Assessment of leadership actions for Environmental Stewardship Enhancement in public schools

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Abstract: Stewardship of environmental resources is likely to yield tremendous benefits by saving operational costs and enhancing teaching and learning. However, environmental stewardship remains a secondary subject in the management of schools. This study, therefore, sought to establish actions that school leaders have undertaken in different schools in the sampled area geared towards environmental stewardship. A survey was undertaken in sampled schools in Githunguri Sub-County of Kiambu in Kenya. Primary data was collected from 260 teachers using a structured questionnaire while data from 15 principals was obtained through interviews. The researcher also collected primary data from the schools through observation. The study established that the majority of the teachers in the study area affirmed environmental stewardship in schools was beneficial in influencing teaching and learning (70%), creating pro-environmental behaviour in teachers, students, and parents (68%), and reducing costs of operation (71%). Despite the benefits, sampled teachers affirmed that schools neither had an environment committee (90.4%) nor an environmental policy (75%). The majority of the teachers, however, asserted their schools practiced water harvesting (80.8%) as well as used improved cook stoves to save on wood fuel. Stewardship activities were however constrained by factors such as insufficient funds, limitation of time, and lack of knowledge which bore the greatest responsibility. Findings from this study will put into perspective some of the environmental good practices that schools have adopted and as such inspire future policies on environmental stewardship in public schools in Kenya. The results highlight the need for a review of educational policies on environmental stewardship if public schools are to have environmental sustainability. Further, the findings provide insights on capacity building gaps which will be useful for public school leadership training as well as contribute to behavioural change required in implementing environmental stewardship.

1. Introduction

Environmental stewardship in schools is a governance issue (Müller et al., 2020). All leaders have to protect vulnerable environmental resources under their care through sustainable consumption and greening (Bopape et al., 2021). Educational leaders have an even bigger role to play since they are responsible for producing future leaders who will be tasked with the duty of safeguarding the overestimated resources of planet earth (Fuertes-Camacho et al., 2021; Bozoglu et al., 2016; UNESCO/UNEP, 1978). Leadership implies influence from a leader who conveys a vision of the future and resonates with followers’ values and beliefs in a way that followers can comprehend and interpret the future into present-time actions (Winston & Patterson, 2006). It is no wonder that the success or failure of environmental stewardship activities in schools is directly linked to school leadership (Al Khajeh, 2018; Warner and Elser, 2015). For successful stewardship
of the school environment, the school leadership is expected to be committed to sustainability and environmentalism, exercise distributive leadership by involving other members of staff as well as the community, and be ready to establish the school as an environmental agent within the given community (Mogren and Gericke, 2019; Mogren and Gericke, 2017; Desfandi et al., 2016; Kadji-Beltran et al., 2013).

With the realisation of ever-dwindling natural resources, stewardship is necessary (Upitis et al., 2013). To create the stewardship spirit, learners must create a connection with nature and thus develop a sense of ownership and the urge to steward the places they resonate with. The duty of caring for school grounds and initiating green initiatives to develop learners’ pro-environmental behaviour lies with school leaders (Upitis et al., 2013). However, while school leaders have the authority to initiate environmental stewardship activities (Bopape et al., 2021), sustainability largely lacks in educational sociology, psychology as well as educational management and leadership classes (Ferreira et al., 2006). As a consequence, schools globally have continued to operate unsustainably in terms of energy and water consumption while waste management remains a challenge. For instance, a study by the Environment Protection Agency (EPA) showed that schools, in the US, spent 8 billion US dollars in 2008 on energy alone (U.S. EPA, 2008). A study in South Africa also reported that water and electricity bills depleted school resources and that schools lacked policies for managing the same (Bopape, 2022). The study showed that while schools practiced water harvesting, most schools were reported to use non-renewable energy and there was no energy-saving lighting. In addition, no school was found to engage in recycling activities and litter was never sorted. The study attributed the situation to the fact that role players in the education sector did not possess skills or knowledge in environmental stewardship (Bopape, 2022).

