and disused old pits.	15 rangers (uniforms and salaries) 2 Drones 1 van (T35)	\$9000 0 \$50 400 \$10 000 \$15 000

	and for arresting powers by BCC - Rehabilitate degraded land								
Deforestation and firewood poaching	Promote the concept of ecosystem based entrepreneurship -encourage alternative energy sources	BCC Rangers BCC Security, EMA,ZRP and Forestry Commission.	Daily patrols around Greater Bulawayo	January to December 2023	- Firewood sold in the city -more of unregistered trucks and scotch	-less unregistered vehicles and increased movement of rangers and other security personnel	-Increase in number of vehicles impounded -complaints of deterrent fee by offenders -increase in payments done in	Rangers Uniforms and salaries. 1 vehicle (van)	\$30 000 \$16 800 \$15 000

	-promote reforestation, orchards and tree plantations				carts on the road.	- impounding of vehicles	revenue offices -reduction of tree stumps in the urban		
Stream bank cultivation	Establish community gardens -promote alternative livelihoods for stream bank cultivators - Educate communities around hotspots on environme	BCC Rangers EMA, ZRP and Forestry Commission.	Daily patrols and around the Greater Bulawayo	January to December 2023	-Siltation of streams Reduction in vegetation cover.	-less siltation of streams	-increase in confiscated farming tools - slashed crops	Rangers Uniforms and salaries.	\$30 000 \$16 800

	ntal rights and stewardship								
Vagrants and squatters	Remove squatters and vagrants in undesignated areas.	BCC Rangers and Security, ZRP, EMA	Daily patrols inclusive of weekends and holidays	January to December 2023	Dumped rubbish - muggings	-Reduction of illegal settlers - reduced dumping and muggings	-Clean and safe areas -reduction in muggings -less complaints from residents	Rangers uniforms and salaries -2 vehicles (vans)	\$30 000 \$16 800 \$30 000
Greening and clearing of bushes	Greening and clearing of bushes around the city	BCC and other stakeholders	November to March 2023	2 months for community groups	- overgrow n verges -vehicle accidents -mugging	-reduction in mugging and accidents. Rejuvenatio n of other	-increase in patronage of leisure facilities -clean and well preserved	290 communit y group members from 29 wards	\$34 800

				-6 months for seasonal workers		plant species.	aesthetic environment - Free movement of traffic and residents.	-90 seasonal workers -tractors, mowers, brush cutters, chain saws and hand tools.	\$134 400 \$10 000 \$6000 \$6000 \$2000
Total recurrent									\$574 000

3.4.3 Table 2 Pair Wise Ranking

Sand Poaching: SP

Illegal Mining: **IM**

Deforestation: **D**

Stream Bank Cultivation: **SBC**

Trenching: **T**

Collapsed Sewerage Reticulation System: **SCRS**

Illegal Dumping of Waste: **IDW**

	IDW	CSRS	T	SBC	D	IM	SP	SCORE	RANK
SP	SP	CSRS	SP	SP	SP	IM	X	4	2
IM	IDW	CSRS	IM	SBC	D	X	--	2	5
D	IDW	CSRS	D	SBC	X	--	--	2	6
SBC	IDW	SBC	SBC	X	--	--	--	4	3
T	IDW	CSRS	X	--	--	--	--	0	7
CSRS	IDW	X	--	--	--	--	--	4	4
IDW	X	--	--	--	--	--	--	5	1

Illegal dumping of waste tops the list when it comes to land degradation. It is followed by sand poaching and stream bank cultivation which is due to poverty. Therefore, the city stakeholders or relevant authorities are challenged to work together in order to protect the environment.

