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Green Information Technology (IT) Strategies in Institutions of Higher Learning in Kenya for Sustainability: Challenges and Opportunities

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ABSTRACT

Green IT strategies refers to measures and steps of promoting environmentally friendly products and services towards reducing the levels of environmental degradation due to such as carbon emissions, air pollution, to combat effects of climate change. There is also the element of leverage on energy-efficient and cost-effective products and services. In this paper an attempt has been made to review previous literature related to the green ITstrategies from the early phases of IT as a producer(device and data center) to the later strategic phases(with future technologies). Drivers of green IT strategies have also been explored and include: costs, regulatory and legal, social and political, new markets, self-drive and enabling business eco-system. Opportunities and recommendations on measures to be taken to enhance green IT strategies in IHLhave also been discussed. To be able appreciate the drivers of green ITstrategies, methodology adopted was that of qualitative content analysis. The aspects of availability of government goodwill,societal goodwill, market infrastructure, costs savings,human resource capacity, cultural shift, laid down government regulations and policies,provided nuances for green IT drivers.Support and adoption of green IT strategies as well as coming up with action plans and frameworks goes along in entrenching the green IT concept for environmental and socio-economical sustainability. There is little research and content on green IT strategies in Institutions of Higher Learning (IHL) in Kenya in terms of activities and institutional governance at the levels of operational, tactical and strategic. Perhaps, this is partly as result of weak link between national policies, institutional policies, and activities. The paper recommends re-configuring of Kenya government policies to better guide its institutions of higher learning in their role deliberated in responding to green IT strategies for sustainability.

Keywords: - green IT strategy, green IT,green procurement, carbon footprints

I. INTRODUCTION

Green information technology (green IT) Strategies are essentially business plans that are developed and implemented with the reduction of carbon emissions and other environmental factors in mind. Successful green IT strategies take into account the goals, industry context, and socio-cultural milieu of a business. Reference [35] advocated for and foresaw the importance of this vital convergence of business, technology, and society. This alignment has recently been seen as necessary for enterprises to advance holistically, particularly in light of the environment as in [36]. Decision-makers in a corporation must therefore coordinate and align their interests in business, society, and the environment. Therefore, a green IT strategy is a strategic corporate approach that does not separate economic goals from environmental issues. The connection of a company's business objectives with its environmental conscience can best be defined as the convergence of its business and environmental sustainability ambitions. Therefore, effective green IT efforts must constantly market themselves and demonstrate their value to corporate stakeholders as in [15].

Green IT strategies comprise of topics that need to be covered which include business, critical thinking, decision-making, business architecture, technology, especially information and communications technology (ICT), as well as sensitive subjects like people, their motivation, and morale. An organization's structure, dynamics, and incentives related to microeconomics, compliance restrictions, and corporate social responsibility (CSR) alignment conflicts with traditional corporate business are all considered in a green strategic approach. Reference [14] states that IT is a producer of carbon emissions with environmental effects throughout a product's life cycle, including during its use. Carbon emissions produced by IT can be reduced by less use of IT, that way immediate benefits can be realized. The simple, preliminary approach to reducing carbon is by switching offidle computers and monitors reducing network traffic, as in [15].

Reference [37] argue that information communication technology sector alone is estimated to produces 2% of the world's CO2 emissions, which is comparable to the amount produced by the aviation sector. ICT infrastructure and its corresponding services being of crucial significance in the business industry, the need to embrace strategies that are ecologically sensitive in their processes of sourcing to disposal is important as in [20]. However, when IT is used as a strategic enabler of carbon emissions reduction, an approach that is more comprehensive is involved, as shown in Fig.1. In such a case, not only the IT systems and processes for IT are put to use to reduce carbon emissions but also the entire organization [15]. The term "green enterprise," which refers to organizational infrastructure, policies, laws, standards, measurements, and other related operations, such as the supply chain and marketing, regardless of whether IT is involved in these processes, emerged from green IT strategies as in [15]. The hallmark of such green business strategies is that they guarantee a more stable foundation for sustainability to the organization as compared to focusing on IT as a silo.

