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# Strategic Environmental Education Framework for Sustainable Ecosystems Management in Lusaka District, Zambia

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**Abstract:** *Many approaches to urban ecosystem management and sustainability have been used locally and globally. However, existing literature still shows that ecosystem management and sustainability is still an issue of concern. To complement engineering, ecological, geographical, and legal approaches, among others that already exist and, partly failed, this study proposes an Environmental Education Framework for Ecosystem Management (SEEFREM) in Informal Settings that could be used to promote behavioral change for sustainable management of ecosystems. Seven institutions responsible for ecosystem management were selected from which eight respondents were purposively sampled. Results indicated that there were a number of frameworks designed for ecosystem management. However, these frameworks had not yielded the required results for ecosystem management because they were deemed to be reactive in nature instead of proactive. The study established that legal frameworks were not implemented with succinct behavioral science strategies and, that partly explained the reason for poor ecosystem sustainability. The study established that there was a need for an environmental education framework for ecosystem management and sustainability. A document analysis of institutional frameworks showed a gap in the use of Environmental Education for ecosystem management and sustainability. Based on responses from the respondents and from document analysis, a SEFREEM for informal settings was designed. The study recommends that Policy makers and implementers should take informal EE as a priority in the management of ecosystems as per provisions in the National Policy on Environment of 2007.*

**Keywords:** *sustainable ecosystems, Environmental Education Framework for Ecosystem Management, Informal Settings*

## 1. INTRODUCTION

Ecosystem services are usually produced along the full spectrum of heavily managed ecosystems (Guery *et al.*, 2015). As a result, a number of approaches to ecosystem management and sustainability have been applied both globally and locally. Some of the notable approaches to ecosystem management and sustainability include the Ecosystem-Based Approach (EBA) (Secretariat of the Convention on Biological Diversity (SCBD), 2004); Ecosystem Approach (EA), and Ecosystem-Based Management (EBM) (Kirkfeldt 2021); Integrated Ecosystem Sustainability Approach (IESA) (Abdullah *et al.*, 2019); global sustainability policies, treaties and conventions (Geijzendorffer, 2017; Monde *et al*., 2023); and Environmental awareness (Ramachandra, 2008); among others. Despite all these implementation, ecosystems still face threats of degradation. Davis *et al.* (2020) reveal that Zambia is one of Africa's most resource-rich countries. As such Zambia has put in place various institutional and legal frameworks and developed a number of national policies for ecosystem management and sustainability. Historically, environmental regulations in Zambia date back to the 1970s when the Natural Resource Act was passed for the conservation of nature (Makondo *et al.*, 2015). A year later, this was followed by an Act on game parks and Birds whose objective was to conserve life. Later on, a number of laws including statutory instruments were put in place for the management of the environment. The Environmental Management Act (EMA) number 12 of 2011 is the main act on the environment in Zambia. In its preamble, the act underscores that it shall provide for integrated environmental management, the protection and conservation of the environment, and the sustainable use of natural resources. Table 1 summarizes some legal frameworks in Zambia since 1970.

To help understand ecosystem sustainability challenges in Lusaka district, this study was philosophically and theoretically informed by pragmatism and social-ecological trap theory. Based on pragmatism, this study designed a Strategic Environmental Education Framework for Ecosystem Sustainability and Management (SEEFREM). With the various perspectives that were included in the SEEFREM, the study posits that it can pragmatically and potentially engage and empower disadvantaged communities such as those found in the Lusaka district to prevent them from being ecologically trapped.

**Table1.** *Summary of Selected Environmental Laws in Zambia*

| YEAR | ENVIRONMENTAL COMPONENT TARGET/OBJECTIVE |
|---|---|
| 1970 | Natural Resources Act/Nature conservation |
| 1971 | Game Parks and Birds Act/ Wildlife Conservation |
| 1973 | The forest Act No 39 |
| 1974 | National Fisheries Act/ Protection |
| 1985 | National Conservation Strategy |
| 1987 | Zambezi River Authority Act/ Water Resources Management |
| 1990 | Forest Act No 7 |
| 1990 | Environmental Protection and Pollution Control Act/ lea to the establishment of Environmental Council of Zambia |
| 1995 | The Land Act |
| 1997 | Environmental Impact Assessment Regulation (SI. 28) |
| 2003 | Water Act: Applies to water rights |
| 2008 | Launched the first environmental Policy |
| 2011 | Environmental Management Act No 12 repeals Environmental Protection and Pollution control Act to include more and stiffer penalties to violators |
| 2013 | Water Resource Management Act/ Repeals Water Act of 2003 |
| 2015 | Forest Act Repealed the one for 1999 |
| 2015 | Urban and Regional Planning Act |