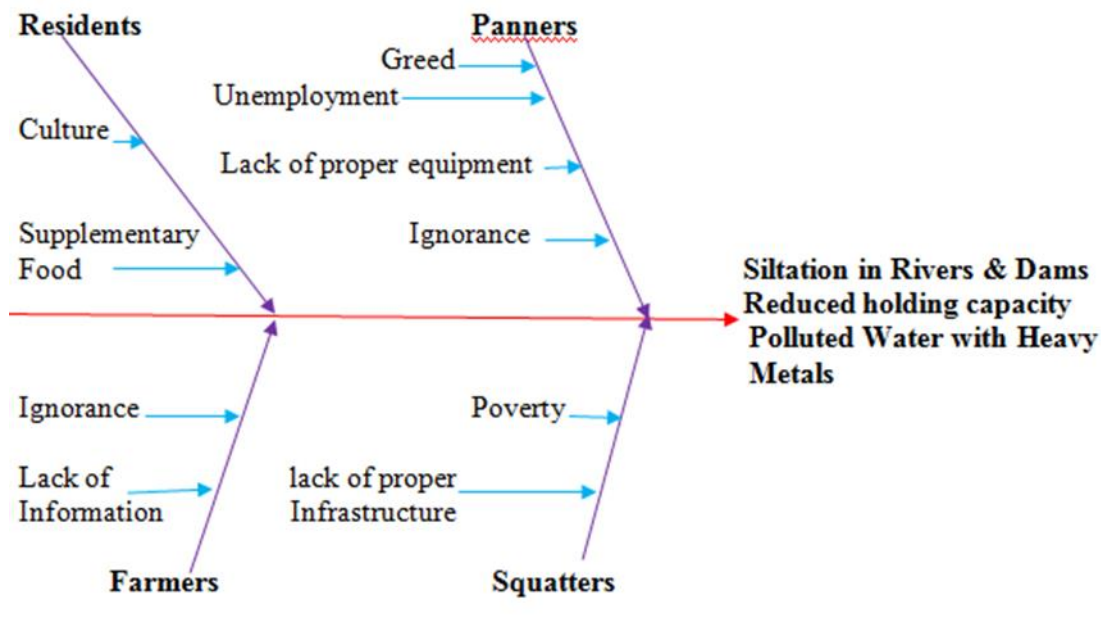
3.5 IMPLEMENTATION STRATEGY

Thematic Area	Objective/Activity	Strategy to deal with land degradation	Implementation/Possible Solutions
Land degradation	Sand and game animals Poaching- it is the illegal excavation of sand whilst animal poaching is the illegal killing of wild and domestic animals.	<ul style="list-style-type: none"> -Educational and awareness campaigns -Enforcement of Council by-laws through patrols, surveillance, blitz, raids and operations. -Establishment of more legal sites for sand extraction currently they are two (2). -Subsidised fee for sale of pit sand. 	-Throughout the year in Greater Bulawayo e.g. St Peter’s, Methodist, Mazwi, Khami, Cowdray Park, Rangemore etc.

	<p>Illegal artisanal mining- Extraction of minerals illegally.</p>	<ul style="list-style-type: none"> -Educational and awareness campaigns -Enforcement of Council by-laws through patrols, surveillance, blitz, raids and operations. -Issuing of certificates to prospectors. 	<p>-Throughout the year in the peri-urban and water catchment areas e.g. Killarney, Sauerstown, Khumalo, Emganwini, Matsheumhlophe etc.</p>
	<p>Deforestation and firewood poaching- harvesting of vegetation without approval.</p>	<ul style="list-style-type: none"> -Educational and awareness campaigns -Enforcement of Council by-laws through patrols, surveillance, blitz and raids. -heavy fines for deterrent. 	<p>-Throughout the year in the peri-urban areas such as St Peter's, Methodist, Mazwi, Khami, Cowdray Park, Rangemore, Tshabalala Sanctuary etc.</p>
	<p>Stream bank cultivation- cropping which is done less than 30m along the streams.</p>	<ul style="list-style-type: none"> -Educational and awareness campaigns -Enforcement of Council by-laws through patrols. -Urban agricultural policy enforcement. -Cutting of crops in undesignated areas. 	<p>-Throughout the year in Greater Bulawayo e.g. in high density suburbs.</p>