Thus, whether not or whether they are IT-focused, business efficiency techniques like Lean or Six Sigma are important for an organization's transition to sustainability as in [20]. Within corporate processes, inefficient activities are optimized or eliminated to increase both business efficiency and carbon efficiency [15]; [14]. Figure 1, illustrates creating new business strategies with a specific focus on environmental greening while extending and/or redefining current business strategies are referred to as business strategies.
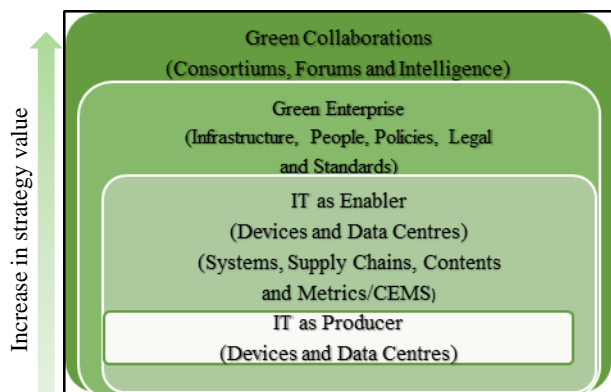

Fig. 1 Green enterprises goes beyond green IT

A strategy that spans the operational, tactical, and strategic levels of an organization will produce green strategies that are more viable [15]. Such strategies result from personal insight, leadership, vision, familiarity with the structure and dynamics of the organization, awareness of the nuances that result from the operations of the company, and people's (i.e. stakeholders') perception of change [15]. The green strategic mindset is aware of these crucial beginning efforts and values them in particular for the visibility they provide to the initial effort. In addition to adopting a long-term, comprehensive, all-encompassing effort, as in [23],

II. STATEMENT OF THE PROBLEM

Green IT strategies, ought to strive towards eco-friendly production as well as service provision so as to supplant the environmental contaminants. Reference [25] acknowledges that global partner members play a crucial role in spearheading the realisation of Paris agreement of 2015 as well as the Glasgow's 2021 enhanced agreement ofConference of Parties (COP) 26 on sustainable development, particularly on combating climate change. Despite the many attempts to institutionalize strives that are of greenand sustainable nature in the various sectors of socio-economic spheres, by domesticating the UN conventions of 2015 on sustainable development at national, regional and local level, Kenya still suffers from challenges that inhibit their fast adoption.

While many institutions in Kenya would be expected to not only be on the forefront in the sensitization on green strategy, but also on its effective and efficient implementation, the intricacies of buy-into the idea of greeningare still inherent.Institutions need to implement more sustainable green IT strategies by combining various viewpoints from operational, tactical and strategic, reducing negative effects, increasing positive uses, and making organizational pledges [38]. The majority of organizations face the difficulty of exploiting the green IT strategies that are available at the different phases. Some of the challenges that come as a result of notbeing able to marshal the drivers that provides impetus to these strategies abounds. Such includes; the aspect of cost reduction, legal and regulatory, cultural pressure, new markets, collaborations among others.

There is need therefore to configure Kenya government policies to better guide institutions in their role deliberated in fast track the green IT strategies operationalization at the enterprise level so as to maximize gains on environmental sustainability in socio-economic spheres.

III. PURPOSE OF STUDY

To find out on Green IT strategies; Challenges and Opportunities in Institutions of Higher Learning in Kenya.

IV. METHODOLOGY

The study used a content analysis research design approach and used a qualitative research methodology. This entails searching through pertinent secondary text sources, papers, websites, and journals for pertinent information to the topic. Data gathered was analyzed using the content analysis method. A qualitative textual description of the analysis technique was used for data presentation.

V. CONCEPTUAL FRAMEWORKS OF GREEN IT STRATEGIES

Green IT strategy development is best pegged on the timeframe of its influence, as in[22]. For example, if viewed by an organization that IT as a singular entity is a producer of carbon footprint, then simple *operational* steps such as switching off devices such as computers and monitors can be effected immediately. Other more strategic approaches and measures are involved for carbon foot print reduction that may take a longer timeframe to achieve, as illustrated in Fig 2.

A.Tactical (1yr)

The organization needs roughly a year to strategically increase its capacity to lower carbon emissions. These tactical efforts can involve switching out the organization's current computer monitors for green flat-screen models or replacing networking and mobile devices within a year. Additionally, recycling and less printing. Businesses frequently find themselves forced to deploy tactical solutions to address urgent needs and highlight the advantages of green IT for legal reasons which may then become the incumbent or are replaced by longer term solutions, as in [21].

