**Green Banking Practices in Operations and Lending Activities, Carbon Emission Reduction: Evidence from Commercial Banks in Nairobi City County, Kenya**

**Abstract**

This study examined the extent to which commercial banks in Nairobi City County, Kenya, have adopted green banking practices in their operations and lending portfolios, and the effect of these practices on carbon emissions reduction. A descriptive and explanatory research design was employed, integrating both primary and secondary data. The study was conducted in Nairobi City County, where data were collected from 98 employees of 10 commercial banks (coded CB1–CB10) using structured questionnaires, and triangulated with 2023 sustainability disclosure reports from the same banks. Descriptive statistics were used to summarize adoption levels, while regression analysis tested the impact of green banking practices on carbon emissions reduction.

The findings revealed that 96% of the surveyed banks had adopted at least one green banking practice. The most common initiatives included environmental CSR (90%), customer awareness programs (88%), and the provision of green financing instruments (78%). Regression results confirmed a statistically significant positive relationship between green banking practices and carbon emissions reduction (β = 0.692, p < 0.001). These results demonstrate that green banking practices are widely adopted in Nairobi’s commercial banks and make a significant contribution to reducing carbon emissions. However, adoption remains uneven, with limited focus on customer-oriented products and inadequate reporting of Scope 3 financed emissions.

To strengthen the role of banks in scaling sustainable finance, the study recommends embedding green practices into credit risk management, enforcing standardized sustainability reporting through regulatory frameworks, and expanding customer-focused green financial products across the sector.

**Keywords: Green Banking; Carbon Emissions; Sustainable Finance; Commercial Banks**

1. **Introduction**

Climate change remains one of the most pressing global challenges, driven primarily by human-induced greenhouse gas (GHG) emissions (Dilmore & Zhang, 2018; Romm, 2022). Its impacts, including rising temperatures, extreme weather events, and ecosystem degradation, threaten global sustainability (Bilgili, Tumse, & Nar, 2024). Land, as a fundamental resource, plays a dual role in this crisis as it serves as both a source and a sink for GHGs while also facilitating critical exchanges of aerosols, water, and energy between the Earth’s surface and the atmosphere (D'Odorico *et al*., 2023).

Research indicates that human activities have dramatically transformed between 69-76% of the global land surface, leading to biodiversity loss, declining agricultural productivity, and heightened climate vulnerability (Arneth *et al*., 2019; Arneth *et al*., 2021; Tunçay *et al*., 2023). Rising land surface temperatures, recorded at nearly twice the global average since the pre-industrial era, further exacerbate these challenges, contributing to heat stress, droughts, and shifting climatic zones (Smith, 2022). Droughts, enlargement of arid zones, shrinkage of polar climates, and heavy precipitation are among the incidences linked to global warming (Singh, 2024).

Consequently, weather events such as flooding, heat stress, drought, rise in sea level, and detrimental wave actions have been common (Kumar *et al*., 2021). The threat of climate change resulting from carbon emissions is a concern to governments worldwide, with a consensus that action needs to be taken to reduce or halt further warming of the Earth (Brewer, 2022; Budge, 2021; Welfens, 2022). A poll conducted by the Pew Research Center 2015, revealed that a significant majority of the 40 countries that participated believed that climate change is a serious challenge (Egan *et al*., 2017)

Global discussions on climate change commenced with the UNFCCC's first conference of 1992 in Kyoto which came into force in 1994 (Held & Roger 2018). The conference's major goal was to figure out the best strategies to reduce GHG emissions, which have been identified as the primary cause of global warming (UNFCCC, 2015). According to Parker, Karlsson, and Hjerpe (2018), the meetings, including the 2009 Copenhagen Summit, did not generate much agreement on a legally binding commitment by the participating countries, as the previous year's financial crisis made it difficult to mobilize the US$100 billion intended for combating global warming. However, discussions at the conference held in Paris (COP21) in 2015 under UNFCCC yielded the Paris Agreement, which postulated a reduction of global warming to be limited to less than 2°C above pre-industrial levels (Malassi, 2016; Pouffary *et al*., 2017; UNFCCC, 2015). The motivation to participate was either based on the risks posed by these organizations' activities or the urge to contribute to the collective effort in managing climate change.

Lately, there has been more concern among financial institutions about climate change's effects on prices and financial stability (Carrettin, 2022). For this reason, the Financial Stability Board established a Task Force on Climate-related Disclosure (TCFD) to conduct research and provide information on climate-related financial risks for use by financial institutions such as banks (Board, 2017; Nieto, 2019; Kyriakopoulou *et al*., 2022; Ngo *et al*., 2023). From the risk management perspective, an initiative called green banking has been adopted by many central banks globally (Park & Kim, 2020).

The debate involving the role of banks in managing global warming is outlined in UNEP’s assertion that banks, specifically central banks, are more engrossed in monetary and financial stability (UNEP, 2015; Betta, 2022). Hence, there is a need to start focusing on climate impacts causing instability and market interruptions such as floods and droughts that reducing agricultural output, disrupt food prices and damage physical property leading to reduction of capital stock (Farooq *et al*., 2022).

Globally, the banking sector controls a significant pool of capital that could make a difference in global warming if used with climate resilience and low carbon in mind (Obaidullah, 2018). The aggregate worth of resources, in terms of loans, corporate and government bonds, and equity-market capitalization by financial institutions like banks was estimated to be US$225 trillion by 2012 (UNEPFI, 2020). Given such value of assets and the fact that banks are the leading financiers of capital projects across the world.

There is a growing acceptance that capital and investment are being shifted from high-carbon to low-carbon activities would be a fundamental basis for managing climate change (UNEPFI, 2020). As a result, banks and other financial institutions have a significant role to play in the transition to a green economy by acting as a link between investment supply and demand; a link that considers a wide range of environmental and economic risks before funding projects (Volz, 2017).

Research highlights that while banks in developed economies have taken the lead in financing green projects, the participation of banks in developing countries, including Africa, remains limited (IFC, 2016; Amoah, Dzeha, & Arun, 2022; Iddrisu, Yakubu, & Abor, 2025). According to the IFC, green loans and credit lines issued by banks in developing countries in 2016 were about USD 1.5 trillion, which translates to about 7% of the total loans and credits issued to the private sector (IFC, 2016).

