

# Waste Minimization Strategy for Sustainable Interior Design

\* Mike Kemboi Chesaro, Samuel Maina Mwituria and Collins Makunda

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## Abstract

*Recently, interior design has experienced a dramatic change with the incorporation of strategies which emphasizes the designing of environmentally sustainable and healthy spaces for people to live in, work in and play in. The awareness of environmental accountability has sparked the necessity for environmentally sustainable interior design practice. Society at large is starting to recognize the link between spaces, people and the community. In Kenya there are no clear waste minimization strategies that interior designers can adopt in their practices in order to practice sustainable interior design. The study aimed to establish the most appropriate waste minimization strategy used by interior designers and to propose a waste minimization strategy that can be adopted by interior designers to attain sustainable interior design. The literature was gathered through desktop research, which entailed document analysis from published online academic journals and books. The study established that interior designers have a great role to play in the reduction of waste produced as they are the party assigned to recommend materials and processes to be used. Moreover, there are numerous waste minimization strategies that can be used to achieve sustainable interior design. The study concluded that assessment tools should be adopted by interior designers as they pose a lot of advantages compared to other waste minimization strategies. Assessment tool assess, indorse and increase sustainable growth in the construction industry, and also offer a scheme that gives a wide-range understanding of sustainability through the process of data examination, assessment, and disparity.*

**Keywords:** Design process, Pollution sustainability, Strategies, Sustainable interior design, Waste minimization.

## INTRODUCTION

Yang, Fenghu and Xiaodong (2011) described traditional interior design practice as a practice that simply focuses on extravagance design while overlooking the effect of the practice on the users' health and environmental contamination. Cargo (2013) added that this traditional practice is single-dimensional and only focuses on coming up with appealing interior spaces for clients. Numerous designers support the campaign towards sustainability in design, however, according to Templeton (2011), the number of interior designers who practice sustainability in their practice is still very few. Furthermore, Cargo (2013) concurs that although Environmentally Sustainable Interior Design (ESID) is a major issue in interior design practice, the number of times interior designers make sustainable choices in their practice is still very limited. Steig (2006) goes ahead and describes this gap as a 'sustainability gap' in the interior design practice.

Research conclusions done by the University of Loughborough and Waste Resources and Action Program (WRAP) is in agreement that designers have an opportunity and play a great part in waste minimization (Osmani, 2013). Furthermore, WRAP in its research 'Designing out waste' went ahead and identified the contributions that designers can make to minimize waste through design (Langdon, 2015). Research by Kibowen (2008) on the identification of waste determining factors in Kenyan construction industry concluded that the problem of waste, which is inherited in most construction processes, is due to lack of awareness by design professionals and contractors on various sources and types of wastes occurring at different stages of the project.

The UN's Sustainable Development Goals (SDGs), released in September 2015, pinpoints on the importance of focusing on the built environment in achieving sustainability (UN, 2015). Goal

\*Corresponding author:

Mike Kemboi Chesaro, School of the Arts and Design, University of Nairobi, Kenya.  
 Email: [mikekemboi7@gmail.com](mailto:mikekemboi7@gmail.com)

number 11, which is concerned with, 'Making cities and human settlements inclusive, safe, resilient and sustainable', is meant to operationalize this goal. With this, interior designers need to be made aware of the significance of sustainable practices. According to Brebbia and Sendra (2017), an inclusive and effective sustainability solution needs a thorough planning and progressive application. Furthermore, it should have a capability of being reused, recycled, and refurbished or disassembled (Brebbia & Sendra, 2017). Based on these standpoints, this research will focus on the strategies and techniques by which waste is minimized and propose a waste minimization strategy that can be employed by interior designers in Nairobi and its environs.

## THEORY

### Sustainability

The world has experienced constant population growth for centuries, and the resources available are inadequate (Bluyssen, 2013). The state of global warming and waste pollution paints an undesirable future for our environmental resources; therefore, an awareness of the importance of sustainable practices is required (Tucker, 2014). Moreover, the impact of human activities in the environment over some period of time is progressively becoming clear. From the contamination of oceans and aquatic life by oil spills to the damage of human health initiated by unsafe processes, materials and constructions (Braganca & Cuchi, 2007). From all the resources consumed throughout the globe, fifty percent is used in building and construction. This makes construction one of the least sustainable activities in the universe. Nevertheless, modern human civilization depends on building structures for its continuous sheltering and survival though our world cannot sustain the present level of resource consumption (Edwards, 2005).