B. Strategic (< 3 yrs.)

These strategies rely on a comprehensive approach to greening that considers the organization's data centers, buildings, supply chains, disposal methods, and even sales and marketing, and have a large budgetary foundation. Additionally, implementing green rules, leveraging software, and employing measurements all add significantly to the value of a green enterprise transformation's

C. Strategic (<5yrs)

An extension of the (<3yrs) strategy levelwhich also adds change the way everyone thinks, redesign the business architecture, put strong governance in place, and collaborate while identifying risks and possibilities. Renewable energy sources are also being researched right now.

D. Strategic-Exploratory (8yrs)

Reference [16] states that strategists explore carbon reduction measures for any alignment changes and also imagine the future in terms of technologies and businesses such as future carbon trading in emerging carbon economy and incorporate it into the green IT strategy.

Reference [23] argues that green ICT may be used to provide tactical solutions as well as enable longer-term strategic ones, enabling firms to make some fast gains and satisfy regulatory obligations. Individual comprehension, leadership, vision, familiarity with the structure and dynamics of the company, awareness of the operational complexities of the organization, and people's understanding all contribute to such methods. (i.e. stakeholders') attitude toward change. Effective green plans, however, come from a strategy that crosses all organizational levels and silos, as in [22]; [14], [15], [39]; [39]; [40]).
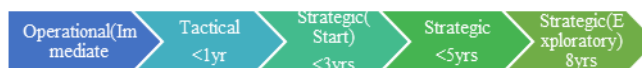

Fig. 2Evolving nature of green IT strategies on organizations

VI. HIGHLIGHTS ON ENVIRONMENTAL IMPACTS OF CLIMATE CHANGE FROM THE MINISTRY OF ENVIRONMENT REPORT.

Kenya continues to struggle with the effects of climate change despite making only a small contribution to global GHG emissions, which represent less than one percent of all global emissions (0.1% in 2018), according to the Kenya Ministry of Environment and Forestry technical report , as in [31], Kenya Climate Change Learning Strategy for Period 2021 to 2031. Extreme weather events like droughts, storms, and floods are increasing in frequency and severity, which has a detrimental effect on infrastructure, infrastructure output, agriculture and animal output, and other aspects. Climate change has been demonstrated to have direct and indirect effects on mortality, sickness, migration, violent conflict,

crime, and labor productivity [4]. As of the United Nations Framework Convention on Climate Change's 2 May 2016 synthesis report6, 189 Parties have communicated 161 Intended National Determined Contributions (INDCs), which would lower the total global emission level to 55.0 Gt CO2eq. in 2025 and 56.2 Gt CO2eq. in 2030., as in [1].

On December 28, 2020, Kenya filed her updated Nationally Determined Contribution (NDC), pledging to reduce GHG emissions by 32% by 2030 compared to the "business as usual" scenario of 143 MtCO2eq, in accordance with the sustainable development agenda and local conditions. The Updated NDC calls for mitigation and adaptation measures to be implemented by 2030, with a projected cost of US 62 billion. Comparing this budget to Kenya's first NDC, Kenya pledges to mobilize resources to cover 13% of it and will need international assistance for the remaining 87%. Kenya's Updated National Development Plan (NDP) will need international assistance in the form of financial resources, technological development and transfer, and capacity building..

The Kenyan government has established national policies, regulations, and institutional framework to support international and regional initiatives in response to its recognition of the need for a concerted global effort to address climate change comprehensively. Kenya's ratification of the Paris Agreement in December 2016 demonstrated commitment to achieving the global adaptation and mitigation goals, as did other follow-up commitments made at COP 26 in Glasgow and COP 27 in Egypt, as in [34].

Additionally, businesses are under pressure to implement policies that encourage environmentally friendly goods and services from a variety of parties both inside and outside the nation. Additionally, this aligns with UN Sustainable Development Goal (SDG) 13—also known as the Paris Agreement—which calls for quick action to combat climate change and its repercussions, as in [26]. Target 13.2 in particular attempts to include climate change measures into national planning, strategies, and policies. In Paris, nations came to a binding agreement to keep global temperature rise to no more than two degrees Celsius over pre-industrial levels. Additionally, they provided national commitments to reduce or stabilize their greenhouse gas emissions by 2030. Since they lost their force, the promises made under the Paris Agreement were modified.

