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Integrating Sustainable Development Goals into Urban Planning to Advance Sustainability in Sub-Saharan Africa: Barriers and Practical Solutions from the Case Study of Moundou, Chad

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Abstract: The accelerating pace of urbanization, coupled with changes in land-use patterns and the exacerbation of extreme climatic events—marked by heightened unpredictability and severity, particularly in regions of the Global South—necessitates a thorough reevaluation of urban governance and management frameworks. In response to these challenges, it is essential for strategies to integrate local socio-economic specificities while navigating the inherent complexities of these issues, leveraging contextually appropriate resources within a sustainability paradigm. In this regard, contextualizing and incorporating the Sustainable Development Goals (SDGs) into urban planning frameworks is crucial for advancing urban sustainability. However, significant obstacles hinder their effective integration at the urban scale, particularly in fast-evolving, resource-constrained settings. This study seeks to address this critical gap by systematically examining the barriers to SDG integration in urban planning within sub-Saharan Africa. For this purpose, Moundou, Chad, is used as a representative case study, reflecting both the challenges and opportunities of urban sustainability in the region. A hybrid methodology underpins this research, combining in-depth interviews with key development stakeholders, a detailed review of strategic documents aligned with the SDGs, and semi-structured questionnaires to capture diverse perspectives. The results reveal that the institutional dimension constitutes 38.46% of the barriers identified by stakeholders, with key challenges including limited capacity for long-term planning, a lack of expertise, and inadequate multisectoral coordination, among others. In addition, the economic and socio-cultural dimensions each represent 23.08% of the identified barriers, encompassing issues such as dependence on external funding, the high cost of green technologies, low public awareness, and resistance to change within communities. Finally, the data access dimension ranks last, accounting for 15.38%. To overcome these challenges, it is essential to implement mechanisms that strengthen institutional capacities, promote cross-sectoral collaboration, enhance public awareness, and cultivate a culture of adaptability and innovation within local communities. Furthermore, improving data accessibility and reinforcing financial mechanisms are vital to addressing these barriers comprehensively.

Keywords: Sustainable Development Goals; urban planning; urban sustainability; barriers; practical solutions; sub-Saharan Africa

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1. Introduction

The spatial and socio-technical structures of cities are currently under unprecedented strain due to global changes, with urbanization acting as a primary driver. According to United Nations projections, the global urban population will continue to rise, reaching approximately 6.68 billion by 2050. In this evolving scenario, Africa will play an increasingly central role, representing an estimated 15.9% of the world's urban population by 2030, a figure projected to rise to 22.3% by the mid-21st century [1]. This inexorable demographic shift across the African continent [2] will inevitably exacerbate the myriad challenges already confronting public authorities, especially in terms of land resource management [3–5], environmental stewardship, and the preservation of urban biodiversity [6–8]. Furthermore, ensuring sustained and inclusive access to essential urban services, including adequate housing, remains a fundamental and persistent challenge [9]. For instance, as of 2018, merely 44% of sub-Saharan Africa's urban population had access to safe drinking water [10]. Additionally, a 2016 UN-Habitat report revealed that 55.9% of urban residents in Sub-Saharan Africa were living in informal settlements, an indicator not only of infrastructural inadequacies but also of deeply entrenched institutional constraints [11]. In line with this, the World Bank's 2023 annual report warned that the rapid urban population growth in this region will exacerbate poverty and heighten socioeconomic inequalities [12]. In addition, recent studies, particularly those conducted by Allarané et al. (2023a, 2023b) and Kappelle (2020), emphasize the increasing vulnerability of African cities to climate change, particularly in sub-Saharan region where adaptive capacities are critically constrained [13–16]. Given these dynamics, a paradigm shift in urban management is imperative, one that integrates local specificities and challenges to foster genuinely sustainable urban development [17–21]. As argued by Haou et al. (2024), the objectives and strategies for urban sustainability differ markedly between developed and developing nations, shaped by divergent institutional capacities, economic resources, pollution responsibilities, and varying levels of exposure to pressing issues such as climate change and rapid urbanization [9]. Developed countries predominantly prioritize environmental sustainability and ecological transitions, focusing on carbon reduction and ecosystem preservation. In contrast, developing nations emphasize poverty alleviation, climate change adaptation, and resource management, necessities driven by intense demographic pressures and heightened vulnerability associated with limited adaptive capacities [9,22].