In Kenya, the education sector has been undergoing tremendous growth since its independence. At independence, the country had only 251 secondary schools with a total enrolment of 30,120 students. The number of schools, as well as enrolment, has been on a sharp increase, especially after the introduction of free primary education in 2003. Consequently, by the year 2016, enrolment had risen to 2.5 million students in 8,609 secondary schools (RoK, 2016; Mumiukha et al., 2015). In the most recent statistics of the financial year 2020/2021, enrolment in Kenya’s public secondary schools hit 3.3 million learners in approximately 9,643 schools (RoK, 2021). The numbers are likely to continue increasing. With the tremendous increase in the number of schools as well as students, it is pertinent to note that the construction of schools poses a direct danger to the environment (RoK, 2019) like any other major construction project. More so, increasing enrolment in schools means higher consumption of water, electricity, and wood fuel compounded by the release of substantial waste. For instance, a study by Renewable Energy Technology Assistant Program (RETAP, 2007) revealed that 75% of boarding secondary schools in Kenya relied entirely on wood fuel for cooking and heating water, translating to 200–300 tonnes of wood. Another study by Moronge and Maina (2015) conducted in Thika, Kenya also revealed that all boarding schools in that area used firewood while only 11.8% and 5.9% used solar energy and biogas respectively. Schools also produce substantial waste (Nakholi, 2021) while proper waste management remains a challenge in schools as in other areas of the country (Wakiaga, 2017). Mbaka et al., (2019) also reported that 95% of institutions in Kenya depend on wood fuel as their main source of energy putting a risk to vegetation cover in the country and consequently land depreciation.

Reviewed research established that the majority of the projects and research have tended to concentrate on energy, specifically the use of improved cookstoves and energy-saving bulbs as a way of saving energy in schools (Mwaura, 2020; Moronge and Maina, 2015). Studies remain limited in Kenya and more so in the study area on water consumption, waste management, and school grounds management in that these utilities were subsidized by the national government. Further environmental issues were perceived as a non-budgetary item in financial planning by school leadership thereby studies focused on financial management unlike environmental stewardship. Besides,
the eco-school program that is mainly responsible for environmental stewardship in schools is reported to have a 4.5% reach in Central Kenya where the study locale is (Otieno et al., 2020). Overall, stewardship of the school environment has not received serious attention and the overall failure in the implementation of the ESD program has resulted from a shortage of time and space in the curriculum (McKeown and Nolet, 2013) as well as a lack of confidence among principals and their unwillingness to adopt change (Kadji-Beltran et al., 2013) compounded by inadequate funding (MoE, 2017). It is based on these situations that this study was conducted in a bid to give insight into my third objective: to assess leadership action for environmental stewardship enhancement in public schools. In so doing, this study highlights some of the good practices that other educational leaders can emulate in their institutions. In addition, the study puts into perspective the progress in the implementation of the ESD program in Kenya and areas that need improvement to achieve its ultimate goal. This study will also give direction to government policy on a coordinated approach to environmental stewardship in public schools in Kenya. Finally, this study is intended to inspire scholars and researchers to undertake more research in the area of environmental stewardship in the education sector coming from a backdrop where environmental issues were perceived as a non-issue and less urgent for school administration. Additionally, the study provides a basis for the enhancement of environmental education to address the myriad of challenges emanating from adverse climate change effects and how pivotal environmental stewardship can aid climate change adaptation strategies.

2. Materials and Methods

2.1. Conceptual Framework

The study draws from the work of Bennett et al., (2018), An Analytical Framework for Local Environmental Stewardship (Figure 1). According to the framework, the creation of environmental stewardship actions and consequently achieving ecological and social outcomes of stewardship will depend on three factors namely: the actors, motivations, and capacity. While actors can be individuals, this study considers that stewardship of the public-school environment is a complex issue that involves a multi-sectoral approach (Romolini et al., 2016) and as such calls for a collective approach (Krasny and Tidball, 2012). Similar thoughts are expressed by studies that stressed distributive leadership and the use of the school as an agent of stewardship within the local community if stewardship is to be achieved (Mogren and Gerckie, 2019; Mogren and Gericke, 2017). As suggested in the model (Figure 1) this study, therefore, recognizes the distinct role to be played by stakeholders that include the principal, teachers, students, NGOs, and government agencies in efforts to achieve environmental stewardship in public schools.