During the COP 26 climate change meeting in Glasgow, United Kingdom, the update was covered. the Glasgow Climate Pact, an agreement that aims to inspire global action in November 2021 on mitigation—reducing emissions—adaptation—helping those already impacted by climate change—finance—making it possible for countries to meet their climate goals—and collaboration—competing to produce even more significant action. More recently, the establishment and operation of a loss and damage fund was decided upon by the COP 27 Egypt accord in November 2022. In the world, and Kenya in particular, are considered as heavily reliant on the success of this agreement. Located in the larger Horn of Africa region, the country has more than 80% arid and semi-arid terrain (ASAL) with insufficient infrastructure and other developmental issues.

VII. DRIVERS (CHALLENGES) OF GREEN IT STRATEGIES

United Nations Sustainable Development Goals (SDG), introduced in 2015 [26], regards green implementation as a public good and a global common good initially approached on a voluntarily basis. Additionally, going green is regarded as a fundamental human right and a basis for guaranteeing the realisation of environmental sustainability in the spheres of socio-economic and political. While the statement holds, some driving forces are required to add impetus to its realisation(also regarded as challenges that ought be surmounted), especially in developing middle-income economies such as Kenya (Kenya being a party member to UN SDG conventions as well as Paris agreement on climate change) leading to gaps in environmental sustainability.

A. Cost Reduction

Unhelkar (2011) observes that cost reduction provides an impetus for green IT strategy, and can be derived as a result of green initiatives due tolow consumption of energy (improving energy efficiency), use of less equipment and raw materials, recycling equipment and waste and optimizing storage and inventory. Reference [23] however, adds that organizations undertaking green transformations ought to strike a balance and be cautious of the investment to be incurred due to greening effort. For example, while improving resource utilization and reducing costs of cooling by leveraging on virtualization technologies, some initial investment will be required. Therefore, costs (in terms of energy and operational) associated with a green enterprise transformation program at the organizational or institutional level, such as Institutions of Higher Learning (IHL), must be

taken into account along with the anticipated cost savings as a result of the transformation.

B. *Regulatory and Legal*

Reference [23] reveals that, Relative to other elements like organizational self-initiative, customer demand, and social pressure, the regulatory component is given 70% more weight than the other factors. As a result, it serves as a key motivator for many programs aimed at transforming businesses into green ones, and as such, it requires careful consideration. Under the National Greenhouse and Energy Reporting (NGER) regulation act (www.climatechange.gov.au/reporting; Reference [2] and the Carbon Pollution Reduction Scheme (CPRS), organizations are required to disclose their carbon emissions if they exceed a predetermined threshold (www.climatechange.gov.au). Regulatory organizations also offer several simple calculators to facilitate estimations of greenhouse gas emissions. One such example is the NGER calculator OSCAR (Online System for Comprehensive Activity Reporting as in [2]. Green information systems include basic calculators as well as external regulatory data (such acceptable emissions numbers), store, analyze, and broadcast the results, and allow a company to track and improve performance [22].

C. *Sociocultural and Political*

Reference[11] argue that green IT strategy is considered to be driven by socio-cultural and political pressure when an organization's society views the environment as having considerable worth and is interested in protecting it, which finally leads to change. The organization is compelled to carefully reevaluate its business priorities and procedures in light of the environment, even though the scope and type of the advantages of change that occurs can vary owing to the structure of the firm and are challenging to quantify.

D. *Enlightened Self-Interest*

When a business voluntarily acknowledges the advantages of being environmentally conscious and develops or implements a green strategy, as in [3], self-interest comes into play. This may include the requirement for an organization to pursue a true common good, personal satisfaction, and improving morale and customer and employee understanding. Additionally, top management of a firm must comprehend that a self-interested strategy can lower costs and increase customer satisfaction while simultaneously benefiting the environment [3]. Furthermore, the organization brand being recognized. These are some of the nuances that an organization must transcend on the aspect of self-interest as a driver of green IT strategy.

E. *New Market Opportunities*

As a result of regulatory legislation, socio-cultural and political and global awareness, new markets that were not envisaged have emerged, as in [12]. Such markets includes; 'green as a business offering' other than the targeted 'green businesses'. Reference [12] further reveals that Carbon emissions management software (CEMS) is a new breed of software applications that are now available. New market that did not exist before was discovered by developers of these new softwares. Opportunities portend themselves therefore for Institutions of higher learning on the framework of 'green as a business offering' and thus are able to generate revenues and widen their capitation base.