In contrast to the Millennium Development Goals (MDGs), which primarily focus on alleviating extreme poverty in the Global South [23], the Sustainable Development Goals (SDGs), established by the United Nations in 2015, address a broader range of global challenges. These updated goals seek not only to eradicate poverty but also to advance environmental stewardship, mitigate the impacts of climate change, and promote inclusive prosperity, transcending geographical boundaries and bridging socioeconomic divides [24,25]. Consequently, integrating the SDGs into development policies has become a cornerstone for achieving progress that meets the needs of present and future generations while ensuring the long-term sustainability of natural resources [9,26–29]. Since their adoption, an extensive body of research has explored the intricate interdependencies among the SDGs and their targets, emphasizing the importance of embedding these goals within national strategic frameworks [30–39]. Such integration is critical for addressing today's multifaceted challenges holistically [40]. As a result, national frameworks incorporating the SDGs now serve as essential tools guiding decision-making processes at both national and urban scales [24,27]. However, these frameworks, often designed around overarching national priorities, frequently overlook the unique socioeconomic dynamics and developmental imperatives of urban areas [27]. This disconnect underscores a criti-

cal limitation: while national-level SDG integration can inform urban policy, it remains insufficient for embedding sustainability principles comprehensively across diverse urban contexts. Recognizing this gap, scholars increasingly advocate for robust SDG integration at the urban level, where decision-making is more closely aligned with actionable measures capable of driving transformative changes within local communities [41–43]. In response, numerous initiatives have emerged to align urban development strategies with the SDGs, ensuring that targets are both contextually relevant and responsive to local challenges. These initiatives underscore the importance of participatory and inclusive approaches that actively engage local communities, fostering solutions that are not only context-sensitive but also impactful [27,44].

Urban areas are increasingly recognized as pivotal drivers of sustainable development, offering unparalleled opportunities to advance the achievement of the SDGs [27,45–47]. This recognition has elevated urban planning as an essential means of translating global SDG targets into actionable, context-specific strategies. By bridging the gap between national policies and local realities, these plans address urban-specific challenges through targeted interventions over short-, medium-, and long-term horizons [48,49]. However, the seamless integration of SDGs into urban plans remains hindered by persistent barriers worldwide [49,50]. These include insufficient comprehension of key integration dynamics, challenges in aligning SDG-focused initiatives with existing urban priorities, and difficulties in harmonizing interventions across spatial and institutional scales [37,49,51,52]. To address these challenges, a recent study by Fu et al. (2024) underscores the urgency of robust multi-level scientific support to overcome these barriers, particularly at the urban scale, to identify these barriers effectively and thus facilitate SDG implementation [53]. Embedding the SDGs within urban development plans not only addresses the limitations inherent in national frameworks but also enhances urban sustainability, driving meaningful progress toward timely SDG achievement.

While there is a growing consensus within the scientific community regarding the urgent need to integrate the Sustainable Development Goals (SDGs) into urban planning frameworks [27,47], the sub-Saharan African context remains underexplored in terms of the specific barriers hindering such integration. Despite an extensive body of research on urban sustainability in the region, a systematic and comprehensive examination of these challenges is conspicuously lacking. For instance, Mutambissi and Chavunduka (2023) investigated the institutionalization of the SDGs at the local level in Zimbabwe, proposing critical reforms to enhance implementation by local authorities. However, their study does not address the structural impediments to embedding SDGs into urban policies [54]. Similarly, Mtapuri and Myeni analyzed the intersections between the SDGs and the New Urban Agenda, identifying areas of convergence and divergence. Nonetheless, their work falls short of addressing the practical challenges of operationalizing the SDGs within urban development plans [55]. Haou et al. (2024) offered valuable insights into the alignment of sustainability indicators with the SDGs in Moundou, Chad. Yet, their analysis did not delve into the complexities of integrating these indicators into urban planning frameworks [9]. Research from Ghana has highlighted the implications of informality on urban sustainability, with implicit references to the SDGs. However, these studies lack a detailed investigation of the barriers to integrating the goals into urban planning [56,57]. Furthermore, Nagati et al. (2023) focused on the mechanisms for monitoring and measuring SDGs 6 and 11.2, but their findings do not adequately address the broader systemic obstacles that undermine SDG integration at the urban level [58]. This critical gap in the literature underscores the need for research aimed at facilitating the seamless incorporation of the SDGs into urban planning frameworks in sub-Saharan Africa. Such research is essential for equipping policymakers with actionable insights to enhance urban sustainability in a

region characterized by intricate socio-economic dynamics and significant developmental challenges [9]. The findings from these investigations will contribute to strengthening governance frameworks, advancing urban planning practices, and refining management strategies. Given the intensifying pressures of climate change and rapid urbanization, embedding the SDGs into urban policies is not only desirable but imperative to fostering sustainable, resilient, and inclusive urban environments [9,28].