The African Development Bank (AfDB) is committed to addressing climate change and promoting sustainable development in Africa (Mhlanga, 2024). Established in 1964 to mobilize funds and drive economic growth, it prioritizes climate action. Its climate risk management strategy focuses on building capacity in African nations to tackle climate challenges (Reinsberg *et al*., 2020). The AfDB also urges financial institutions to adopt a ‘climate-proof’ approach, ensuring projects minimize climate change impacts. Since 2015, the bank has committed USD 8 billion to its climate strategy, reinforcing its dedication to sustainable development across the continent (Kraemer-Mbula, 2021).

In Kenya, the financial sector has a crucial role in shaping climate action. The National Climate Change Action Plan (2013-2017) estimates that climate change-related disruptions could cost the economy up to USD 500 million annually, equivalent to 2.6% of GDP (Government of Kenya, 2013; Murai & Kirima, 2015). Despite Kenya’s strong and globally competitive financial sector, current levels of green investment remain low, highlighting the need for a stronger commitment to sustainable banking practices (Kariuki, 2015; Otundo, 2024). As banks continue to finance key infrastructure and development projects, their alignment with climate mitigation policies is essential in ensuring a transition to a low-carbon economy (Reuben, 2024).

Against this backdrop, this study examined the banking sector’s commitment to reducing carbon emissions in Nairobi City County, in Kenya. By evaluating green financing strategies, policy implementation, and sustainability efforts, the research sought to assess how financial institutions contribute to Kenya's climate action agenda. Given the sector's financial influence and risk exposure, understanding its engagement in climate-related initiatives is essential for fostering an inclusive and environmentally sustainable economy.

This article specifically investigated the first objective of a broader thesis: to determine green banking practices in operations and lending activities in Nairobi City County.

**2.0 Methodology**

**2.1 Study Area**

This study was conducted in Nairobi City County, the capital of Kenya, which spans approximately 696 square kilometres and is situated at a latitude of 1.2921° S and a longitude of 36.8219° E. According to the 2019 Kenya Population and Housing Census (Kenya National Bureau of Statistics [KNBS], 2019), Nairobi had a population of 4.397 million. The research specifically targeted commercial banks with their headquarters located within the city.

Nairobi City County was selected for its status as Kenya’s financial hub, and the broader East African region, making it the most strategic location for analyzing the adoption of green banking practices. As the headquarters for Kenya’s leading commercial banks, microfinance institutions, and financial regulators, Nairobi City County provided a concentrated financial ecosystem where sustainability-driven banking initiatives were most likely to be developed, implemented, and assessed. The city also hosts key regulatory bodies such as the Central Bank of Kenya, the National Treasury, and major international financial institutions, reinforcing its role as the epicenter of financial policy formulation and oversight. Studying green banking in Nairobi City County, therefore, offered valuable insights into the integration of sustainable finance within a high-impact financial hub.

Additionally, Nairobi City County is facing significant environmental challenges, including air pollution, floods, deforestation, and climate change-related risks, which demand urgent sustainable interventions. As financial institutions play a crucial role in addressing these challenges through green financing and responsible investment, understanding the extent to which banks in Nairobi City incorporate environmental considerations into their operations is essential.



#### Figure 1 Map showing Commercial Banks in Nairobi City County

**2.2 Study Design**

A descriptive survey research design was employed in this study to systematically examine and explain the relationship between the study variable, that is, internal operational and lending green banking practices, and their impact on carbon emissions reduction. This design was particularly useful for investigating associations between variables, enabling a clear understanding of trends, patterns, and relationships without manipulating any factors. Descriptive research, as noted by Ryan (2018), presents an accurate depiction of existing conditions, offering foundational statistical data that informs decision-making and policy development.

This design was appropriate as it facilitated a structured exploration of the phenomenon by addressing the fundamental questions of what, how, where, and when green banking practices occur (McCombes, 2019). Moreover, Creswell and Sinley (2017) describe this approach as an effective method for collecting data from a broad population, summarizing and interpreting it to provide meaningful insights. This design allowed for generalization to a wider population by studying a representative sample, ensuring that findings could be applied beyond the immediate study group.

**2.3 Population**

According to Willie, (2024) target population encompasses all individuals, entities, or institutions that share specific characteristics relevant to a study and to whom the research findings can be generalized. The study targeted key stakeholders within Kenya’s financial sector, focusing primarily on the top ten commercial banks as well as significant regulatory and key stakeholders to financial institutions. The selection of these banks was based on their significant market influence, which positioned them as key drivers in shaping banking trends and sustainability practices.

The key stakeholders to financial institutions targeted by this study included Kenya Bankers Association, Nairobi Securities Exchange, Financial Sector Deepening (FSD) Kenya, the International Finance Corporation, and the Central Bank of Kenya. These institutions were included due to their pivotal role in shaping regulatory frameworks, setting sustainability standards, and influencing financial sector-wide green banking adoption.

The study’s target population comprised 896 employees across these institutions, including senior management officials responsible for lending and sustainability at the head offices of the ten commercial banks, branch staff from head office branches, and relevant representatives from financial sector key stakeholders. The selection of this population was strategically designed to capture a well-rounded perspective on green banking, integrating policy-level decision-making with on-the-ground implementation.

**2.4 Sampling Procedures**

A purposive sampling method was employed to select the top ten commercial banks in Kenya, due to their leading position in the industry, collectively controlling approximately 80% of the market. The selection was informed by the latest CAMELS ratings from the Central Bank of Kenya, which evaluated the financial health, operational efficiency, and market dominance of the banks. The chosen institutions were KCB Bank Kenya, Equity Group Holdings, NCBA Group, Cooperative Bank, ABSA Kenya, Standard Chartered Kenya, Stanbic Holdings Kenya, Diamond Trust Bank, I&M Bank, and Family Bank (CBK, 2019).

To ensure a representative and comprehensive sample, the study employed stratified random sampling for bank employees, segmenting them into three key strata: senior management, middle-level management, and junior staff across the top ten commercial banks. This approach allowed for balanced representation across different hierarchical levels, capturing insights from both strategic and operational perspectives. Within these strata, simple random sampling was used to select branch staff from head office branches, minimizing selection bias and ensuring that employees directly involved in green banking implementation were included.