F. *Responsible Business Eco-system*

When a large organization is heavily involved in environmentally sustainable programs involving its supply chain, as in [42]; [23], it has an impact on an entire ecosystem made up of business partners, clients, suppliers, and internal users in organizations, as well as the industry and business consortiums in which the organization exists. These eco-friendly actions must be taken by all of these parties. Reference [43] describes a case study where HP shared environmental impact monitoring; as a result of its own management and proactive interaction with its supply chain partners, the overall carbon effect of HP's suppliers' operations is also reduced. Other factors include the superimposition of long-term trends onto short-term markets, as in [44]. Such superimpositions result in major business restructuring and transformations in support of ideas that are environmentally friendly.

VIII. GREEN IT STRATEGY OPPORTUNITIES AT THE INSTITUTIONS OF HIGHER LEARNING IN KENYA

According to the UN Sustainable Development Goals, as in [10], it is the responsibility of the member states' environmental ministries to champion for realization of the aspirations of environmental sustainability. These ministries are also tasked with reviewing the objectives of their environmental systems in light of the UN-SDGs' aspirations.

In light of this, and auspice of the multisectoral approach, different institutions in Kenya are mandated to domesticate the national policies from their relevant ministries to take advantage and leverage green strategies to reduce predisposition factors to environmental degradation, and collectively contribute to environmental, socio-economic sustainability. Green ITstrategy is one of the strategies and is to be realised from approach that cuts across all the tiers and silos of an organization,as in([22]; [14], [15], [39]; [39]; [40]).

The tiers of an organization includes: operational, tactical and strategic as illustrated in Fig. 2, as in [23].The initiatives at the varied tiers or levels of organization have varied effects on the greening concept on carbon emission reduction, GHG and toxin level reduction, green strategies towards environmental and socio- economic sustainability. The effect can be of direct, enabling and systematic.

Reference ([45]; [16]) defines direct effects as those involved in the process of "production, use, recycling and disposal of ICT hardware", enabling effects as those to influence of change processes and *systematic* as those with bearing on adaptation and behaviour. Such direct, indirect and systematic of greening approaches are spread across the Green enterprise.

A. Hardware and Software Energy Saving Techniques

A green IT infrastructure encompasses both hardware and green software [16]. Hardware energy savings techniques implementable at the operational level involves use of energy saver devices that consumes less energy; such as deploy of TFT monitors in place of the CRT, regulation on enabling power management features by ensure sleep, hibernation or off mode when not in use. Reference [45] adds that whilst platform hardware designers make a concerted effort to reduce power consumption, any one power-inefficient or poorly behaved software component on the system can negate all of the hardware's power management advantages.

Therefore, selecting an effective software system architecture is essential. Utilizing virtualization technology is also helpful for reducing energy use, as shown in [28]. One physical server can host several virtual servers thanks to virtualization. Virtualization, which hosts more virtual servers on fewer actual servers, is a tactical strategy that allows data centers to consolidate their physical server infrastructure while consuming less electricity and automating the data center, as described in [23]. This reduces expenditures for

Institutions of Higher Learning (IHL), which, as stated in [46], have recently undergone budget cuts.

B. Dematerialization and Substitution

Dematerialization and substitution is where environmentally friendly online alternatives can take the place of significant items and processes. Replacement might be over complete (acceptance of ICT change) or incomplete (opposition to ICT change) (as a result of additional feature in ICT Products) as in [9]. The current practice at Strathmore University is the common printing system, as in [47]. The system makes use of a user password to ensure that printing waste is kept under control. Since cost reduction is one of the main forces behind green IT strategy, this idea portends "low-hanging fruit" opportunities that can be taken advantage of in higher education institutions to reduce costs and promote environmental sustainability..

C. Use of New Critical Infrastructure and Online Technologies

Reduced commuting times, flexible office and classroom layouts, distance learning, and the employment of green ICT approaches are a few tactical strategies whose results are systematic, as in [45]. A systemic impact of ICT accessibility and the services it provides "results in Effects on the environment of long- or medium-term adaptations in behavior (such as patterns of consumption) or cost-effective structures" [49]. The Internet and ICTs help close the information gap by "allowing monitoring, measuring, and reporting of environmental information." ICT applications enable dynamic learning systems where students may interact with their instructors online in real-time, which increases effectiveness. Electricity customers have the option of turning off non-essential equipment when renewable energy is scarce and turning it back on when it is available. ICT produces rebound effects, which are all general impacts that are a (system) response to bringing change, according to more research, as in [49].