The case of Chad exemplifies the multifaceted challenges associated with integrating the Sustainable Development Goals (SDGs) at the local level. Although the Chadian government's 2017 National Development Plan (NDP) ostensibly incorporates the SDGs [9], it notably lacks clear and actionable guidelines for its local implementation. This critical shortfall not only hinders the operationalization of the SDGs but also perpetuates a disconnect between national ambitions and local realities, thereby undermining broader efforts to promote urban sustainability. This issue is not unique to Chad but is symptomatic of a broader trend across numerous sub-Saharan African cities, where similar deficiencies highlight the urgent need for a systematic examination of the barriers obstructing SDG integration within urban development frameworks. This study aims to address this gap by addressing three pivotal research questions (RQ) essential for understanding and overcoming these challenges: RQ1: What are the viewpoints, expectations, and concerns of key stakeholders in Moundou regarding the integration of SDGs into urban planning? RQ2: What are the primary barriers hindering the integration of the SDGs into urban planning in Moundou? RQ3: What strategic and practical solutions can effectively support the integration of SDGs into urban plans in Moundou? These inquiries are particularly pressing, given that Moundou is poised to play a central role in realizing the SDGs, not only as an economic hub but also as a strategic locale where global policies must be translated into actionable local initiatives. The research objectives (RO) of this research are three-fold:

RO1: To analyze the viewpoints, expectations, and concerns of key stakeholders in Moundou regarding the integration of the SDGs into urban planning;

RO2: To identify the primary barriers hindering the integration of the SDGs into urban planning in Moundou;

RO3: To propose strategic and practical solutions that can effectively support the integration of the SDGs into urban plans in Moundou.

Achieving these objectives will constitute a substantial progression in enhancing urban sustainability in Moundou. While the findings and strategies identified in this study are specific to the unique context of Moundou, they also highlight methodological approaches and lessons that could inspire similar analyses in other Chadian cities. By addressing barriers and showcasing context-specific practices, this study aims to encourage localized approaches to integrating SDGs into urban plans across sub-Saharan Africa, rooted in the unique characteristics and needs of each city.

2. Literature Review

2.1. Theoretical Framework: Urbanization, Urban Planning, Sustainability and SDGs

(1) *Urbanization and its multifaceted impacts*: Urbanization, as defined by the United Nations, refers to a demographic transition characterized by the increasing proportion of populations residing in urban areas. This phenomenon induces profound transformations, particularly in spatial organization, economic structures, and social dynamics [1]. According to Bodo (2019), two prominent theoretical frameworks provide insights into the urbanization process. On the one hand, the Theory of Self-Generated Urbanization argues that urbanization is driven by two interdependent factors. The first is the generation of surplus resources enabling non-agricultural activities. The second is the attainment of social development levels sufficient for the autonomous functioning of large communities.

This perspective underscores the evolution of urban economies surpassing traditional agricultural systems. On the other hand, Modernization Theory attributes urbanization to the introduction of innovations—such as industrialization, technological advancements, information dissemination, and cultural exchanges—that stimulate both economic growth and societal transformation [59].

Angelopulo (2021) emphasizes that urbanization is neither a linear nor a uniform process but one shaped by specific socio-political, economic, and ecological contexts [2]. Similarly, Güneralp et al. (2017) highlight the uneven manifestation of urbanization across regions, underscoring the need for policies that harmonize global sustainability objectives with localized priorities [8].

In sub-Saharan Africa, urban growth predominantly occurs through informal mechanisms, posing significant challenges to infrastructure provision, service delivery, and environmental management [11]. Teklemariam (2022), along with Guarneri and Romalho (2023), argue that addressing these challenges requires integrating sustainability principles into comprehensive urban planning frameworks. Such frameworks rely on tools like the "urban sustainability transitions" model, which emphasizes resilience-building through nature-based solutions, inclusive governance, and proactive policy interventions. These interventions aim to align economic growth with environmental protection and social equity [27,45].