The model also advances an argument that local stewardship actions will succeed or not owing to the capacity of the community. Researchers have argued that such capacity would include good governance, knowledge and skills, financing, technology, and infrastructure among others (McConney et al., 2014; Chapin et al., 2010). Capacity would also be enhanced by governance in the form of formal and informal organisations as well as laws and policies (Soliman, 2014; Lockwood et al., 2010). Similar arguments are advanced in this study as envisaged in the ‘whole institution approach’ of the ESD program. For successful stewardship of the school environments and environmental resources, school leadership will play a pivotal role (Upitis et al., 2013) while cooperation among all other stakeholders including teachers, students, the community, Non-Governmental Organisations as well as government agencies will enhance the same (Otieno et al., 2020; FAO, 2015; Soliman, 2014).
Finally, stewardship actions call for motivation. Motivation is the driving force behind stewards’ urge to act (Bennett et al., 2018). Bennett et al., (2018) broadly categorize motivations as either intrinsic or extrinsic. They argue that while intrinsic motivation arises from one’s need for personal satisfaction extrinsic motivations either come from costs and benefits associated with stewarding environmental resources or sanctions and rewards that may follow stewards (Bennett et al., 2018; Reto and Garcia-Vega, 2012). This paper calls for school leadership that is well-motivated to act and steward environmental resources in their schools. Besides we call for a comprehensive legal framework for coordinated stewardship activities in public schools in Kenya. This model would be of help in coordinating stewardship activities for schools.

2.2. Study Area

The study was undertaken in public secondary schools in the Githunguri Sub-County of Kiambu County in Kenya. The sub-county has a total of 37 public secondary schools.

2.3 Data Collection and Analysis

The study adopted a correlational research design. A sample of 260 teachers was selected randomly while 15 principals were selected using purposive sampling. Purposive sampling is useful in selecting a small sample for a targeted group that contains the information needed (McMillan and Schumacher, 2014; Creswell, 2014). Data from teachers was collected using a close-ended questionnaire in a mobile app, Kobo Collect while data from school principals was collected through interviews. Observations were also done to ascertain if schools were engaged in some environmental stewardship programs. Secondary data was obtained using systemized desktop reviews. The use of these multiple data collection methods was meant to increase the trustworthiness of the data and allow triangulation (Brundrett and Rhodes, 2013). Quantitative data was analysed through descriptive statistics particularly crosstabs to establish statistical significance between the positive and negative responses. Analysed data is presented in tables, charts, and graphs.
3. Results and discussion

3.1 Benefits of environmental stewardship

The study sought to establish teachers’ opinions on the benefits that schools are likely to accrue from proper stewardship of the school environment. The results obtained are presented in Figures 2, 3, and 4.

![Figure 2. Teachers’ opinion on whether physical environment influences teaching and learning](image)

Results shown in Figure 2 indicate that 70% of sampled respondents were of the opinion that stewardship of the school environment would positively influence the teaching and learning process. Another 25% of the respondents strongly agreed while only 5% of the respondents disagreed with the statement.

![Figure 3. Opinion on whether stewardship in school transforms teachers, students and parents to be better stewards](image)

Figure 3 indicates that 68% of the sampled respondents agreed while another 28% of the respondents strongly agreed that environmental stewardship in schools is likely to socially transforms teachers, students and parents to be better stewards. Only 4% of the respondents had a contrary opinion.
Figure 4 indicates that majority of the sampled teachers (71%) were of the opinion that environmental stewardship is likely to reduce operational costs for schools. Another 14% of the respondents strongly agreed with the statement while only 13% and 2% disagreed and strongly disagreed with the statement respectively.

3.2 Leadership Actions towards Environmental Stewardship

The analysis established a statistically significant large number (90.4%) of schools lacked an environmental committee. In this connection, the study also found that of the many schools that lacked an environmental committee, 75% of them also failed to establish a policy that would enhance environmental stewardship. On the hand, most schools (80.8%) in the study locality had initiated activities that promoted water harvesting to ensure access to safe and continuous water supply. Similarly, 76.1% of the surveyed schools recognised the importance of sustainability and had fixed energy-saving bulbs for lighting purposes. Interestingly, 82.7% of the schools in this study were unable to ensure energy conservation by switching off lights, computers, and printers when not in use. Aside, a comparable number (n = 211, 82.3%) did not harness solar energy as an alternative source of power (Table 1).