It is projected that by the year 2056, the world economic activities will have amplified five times, worldwide population increased by more than 50%, worldwide energy consumption will have amplified approximately three times, and global industrial activities will increase at least three times (Matthews et al., 2000). The design field and its subordinate occupations, that is, industrial design,

engineering, architecture, etc. is the main focal point for sustainability. This is not astonishing since poorly designed products, processes and structures can significantly add to social and environmental dilapidation. 'Sustainability' and 'green' have become a slogan in virtually all design discipline (Stegall, 2006).

Sustainability turned out to be a significant international commissions' problem. Particularly, Brundtland Commission in 1987 professed a report on the primary substances in sustainable development. The report stated that sustainable development is first about guaranteeing that every person, that is, in poor and rich republics, and now as well as the forthcoming generations can have their basic needs meet (Ayalp, 2013). This ought to be acquired without endangering nature in which life on the globe is reliant on (Ness, 2001). Moreover, the World Summit (1992) and United Nations Conference on Environment and Development (UNCED) encompassed environmental contamination and resource exhaustion in their programmes. The dissertation was widened in Agenda 21 and Rio Declaration whereby the ideologies of sustainable development was discoursed. Also, in the Declaration of Interdependence for a sustainable future at the Chicago Assembly of the International Union of Architects (IUA) in 1993, architecture was also united in the movement and numerous states and foundations began creating energy and environmental conservation policies (Szokolay, 2004).

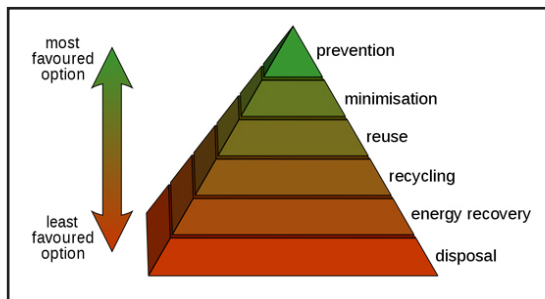
Interior designers, establishments, institutions, companies and the governments recognize the significance of sustainability in interior design, hitherto they do not constantly apply sustainability in their practices. Moreover, inadequate campaign of sustainable facets and effective barricades are held responsible when employing sustainability (Khaleel, 2013).

Current sustainability strategies and methods stress on broader global goals and strategic objectives hence they are conspicuously feeble in addressing project specific level decision-making (Ugwu, 2006). Ironically, it is exactly at micro-levels that the goals of sustainability need to be

transformed into actual practical actions. This is done by using an all-inclusive approach to enable decision making.

### Sustainable design strategies

The sustainable design strategies permit control over the adverse effects of damaging processes to the natural eco-system. These measures are positioned between the prevention of waste produced and discarding of the waste in landfills (Figure 1). The aim of these sustainable design approaches is to generate a negligible amount of wastes (Attmann, 2009).



**FIGURE 1**  
Waste management hierarchy  
**Source:** European Union 1997

Although the reduction and prevention of waste are at the top of the European Union Waste Management Hierarchy, it is positioned at the lowest in the waste minimization exploration programs (Keys, Baldwin, & Austin, 2000). Countless obstacles and chances are present in coming up with a strategy of waste minimization in interior design. Study on 'Designing to encourage waste minimisation in the construction industry' by Loughborough University together with AMEC Construction, concentrated on methods that generate waste. Results showed the numerous industries preferred waste minimization alternatives, including designing for waste reduction, designing for recycling, extended life and disassembly. They were termed 'best practices', as they addressed the causal matters and not the outcome which is the problem.