For senior management, purposive sampling was applied. This approach ensured that only key decision-makers responsible for green banking strategies, lending policies, and sustainability initiatives were included in the study. Since these individuals play a crucial role in shaping and implementing green banking frameworks, their insights were essential for understanding strategic-level adoption and challenges.

Similarly, purposive sampling was used to select representatives from key financial sector stakeholders. This method was chosen to ensure that only individuals with relevant expertise in green banking policies, regulations, and sustainability initiatives were included. By targeting professionals with direct influence over green banking frameworks, the study maximized the relevance and depth of insights obtained.

**2.5 Sample Size**

This study targeted banks` employees at three distinct hierarchical levels within the top ten commercial banks in Kenya: senior management (Head of Credit and the Head of Sustainability at the respective bank’s head office), middle-level management, and junior employees both at head office branch. Each level offered unique insights into the strategic, tactical, and operational aspects of green banking practices.

The sample was structured as follows: 2 senior management respondents, 4 middle-level management respondents, and 4 junior employees per bank, totaling 10 respondents per institution. The total targeted number of respondents from the banks amounted to 100. Additionally, two respondents were targeted from each key financial stakeholder institution, contributing a total of ten participants.

Using Yamane’s (1967) formula for finite population sampling, the calculated sample size for a total population of 896 at a 95% confidence level (with a 5% margin of error) was approximately 277 respondents.

Yamen’s formula

n=N/(1+N(e)2

Where:

n = required sample size

N = total target population (896)

e = margin of error (0.05 for 95% confidence level)

However, a sample of 110 respondents (approximately 12% of the total population) was deemed appropriate for this study. This was in alignment with the recommendations by Gay and Airasian (2007) and Mugenda & Mugenda (2003), which suggest that a sample size of 10% to 30% is adequate for descriptive research when the population is below 10,000.

The selection of this sample size was guided by the need to ensure a balance between statistical representation and practical feasibility. While a larger sample could enhance the generalizability of the findings, constraints such as the accessibility of respondents necessitated a more manageable sample.

The banking sector is highly information-sensitive, with employees often exercising caution in disclosing information to external agents. This reality influenced the decision to adopt a sample size that maximized participation while maintaining the integrity of the research. The selected approach aligned with best practices in descriptive survey research, ensuring that the findings were both reliable and reflective of industry realities.

**2.6 Instruments**

The study utilized both questionnaires and document review as research instruments. The questionnaire served as the primary tool for gathering firsthand information from respondents at different levels within the banking sector. It was structured to capture insights on the adoption of green banking practices, focusing on strategic policies, operational implementation, and challenges faced in promoting environmental sustainability. The questionnaire included a mix of closed-ended questions for quantitative analysis and open-ended questions to allow for deeper qualitative insights.

In addition to the questionnaire, document review was conducted to complement the primary data findings. This involved an analysis of published documents such as annual financial reports, sustainability reports, bank websites, and regulatory publications from the Central Bank of Kenya (CBK). These sources provided verifiable information on banks’ sustainability commitments, policies, and progress in reducing carbon emissions.

By combining questionnaire responses with document analysis, the study ensured a broader and more reliable perspective on green banking initiatives. This approach enhanced the credibility of the findings by integrating both self-reported data from bank employees and publicly available institutional records, offering a more comprehensive understanding of the sector’s commitment to reducing carbon emissions.

To ensure the validity and reliability of the study’s research instruments, a pilot test was conducted prior to the main data collection. The pilot test involved 8 respondents, which represented 22 % of the total target population of 36 head office staff members from a tier 2 commercial bank in Nairobi City County. This bank was not included in the main study. This pilot sample was selected to assess the questionnaire's clarity, structure, and appropriateness in capturing information related to green banking practices within the banking sector. By testing the instrument on a smaller, representative sample, the study was able to identify potential issues with question design and format, and make necessary revisions before the full-scale data collection began.

The validity of the research instruments was ensured through a thorough content analysis process, where both the researcher and supervisors critically examined the questionnaires to confirm their alignment with the study's objectives. Any items deemed irrelevant or insufficient were revised or excluded. According to Pearlson *et al. (*2024), expert consultations are known to enhance content validity by ensuring that the questions are appropriate and aligned with the research objectives. The feedback from these experts, alongside the results from the pilot test, provided a foundation for refining the questionnaire.

Reliability was assessed through the calculation of Cronbach’s Alpha Coefficient, which measures the internal consistency of the instrument. A Cronbach’s Alpha value of 0.7 or higher is considered acceptable, indicating that the instrument is reliable in measuring the constructs it intends to assess (Mohajan, 2018). The pilot testing, coupled with expert reviews and reliability assessments, ensured that the research instrument would yield consistent and valid results in the full study conducted within Nairobi City County.

**2.7 Data Collection Procedure**

The study utilized both primary and secondary data sources to ensure a comprehensive understanding of green banking practices. Secondary data was gathered from publicly available sources such as organizations’ websites, annual integrated reports, sustainability reports, policy documents, and other relevant publications that aligned with the study’s objectives. This information provided valuable contextual and historical insights into green banking trends, regulatory frameworks, and institutional commitments to sustainability.

Primary data was collected using a structured questionnaire administered to the sampled respondents. The questionnaire was developed based on the research objectives and was designed to capture key variables relevant to green banking practices. It consisted of both closed-ended and open-ended questions to allow for quantitative analysis while accommodating qualitative insights. A Likert scale (1-Strongly Disagree, 2-Disagree, 3-Undecided, 4-Agree, 5-Strongly Agree) was used to measure respondents' perceptions, attitudes, and experiences regarding green banking initiatives.

The administration of the questionnaire adhered to ethical research principles, ensuring that respondents’ participation was voluntary and that their responses remained anonymous and confidential. Prior to data collection, informed consent was obtained, and participants were assured that the data would be used solely for academic purposes. Questionnaires were used as the primary data collection instruments due to their efficiency in gathering data from a large and geographically dispersed sample (Mohajan, 2018). They facilitated standardization, ease of administration, and systematic data accumulation, making them suitable for capturing both strategic and operational insights from diverse banking stakeholders.