	Vagrants and squatters- illegal settlement on an undesignated site.	Educational and awareness campaigns Enforcement of Council by-laws through patrols.	-Throughout the year in the CBD and low density areas.
	Greening and clearing of bushes- removal of unwanted growth along roads, open spaces etc.	Educational and awareness campaigns to stakeholders. -Tree propagation along roads, open spaces and installations. -Replacement of old trees. -Involvement of other stakeholders for donations of trees.	-Seasonally: sourcing of trees in August, September -digging of holes September, October -Planting of trees November and December.

Land degradation is caused by gold panners, farmers and squatters. This is a result of unemployment, ignorance, need for supplementary food, cultural practises, poverty and this is illustrated below.



3.6 INVASIVE ALLIEN SPECIES

3.7 Background

Invasive species are plants from another region of the world that do not belong in their new environment and have a potential to cause harm to the environment. They can lead to extinction of native plants and destroy biodiversity. Invasive species compete with native organisms for limited resources resulting in fundamental disruptions of the ecosystems. The main invasive species in the province are lantana camara, mexican daisy, water hyacinth and opuntia fulgida. To date; in October 2023 the province managed to map lantana camara species which had spread over **5354** hectares with a cumulative stretch of **20 413** metres. Opuntia fulgida is covering **284** hectares with a stretch of **99**metres .A total of **212** points were mapped. Water Hyacinth is covering **142** hectares with a stretch of

57metres.However continuous mapping of the invasive species need to be done to track changes and see if the interventions employed are working.

Invasive species are also found along roads and open spaces in the different surburbs of Bulawayo. The heavy presence of invasive species for example lantana camara in the province is attributed to by live fencing which is mainly done in the former and white community surburbs although in some medium and high density suburbs it is present. The spread is also due to bird dispersers carrying seeds over long distances in the case. Lantana camara is used as ornamental flowers and for fencing (hedges)

The laxity inherent among communities to eradicate the invasive species is caused by their ignorance to the law which is also contributing to the spread. Lack of knowledge on the effects of invasive species on the environment is also a factor promoting its wanton spread. Limited to no researches that have been done on the invasive species in the province, hence proper knowledge on the causes, spread, effects, and eradication

Goal: To assess, educate, eradicate and strengthen research in proliferation of alien invasive species.

Objective: 1.To raise awareness on the environmental impacts of invasive species

2. To eradicate and reduce the spread of Invasive species

3. To strengthen research and innovation in eradication of invasive species

Actions	Specific tasks	Time frame	Implementation responsibility	Monitoring responsibility	Budget	Resources required	Source of resources	Performance indicators
Management of alien invasive species -lantana camara -opuntia fulgida	-mapping - awareness campaigns - eradication	-5 years	- local authority -EMA -Forest commission -community members -NGOs	-EMA -local authority -forest commission	- mapping(USD1 000) -awareness campaigns(USD1000) - eradication(USD2500)	-Fuel -Equipment for eradication -Transport -T and S	-Local Authority -NGOs -	- hectares of eradicated invasive species -number of people reached -research findings

-Mexican daisy -water hyacinth	- conducting research -greening initiatives on eradicated areas - enforcement				-conducting research(USD2000) -greening initiatives on eradicated areas(USD2000) -Enforcement (USD 10000)			

3.8 ECOLOGICALY SENSITIVE AREAS

3.8.1 Background

Ecologically sensitive areas are areas whose ecological balance is prone to be easily disturbed. Ecologically sensitive areas include national parks, state forests, world heritage areas, Ramsar wetlands, nationally important wetlands, ‘endangered’ and ‘of concern’ Regional Ecosystems and Essential Habitat.