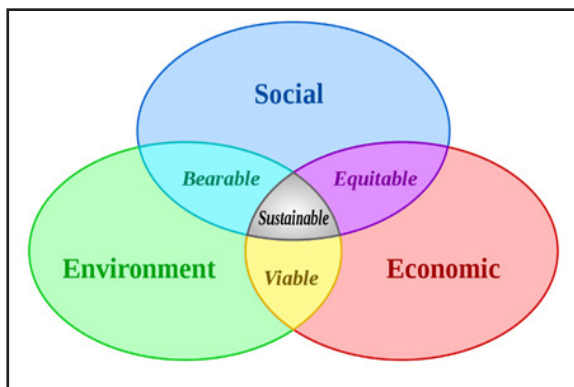
According to Lu and Yuan (2011), one of the best waste minimization method is reduction. It lessens the waste produced, eradicates disposal of waste and also reduces the cost of sorting, shipping,

and discarding of waste (Lu & Yuan, 2011). Another efficient method is Waste Minimization Design (WMD) which is commonly termed as a significant strategy as it entirely considers all aspects of the entire project ahead of time, hence avoids redundant wastage of materials (Baldwin et al., 2009). Zhang et al. (2012) address other design methods of waste minimisation, including prefabricated modular (Baldwin et al., 2009); use of modular designs (Poon and Jaillon, 2002); evading adjustments to the design (Faniran and Caban, 1998); and using recycled materials (Tam et al., 2006). Bertram et al. (2019) agreed that the use of modular structures can lessen the waste produced since production is undertaken in workshops where the making is manageable.

### Sustainable interior design

As an occupation, Interior design defines the connection between people to spaces grounded on emotional and psychological structures, in order to increase the quality of life (IFI, 2013). Sustainable interior design is designing of interiors whereby every system, process and materials are considered with an accent on incorporation into a whole for the purpose of lessening damaging effects on the environment and inhabitants while exploiting positive effects on the ecological, economic and societal organizations in the lifetime of a structure (Guerin, 2009). Additionally, according to Kang & Guerin (2009) and Moxon (2012), ecologically sustainable interior design is the technique of diminishing harmful effects and exploiting positive effects of the indoor environmental structures throughout the lifecycle of a building. Pilatowicz (1995) defined sustainable interior design as interior spaces planned in such a fashion that they shrewdly discourse the effect of their function, part and features on the universal environment. Plus, it's the efforts to make interior spaces which are ecologically sustainable and fit for the inhabitants (Pilatowicz, 1995). Sustainable interior design practice transforms the obligation of interior designers not to be restricted and adjust planning of spaces and furnishing locations conferring to HVAC zones (Heating, ventilation, and air conditioning), powered rooms, tools, picking of colors, finishing, lighting and window treatment comparative to energy productivity and other sustainable approaches (Kang & Guerin, 2009).

To accomplish sustainability in any interior design project, it is vital to construct an equilibrium between social, economic, and conservational dimensions; the three are interconnected parts of sustainability. Whereas involving environmental principles in an interior design project, the aspects of social and economic sustainable design can certainly be recognized (Kramer, 2012). The idea of incorporating ecological aspects in an interior design project can accomplish about 80 percent for the economic and social aspects (Moxon, 2012).



**FIGURE 2**  
 The three constituent parts of sustainability  
**Source:** Adams 2006

## RESEARCH METHODS

The data was collected through secondary sources. This was done through a desktop research where by existing documents including online academic journals and books were examined in search of the existing waste minimization strategies and the best practices of reducing waste for sustainable interior design. Google scholar and Jstor are some of the websites where the secondary data was retrieved from. Key words like Design process, Interior design, Interior designer, Pollution Sustainability, Sustainable interior design, Waste, Waste minimisation, Waste minimisation strategies, Nairobi were searched. Articles that included at least two of the five terms used were selected for in-depth review. Twenty-five publications were studied and analyzed to identify the waste minimization strategies that interior designers can use to achieve sustainable interior design practice.

## RESULTS

### Waste Minimization Strategies

Waste minimisation strategy is any method used which either evades, eradicates or lessens waste at its cause (Crittenden, 1995). Furthermore, numerous associated terms are being used to define waste minimisation in diverse fields including waste reduction, clean technology, pollution prevention, environmental technologies, low and non-waste technologies (Keys et al., 2000). Below are some of the existing waste minimization strategies that can be adopted by interior designers.

### Interior design for adaptive reuse

Interior design for adaptive reuse is defined as a waste minimisation concept that is based on the restoration of salvaged building materials acquired from refurbished building structural portions in to the building of interior constituents (Celadyn, 2019). The strategy puts design approaches and techniques in the interior design practice at the center of environmentally accountable architectural design. Mc Donough and Braungart (2002) termed it as a design practice towards the achievement of a closed loop concept.