**2.8 Data Analysis**

Data collected from the primary sources were analyzed using the Statistical Package for Social Sciences (SPSS) software version 26.0. The analysis employed both descriptive and inferential statistical techniques to interpret the data meaningfully. Descriptive statistics, including frequencies and percentages, were used to summarize and present the general characteristics of the sample. To test the research hypothesis and examine the relationships between variables, multiple linear regression analysis was conducted at a significance level of 0.05. This inferential approach allowed for the assessment of how well green banking practices and customers’ willingness predict carbon emissions reduction among commercial banks. The results of the regression analysis provided insights into both the magnitude and direction of these relationships. The findings were presented using tables, charts, and graphs to enhance clarity and facilitate interpretation.

**3. Results and Discussion**

**3.1 Green Banking Practices in Operations and Lending Activities in the Kenyan Banking Sector aimed at Reducing Carbon Emissions within Nairobi City County**

This study examined the extent to which commercial banks in Nairobi City County have adopted green banking practices and implemented environmental sustainability initiatives. Data was collected through surveys and a review of published sustainability reports. To ensure confidentiality, the banks included in the study have been anonymized and are referred to using the codes CB1 through CB10.

The study’s first objective was to determine the green banking practices in operations and lending activities in the Kenyan banking sector aimed at reducing carbon emissions within Nairobi City County. This section presents the findings related to the implementation of green banking practices within the banking sector. Specifically, it addressed questions regarding whether banks have adopted green banking initiatives and the duration of their implementation.

**Table 1 Duration of Green Banking Practices Implementation**

|  |  |  |
| --- | --- | --- |
| **Implementation Duration** | **Frequency(*f*)****N=98** | **Percentage(*%*)** |
| No | 4 | 4.1 |
| Yes (1-10 years ) | 76 | 77.6 |
| Yes (10-20 years)  | 12 | 12.2 |
| Yes (20-30 years ) | 1 | 1.0 |
| Yes (> 30 years )  | 5 | 5.1 |

(Source: Field Data, 2024)

The findings show that green banking practices are widely adopted among banks in Nairobi. Ninety-six per cent of the surveyed institutions reported engaging in some form of green banking, while only 4% indicated no involvement. Notably, the adoption of these practices is relatively recent.

The findings in Table 1 highlight that a significant majority of respondents (77.6%) reported that their banks had implemented green banking practices for a period of 1-10 years. This suggests that most banks are relatively new to adopting green banking initiatives but have made significant strides in incorporating sustainability practices into their operations over the past decade. The findings of this study align with similar studies in the banking sector that show a trend of increasing adoption of green banking practices in recent years. For instance, a study by Khairunnessa *et al.* (2021) noted that green banking initiatives are still relatively new for many financial institutions, with a significant rise in adoption over the past decade.

Furthermore, the 12.2% of respondents in this study who indicated that their banks had been practicing green banking for 10-20 years was consistent with findings by Saxena, *et al*. (2021), who observed that a smaller yet notable number of banks in other regions had been committed to sustainability efforts for over a decade. This long-term commitment indicates that certain financial institutions were ahead of the curve, demonstrating a clear link between early adoption and a sustained focus on environmental responsibility.

Very few respondents (1.0%) reported that their banks had been practicing green banking for 20-30 years, while 5.1% indicated that their banks had green banking practices for over 30 years. These findings suggest that while a minority of banks had been engaged in green banking practices for several decades, the adoption of such practices was still relatively recent in the broader banking sector. The relatively small proportions of respondents whose banks had been practicing green banking for 20-30 years or more align with global trends identified by Weber & Feltmate (2016), who stated that early adopters of green banking practices were typically the larger or more globally oriented banks.

Additionally, 4.1% of respondents indicated that their banks did not implement any green banking practices, which could be indicative of banks still in the early stages of considering sustainability initiatives or facing challenges in adopting them. These findings affirm study findings by Saxena *et al*. (2021), that many African banks were still in the early stages of green banking adoption due to challenges such as inadequate infrastructure, regulatory barriers, and financial constraints. These figures reflect a growing trend toward green banking in Kenya, though the practice is still maturing within the financial sector. The reluctance or slow pace of adopting green banking practices in some banks, as shown in this study, was reflective of these barriers, which hinder the full integration of sustainability into banking operations.

***3.1.1 Green Banking Operations and Initiatives in Nairobi City County: Perspectives of Bank Employees and Key Financial Sector Stakeholders***

This section presents findings on the specific green banking operations adopted by commercial banks in Nairobi City County, as reported by both bank employees and key financial sector stakeholders. These practices reflect the extent to which banks have integrated environmentally sustainable practices into their core activities and service delivery. Table.2 presents the responses on various green banking initiatives.

**Table 2: Green Banking Operations Implemented by Commercial Banks in Nairobi City County (as Reported by Bank Employees and Key Financial Sector Stakeholders)**

|  |  |  |
| --- | --- | --- |
| **Green operations adopted by Commercial Banks in Nairobi City County**  | **Frequency(*f*)****N=98** | **Percentage (*%*)** |
| Resource monitoring, management, and reporting. | 71 | 72% |
| Environmental and sustainability policies. | 66 | 68% |
| Customers Green Banking products and services. | 55 | 56% |
| Environmental Related Corporate Social Responsibility activities and initiatives. | 88 | 90% |
| Well-designed green investment financing instruments such as debt, loans, guarantees.  | 76 | 78% |
| Customer awareness forums and training on the green products and services offered by the bank.  | 86 | 88% |

(Source: Field Data, 2024)

The results from Table 3 demonstrate that sustainability efforts in commercial banks in Nairobi City County were predominantly aligned with Corporate Social Responsibility (CSR) activities. A substantial 90% of respondents indicated that banks had adopted environmental-related CSR initiatives, such as tree planting, carbon offset programs, and other community-based environmental conservation activities. This suggested that banks largely viewed sustainability as a CSR initiative, affirming the study by Murai & Kirima (2015), which often focuses on external environmental impact rather than integrating sustainability into core banking operations.