Table 1. Analysis of leadership actions towards environmental stewardship

<table>
<thead>
<tr>
<th>Policy</th>
<th>Yes %</th>
<th>No %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the school have an environment committee?</td>
<td>9.6 ± 6.5a</td>
<td>90.4 ± 4.6b</td>
</tr>
<tr>
<td>2. Is there an environmental policy?</td>
<td>25.0 ± 2.2a</td>
<td>75.0 ± 1.5b</td>
</tr>
<tr>
<td>3. Do you engage in water harvesting?</td>
<td>80.8 ± 13.5a</td>
<td>19.2 ± 9.4b</td>
</tr>
<tr>
<td>4. Does your school practice energy saving practices?</td>
<td>17.3 ± 4.4a</td>
<td>82.7 ± 3.1b</td>
</tr>
<tr>
<td>5. Does the school harness solar energy?</td>
<td>17.7 ± 4.3a</td>
<td>82.3 ± 3.0b</td>
</tr>
<tr>
<td>6. Does the school have litter sorting bins?</td>
<td>11.9 ± 5.9a</td>
<td>88.1 ± 4.1a</td>
</tr>
<tr>
<td>7. Does the school have a tree-planting day?</td>
<td>8.5 ± 6.9a</td>
<td>91.5 ± 4.8a</td>
</tr>
<tr>
<td>8. Does the school practice recycling?</td>
<td>0.8 ± 9.0a</td>
<td>99.2 ± 6.3a</td>
</tr>
<tr>
<td>9. Does the school have improved cook stoves to save on energy?</td>
<td>80.8 ± 13.5a</td>
<td>19.2 ± 9.4a</td>
</tr>
</tbody>
</table>

Pearson Chi-Square value (1130.902a), Asymp.Sig.(2 – sided) = 0.000, letters ab in a row, differ statistically by Chi-square.
Also, notable in Table 1, only 11.9% of the schools under study had litter sorting bins. A similar number (n = 22,8.5%) of these schools had programs that enhanced tree planting activities on designated days. Recycling also remained a challenge to nearly all (99.2%) of the schools surveyed. Nevertheless, a significantly substantial number of the surveyed schools had already installed and were using improved cook-stoves in their kitchens.

3.3 Factors that hinder stewardship activities in public secondary schools

The researcher ran a multiple linear regression test to predict the factors that hinder extent of stewardship activities from limited time, insufficient funding, a lack of knowledge, and an overloaded curriculum. The model returned a strong positive linear association (R = 0.844a) (Table 2). Additionally, the model statistically significantly predicted stewardship activities (F(4,255) = 157.368, P = 0.000b < 0.05, R² = 71.2) (Table 2; Table 3).

Out of four, only three variables i.e. limited time, insufficient funds and a lack of knowledge added significantly to the prediction (Table 4). Lack of knowledge/skills (0.682) is the highest contributing factor followed by insufficient funds (0.177), and lastly limited time (0.016) in predicting stewardship activities (Table 4, Beta column). Overall, the unique contributions of all the factors to the variation of the stewardship activities are (0.004² + 0.083² + 0.39²) x 100% = 15.9% (Table 4, Part column). This value is different from the R² value (R² = 71.2%) of the model (Table 2). This aspect implies that (71.2 – 15.9) = 55.3% overlying predictive work was a result of the predictors. Hence a good combination of the predicting variables. Importantly, each of the significant factors diminishes the extent of stewardship activities each time it arises. For instance, stewardship activities diminished by 0.019 whenever time was limited and by 0.016 due to insufficient funds.

Table 2. Correlational analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.844a</td>
<td>0.712</td>
<td>0.707</td>
<td>0.13415</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), knowledge, time, funding, curriculum

Table 3. ANOVA Analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>11.329</td>
<td>4</td>
<td>2.832</td>
<td>157.368</td>
<td>0.000b</td>
</tr>
<tr>
<td>Residual</td>
<td>4.589</td>
<td>255</td>
<td>0.018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15.918</td>
<td>259</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: activities
b. Predictors: (Constant), knowledge, time, funding, curriculum

Table 4. Regression analysis for the factors and their hindrance effect on stewardship activities