This strategy adheres to the ecologically sustainable mandate for waste reduction in the built environment (Celadyn, 2019). Celadyn (2019) further added that the issues associated with the increment of the lifecycle of a building with its physical constituents are inadequately acknowledged by the interior designers. Akadiri (2012) suggested that the recycle of reclaimed construction materials and products should be treated as the subsidiary method for the reduction of construction waste. Victor Papanek also asserts that the Interior Design for Adaptive Reuse (IDAR) notion can be assessed as an effort to accomplish resources efficacy, as well as an alternative solution to the waste of valuable construction materials (Papanek, 1980).

### The concept of designing out waste

Designing out waste in the primary phase of the building process provides the utmost major opportunity for waste minimisation. The most effective waste management method is the one that manages the process and systems so that

there is no waste to manage. The fundamental goal is to eradicate or minimise the waste produced at each step in the building process. This includes conception, detailing, construction information, description, procurement, supplying, site preparation and building. Koskela (1992) and Alarcon (1993) conquered in their studies on the other forms of waste, finding that time and procedures used generated waste. This may be from the activities that take a lot of time and resources without significant value addition. Formoso et al. (1999) additionally defined time and resources waste as all the damages created through actions that create costs directly or indirectly but has no value addition to the final product from the consumers' opinion.

However, Treloar et al. (2003) proposed that the amount of waste should be measured in terms of the energy of the resources. Bossink and Brouwers (1996) described three cases where the waste of different types was quantified through diverse approaches: proportion of the entire quantity of waste; proportion of acquired material; and proportion of the entire cost of the wastes. All three approaches are descriptive of the levels of waste produced and they can be applied concurrently. Though, to compute the proportions, the documentation of waste sources and volumes produced for everyone is essential. Moreover, according to Wrap (2007), calculating waste is a requirement to its managing i.e. knowledge on the quantity produced can be used as a reference instrument for other projects, firms or a noble practice. The next phase is to establish the gap amid the accomplished and the good practice. Decreasing this gap can be accomplished by knowing the causes of waste and examining the sources behind its production. The introduction of environmental guidelines reinforced by escalating user consciousness is redefining the perception of waste from 'by-products' of procedures to unused chances to reduce expenses, improving project performance and to boost the business forecasts.

According to Keys et al. (2000), the concept of designing out waste addresses the causal aspects of waste. Keys et al. (2000) further gave a summary of the methodologies that can be used to design out waste including: Use of prefabrication and off-site prefabrication, Standard component/bespoke

design, Realistic component size, capacity and specification, Minimizing temporary works, Optimizing design lives, Allowing specification of recycled materials in design, Designing for recycling and ease of disassembly and Identify building products which create waste.

### **Design for recycling**

Recently, the amount of construction waste materials being retrieved and recycled has been dropping. The quantity of recyclable materials being sent to landfills is currently around 50 percent greater than what it used to be a decade ago (Addis, 2006). The overall goal of this strategy is to upsurge resource and financial proficiency and decrease pollution effects in the final elimination of structures, also, to recuperate materials for salvaging, re-building and recycling (Guy et al., 2006).

### **Design using sustainable materials**

Sustainable interior design in the recent years has become a key topic in interior design practice. However according to studies, the rate at which interior designers make sustainable choices in actual practice is quite inadequate, predominantly where the materials choice is concerned (Hayles, 2015). Materials selection and choice is a zone where interior designers can play a significant role on the sustainable performance of the spaces. Aspects like cost margins, design negotiations and environmental requirements can play a substantial part in the selection of materials.

Materials choice has a higher effect on the sustainable result of entirely interior design developments but specifically commercial interior design project. This is because they are generally replaced every 5 to 7 years, which means, introducing a hefty burden on resources and generating enormous quantities of waste (Maté, 2009). By incorporating sustainable materials into construction projects, it makes it conceivable to reduce environmental effects through minimizing energy intake, minimum natural resource exhaustion and contamination, plus lesser toxicity to both the inhabitants and the whole environment. These eventually minimizes the harmful effects on the environment and

inhabitants while exploiting positive effects over the lifespan of a structure (Araji & Shakour, 2013).