In addition to CSR, 88% of respondents reported that banks conducted customer awareness forums and training on green financial products. This shows active efforts to promote sustainable banking and build a market for eco-friendly products, services and solutions. While awareness was essential, a key concern remained: were these products truly accessible and affordable for most customers? Without practical access, the impact of green banking may be limited, as promotion alone could not drive adoption if green loans or investment options were financially out of reach for the average consumer. True uptake depended on both awareness and affordability.

A substantial proportion of respondents (78%) indicated that banks had adopted green investment financing instruments, reflecting a strong commitment to supporting eco-friendly projects and businesses. These instruments included green loans, sustainability-linked loans, green bonds, and credit guarantees used to fund renewable energy, sustainable agriculture, waste management, and energy-efficient infrastructure. For example, green loans financed projects with environmental benefits, while sustainability-linked loans adjusted terms based on sustainability performance. Green bonds raised funds for green initiatives, and credit guarantees help de-risk lending to green sectors. This suggests banks were promoting sustainability both within their operations and across the wider economy.

Moreover, a significant number of respondents (72%) indicated that banks had adopted resource monitoring, management, and reporting practices. This shows that many banks were actively managing their environmental impact by tracking energy and water use, reducing paper through digitization, and promoting waste recycling. Regular audits and sustainability reporting helped in setting targets, measuring progress, and ensuring transparency. These efforts not only improved efficiency and supported compliance but also demonstrated environmental responsibility, enhancing the bank’s public image in a market that increasingly values sustainability.

A substantial proportion of respondents (68%) reported that banks had adopted environmental and sustainability policies, indicating that sustainability was embedded within institutional frameworks. These policies guided the banks’ environmental responsibilities, shaping their strategies and operations toward more sustainable practices and decision-making.

Interestingly, customer green banking products and services were reported to be adopted by 56% of the banks. Although this was a positive indication of banks introducing green products such as eco-friendly loans and mortgages, it was the area with the least adoption compared to other green practices. This suggests that while banks were increasingly focusing on sustainability in their operations, there was still room for growth in offering a wider range of green financial products to customers. The data gathered provided insight into the adoption timeline of these practices within the banking sector, reflecting the level of commitment to sustainability efforts and in consequence, reduction of carbon emissions.

Commercial banks in Nairobi City County demonstrate a strong and growing commitment to green banking and environmental sustainability. This is reflected in their widespread adoption of green practices, significant investment in training and awareness, implementation of operational efficiency measures, and substantial green financing portfolios. However, for the banking sector to play a transformative role in Kenya’s climate and development agenda, it must advance further by embedding sustainability principles into core banking operations, standardizing best practices, and enhancing the impact and reach of its initiatives.

***3.1.2 Green Banking Practices for Commercial Banks: Triangulation of Bank Employees' Responses and Review of Relevant Disclosure Reports***

This section triangulates data from bank employees and relevant disclosure reports from commercial banks in Nairobi City County, ensuring confidentiality by coding the banks for anonymity. By cross-referencing these sources, it offers a comprehensive view of the green banking practices adopted by these institutions, highlighting the alignment between reported green initiatives and actual sustainability practices disclosed in official 2023 reports.

**Table 3: Green Banking Operations Implemented by Commercial Banks in Nairobi City County**

|  |  |
| --- | --- |
| **Green Banking Practices** | **Frequency *(f)*** |
| **SA(5)** | **A(4)** | **N(3)** | **D(2)** | **SD(1)** |
| Build capacity for environmental awareness | 22(24%) | 28(30%) | 28(30%) | 11(12%) | 3(3%) |
| Evaluate sustainability with clear criteria. | 18(20%) | 29(32%) | 24(26%) | 15(16%) | 6(6%) |
| Reward branches for green practices. | 22(24%) | 28(30%) | 22(24%) | 13(14%) | 7(7%) |
| Improve efficiency, reduce material waste | 24(26%) | 20(22%) | 28(30%) | 20(22%) | 0(0%) |
| Install energy-efficient banking systems. | 26(28%) | 24(26%) | 22(24%) | 10(12%) | 10(10%) |
| Manage e-waste through effective solutions. | 29(32%) | 28(30%) | 24(26%) | 7(8%) | 4(4%) |
| Implement environmentally friendly banking practices. | 20(22%) | 33(36%) | 24(26%) | 9(10%) | 6(6%) |
| Offer loans for environmental sustainability. | 28(30%) | 29(32%) | 18(20%) | 11(12%) | 6(6%) |
| Incorporate green initiatives like reforestation | 26(28%) | 28(30%) | 24(26%) | 9(12%) | 5(5%) |
| Support eco-enterprises with grants and guidance. | 28(30%) | 29(32%) | 26(28%) | 9(10%) | 0(0) |
| Evaluate credit proposals using ESM systems | 20(22%) | 26(28%) | 28(30%) | 9(10%) | 9(9%) |
| Establish energy-efficient green branches | 24(26%) | 33(36%) | 20(22%) | 7(8%) | 8(8%) |
| Adopt comprehensive environmental policies. | 22(24%) | 31(34%) | 26(28%) | 13(14%) | 0(0) |
| Partner with stakeholders on sustainability initiatives | 24(26%) | 26(28%) | 29(32%) | 8(8%) | 5(5%) |
| Engage leadership in environmental planning | 26(28%) | 24(26%) | 31(34%) | 6(6%) | 5(5%) |
| Procure supplies from eco-friendly sources | 20(22%) | 29(32%) | 22(24%) | 11(12%) | 10(10%) |

(Source: Field Data, 2024)

From Table 4, a notable proportion of respondents, 54%, acknowledged that their institutions invested in staff capacity building and awareness creation regarding environmental sustainability. These findings were corroborated by a document review, which involved a systematic analysis of publicly available materials such as annual financial reports and sustainability reports. Banks such as CB10, CB7, and CB3 were particularly recognized for prioritizing employee training on environmental issues. Additionally, CB5 and CB2 had embedded sustainability training into their organizational policies, ensuring long-term commitment. CB10 and CB7 demonstrated proactive engagement by incorporating over 5,000 clients into environmental, social, and governance (ESG) awareness programs.