**Source:** *Makondo et al, (2015), Forest Act (2015) and Urban and Regional Planning Act (2015)*

Despite all the outlined measures on ecosystem sustainability in Zambia and as outlined in EMA (2011), it was still noted (Musenga and Aigbavboa, 2019; Kalulu and Mukonda, 2017) that many components of the environment in Zambia still faced degradation. In addition to legal frameworks, the Community Based Natural Resource Management (CBNRM) approach has also been used in ecosystem sustainability in Zambia. Over the years Zambia has developed a number of strategies to manage wildlife and forest using the CBNRM (Milupi *et al.* 2023). However, this strategy has been constrained by institutional and governance barriers that limit community rights and access to the benefits from sustainable use (USAID 2020). This study posits that the lack of commitment to the implementation of such important national activities is due to a lack of an environmentally educated workforce.

Studies by Milupi *et. al.* (2020), suggest that that lack of education is a challenge in environmental management and also a challenge in the implementation of these environmental laws (Kalulu and Mukonda, 7017) as seen in the replacements of one law after another. Fonte *et al.* (2022) carried out a study in which EE was used to prevent the extinction of the only existing species of the Redbelly Toad in a mountainous river in Brazil. At the time of the research in 2022, only one species of this amphibian was known to exist and the country planned to erect a hydropower plant at the same river. Through multiple collaborations, the power station was not constructed. To help raise awareness among the local people, EE activities were carried out. Fonte *et al*. (2022) acknowledge that, despite having minor challenges, they achieved important milestones in the conservation of the Redbelly Toad. The current study differs from the study by Fonte *et al.* (2022) by first assessing the loss of flora and aquatic ecosystems in an urban area and using the findings to design an EE framework for the sustainability of ecosystems. Another study by Mtonga and Muchanga (2021) showed how an informal EE approach could be used for the mitigation of other environmental challenges such as climate change but did not specifically target ecosystem management. The aim of this study was to explore the management of aquatic and floral ecosystems in the Lusaka District in order to design an informal environmental education framework for ecosystem sustainability.

## 2. METHODS AND TOOLS

The study was conducted in Lusaka the capital city of Zambia. Lusaka District is located in the southern half of Zambia within latitudes 15° 18′ 08″ S and 15° 35′ 08″ S, and longitudes 28°11′ 59″ E and 28° 29′ 13″ E. Its central location makes it a hub of economic activities in the country. Besides being a hub of economic activities, Lusaka District's agro-ecological location makes it more vulnerable to resource exploitation.

Agro-ecologically, Lusaka district is located within zone IIa as shown in Figure 1. The area occupies a watershed area with shallow water levels of depths ranging from 6 to 15m throughout the area (Reaver *et al*., 2021). According to the (ADB, 2015), the dominant flora species found around Lusaka District included the following; *Khaya nyasica, Bauhinia petersiana, Piliostigma thoninngi, Acacia polyacantha, Albizia species, Ficus*. Others include a number of ornamental exotic tree species such as the *Gmelina aborea, Jacaranda mimosifolia, and Delonix ragia.* Most of the natural vegetation of Lusaka District have been removed and replaced by exotic plants.