Inversely, a study by Maté (2006) on designers in Australia established that designers' morals were an influential factor when it came to choosing of environmentally sustainable materials. Designers who supported sustainable interior design exhibited certain characteristics and behaviors, for example, inquiring on the legitimacy of eco materials. Furthermore, they did not see price as a barrier while they contemplated the significance of sustainable abilities in materials choosing (Maté, 2006). Additionally, Lee, Allen and Kim (2013) establish that interior designers with affirmative attitude towards selection of sustainable materials led to their stronger actions conflation to embrace use of sustainable materials. The outcomes advocate on the significance of developing interior designers' positive environmental attitudes.

#### The use of assessment tools

Interior designers everywhere have instigated the awareness of sustainable strategies as the call for sustainability in interior design solutions has amplified. This is as a result of most traditional interior design practices having a hostile environmental effect owing to the noteworthy consumption of resources throughout building and installation (Wael & Ashour, 2017). Assessment tool assess, endorse and increase sustainable growth in the construction industry, and also offer a scheme that gives a wide-range understanding of sustainability through the process of data examination, assessment, and disparity (Nguyen & Altan, 2011). According to Cole (2005), the objective is to induce a process that evaluates buildings' environmental performance while including sustainable growth into construction processes. Furthermore, they establish a feasible design requirements and goals, create appropriate design processes, and finally, determine measures of enactments to regulate the design process. Also, they offer a measurable performance indicator to the design choices and as a grading tool for the whole building performance (Cole, 2005).

Assessment tools assist in reinforcing a sustainable methodology of the design. Furthermore, it explores on how to create sustainable design

selections about space planning, suitable energy systems and products. These roles of these tools differ according to the user's interests i.e. users can be interior designers, clients, and inhabitants' e.tc. For instance, it aids interior designers to come up with projects towards a negligible environmental effect while satisfying the financial part for clients and produce comfortable and safe environments for the inhabitants (Cain, 2007). Leadership in energy and environmental design (LEED) and Building Research Establishment Environmental Assessment Method (BREEAM) are possibly the well-known and extensively used. Other significant tools for interior designers include Ska-Rating, that is designed for interior furnishings, while National Australian Building Environmental Rating Scheme (NABERS) is intended for evaluating the sustainable performance of existing building structures. Other tools include Green Star, Green Globes, BEAM, CASBEE, DGNB etc. (Moxon, 2012; Ding, 2008).

**Table 1** summaries the chief assessment tools existing globally, the areas they contain, the classifications of assessment and the phase they apply.

Atanda (2018) highlighted that the sustainable construction environment encompasses two categories of valuation apparatuses which include life cycle assessment tools and criteria-based tools. The criteria tools include Building Research Establishment Environment Assessment Method (BREEAM), Leadership in Energy and Environmental Design (LEED), Comprehensive Assessment System for Building Environment Efficiency (CASBEE), Green Building Council of Australia (GBCA) also known as Green Star, Green Building Tool (GB Tool), Global Sustainability Assessment System (GSAS) and Sustainable Building Assessment Tool (SBAT).

Assessment tools in construction have been established with a precise end goal which is to help the solicitation of sustainable growth in the building and construction area (Atanda, 2018). Yet, regardless of the international attention towards sustainable assessment tool as a marvel, it continues to lack a comprehensive scrutiny for the collective feature of sustainable growth.

**TABLE 1:** Chief assessment tools worldwide

Assessment tool	Categories, stages, ratings	References
<b>LEED</b> Leadership in energy and environmental design	Sustainable sites Water efficiency Energy and atmosphere Materials and resource Indoor environmental quality Innovation and design process Regional priority	(Kubba, 2010)
	For new and existing commercial interior projects	
	Silver, gold, platinum	
<b>BREEAM</b> Building Research Establishment's Environmental Assessment Method	Energy Transport Pollution Materials and waste Water Land use and ecology Health and Well-being, and Management	(Moxon, 2012)
	Both new and existing buildings can be assessed	
	BREEAM has five levels: Pass, Good, Very Good, Excellent and Outstanding	
<b>Ska-rating</b>	Energy and carbon Waste Water Materials Pollution Well-being Transport and other	(RICS, 2012)
	Assessments are carried out at the design stage, at handover to the client and one year after occupation	
	There are four ratings: Unclassified, Bronze, Silver and Gold	
<b>NABERS</b> The National Australian Building Environmental Rating Scheme	Energy Water Waste Indoor Environment performance	(Ding, 2008)
	Projects are assessed during occupation, using performance data for the previous 12 months	
	Rating of up to 5 stars	