Environmental performance evaluation and sustainability policies varied among the banks. Approximately 20% of employees strongly agreed, while 32% agreed that environmental performance evaluation was actively undertaken in their institutions. In terms of established environmental policies, 58% of respondents confirmed that their banks had implemented structured green policies. CB10 stood out with a robust Environmental and Social Management System (ESMS) and climate risk management framework, while CB7 enhanced its ESMS by integrating climate risk considerations into its Environmental and Social Due Diligence tools. CB6 introduced an automated ESMS for transaction screening and mandated climate risk assessments for large loan approvals. Similarly, CB9 implemented advanced analytics tools within its Environmental and Social Risk Management framework.

The research further examined sustainability reward systems, revealing that 24% of employees strongly agreed and 30% agreed that such mechanisms were in place, though these were not prominently highlighted in public ESG reports. Regarding resource and material use efficiency, 26% of respondents strongly agreed and 22% agreed that their institutions had taken substantial steps to optimize resources. CB9 categorized its waste into paper (315.5 tons, 72%), plastics (47.2 tons, 11%), organic waste (76.3 tons, 17%), and metal (1.4 tons, less than 1%). CB10 achieved a 17% decrease in water consumption, an 8% reduction in power usage, and a 45% decline in paper consumption. CB5 reduced paper usage by 42% compared to the previous year, while CB2 documented a baseline paper consumption of 15,188 reams annually, averaging 5.4 reams per employee. CB2 also managed 10,513 kg of waste through recycling initiatives.

The adoption of energy-efficient equipment and practices was significant across the surveyed banks, with 28% of respondents strongly agreeing and 26% agreeing that such initiatives were being implemented. CB9 reported a 9.7% reduction in energy consumption, installation of LED lighting in 53% of its branches, and the replacement of 47 air conditioners and 63 generators with more energy-efficient alternatives. CB10 set a target to source 50% of its operational energy from renewable sources by 2030. CB6 retrofitted more than 85 branches with energy-saving technologies, achieving an 8.3% reduction in energy usage in 2023. CB2 recorded a 37.8% reduction in monthly energy consumption at head office branch and a 2.7% reduction at another branch. CB4 optimized its energy efficiency by installing LED lighting and motion sensors.

E-waste management was another crucial area of analysis, with 32% of employees strongly agreeing and 30% agreeing that their banks had established structured e-waste disposal programs. CB10 safely disposed off 1,500 kg of e-waste in 2023, while CB7 introduced an e-waste recycling program that processed 2,100 kg of electronic waste. CB2 partnered with the WEEE Centre, resulting in a reduction of 9,000 kg of greenhouse gas emissions. CB1 collaborated with certified e-waste recyclers to ensure responsible disposal of electronic materials.

The study also explored environmentally friendly banking practices, with 22% of employees strongly agreeing and 36% agreeing that their institutions had implemented digital banking solutions to minimize environmental impact. CB10 led the sector, conducting 99% of its transactions electronically. CB7 processed over 91% of transactions digitally, while CB4 digitized more than 90% of its transactions in 2023. CB1's mobile banking app platform facilitated over 80% of customer transactions digitally, and CB2’s digital platforms benefited over 2.1 million people in 2023.

Green financing emerged as a significant area of investment, with 30% of respondents strongly agreeing and 32% agreeing that their banks offered loans for sustainability projects and supported environmental enterprises. CB9 disbursed KES 24.7 billion for climate-related projects, while CB10 allocated 15% of its loan portfolio to green loans and had over Kes 615 billion screened under the environmental social due diligence (ESDD) review process. CB7 classified 33% of its large loans as green, accumulating a portfolio valued at KShs. 12.3 billion. CB4 provided USD 122 million in green and sustainability-linked loans, representing 8% of its total portfolio. CB8 mobilized KES 30 billion in green and sustainable financing, and CB6 invested KES 6.7 billion in green building development and KES 2 billion in solar projects.

Independent environmental initiatives undertaken by banks were also examined, with 58% of respondents expressing strong agreement or agreement regarding the implementation of such projects. Tree planting and conservation efforts were particularly noteworthy, with CB9 planting 25.2 million trees across 8,830 locations and targeting 35 million trees by the year 2035. CB10 planted 314,129 trees in 2023 and set a goal of 10 million trees by 2030. CB6 had committed to planting 10 million trees by 2032, having already planted 728,095 trees in 2023. CB8 set a goal of 10 million trees by 2030 and planted 344,437 trees in 2023. CB4 planted 23,960 trees, while CB1 supported youth-led conservation initiatives and planted over 50,000 trees.

The study also evaluated sustainable banking infrastructure, with 26% of respondents strongly agreeing and 36% agreeing that their banks had implemented green branch initiatives. CB9 had installed LED lighting in 53% of its branches and conducted energy audits at high-consuming locations. CB10 fully powered two branches using solar energy. CB7 retrofitted its branches with LED lighting, reducing energy consumption by 20%. CB6 adopted energy-saving technologies in over 85 branches and achieved IFC EDGE certification for five of them. CB2 had established 3 green branches, utilizing recycled materials and solar energy. CB5 incorporated solar panels at branches and ATMs while implementing waste recycling programs.

Sustainable banking practices and environmental commitments were further examined, with 54% of respondents agreeing or strongly agreeing that their banks had environmental agreements with stakeholders and involved top management in green initiatives. Additionally, 54% confirmed the existence of green procurement policies in their institutions. Several banks collaborated with development finance institutions (DFIs) and international organizations, participating in global sustainability initiatives such as the Net-Zero Banking Alliance and the UNEP Finance Initiative. Special financing programs were developed for underserved groups, including women-led enterprises and vulnerable communities. Furthermore, supply chain sustainability initiatives were emphasized, with CB6 training over 400 suppliers on ESG principles.

The study findings revealed a substantial commitment to environmental sustainability among banks in Nairobi City County, albeit with varying levels of implementation across different areas. While progress has been made, further efforts are required to strengthen sustainability reward systems, enhance digital banking infrastructure, and increase investment in renewable energy solutions to ensure long-term environmental resilience within the financial sector.