(2) ***Urban planning as a strategic tool for sustainability***: According to Douay (2013), urban planning is a structured process aimed at organizing the physical, social, economic, and environmental dimensions of cities by preparing, regulating, and managing urban spaces. In particular, it involves strategies that balance development needs with ecological, social, economic, and governance challenges [60]. Building on this understanding, Wiechmann (2018) refines the definition by emphasizing that urban planning aims to create functional, equitable, and sustainable urban spaces [61].

Ghorbi and Mohammadi (2017) highlight that contemporary theoretical frameworks, such as Sustainable Urban Planning and New Urbanism, offer innovative approaches to urban form and development. These frameworks prioritize principles like mixed-use urban functions, integration of green spaces, urban densification, and community participation. Together, these principles promote environmental sustainability, social inclusion, and the well-being of residents [62].

Guarneri and Romalho (2023) highlight that, within the context of the SDGs, urban planning acts as a key mechanism for translating global aspirations into actionable, context-specific strategies [45]. Building on this perspective, Medeiros and Van Der Zwet (2020) emphasize the strategic role of urban planning in advancing inclusive sustainability [46]. Hasan Rashed (2024) observes that urban planning serves as a strategic lever in rapidly urbanizing regions, particularly African cities. It plays a critical role in aligning local community needs with overarching sustainability goals. To achieve these objectives, participatory approaches are essential, alongside a focus on addressing critical challenges such as natural resource management, social inequality reduction, and enhancing resilience to climate change impacts [46].

(3) ***Sustainability as a guiding paradigm***: Sustainability, rooted in the seminal work of the Brundtland Commission (1987), advocates for the integration of economic, social, and environmental goals to ensure intergenerational equity [63]. This principle underscores the equitable transfer of resources and assets to future generations. Building on this foundation, Diaz-Iglesias et al. (2021) identify two divergent theories that underpin this concept, emerging from distinct schools of thought. Proponents of "strong sustainability" contend that populations must not exploit ecological resources beyond the regenerative capacity of nature. In this view, only the surplus generated by ecosystems should be used, leaving the

natural capital intact. Conversely, advocates of "weak sustainability" argue that natural capital can be replaced by artificial forms of capital. Diaz-Iglesias et al. (2021) suggest that the destruction of natural resources is permissible if these are transformed into financial or technological assets, which can be passed on to future generations as substitutes for degraded ecosystems [64].

Despite these theoretical distinctions, their practical application in varied contexts provokes crucial debates—particularly regarding equity, feasibility, and long-term resilience. These challenges are especially pronounced in resource-scarce regions, where sustainability principles must balance ecological preservation with urgent development needs [6,64].

The concept of sustainability, when applied to the urban context, is commonly referred to as "urban sustainability" [41]. According to Krellenberg et al. (2019) [42], urban sustainability is grounded in a "triple bottom line" approach, which emphasizes the alignment of economic activities with social inclusion and environmental preservation. This principle is particularly critical in regions experiencing rapid urbanization, such as sub-Saharan Africa, where cities face a rapid growth rate, exacerbating the strain on finite natural resources [11]. Consequently, urban sustainability initiatives play a pivotal role in addressing escalating challenges associated with climate change and entrenched socio-economic disparities. These initiatives include the efficient management of land use, the sustainable utilization of natural resources, and the reinforcement of community participation. Together, they aim to mitigate negative externalities and enhance resilience in urban environments [35]. Specifically, in sub-Saharan Africa, sustainability efforts must respond to the region's distinct challenges, such as resource scarcity, climate vulnerability, and socio-economic inequities, which directly affect urban quality of life [6].

According to Teklemariam (2022), achieving a balance between economic, social, and environmental objectives demands the integration of sustainability principles into urban planning. This requires context-specific policy innovations tailored to local challenges. For example, adopting participatory governance strategies fosters inclusive decision-making processes. Additionally, establishing financing mechanisms that cater to the unique needs of local communities and urban contexts ensures the sustainability and adaptability of these initiatives [27].