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
<th>Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
<td>Zero-order Partial Partial</td>
</tr>
<tr>
<td>(Constant)</td>
<td>0.385</td>
<td>0.078</td>
<td></td>
<td>4.943 0.000</td>
<td>0.562 0.008 0.004</td>
</tr>
<tr>
<td>Limited time</td>
<td>-0.019</td>
<td>0.140</td>
<td>0.016</td>
<td>0.133 0.025</td>
<td>0.748 0.152 0.083</td>
</tr>
<tr>
<td>Insufficient funds</td>
<td>-0.160</td>
<td>0.065</td>
<td>0.177</td>
<td>2.462 0.014</td>
<td>0.837 0.587 0.390</td>
</tr>
<tr>
<td>Lack of knowledge/skills</td>
<td>-0.528</td>
<td>0.046</td>
<td>0.682</td>
<td>11.588 0.000</td>
<td>0.585 0.000 0.000</td>
</tr>
<tr>
<td>An overloaded curriculum</td>
<td>-2.377</td>
<td>0.142</td>
<td>0.000</td>
<td>0.000 1.000</td>
<td>0.585 0.000 0.000</td>
</tr>
</tbody>
</table>
4. Discussion

4.1. Benefits of Environmental Stewardship to Schools

Majority of the sampled teachers in the study area agreed that stewardship of environmental resources was beneficial in saving on the costs of operation as well as benefits to the entire process of teaching and learning. Besides, the teachers were for the opinion that stewardship of the environment in schools would inspire teachers, students and even parents to be good stewards outside of the school. The findings of this study concur with those of Obong et al., (2010) and Abdulakadir et al., (2017) whose studies established that the management of the school environment had a significant effect on learners’ study habits.

Similarly, the results were in tandem with Gan et al., (2019) who affirm that environmental stewardship in schools creates pro-environmental behaviour in learners, teachers, other school staff and even the community at large. More so, on reducing operational costs, the study is in agreement with Kerlin et al., (2015) who affirm that indeed green-schools are cost effective, healthy and save schools money. Bopape (2022) also claims that water and energy swiftly deplete school funds and as such sustainable use of the resources and their proper stewardship would reduce operational costs.

Finally, other studies have outlined benefits of greening schools that include reducing absenteeism and improving teachers’ morale (Medical Health Report, 2015; Kerlin et al., 2015; Plunkett and Dyson, 2011). This realization of the benefits that schools would draw from proper stewardship of school environment calls upon stakeholders in the education sector to intensify coordinated stewardship activities in schools.

4.2. Leadership actions towards environmental stewardship

4.2.1 Environmental Committee

Reports in Table 1 indicate that almost all schools in the study area did not have environmental committees in their schools. Similarly, only one of the interviewed principals alluded to having an environment committee in the Board of Management (BOM) while other school principals were not even aware of such a provision in Kenya’s Basic Education Act. This is despite the fact that Article 61(2) of the Basic Education Act of 2013 dictates that the BOM forms among others an academic standards, quality and environment committee (RoK, 2013). Notable though, the functions of this committee are not highlighted in the Act. Studies have stressed the need for an eco-committee as the first step in establishing green schools (Sousa, 2022). The committee is tasked with undertaking environmental review and advice on a theme and annual course of action (Dzerefos, 2020). The committee is supposed to be composed of students, teachers, parents, staff and the wider school community. It is the driving force for stewardship activities in a school and popularises the eco-school program as well as deciding on environmental actions for the schools (Sousa, 2022). The fact that most schools were reported to be lacking an environment committee is likely to have adverse effects on successful stewardship actions in schools. This study, therefore, calls for capacity building among teachers and principals on legal provisions. Additionally, the government should enforce the law to ensure that such committees are formed as provided for in the Basic Education Act.