**3.2 Carbon Emissions Measurement and Disclosures by Commercial Banks in Nairobi City County**

**Table 4: Analysis of Carbon Emissions Measurement and disclosures for Commercial banks in Nairobi City County**

| **Bank Code** | **Total Emissions (tCO₂e) 2023** | **Scope 1 Emissions (tCO₂e) 2023** | **Scope 2 Emissions (tCO₂e) 2023** | **Scope 3 Emissions (tCO₂e) 2023** | **Emission Reduction Achieved (%)** | **Net Zero Target Year** |
| --- | --- | --- | --- | --- | --- | --- |
| CB10 | 21,825.1 | 3,039.8 | 8,470.6 | 10,314.6 | 11% | 2050 |
| CB9 | 22,482.0 | 7,484.0 | 12,128 | 2,870 | 24% | - |
| CB8 | 10,089.5 | 7,765.5 | 2,324.0 | - | - | 2040 |
| CB7 | - | - | - | - | - | - |
| CB6 | 4,066.2 | 2,413.7 | 1,136.3 | 516.2 | - | 2030 |
| CB5 | 282 | 282 | - | - | 65% (since 2018) | 2050 |
| CB4 | 3,541 | 2,819 | 722 | - | 13% | 2035 |
| CB3 | 2,220.6 | 800.9 | 1,419.7 | - | 2050 |
| CB2 | 2,308 | 292 | 2,016 | - | - | 2030 |
| CB1 | - | - | - | - | - | - |

(Source: Banks’ Sustainability Reports, 2023)

The research findings presented in Table 4 offer valuable insights into the carbon emissions profiles and reduction strategies of banks operating within Nairobi City County. These data, when examined alongside the contextual information provided in the sustainability disclosure reports, illuminate the varying degrees of progress in the sector's transition toward climate consciousness and environmental sustainability.

The study reveals significant variations in emissions reporting and reduction achievements across the banking institutions. CB5 emerged as a notable performer, having achieved a remarkable 65% reduction in emissions from 2018 to 2023, with emissions amounting to 282 tCO₂e in 2023 disclosed, all categorized as Scope 1. This substantial reduction positioned CB5 as an industry leader in operational emissions management, significantly outperforming the global banking industry standard of 15-30% reductions over comparable timeframes as noted by Sullivan & Gouldson (2020). The bank's 2050 net-zero target aligned with global climate ambitions established under international frameworks.

In contrast, CB6 presented a more complex emissions profile, with a total of 4,066.2 tCO₂e distributed across all three scopes: 2,413.7 tCO₂e (Scope 1), 1,136.3 tCO₂e (Scope 2), and 516.2 tCO₂e (Scope 3). Despite higher absolute emissions than CB5, CB6 demonstrated comprehensive emissions reporting across all scopes and had established an ambitious net-zero target for 2030, which positioned it at the forefront of climate ambition within the Nairobi banking sector.

CB9 registered as the highest emitter with a total of 22,482 tCO₂e, comprising 7,484 tCO₂e (Scope 1), 12,128 tCO₂e (Scope 2), and 2,870 tCO₂e (Scope 3). However, the 24% reduction in operational emissions achieved by CB9 reflects a substantive commitment to environmental stewardship, aligning with observations by Vivier and Wentzel (2017) regarding African banks with higher emissions increasingly adopting mitigation strategies. The absence of a specified net-zero target year represents a strategic deficiency that diminished the long-term clarity of the bank's sustainability framework.

CB10 reported a total of 21,825.1 tCO₂e in emissions, with an 11% reduction in carbon intensity per employee. The bank's commitment to reducing operational emissions by 30% by 2030 and achieving net-zero by 2050 demonstrated alignment with global climate ambitions. Particularly noteworthy is CB10's comprehensive approach to emissions reporting, which included transparency around its financed emissions (Scope 3), predominantly linked to the real estate sector (96.95%). This approach positioned CB10 as a leader in incorporating full-spectrum emissions reporting into its climate strategy, consistent with frameworks such as the Partnership for Carbon Accounting Financials (PCAF).

The research findings also revealed varying degrees of institutional readiness for comprehensive emissions reporting. CB7 explicitly acknowledged its unpreparedness to disclose information on Scope 1, 2, and 3 emissions, while committing to full disclosure in future reports. The specific note for CB7 that "The Bank was not ready to disclose information on Scope 1, 2, and 3 emissions" suggested institutional barriers to emissions reporting that transcend mere technical capacity.

Similarly, CB1 indicated that it was in the process of establishing metrics and targets for monitoring performance in Scope 1 and 2 emissions. CB8's annotation that it lacked emissions data for specific scopes indicated ongoing challenges in data collection and reporting infrastructures. These gaps undermined the sector's ability to present a coherent collective response to climate challenges and complicated comparative analysis of institutional performance.

This developmental spectrum in emissions reporting maturity aligns with observations by Baboukardos *et al*. (2025), who noted that the banking sector in emerging economies often exhibits delayed adoption of comprehensive climate risk disclosures. The heterogeneity in reporting practices observed in the Nairobi banking sector reflects the broader challenge of establishing standardized approaches to emissions accounting and disclosure in the absence of regulatory mandates.

A critical observation from the data was the inconsistent reporting of Scope 3 emissions across the banking institutions. While CB6, CB9, CB10 and CB3 provided Scope 3 emissions data, all the other banks did not report any Scope 3 emissions data. This pattern corroborates findings from He (2022), which identified transparency in Scope 3 emissions reporting as a persistent challenge in the global banking sector.

The limited disclosure of Scope 3 emissions represents a significant gap in the sector's climate risk management framework, as these emissions particularly those associated with lending and investment activities typically constitute the largest portion of a bank's carbon footprint. This omission undermines the comprehensiveness of the banks' emissions profiles and limits stakeholders' ability to assess the true environmental impact of these institutions. The limited transparency around Scope 3 emissions among most banks in the sample reflected a broader industry pattern wherein financial institutions primarily focus on operational emissions while neglecting the more significant emissions associated with their financing activities.

The net-zero target years specified by the banks provided insight into the varying levels of climate ambition within the sector. CB6's 2030 target represents the most ambitious timeline, followed by CB4's 2035 target, CB8's 2040 target, and the 2050 targets set by CB2, CB3, CB5, and CB10. The absence of a specified target year for CB9 was notable, particularly given its position as the highest emitter in the sample.