(4) ***The SDGs as a Framework for Urban Sustainability*****:** Adopted in 2015, the 17 SDGs and their 169 targets embody an ambitious vision of universality and global solidarity. They mobilize a heterogeneous array of stakeholders—including governments, international organizations, civil society, and the private sector—in a coordinated endeavor to integrate sustainability principles into public policies and decision-making frameworks at all levels of governance [24]. An integrated approach is indispensable. Aligning public policies, regulatory frameworks, and local initiatives enhances cross-sectoral synergies while mitigating negative externalities that could undermine long-term sustainability [39]. Moreover, theories of sustainable urban development emphasize that achieving such equilibrium requires harmonizing priorities across multiple scales, integrating both internal dynamics and external influences inherent to urban systems [65–68]. For instance, Wang and Liu (2016) and Krähmer (2021) underscore the urgent need for a paradigmatic shift in urban management. They advocate for an approach that transcends urban boundaries to address interdependencies with peri-urban and rural areas, as well as broader regional and national flows. Such multi-scalar coherence is essential for cohesive and strategically aligned SDG implementation [65,69].

Therefore, this analysis highlights the critical role of multilevel coordination in embedding SDG integration within local contexts while ensuring alignment with national priorities [20]. However, persistent challenges remain in clarifying the practical dimension of "local" within the SDG framework. While there is widespread consensus on the

necessity of local anchoring, implementing SDGs effectively across diverse urban areas is inherently complex [68]. Consequently, numerous scholars advocate for active community engagement, encouraging local stakeholders to take ownership of these objectives, comprehend core issues, and contribute to context-specific implementation strategies [27,41–44]. Ultimately, several authors highlight the urgent need for transformative shifts in urban planning and governance practices to tackle the formidable challenges associated with SDG integration into urban contexts [17,20,21,46,48,70].

(5) ***Interconnections Among Urbanization, Urban Planning, Sustainability, and the SDGs***: The concepts of urbanization, urban planning, sustainability, and the SDGs are deeply interconnected. Guarneri et Romalho (2023) observe that urbanization exacerbates both the challenges and opportunities inherent to sustainable development. This calls for urban planning strategies that harmonize economic growth, social equity, and environmental sustainability [45]. Indeed, urban planning serves as an unparalleled tool for translating sustainability principles into practice. It translates SDG targets into actionable frameworks that can be tailored to local contexts.

For instance, urbanization drives demand for infrastructure and services, which urban planning addresses by aligning infrastructure priorities with sustainability goals. Furthermore, sustainability provides a normative approach guiding urban planning efforts to mitigate urbanization's negative externalities, such as environmental degradation and social inequalities. The SDGs, in turn, provide a structured guideline for integrating these principles into policies and practices, ensuring coherence and synergy across sectors.

2.2. Navigating the Sustainable Development Goals and Their Complex Interdependencies

The primary aim of the SDGs is to orchestrate collective actions to address the most pressing global challenges, including poverty eradication, inequality reduction, ecosystem preservation, and combating climate change and its detrimental impacts [71]. However, the diversity of national contexts and the complexity of development challenges across regions have led to divergent approaches to SDG implementation [72,73]. As a result, empirical studies highlight pronounced disparities in progress, raising significant concerns about the feasibility of achieving these goals globally by 2030 [25,74]. Indeed, nations exhibit substantial variability in development priorities, resource capacities, and political trajectories. In this context, Wu et al. (2023) analyzed performance indicators across 166 countries, classifying them into five clusters based on their multidimensional characteristics. Their findings indicate that lower-income countries (Group SDG1) have made notable progress in SDGs 12 (Responsible Consumption and Production), 13 (Climate Action), and 15 (Life on Land), although they show weaker outcomes in social and economic SDGs. Conversely, developed nations (Group SDG5) excelled in economic and social SDGs, including SDG 15, while facing challenges in SDGs 12, 13, and 14 [32]. These disparities, further exacerbated by geographic, governance, and technological differences, underscore the necessity for nations to contextualize the SDGs according to their unique circumstances and stages of development. A one-size-fits-all approach would obscure these particularities, resulting in incongruous national interpretations and ultimately undermining the efficacy of SDG implementation [33].

In addition to previous considerations, a substantial body of contemporary research highlights that the principal challenge in accelerating the realization of the SDGs lies in comprehending the intricate interrelationships among these goals [74,75]. Research indicates that the 17 SDGs are not isolated; they are interconnected through a complex web of multidimensional interactions [31–34,36,38,39]. These often unpredictable interconnections can exert both positive and negative effects on multiple SDGs [33]. For instance, Anderson et al. (2021) developed a systemic model demonstrating that the 17 SDGs constitute an