4.2.2. Environmental Policy

Most teachers and principals in the study area indicated that their schools did not have an environmental policy (Table 1). From the interviews with the principals, they asserted to have informal and unwritten policies on littering and energy conservation. However, none of the principals expressed having a formal written environmental policy in their schools. The scenario clearly indicates a lack of direction from school leaders that
are responsible for coming up with school policies. The results seemed to agree with a study conducted in South Africa which established that out of three sampled schools in the study, only one school had an environmental policy (Bopape et al., 2021). A school environmental policy is expected to outline the school’s ecological targets and commitments to sustainability and is supposed to be familiar to the entire school community (FEE, 2022). Policies have been argued to constitute extrinsic motivation for stewards by outlining expectations, responsibilities, and sanctions (Soliman, 2014; Bennett et al., 2018). Without such a policy, then schools are bond to lack direction and fail altogether in their stewardship actions. An analysis of the factors that hinder environmental stewardship activities shows lack of knowledge as the highest negative contributor (Table 4). Thus, the outcomes in Table 1 are likely a result of teachers lacking the foundational knowledge to enable them to formulate a standard environmental policy in their schools. Besides, educational leaders may not even be aware of the possible environmental crisis that requires their attention. Problem awareness is the very first step in the development of stewards (Seng, 2008). As a result, the study calls for capacity building geared towards the knowledge of environmental stewardship, especially among educational leaders.

4.2.3. Water harvesting and management

Most of the schools performed well in reference to water harvesting (Table 1). Rainwater harvesting systems capture free rainwater from rooftops and direct it into storage tanks and the water can be used for cooking, cleaning, and drinking if well treated. The study area receives substantial rainfall, up to 1200 mm, per year (County Government of Kiambu, 2018). This indicates that if schools in the area practice water harvesting, they would save a substantial amount of money that is used in paying water bills. School leaders in the sampled area seemed to understand the importance of water harvesting and went on to put it into action as observed in most of the sampled schools, an example of which is shown in Figure 5. However, observations in the study area still showed some schools having only one tank while others did not have any. Interviews with school principals mainly expressed lack of funds to purchase tanks as the hindrance to water harvesting. Similar results were found in Bopape et al., (2021) who established that 2 of 3 sampled schools in South Africa had water tanks for harvesting rain water while one of the schools had the tanks for storing borehole water (Figure 5). Observations also revealed poorly maintained gutter systems that were clogged with leaves, preventing free flow of water. Interestingly, one of the schools was found to have a good gutter system but all the water was directed to the ground. This is likely to cause soil erosion further worsening the school environment.

In addition, wastage of water was noted in some schools where taps were left open or pipes were leaking. A system of flashing students’ lavatory was also observed in different schools and deemed wasteful in terms of water usage. The system shown in Figure 6 was designed to continuously flash students’ washrooms even when there was no need to do so. This is contrary to good environmental practices that recognize the importance of water while emphasizing on simple actions that can save on water (FEE, 2022). All these points out to school leaders who are not conscious about proper management of environmental resources.

While the study could not establish reasons why some school leaders took decisive steps in water harvesting and conservation, it is most likely that the same was intrinsically motivated in addressing environmental issues of water shortage (Bennett et al., 2018). The study recommends that future studies should endeavour to establish why leaders adopted different approaches in environmental stewardship actions.
4.2.4. Use of Solar Energy in Public Schools in Githunguri, Kiambu County

The use of solar energy remains minimal in the study as are shown by results in Table 1. Observations in the sampled schools revealed that all participating schools relied entirely on electricity from the national grid for lighting and operating machines. These findings correspond with a study conducted within the same county that affirmed that 70.6% of schools use electricity from the national grid while only 11.8% of the schools used solar energy (Moronge and Maina, 2015). A similar study revealed that 60% of
schools in Mtito-Andei used electricity for lighting (Kazungu et al., 2019). Bopape et al. (2021) also report that in their study in South Africa, no school was found to utilize either wind or solar energy. This traditional energy source is increasingly becoming expensive and unreliable (Bopape et al., 2021). The findings of these two studies are a reflection of the economic constraints that schools are grappling with. It should also be noted that public schools in Kenya are funded by the government on strict vote heads and restrictions on charging extra fees is strictly enforced. As such, school can hardly undertake major projects such as solar energy harnessing which could have high initial costs. This study, therefore, calls upon the government to rethink areas of funding in public schools so as to enhance future adoption and implementation of projects such as solar energy harnessing. Studies should also be undertaken to quantify how much the government would save in the long run by adopting cheaper solar/wind energy to encourage the government to consider such initiatives.