<b>Green Star Australia</b>	Management Indoor Environment quality Energy Transport Water Materials Land use and ecology Emissions and innovation	(Moxon, 2012)
	Existing offices is in the pilot stage	
	Rating from 0 to 6 stars	
<b>BEAM Society</b> Building Environmental Assessment Method	Site aspects Materials aspects Energy use Water use Indoor environmental quality Innovations and additions	(Ding, 2008)
	New and existing buildings	
	Rating of Bronze, Silver, Gold or Platinum	

**Source:** Author 2020

There is need for improving construction practices so as to reduce their negative effects on the environment (Cole, 1999; Holmes & Hudson, 2000). Building enactment has become a major worry of professionals in the building industry (Crawley & Aho, 1999) and their performance assessment has become one of the key subjects in sustainable building (Cole, 1998; Cooper, 1999; Holmes & Hudson, 2000). The objective of sustainable assessment goes further than at the design stage afore any comprehensive design or even before an obligation is made to proceed with the development (Ding, 2008). Nevertheless, slight or no apprehension has been set to the importance of choosing environmentally friendly designs at the project evaluation stage which is the stage in which environmental matters are best fused.

## DISCUSSION

From the gathered theory, it is apparent that the state of waste pollution from the construction industry has led to an undesirable future for our environmental resources. Moreover, interior designers have an opportunity to play a great part in waste minimization. This is because poorly designed products, processes and structures can

significantly add to social and environmental dilapidation. However, interior designers do not constantly apply sustainability in their practices because the waste is inherited in most construction processes and is due to lack of awareness by design professionals and contractors on various sources and types of wastes occurring at different stages of the project. Besides, Osmani et al. (2008) concluded that negligible efforts are there in addressing the consequence of design practices in waste generation. Very few attempts have been made to address the effect of design practices on the generation of waste (Osmani, 2013).

According to Lu and Yuan (2011), one of the best waste minimisation methods is reduction. On the European waste management hierarchy, it is placed as one of the best waste management method. It lessens the waste produced, eradicates disposal of waste and also reduces the cost of sorting, shipping, and discarding of waste (Lu & Yuan, 2011). The most effective waste management method is the one that manages the process and systems so that there is no waste to manage. The fundamental goal is to eradicate or minimize the waste produced at each step in the building process.



The highlighted waste minimization strategies include; Interior design for adaptive reuse, Concept of designing out waste, Design for waste prevention, Design for recycling, Design using sustainable materials and Use of assessment tools. Designing out waste in the primary phase of the building process provides the utmost major opportunity for waste minimization. Designing using sustainable materials by incorporating sustainable materials into construction projects, makes it conceivable to reduce environmental effects through minimizing energy intake, minimum natural resource exhaustion and contamination, plus lesser toxicity to both the inhabitants and the whole environment. Assessment tools assist in reinforcing a sustainable methodology of the design. Furthermore, it explores on how to create sustainable design selections about space planning, suitable energy systems and products.

## CONCLUSION

This paper has examined waste minimization strategies for sustainable interior design. For interior designer in Nairobi and its environs to be more sustainable in their practices, they ought to incorporate assessment tools in their practice as this tool offers some advantages over the other tools. The advantages include; indorse and increase sustainable growth in the construction industry; they offer a scheme that gives a wide-range understanding of sustainability through the process of data examination, assessment, and disparity; establish a feasible design requirements and goals, create appropriate design processes and finally they determine measures of enactments to regulate the design process.

## RECOMMENDATIONS

From the results and discussion of this study, it is recommended that interior designers adopt assessment tools as the waste minimization strategy for them to achieve sustainable interior design. This is because the assessment has proven to be an effective waste minimization tool and has stood out because of the numerous advantages that it has proven to possess.

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