integrated and interdependent system rather than merely a collection of discrete objectives. Their analysis revealed that 15 of the SDGs exert positive influences on others, indicating that advancements in one area can yield benefits across various domains. However, certain goals—particularly SDG 10 (Reduced Inequalities) and SDG 16 (Peace, Justice, and Strong Institutions)—may hinder the achievement of other SDGs due to the complex trade-offs they involve [35]. Other studies show that in the context of specific global crises, such as the COVID-19 pandemic, an overemphasis on particular SDGs—notably SDG 3 (Good Health and Well-being) and SDG 9 (Innovation and Infrastructure)—has led to delays in progress across other critical areas, especially in developing nations [76]. These circumstances necessitate a reassessment of global priorities, with projections suggesting that two-thirds of the 169 targets may remain unmet by 2030, while approximately 10% of the SDGs could be directly impacted by future pandemics [77]. Likewise, certain climate initiatives, which disproportionately focus on SDG 13 (Climate Action) and allocate substantial resources toward the energy transition without adequately integrating other SDGs, risk undermining broader global efforts to achieve these goals in a balanced and holistic manner [78–80]. Thus, while not exhaustive, these examples underscore the inherent complexity of SDG implementation and the myriad trade-offs that must be managed. The successful realization of the SDGs will largely depend on the capacity of governments and their partners to mobilize the necessary expertise and tools to maximize positive synergies while minimizing adverse trade-offs. Additionally, they must proactively address escalating global uncertainties, such as natural disasters, that threaten to impede progress toward achieving the SDGs [75]. Without systematic adaptation and coordinated management of these challenges, progress toward the SDGs is likely to remain uneven and uncertain [75].

2.3. Integrating the Sustainable Development Goals into Urban Plans: Strategic Issues, Implementation Challenges, and Governance Paradoxes

A major advancement in promoting urban sustainability lies in the growing recognition of the imperative to embed the SDGs within urban planning frameworks—a prerequisite for fostering urban sustainability [41,42,45,46,49,81]. This approach is grounded in the principle that contextualizing and operationalizing the SDGs' targets at the urban level enables cities to balance economic growth, social equity, and environmental protection while addressing both national mandates and local challenges [54,70]. However, in practice, numerous challenges persist. One such challenge is effective orchestration—defined as the systematic coordination and alignment of diverse actions to achieve these objectives in a holistic manner. Prominent cities such as Copenhagen, Stockholm, and Amsterdam, often celebrated for their strides in SDG integration [41,82], illustrate the enduring tensions between economic growth, social inclusion, and environmental stewardship when their approaches are closely scrutinized [83–85]. For instance, Copenhagen, lauded globally as a sustainability trailblazer, aspires to become the world's first carbon-neutral capital by 2025 [86–88]. To achieve this, the city has adopted a participatory governance model, aligning initiatives with the 2030 Agenda. These initiatives include the development of renewable energy sources, the enhancement of green infrastructure to mitigate flood risks, the creation of an extensive cycling network, the deployment of real-time traffic management systems, and the expansion of sustainable housing options [87,88]. However, scholars advocating a critical degrowth perspective argue that certain compromises in Copenhagen's urban development may paradoxically exacerbate pollution levels and deepen social inequalities. The ultimate aim of urban-level SDG integration is to cultivate an equilibrium where economic growth, social inclusion, and environmental sustainability mutually reinforce each other [69,84,85,87,89]. Similarly, Stockholm faces comparable paradoxes in its quest for leadership in sustainable urban development. The city has enacted comprehensive policies aimed at embedding SDGs into its urban planning to foster a green

economy, bolster social cohesion, and enhance climate resilience [90–92]. Paradoxically, these policies have intensified social inequalities and driven up housing prices, restricting affordable access for vulnerable populations and younger families [83,84].

A broad consensus among scholars attributes these structural deficiencies to conflicting priorities and a persistent lack of synergy among initiatives aimed at sustainable development. Thus, beyond the imperative for governance reform, integrating the SDGs within urban planning requires robust multisectoral coordination. Governance models must evolve to demonstrate the flexibility needed to reconcile competing sustainability objectives while aligning with overarching national frameworks [17,93]. This challenge is particularly pronounced in cities across the Global South, especially in Africa, where additional pressures—such as fragile governance institutions and rapid demographic growth—complicate the integration of the SDGs [94–96]. For example, Kigali is proactively incorporating urban green spaces and advancing affordable housing in alignment with SDG 11, while Addis Ababa prioritizes sustainable urban mobility through the development of environmentally friendly transportation systems. These initiatives highlight how embedding the SDGs within urban policy can catalyze sustainable development. However, despite these efforts, the rapid pace of urbanization and high levels of informality present intricate obstacles that challenge but do not preclude, the attainment of SDG targets [56,97]. Identifying and addressing these barriers within African cities is crucial, as their success in implementing the SDGs holds profound implications for global sustainability [98,99]. Given Africa's rapidly growing urbanization and increasing vulnerability to climate change, it stands as a critical testing ground for innovative models of sustainable urban development [100,101]. If African cities face insurmountable difficulties in integrating the SDGs, the broader global sustainability agenda risks significant setbacks, with potentially destabilizing economic and environmental consequences worldwide [98].