These divergent timelines reflect the strategic considerations influencing each bank's approach to climate risk management, including operational constraints, resource availability, and competitive positioning. The more ambitious targets, such as CB6's 2030 goal, may signal a strategic orientation toward leveraging sustainability as a competitive differentiator, potentially aligning with findings from Sullivan & Gouldson (2020) regarding the business benefits of climate leadership.

The findings from this analysis both corroborate and extend previous research on carbon emissions management in the banking sector. The 65% emissions reduction achieved by CB5 significantly exceeds the 15-30% range typically observed in developed markets over similar timeframes, as noted by Sullivan & Gouldson (2020). This exceptional performance demonstrates that substantial emissions reductions are achievable in emerging market contexts when institutions commit appropriate resources and strategic focus.

The findings also support observations by Wambui *et al.* (2023) regarding the adoption of mitigation strategies by high-emitting African banks. CB9's 24% emissions reduction, despite its position as the highest emitter, exemplifies this trend and underscores the potential for substantial progress even among institutions with significant carbon footprints.

The research findings provide valuable insights for policymakers, regulators, and banking executives seeking to enhance the sector's contribution to Kenya's climate objectives. By addressing the identified gaps in emissions reporting, strengthening internal capacity for carbon accounting, and aligning with global best practices, the Nairobi banking sector can accelerate its transition toward environmental sustainability and position itself as a leader in climate-conscious finance within the African context.

**3.3 *Regression Analysis: Hypothesis Testing and Interpretation***

The results of hypothesis testing conducted to examine the relationship between green banking practices and carbon emissions reduction among commercial banks in Nairobi City County. In line with the study’s first objectives, a multiple linear regression analysis was employed to determine the predictive strength and statistical significance of the independent variables, green banking practices, on the dependent variable, carbon emissions reduction. The results are presented in Table.5**.**

The following null hypothesis was tested:

H₀1: Green banking practices had no significant impact on carbon emissions reduction.

##### **Table 5 Regression Coefficients for Predicting Carbon Emissions Reduction (Dependent Variable)**

| **Variable** | **B (Unstandardized)** | **Std. Error** | **β (Standardized)** | **t-value** | **p-value** |
| --- | --- | --- | --- | --- | --- |
| **(Constant)** | -0.223 | 0.248 | - | -0.899 | **0.002** |
| **Green banking practices** | 0.740 | 0.039 | 0.692 | 18.754 | **0.000** |

The results presented in Table 5 of the regression analysis offer critical insights into the extent to which green banking practices predict reductions in carbon emissions. The predictor was found to have statistically significant effects on the dependent variable, with green banking practices emerging as the most influential factor.

Based on the regression coefficients presented in Table.5, the study provides strong statistical evidence to reject the null hypothesis (H₀1), affirming that green banking practices have a significant effect on carbon emissions reduction. The p-value for green banking practices is 0.000, which is well below the conventional significance level of 0.05, indicating a highly statistically significant relationship. The standardized beta coefficient (β = 0.692) suggests a strong positive influence, meaning that a one standard deviation increase in green banking practices results in a 0.692 standard deviation decrease in carbon emissions. Additionally, the unstandardized coefficient (B = 0.740) points to a substantial practical impact with each unit increase in green practices. This finding is further reinforced by a robust t-value of 18.754, which exceeds the critical threshold of 1.96, confirming the reliability and strength of the results. These findings support the conclusion that green banking practices play a statistically significant and practically meaningful role in reducing carbon emissions. The regression analysis confirms the alternative hypothesis and underscores the importance of institutional sustainability initiatives in advancing climate change mitigation.

The regression coefficient for green banking practices was both statistically and practically significant. Specifically, the unstandardized coefficient (B = 0.740) indicates that, holding other factors constant, a one-unit increase in green banking practices leads to a 0.740-unit reduction in carbon emissions.

**4.0 Summary of Findings, Conclusions and Recommendations**

**Summary of Findings**

The study sought to determine the extent of green banking practices in operations and lending activities among commercial banks in Nairobi City County. Findings revealed that 96% of the surveyed institutions had adopted at least one green banking practice, though the level of implementation varied. The most common practices were environmental CSR programs (90%), customer awareness initiatives (88%), and the introduction of green financing instruments such as loans and bonds (78%). Operational efficiency measures, including paperless banking, digitization, and energy-efficient technologies, were reported by 72% of banks, while 68% had developed formal environmental policies. Analysis of disclosure reports further showed that some banks had made substantial commitments, with CB9 issuing KES 280 billion in green loans and CB10 allocating 15% of its lending portfolio to sustainable projects. Regression analysis established a significant positive relationship between green banking practices and carbon emissions reduction (β = 0.692, p < 0.001), confirming their role in climate mitigation.

**Conclusions**

The results demonstrate that commercial banks in Nairobi City County have embraced green banking practices both in operations and lending, thereby contributing significantly to carbon emissions reduction. However, the adoption remains uneven, with more advanced practices concentrated in a few institutions, while others limit their sustainability efforts to CSR and basic operational measures. Although the sector shows progress in integrating sustainability, the limited focus on customer-oriented green products and inadequate Scope 3 financed emissions reporting highlight critical gaps in embedding sustainability within the core of banking operations.

**Recommendations**

To scale up and strengthen green banking in Kenya’s financial sector, several measures are necessary:

1. Institutionalize Sustainability - Move beyond CSR to embed green practices into credit risk assessment, lending decisions, and investment appraisals.
2. Expand Green Products - Develop and promote innovative customer-oriented green financial products, such as mortgages for energy-efficient housing, electric vehicle loans, and renewable energy financing facilities.
3. Standardize Emissions Reporting - Regulators should establish mandatory carbon accounting and reporting frameworks, with particular emphasis on Scope 3 financed emissions.
4. Capacity Building - Banks should invest in training staff and educating customers on the importance and benefits of green finance.
5. Policy Incentives - Policymakers should support adoption through tax incentives, concessional credit lines, and regulatory enforcement of sustainability disclosure to accelerate sector-wide green transition.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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**Highlights**

- First empirical study of green banking practices in Nairobi, Kenya.
- 96% of banks reported at least one green practice in operations or lending.
- Regression shows green banking significantly reduces carbon emissions (β=0.692).
- CSR and awareness dominate, but Scope 3 financed emissions remain underreported.
- Provides policy and practical recommendations for scaling sustainable finance.