Goal:

Objectives: 1.To manage and regulate the activities around the ecologically sensitive areas

2. To assess, classify proposed development areas

3. To restore/ rehabilitate degraded ecologically sensitive areas

Actions	Specific tasks	Time frame	Implementation responsibility	Monitoring responsibility	Budget	Resources required	Source of resources	Performance indicators
- Protection	-mapping	-5 years	-Local Authority	-EMA -Local Authority	Mapping (USD 3000)	-Fuel -GPS	-EMA	-area protected -area rehabilitated

and management ecologically sensitive areas	-assessments before EIA approval -enforcement -raising awareness -rehabilitation of ecologically sensitive areas		-EMA -Environmental consultancy -ZINWA -Forestry Commission -Department of Water	-ZINWA	EIA inspections (USD 5000) Raising awareness(USD 50000) Rehabilitation of ecologically sensitive areas(USD 10 000)	-Transport -T and S	-Local authority - concerned proponent	
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3.9 CLIMATE CHANGE

Bulawayo is already experiencing the impacts of a changing climate through heat waves, more erratic rainfall and frequent droughts. As the effects of global warming intensify in the coming decades, the livelihoods, health and security of Bulawayo’s inhabitants will be increasingly threatened if no action is taken to reduce emissions and prepare for future risks. Within this environmental action plan, the City aims to spearhead the transition to a greener, more climate-resilient urban area. Climate change intensifies existing challenges like water insecurity, demanding an integrated response across key development sectors. Through both mitigation and adaptation initiatives tailored to our local context, carbon pollution can be curbed while strengthening Bulawayo’s ability to “build back better” from climatic disruptions.

Outlined strategies target improved water, waste, energy and transport management, as these are currently major sources of the city’s emissions, whilst enhance natural carbon sinks, protect vulnerable populations and critical infrastructure from looming impacts. With committed leadership and meaningful participation from private partners, NGOs and citizens, Bulawayo will play its part in global climate action while safeguarding livelihoods and the health of residents for generations to come. Through the implementation of initiatives outlined in this plan, Bulawayo will transition to a more sustainable, equitable and climate-resilient urban model over the next

decade despite financial constraints. The vision is a green-powered Bulawayo, enhancing lives while reducing emissions through collaborative effort. This climate change thematic area of the LEAP focuses on reducing greenhouse gas emissions, through the achievement of the following goals and outcomes.

3.9.1 Goals

- Develop and implement an energy policy.
- Promote energy efficiency in buildings and industry.
- Invest in public transportation and bicycle infrastructure.
- Improve the city's drainage system to reduce flooding.
- Plant trees to provide shade and reduce heat island effects.
- Develop early warning systems for extreme weather events.
- Improve water security through water efficiency management
- Educate the public about climate change and how to reduce their impact on the environment.

Outcomes

- Reduced greenhouse gas emissions
- Increased resilience to climate change impacts.
- Improved air quality.
- Reduced energy costs.
- Increased water security.
- Reduced risk of damage from extreme weather events.

- Improved public health and well-being.
- A more sustainable and liveable city.

ENVIRONMENTAL CHALLENGES	SPECIFIC TASK ACTIONS	TIME FRAME	IMPLEMENTATION RESPONSIBILITY	MONITORING RESPONSIBILITY	OUTCOMES	PERFORMANCE INDICATORS	SOURCES OF RESOURCES	BUDGET
Water security	Limit water usage through water rationing Installation of flow limitors Non-revenue water reduction Climate reliance water resources plan	January 2023 to December 2023	Principal Engineer Principal Engineer Principal Engineer	EMA EMA EMA EMA	Reduced electricity consumption	20MLD Reduced water demand 15 MLD Non-revenue water strategy CRWR plan	Public notices List of residents to install flow limitors Flow limitors Works assistant Hydraulic model Monthly water balance determination Plumbers	\$100000