Figure 1 below delineates the scalar hierarchy required for embedding the SDGs into urban planning frameworks. It elucidates the principal challenges and operational levers and, more critically, highlights the foundational considerations that must be systematically integrated to promote urban sustainability. Collectively, these components serve as strategic catalysts that enhance both global contributions to the SDGs and the resilience and long-term viability of urban areas.

2.4. The Multifaceted Challenges Confronting Urban Development in Chad: Socioeconomic and Environmental Dimensions

Although Chad remains one of the least urbanized countries in sub-Saharan Africa, with an urbanization rate of merely 26.39% in 2023, rapid urban expansion over the past decade in major cities like N'Djamena, Moundou, Sarh, and Abéché underscores complex and concerning developmental trajectories [102,103]. This urban growth highlights a stark imbalance between rapidly increasing demographics and inadequate socio-economic opportunities, revealing critical vulnerabilities within Chad's urban development model [103]. Consequently, pervasive urban unemployment, particularly severe among youth, threatens social stability [104,105]. This issue is compounded by the influx of displaced populations fleeing conflicts in neighboring countries such as Libya, Nigeria, Sudan, and, previously, the Central African Republic. As of June 2024, Chad has accommodated 1,767,013 displaced individuals, including refugees and asylum seekers, placing immense pressure on already overstretched urban infrastructure and worsening living conditions in informal settlements [106,107]. In response to these pressures, Chad's urban landscape is increasingly shaped by a burgeoning informal economy characterized by precarious employment, low wages, and minimal social protections. According to Doudjidingao (2017), While this sector provides essential livelihoods for many families, it also imposes significant challenges

on urban governance and hinders formal economic growth as municipalities struggle to generate necessary tax revenues [108].