4.2.5. Energy Saving Practices of Public Schools in Githunguri, Kiambu County

Table 1 reveals that the majority of the teachers did not believe that their schools had energy-saving practices. However, observations from the sampled schools established that most of the schools had energy-saving bulbs installed. This is quite commendable owing to the fact that such bulbs are likely to save between 20-33% of energy (Topping, 2021). Some schools were also observed to have light sensors that controlled the lighting system especially for security lights ensuring that they were only on when necessary. These findings are in coherence with Gutierrez and Metzger (2015) who affirm that most schools in the US now have greener technologies including modern lighting and automatic lighting systems among others. Other schools were found to have lights controlled from a central point which again reduced the tendency of putting on lights during the day. All these practices are likely to reduce energy bills that consume a substantial amount of money in schools (U.S. Environmental Protection Agency, 2011). Notwithstanding the good practices, some schools were found to have lights on during the day while computers and printers remained on throughout the day even when they were not in use. Notably also, while windows are meant to ensure that buildings were well-lit and save on energy, most schools had a tendency of painting the window panes to reduce students being disrupted by events outside the classrooms. This practice only worked to make classes and laboratories poorly lit during the day requiring more energy. A sample of such schools is shown in Figure 7. This study however did not examine the amounts that schools can save through energy-saving practices and green technologies. The study, therefore, recommends future research to ascertain how much the government would save. This is likely to inform governments to invest in energy-saving practices in schools.

Figure 7. Painting on school windows
4.2.6. Waste Management in Public Schools in Githunguri, Kiambu County

Solid waste management remains a challenge for most schools in the study area. Paper constitutes the main solid waste generated in schools while others include plastic in form of cups, plates and buckets as well as food remains (Ana et al., 2011). Table 1 show that majority of the sampled teachers expressed that their schools did not practice sorting of solid waste. Observations from all the visited school simply showed that all manner of litter was collected and dumped in litter pits from where it was burnt by open fire. Figure 8 captures solid waste disposal in two of the sampled schools in the study area. The findings of this study emulate those of Ana et al., (2011) whose study of schools in Nigeria established that litter was mainly collected in dustbins and burnt in open fires.

Figure 8 (A) shows grass residues being burnt alongside papers. The residues would have been used for mulching in the school garden thus enhancing production. The open dumping and burning of solid waste are likely to have detrimental effects on the environment as well as leaners and teachers’ health. Schools should strive to recycle some of these wastes by first sorting them. Studies have attributed the poor waste management practices to financial constraints while advocating for appropriate legislation, community participation, and public awareness as possible components for successful waste management practices (Hasan, 2004). Future studies should therefore focus on innovative waste management practices in schools to solve the menace.

![Figure 8](image.png)

**Figure 8.** Waste disposal in sampled schools

4.2.6. Improved Cook stoves for public Schools in Githunguri, Kiambu County

The study established that most schools had made effort to use improved cook stoves aimed at saving on wood fuel. The results were in line with Kazungu et al., (2019) who affirmed an acceptance rate of 87% of improved cooking stoves in public secondary schools in Mtito-Andei, Makueni County, Kenya. Elsewhere in Uganda, energy saving stoves were reported to save up to 50% of firewood used in schools (Martin, 2017). A sample of the improved stoves in the study area is shown in Figure 9. The adoption of improved cooking stoves was deemed very necessary owing to the fact that nearly all school in Kenya depended on wood fuel for cooking and heating of water (Kazungu et al., 2019; Mbaka et al., 2019). Schools on average spend about USD 138 per month (Kamillaet al., 2014). The use of improved stoves is likely to ease the financial burden
for schools (Muronge and Maina, 2015). Besides, in a country that is struggling to attain a 10% tree cover, this is a welcome move. However, the study is of the opinion that the government should invest even more in having cleaner sources of energy. For instance, some schools have a high potential for biogas which could be utilized to save on wood. This again shifts the focus to the issue of funding and the knowledgeability of educational leaders.