ENVIRONMENTAL CHALLENGES	SPECIFIC TASK ACTIONS	TIME FRAME	IMPLEMENTATION RESPONSIBILITY	MONITORING RESPONSIBILITY	OUTCOMES	PERFORMANCE INDICATORS	SOURCES OF RESOURCES	BUDGET
	Water safety plan							
	Feasibility study Recycling of wastewater use for secondary use	December 2023	Principal Engineer	EMA	Reduced competing water demand	1 Feasibility study documents and data	Expert on prefeasibility study for wastewater recycling GIS data collection of potential users PPPs	\$100,000
	Implement awareness campaigns to encourage water reuse Develop stakeholder engagement programs	December 2023	Principal Engineer	EMA	Increase on potential on recycled wastewater user	20 Buy-in on wastewater recycling	Funding	\$50000.00 \$10,000.00

ENVIRONMENTAL CHALLENGES	SPECIFIC TASK ACTIONS	TIME FRAME	IMPLEMENTATION RESPONSIBILITY	MONITORING RESPONSIBILITY	OUTCOMES	PERFORMANCE INDICATORS	SOURCES OF RESOURCES	BUDGET
Greenhouse gas (GHG) emissions	Upgrade municipal buildings to improve energy efficiency Reduce waste generation and improve recycling Developing an energy policy	December 2023	BCC BCC	EMA EMA EMA	Reduce GHG emissions	1% Reduced energy bill	LED lighting Building energy modeler Project management services Funding	\$15,000.00
Use of non-renewable energy	Install solar panels on municipal buildings.	December 2023	Principal Engineer	EMA	Reduced GHG emissions Cleaner air and water Economic development	20 municipal buildings with installed solar panels Reduced energy bill Reduced reliance on fossil fuels Increased	NGO funding	\$50,000.00

ENVIRONMENTAL CHALLENGES	SPECIFIC TASK ACTIONS	TIME FRAME	IMPLEMENTATION RESPONSIBILITY	MONITORING RESPONSIBILITY	OUTCOMES	PERFORMANCE INDICATORS	SOURCES OF RESOURCES	BUDGET
						energy security		
	Explore PPP in use of solar panels for power generation	December 2023		EMA		1 PPP engaged for solar plants		\$500,000.00
Littered public spaces	Protect public spaces and collect garbage timeously.	December 2023		EMA	Clean city Improved public health and wellbeing	Paperless streets Collected garbage Clean streets and other public space Protected and enhanced natural ecosystems	Human resources Tipper Truck Public awareness campaigns	\$30,000.00
Blocked drainage and non-rideable roads	Clearing drains and Repair of roads using more adaptive materials	January to December 2023	Principal Engineer	EMA	Reduced risk of damage from floods	Limited flush floods Reduces flooding occurrences	PPE, Tools, Labour Lifting equipment	\$200,000.00

ENVIRONMENTAL CHALLENGES	SPECIFIC TASK ACTIONS	TIME FRAME	IMPLEMENTATION RESPONSIBILITY	MONITORING RESPONSIBILITY	OUTCOMES	PERFORMANCE INDICATORS	SOURCES OF RESOURCES	BUDGET
	<p>Construction of additional stormwater drainage infrastructure</p> <p>Construction and repair of walkways, pavements and cycle tracks</p> <p>Promote public transportation, cycling, and walking.</p>				<p>Rideable roads</p> <p>Free flow of surface water</p>	<p>...km of storm water drains constructed</p> <p>11km of walkways and cycle track</p> <p>Launch of the Asitshoveni campaign</p> <p>Reduction in number of road accidents</p>	<p>Traffic control,</p>	<p>\$500,000.00</p>
				<p>EMA</p>	<p>Reduced GHG emissions</p> <p>Improved public health and quality of life</p>	<p>10% increase in the use of cycle tracks and walkways</p>	<p>Public awareness material</p> <p>1 Vehicles</p> <p>Personnel</p>	<p>\$250,000</p>