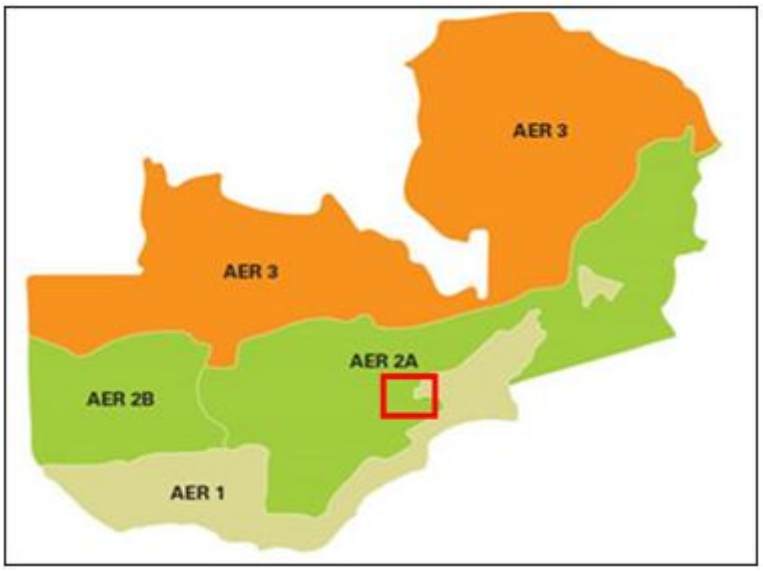


**Figure1.** *Study Location within the agroecological Zones of Zambia (MWDS, 2021).*

Primary data was collected using unstructured interview schedules. Interviews were conducted with eight respondents, purposively selected from six organisations in charge of ecosystem sustainability As shown in Table 2.

**Table2.** *Distribution of Respondents*

| Source of Key informants | No of participants | Selection method |
|---|---|---|
| ZEMA | 1 | Expert Purposive |
| Ministry of Local Government | 1 | |
| Ministry of Lands | 2 | |
| Forest department | 2 | |
| Environmental Advocates | 1 | |
| WARMA | 1 | |
| **Total** | **8** | |

Thematic analysis was used to analyze the data that was collected from the key informants. For ethical reasons, the study withheld the actual names of participating institutions by using the following codes: 1LN, 1FD, 2FD, 1ME, 1WA, 1ZM, 1LG, and 1EA. Responses on the EE framework were put together and provided a framework that was later taken back to the respondents to confirm their input. The verbatim data were analysed using text content analysis in order to tease out deep insights from what was said by the participants in view of informing the SEFREEM. Ecosystem management and sustainability were collected from various institutional documents such as Environmental Management Act, National Policy on the environment, and documents on Community Based Natural Resource Management in Zambia. Thematic analysis was also used for the data that was collected.

## 3. Results And Discussion

Following responses on the need for an EE-based framework for ecosystem sustainability, this study designed a framework that can be used in ecosystem sustainability. Table 3 shows the proposed Strategic EE Framework for Ecosystem Management (SEEFREM). The framework suggests a multi-faceted framework that brings together diverse informal approaches toward addressing environmental issues such as those identified by the study. The results suggest there is value in using an informal EE framework to shift the behavior of people from mere theoretical awareness to engaged activism for the well-being of their surroundings.

**Table3.** *Strategic Environmental Education Framework for Ecosystem Management (SEEFREM) in Informal Settings*

| Issue | Objectives | Strategic Ecosystem Management Activities | Output | Measurable Indicators of behavioral change for ecosystem Sustainability | Performance Targets | Responsible Stakeholders |
|---|---|---|---|---|---|---|
| **Rapid floral and aquatic ecosystem loss** | Conduct periodic EE Lessons on Ecosystem Management in all residential areas | Educationally engaging local communities using informal strategies such as Drama, Poetry, Music, and practice-based environmental awareness (e.g. tree planting). | Diverse lessons on Ecosystem Management conducted in various communities | Community members engage in:<br>a. Geocoded tree planting activities at residential level and beyond<br>b. Zero dumping of waste in aquatic environments<br>c. Recycling of recyclable waste<br>d. Numbers of Communities trained and adopting sustainable practices towards ecosystem<br>e. Regenerative sign on the floral and aquatic systems observed through remote sensed monitoring | 90% | Academic institutions that offer Environmental Education<br><br>Schools within the community and the Ministry of Education<br><br>Ministry of Green Economy and Environment<br><br>Ministry of Local government and Housing<br><br>Local authorities & communities, Artists |