![Figure 9. An improved cook stove](image)

4.2.7. Recycling in public schools

Almost all the sampled teachers alluded that their schools did not engage in any form of recycling. The findings concur with Ana et al., (2011) whose study in Nigeria established that waste segregation and sorting were not practiced in their study area and that made recycling and proper waste disposal difficult or not practiced altogether. Simple acts of recycling are likely to save school spending while also generating income for the school. An eco-school in Kariobangi slums in Nairobi was able to recycle plastic wastes to make mats, baskets, toys and handbags. The project not only generated income for the students but also ensured a clean environment free of plastic as well as inculcating entrepreneurial skills in learners (Otieno et al., 2020). In yet another case in South Africa, a school was reported to use food remains and waste from the garden to make compost manure that was used in the school farm to grow vegetables and sell to the local community (Bopape et al., 2021). The lack of action in most of the schools in the study locale as far as recycling is concerned is likely a result of inadequate knowledge and skills in undertaking such activities. This is confirmed by the findings in table 4. As such, concerted efforts should be made to ensure that educational leaders are equipped with the knowledge and skills to undertake activities that would enhance recycling.

4.2.8. Tree planting days in public schools

Tree planting days were not part of the programmes that a majority of the schools had planned for (Table 1). Interviewed principals indicated that while tree planting was practiced in schools, the practice was not on regular basis and no tree planting days were set aside for the exercise. The principals cited lack of funds as a barrier to this venture while one of the principals averred that the school did not have the space to
plant trees. Consequently, schools relied on NGOs and private sector organisations such as Equity Bank Group to donate trees for planting. The planting of trees in this area would help in bridging the gap that Kenya faces in attaining a 10% tree cover owing to the fact that the study area received high rainfall and high temperatures (County Government of Kiambu, 2018), favourable conditions for the growth of a wide variety of trees. Kiambu County as a whole is also facing unprecedented encroachment by urban areas and schools would offer a remedy for the vegetation that is being cleared to establish settlements. Unfortunately, as it stands, schools are not doing enough to help the country attain the required tree cover and even the steady growth of schools is putting a risk on natural vegetation in the schools.

4.3 Factors Hindering Stewardship Activities for Public Schools in Githunguri, Kiambu County

Statistical tests were conducted to establish the factors that are hindering actions towards environmental stewardship in the study area. The results of the statistical tests are presented in Tables 2, 3, and 4. According to Table 4, lack of knowledge was found as the major hindrance to environmental stewardship. The findings demonstrated that the lack of knowledge would diminish the extent of stewardship activities by a value of 0.528 which is higher compared to the other two factors. For this reason, this study holds that teachers (actors) from the surveyed schools lacked the knowledge to enable them to undertake stewardship actions as indicated in Table 1. Similar thoughts are expressed by Sharma (2016) who points out that the major hindrance to the successful implementation of ESD in schools is a poor understanding of environmental sustainability among stakeholders. Bopape (2022) also adds that little knowledge of sustainability and lack of a clear policy framework are to blame for limited greening activities in schools. This study, therefore, calls for the re-orientation of educational policies and training of educational leaders including teachers to address the gap that exists. Without doing so, the dream of achieving the SDGs and in particular, Target 4.7 will remain a pipe dream.

4. Conclusion

The study concludes that while efforts have been made to enhance environmental stewardship in schools through eco-school and green-school programs, achievements in the area leave a great deal to be desired especially in developing countries. Most school leaders globally seem to be in oblivion as far as environmental good practices are concerned while governments have spared little or no investments in schools to facilitate environmental stewardship. As a consequence, schools continue to miss out on benefits that would accrue from proper stewardship of school environment. Capacity building among school leaders should also be emphasized since inadequate knowledge/skills is a hindering factor to propelling environmental stewardship in schools. Enhancing environmental stewardship in schools will boost leaners’, teachers’ and community members’ knowledge, skills, and attitudes towards sustainable development and consequently help in attaining Goal 4 of the SDGs for a sustainable future. The simple steps that schools will take in stewarding the environment will also contribute to climate change mitigation while also producing knowledgeable citizens who can better handle emerging environmental issues including but not limited to climate change.

Based on the findings of this study, the following policy recommendations are made:

- The Ministry of Education (MoE) collaborates with other government institutions to provide in-service teacher training on leadership actions towards environmental stewardship.
- The government should seek the help of NGOs to initiate more stewardship activities in public schools across the country.
- More funds should be set aside to help schools initiate stewardship activities in their schools.
• A more flexible curriculum should be implemented to allow students and teachers more time to engage in practical activities of environmental stewardship.

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