ENVIRONMENTAL CHALLENGES	SPECIFIC TASK ACTIONS	TIME FRAME	IMPLEMENTATION RESPONSIBILITY	MONITORING RESPONSIBILITY	OUTCOMES	PERFORMANCE INDICATORS	SOURCES OF RESOURCES	BUDGET
Lack of public knowledge	<p>Raise public preparedness and awareness using communication</p> <p>Disaster preparedness plans</p> <p>Encourage home owners to create weep holes on their properties</p>	January - December 2023	Public Relations	EMA	Increased knowledge, attitudes and behaviors	10% 10% of Bulawayo population reached	Various media platforms	<p>\$8,000.00</p> <p>\$10,000.00</p> <p>\$4,000.00</p>

Table 3 Pair Wise Ranking for the proposed Action plans

	LPS	LPK	RW	GHG	WS	BDRR	TOTAL	RANK
BDRR	BDRR	BDRR	BDRR	BDRR	WS	X	4	2
WS	WS	WS	WS	WS	X		5	1
GHG	LPS	LPK	GHG	X			1	5
RW	LPS	LPK	X				0	6
LPK	LPS	X					2	2
LPS	X						3	3

Blocked Drainage System & Non –Rideable Roads: BDRR

Water Security: WS

Greenhouse Gas emissions: GHG

Renewable Energy: RW

Lack of public knowledge: LPK

Littered public spaces: LPS

3.9.2 Maintaining the climate change mitigation and adaptation strategy

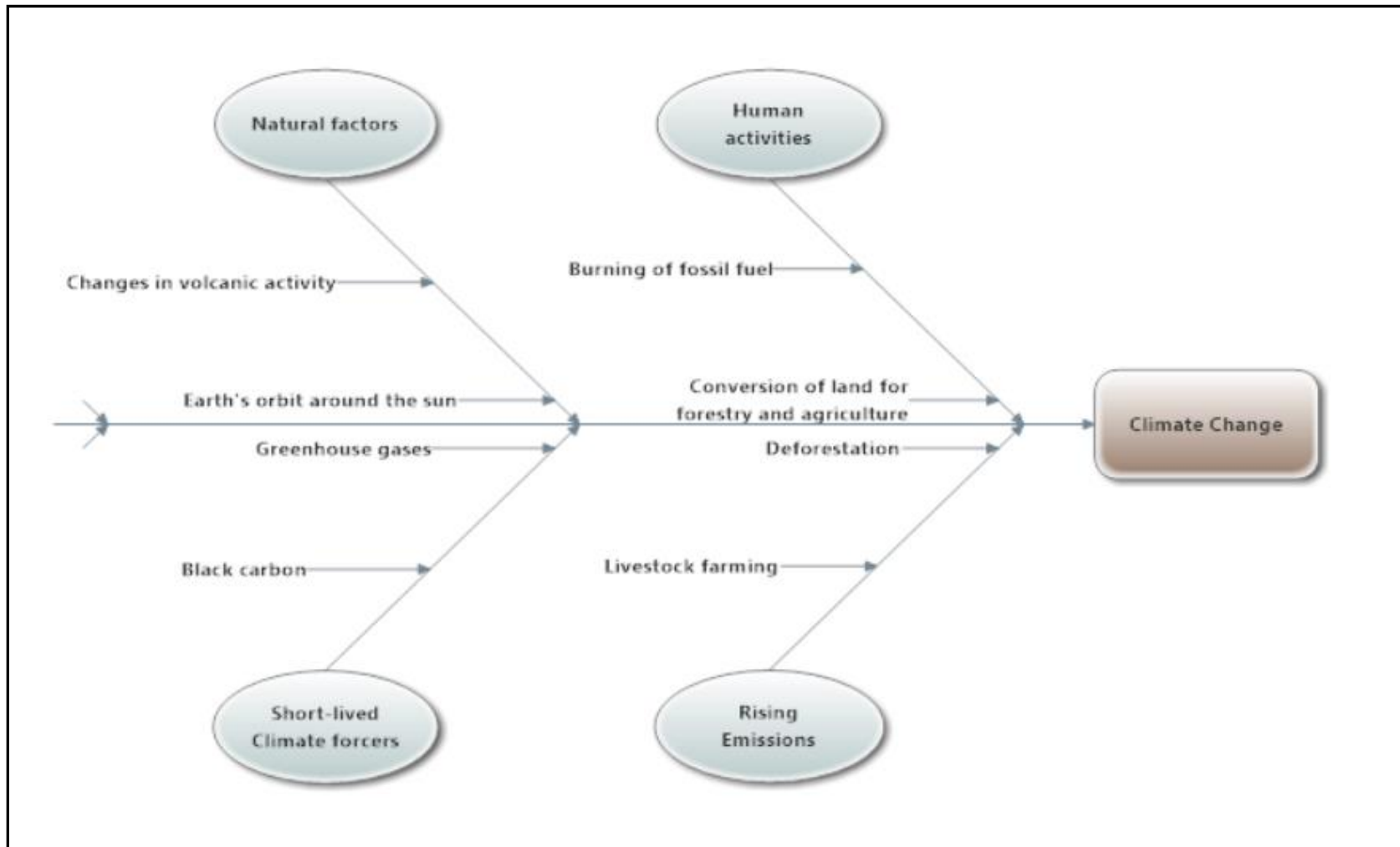
Going forward, the action plans listed above and some additional below should be implemented in the immediate to long-term periods to contribute to the Paris Agreement's long-term goal of keeping the global average temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.