| Issue | Objectives | Strategic Ecosystem Management Activities | Output | Measurable Indicators of behavioral change for ecosystem Sustainability | Performance Targets | Responsible Stakeholders |
|---|---|---|---|---|---|---|
| **Poor environmental communication on ecosystem** | To design and establish an environmental community radio station and social platforms for environmental communication | Developing a Community-led Communication, Education and Public Awareness Strategy (CLEPAS) Establishing radio stations and community social media platforms for the environment (e-clubs), producing local materials such as brochures | CLEPAS developed and operationalized<br><br>Community environmental radio station | a. Improved communication about ecosystem conservation and protection<br>b. All environmental issue widely communicated<br>c. Number of people being engaged through radio and community environmental social media groups/pages<br>d. Number of local materials produced and being used | 100% | Academic institutions<br>Local community<br>ZICTA<br>Relevant government ministries and departments<br>Media influencers |
| **Unprecedented increase in housing development** | To initiate Green Building Initiative (GBI) through EE | Engaging with local communities towards the transformation of ordinary houses into green buildings (which have energy efficient fittings, water harvesting, have a tree or more planted, etc) | Communities engaged in change projects on GBI using locally available resources | Number of households transformed into green buildings<br><br>Initial ecosystem loss traded off | 90% | Relevant government ministries and private sector<br>Academia<br>Community groupings<br>Environmental NGOs |
| **Poor Implementation of Environmental Laws** | To promote environmental law awareness | Carrying out legal education around various laws and policies about the environment | Legal education around environmental laws conducted. | Number of legal environmental education expos conducted<br>Number of people reached and taught<br>Number of people engaging in raising | 90% | Academia<br>Ministry of Justice<br>Ministry of Education<br>Schools and community members |

| Issue | Objectives | Strategic Ecosystem Management Activities | Output | Measurable Indicators of behavioral change for ecosystem Sustainability | Performanc e Targets | Responsible Stakeholders |
|---|---|---|---|---|---|---|
| | | | | awareness | | |
| **Weak synergies among different players** | To build strong partnership for sustainable ecosystem management | Mobilizing various players involved in environmental issues especially in urban/peri-urban settings<br><br>Establishing a Consortium for Ecosystem Management (CEM) | Various players in environmental issues mobilized<br><br>CEM established | Number of players mobilized<br><br>CEM operational in spearheading community environmental education around ecosystem restoration and protection. | 100% | Relevant government ministries and private sector Academia Community groupings Environment al NGOs |

Informal EE could be used as an alternative way to escape the social-ecological trap that people may find themselves in because it suggests some trade-off kind of EE engagement where instead of abandoning the residences, residents can be educated to transform their local environments into green buildings based on locally available resources. The proposed SEEFREM suggests that education is key in ecosystem sustainability. Education that is brought through environmental education provides skills that lead to behavioural change and thereby promoting education for sustainable development (Milupi *et. al.*, 2022). This was also proven by studies by Ramachandra (2008), Clover (2000), and (Monde, 2011). The scholars have shown through their studies, the effects of a lack of environmental education on the conservation of natural resources. Ramachandra (2008) emphasized the need for people to become environmentally literate because the management of the ecosystem involves inventorying, monitoring, and applying integrated technologies, methodologies, and interdisciplinary approaches for its conservation. According to Mubita *et al.* (2022), most environmental management interventions propose the use of EE. Clover (2000, p. 214) also emphasized that EE should be "understood as a lifelong process, actively, critically and creatively engaging children and the adult population in the daily decisions that affect the biosphere". This explains why many frameworks have been failing to enhance ecosystem sustainability and management. Enforcement of environmental education is lacking in a number of these frameworks.

The suggestions in the framework are also supported by the Environmental Protection Agency (EPA). EPA (2023:1) defines green building as "the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort." Applied into the study context, this initiative through the SEEFREM could be a game changer for the majority of urban dwellers. Speaking from a pragmatic philosophical lens whose ontological stance partly advocates for the practical generation of solutions to real-life challenges such as ecosystem loss, the SEEFREM is strategically designed in a ready-to-implement way.

## 4. Conclusion

There were several frameworks for ecosystem management, but the need for a Strategic Environmental Education Framework for Ecosystem Management (SEEFREM) was also identified. As a matter of urgency, SEEFREM was needed to restore the lost services of ecosystems in Lusaka District through the promotion of skills and behavioural change using informal participatory pedagogies. It was also established that since the government is the main stakeholder in ecosystem

management, SEEFREM should have buy-in from both the community and the government. It is recommended that communities in Lusaka adopt the Framework and implement ecosystem services restoration activities such as greening their communities. This could be done by each household planting a tree, energy-saving activities, water harvesting, and other such related activities. There is need also to introduce and enhance community social media platforms for ecosystem management. This could be done by local leaders such as councilors and the local government. The use of social media cannot be over-emphasized as the world keeps evolving towards advanced ways of communication. Such techniques can help reach out to wider audiences as long as effective measures are adopted for implementing them.

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