D. Re-use of Electrical and Electronic Equipment (EEE)

Longer gadget lifespan conserve resources and energy during the life cycle and lessen the quantity of hazardous waste dumped in landfills. An effective strategy to extend the lifespan of an outdated computer is to reuse it. Recycling is not as eco-friendly as reusing a computer. Reusing a computer has been demonstrated to be 20 times more energy-efficient than recycling, as in [50]. It is crucial to

use a computer until the very end before throwing it away because manufacturing electronics has a significant environmental cost, as stated in [16]. You may perhaps donate it to someone in need or use useful parts from a decommissioned product as an alternative. IHL could donate to schools nearest as part of their corporate social responsibility. It is possible to lessen the overall environmental impact of computer manufacturing and disposal by using the hardware for longer periods of time (Murugesan, 2008).

E. Refurbishing of EEE

To fulfill new needs, outdated computers and servers can be upgraded and repaired [15]. By refurbishing and replacing their components, old and used computer hardware and software can be restored to virtually new condition. Refurbished IT gear can be purchased on the market as an alternative to purchasing a new computer with precise specs. Refurbished products are already widely available in many businesses, and the market for refurbished IT hardware is expanding. Reusing existing resources is said to be a better long-term resource management strategy in reference [15]. Leveraging reuse allows institutions of higher learning (IHL) to reduce capital expenditure and cash flow. Additionally, there is the choice of giving the equipment to charity, schools, or businesses or trade in with them.

F. Recycling of EEE

If reusing is not an option, as in [16], recycling is the next best thing. In comparison to producing these devices from virgin materials, recycling results in less waste and a decrease in the amount of environmental emissions because the majority of the original device's materials are used as raw materials for a new device. Reference [15] adds that consumers' old gadgets are collected to enable recycling. Take-back, mail-in, and trade-in programs are a few of the well-liked initiatives that entice clients to send back their electronics to the producers. Additionally, businesses help regional groups gather the gadgets. The US produced 3.19 million tons of e-waste in 2009. As stated in [27], the Environmental Protection Agency (EPA), reports that only 600 000 tons or 17.7% was recycled. The rest was trashed – in landfills or incinerators.

G. E-waste disposal

According to the United Nations Environment Program (www.unep.org), there are an estimated 20 to 50 million tons of electronic garbage produced annually around the world, and this number is rising. According to the National Environmental Management Authority, [17] Kenya lacks a regularity framework and e-waste management policy. However, strategy guidelines formulated in 2010 by NEMA for e-waste management to manage Waste Electrical Electronic Equipment (WEEE) effectively will assist the government, private sector, educational institutions and other interested parties can improve environmental conservation. Reference [19] states that these standards cover topics such methods for enhancing environmental protection, environmental sensitization, various e-waste categories and target audiences, e-waste treatment technologies, and disposal procedures.

H. Alternative sources of Energy and Innovation

A strategic option on innovation efforts and partnering is another opportunity available in green IT strategy. Among other universities, Strathmore University in Kenya has put its commitment to sustainability into practice by managing social, environmental, and governance challenges, as seen in [18]. By putting in solar panels with the ability to create 0.6 megawatts yearly, it has already implemented low-carbon. In addition to being environmentally friendly, the move has also shown to be financially viable, as demonstrated by the university's sale of 0.25 megawatts to Kenya Power Company, as seen in [47]. The Strathmore University has chosen green buildings for its built environment. The Student Center (SC), Management Science Building (MSB), and Strathmore Business School (SBS) were constructed on a 22,000 square meter site in compliance with LEED (Leadership in Energy and Environmental Design) guidelines. The energy usage has been cut by 40% compared to typical buildings [47]. Buildings have a Building Management System (BMS) incorporated to manage resource usage. In order to enable sustainability, the BMS uses room orientation and time of day to turn off lighting fixtures near windows when there is enough natural lighting available. When the BMS Motion Detectors determine that the space has been abandoned, it also turns off all of the lighting in that room, as seen in [47].