- Reduce greenhouse gas emissions from municipal operations:
 - Upgrade municipal buildings to improve energy efficiency.
 - Switch to renewable energy sources for municipal operations, such as solar and wind power.
 - Electrify municipal vehicles.
 - Reduce waste generation and improve recycling.
- Increase the use of renewable energy in municipal operations:
 - Install solar panels on municipal buildings.
 - Purchase renewable energy from local utilities.
 - Develop community solar gardens.
- Improve the energy efficiency of municipal buildings and infrastructure:
 - Retrofit municipal buildings to improve insulation and air sealing.
 - Upgrade municipal lighting to energy-efficient LED bulbs.
 - Install smart thermostats and other energy-saving devices in municipal buildings.
- Reduce waste generation:

- Implement curbside composting.
- Expand recycling programs.
- Reduce single-use plastics.
- Increase the recycling rate:
 - Expand curb side recycling programs.
 - Make recycling more convenient for residents and businesses.
 - Educate the public about the importance of recycling.
- Plant 100,000 trees by 2030:
 - Work with community groups to plant trees in parks, public spaces, and schoolyards.
 - Develop a tree care and maintenance plan.
- Develop and implement a climate change adaptation plan:
 - Assess the municipality's vulnerability to climate change impacts.
 - Develop strategies to adapt to these impacts.
 - Implement these strategies in a coordinated and phased approach.
- Transportation:
 - Promote public transportation, walking, and biking.
 - Invest in electric vehicle charging infrastructure.
 - Support the development of carpooling and vanpooling programs.
- Land use and planning:

- Promote infill development and mixed-use zoning.
- Protect open space and green spaces.
- Develop walkable and bikeable communities.
- Building codes and standards:
 - Adopt energy-efficient building codes and standards.
 - Require the use of renewable energy in new and existing buildings.
 - Promote green building practices.
- Economic development:
 - Support the development of green businesses and industries.
 - Offer financial incentives to businesses to reduce their environmental impact.
 - Attract and retain businesses that are committed to sustainability.
- Education and outreach:
 - Educate the public about climate change and what they can do to reduce their impact.
 - Promote sustainable lifestyles and behaviors.
 - Support climate change education in schools.

Fishbone Diagram for Climate Change



Fishbone Diagram for Climate Change