I. Green Procurement

Both the national and county governments in Kenya rely on contractors and/or established vendors to handle numerous procurement-related tasks. To get the majority of their goods and services, Kenya's huge public corporations and institutions rely on procurement, which includes

purchasing, sourcing, and contracting. Through the Public Procurement Oversight Authority (PPOA) and Public Procurement and Asset Disposal Act, the government implemented the concept of competitive procurement throughout all government agencies (PPDA), and the Procurement Regulations of 2015. Governments have embraced Green Public Procurement (GPP) as a green IT strategic instrument to achieve environmental goals by purchasing environmentally friendly products thanks to their significant purchasing power. Reference [51] notes that, little attention is paid on the green procurement concept as some of the entities only have this concept on paper but hardly implement.Some green procurement initiatives were found to be hampered by unwillingness of suppliers to cooperate, as in [52].

Reference [32] also reveals that a variety of factors, such as worries about sensitive information, bad supplier practices, and resource limitations that have an impact on procurement performance, may be to blame for the hesitation. In the nations and regions where it is widely practiced, green procurement is significant as a strategic measure because it ensures resource sustainability to support future generations, fosters more innovative markets to produce green products, and reduces costs associated with the acquisition and disposal of goods and services.

J. Green Human Resource Management.

The application of human resource techniques to promote resource sustainability within commercial organizations is known as green human resource management (GHRM), as in [6]. Additionally in [29], there is a systematic method for advancing environmentalism throughout all divisions of an organization. According to Reference [53], the impact of green training and development strategies on employees' attitudes toward their work performance can be considered as a part of organizational management that is lacking. The Kenya Green Network (KGN (website)'s in [13]) green initiatives at Kenya's higher education institutions have contributed to statistical improvements in training and institutional operations as in ([27]; [31]).This responsibility covers the institutions' carbon emission reduction, conservation of energy and water and other sustainability initiatives.

K. Green Finance

Reference [54] states that, a contract between the economy and nature can be achieved through green finance, which provides financial support for environmentally friendly development that entirely lowers emissions of air pollution and ozone-depleting substances. In order to achieve a low-carbon, resource-efficient, egalitarian, and inclusive socio-economic change, the Kenyan government introduced the Green Economy Strategy and Implementation Plan 2016-2030 in 2016., as in ([54]; [57]). According to reference [56], under normal circumstances, a financially stable university invests its revenue in the institution's core academic activities, particularly in academic and research endeavors, as well as capital projects to upgrade its facilities and raise the standard of its academic programs. However, where rationing is placed onsuch as academic conferences, research grants, libraries, labs and equipment procurements, lack of good accommodation for students among others, strategies such as green financing can prove be a game changer. Institutions of higher learning (IHL) can be able transcend such challenges by leverage on such measure as green financing, a strategy at an exploratory level, as in [31].

In order to influence policies that support higher education, increase research funding, secure scholarships, and acquire the material and intangible resources necessary, it is crucial to cultivate and leverage partnerships and collaborations with donors. This will increase the value of higher education institutions in the overall transformation of society. Green bond is one such potential, as in [8],

IX. CONCLUSION

The reviewed literature has shed light on the Green IT strategy. A number of the national policies and climate action strategies acknowledge the potential of IHL in playing a major role incontributing towards containment of climate change issues, as well as sustainable deliverables on spheres of environment and socio-economic, through institutional practices and strategies.Some initiatives have been made by Kenyan universities to guarantee sustainable development. For example, to apply greening IT strategies in universities, both public and private universities took part in creating the "Kenya Green University Network (KGUN)". There are many areas where the efforts have borne fruit especially at operational and tactical levels where 'low-lying fruits' options have been easily put to use to reduce energy consumption and lessen GHG.

More still needs to be done at the green IT strategy options that call for long term deliberation strategy on how to go about. This can also be enhanced by further leverage on the

nuances that are availed by the drivers of green IT at the different levels, especially at the strategic exploratory level. Examples of such includes; transformation on green procurements, green financing (green bonds), green human resource to tap on the collective sensitization and the entrenching of green concepts on people in the organizations and projections on green economy.

This was a qualitative desktop research and thus hypothetical, thus, if it was possible,research approach by mixed methodology could be carried out to arrive at results that can be generalized to other populations.

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