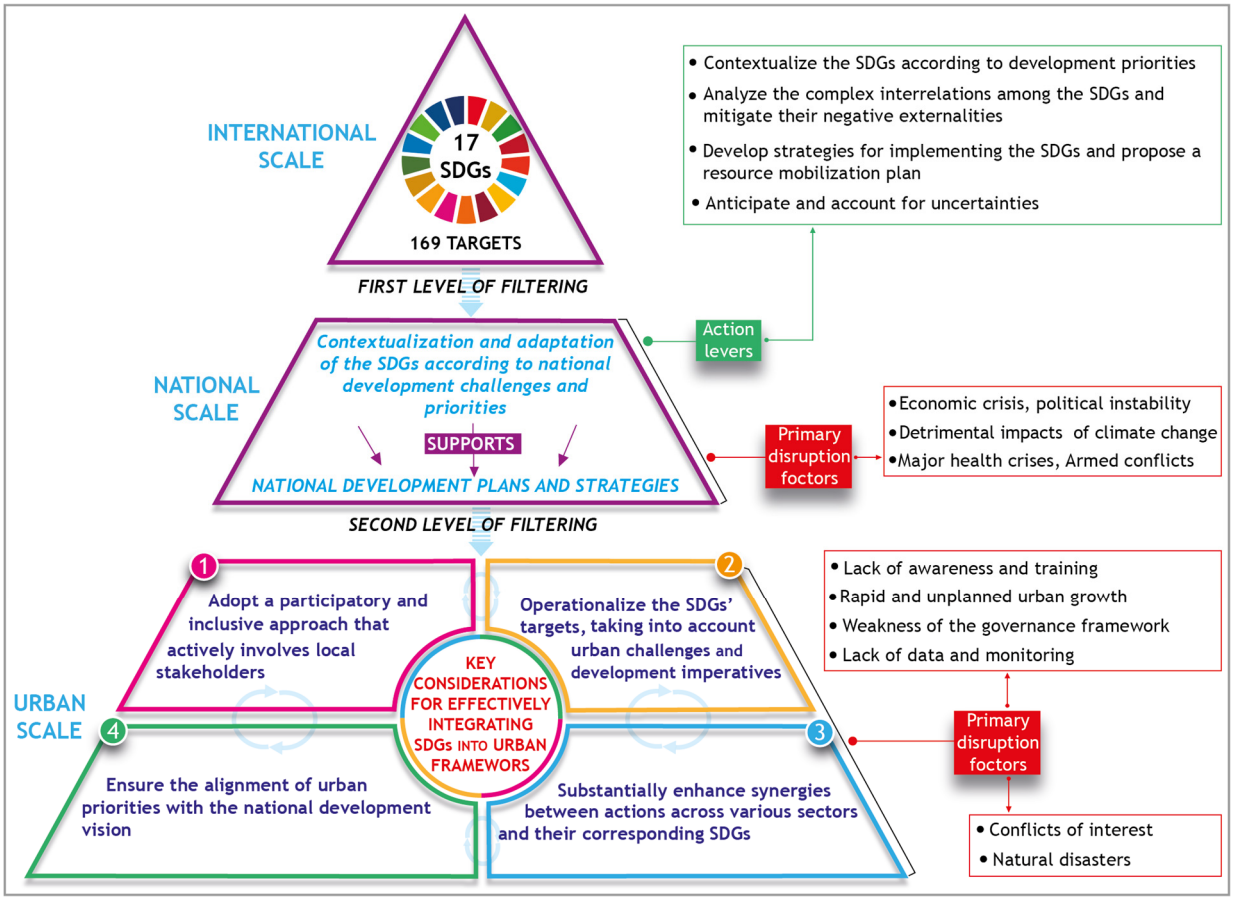

Figure 1. Key considerations for integrating SDGs into urban planning (source: authors, 2024).

Furthermore, numerous studies indicate that Chad's rapid urbanization, rather than driving substantial development, has outpaced municipal capacities to deliver essential services such as adequate housing, water, electricity, sanitation, and transportation [102,109–111]. Urban governance deficiencies further exacerbate this disconnect between urban growth and service provision. Scholars highlight that inadequacies in urban planning not only obstruct coherent development but also hinder the coordinated delivery of essential infrastructure [112–114]. Haou et al. (2024) emphasize that decades of underinvestment in urban infrastructure have widened the gap between the demand for and supply of essential services, resulting in deteriorating living standards across many urban districts [9].

In addition to socio-economic challenges, urban areas in Chad face severe environmental vulnerabilities. Situated within the Sahelian region, these cities contend with intensifying climate risks, including rising temperatures and increasingly erratic precipitation patterns [115]. These climatic shifts exacerbate vulnerabilities, particularly in informal settlements located in flood-prone, ecologically sensitive zones [114]. A recent report by OCHA (2024) highlights the severity of these impacts: recent floods have affected approximately 1.94 million individuals and destroyed 217,700 homes [116], illustrating the profound socio-economic and environmental consequences of climate change on Chad's urban centers [116,117]. In cities like N'Djamena and Moundou, inadequate drainage systems and widespread non-compliance with urban planning regulations have led to recurrent flooding, causing substantial material losses, disrupting livelihoods, and facilitating the spread of waterborne diseases [114,115]. Adding to these vulnerabilities is the

mismanagement of urban natural resources. Rapid urbanization places mounting pressure on resources, leading to the conversion of fragile ecosystems—such as wetlands and urban forests—into residential zones to accommodate population growth [102,118]. For instance, urban wetlands are increasingly repurposed for housing, a direct result of accelerated urban expansion and weak enforcement of environmental protections [113,114,119].

Moreover, inadequate waste management and the discharge of industrial pollutants significantly contribute to urban pollution, exacerbating public health risks and diminishing quality of life [120,121]. The convergence of rapid urbanization, insufficient infrastructure, and environmental degradation presents formidable obstacles to the sustainability of Chad's urban areas. Without urgent intervention, these challenges could undermine urban resilience, endanger public health, and compromise economic stability, ultimately threatening Chad's progress toward sustainable development.

3. Materials and Methods

3.1. Case Study as the Chosen Research Methodology

This study employs a case study method that is uniquely suited for investigating complex, context-dependent phenomena such as the integration of SDGs into urban planning. By delving into the specific dynamics shaping public policy implementation, this approach offers a nuanced understanding of the barriers, enablers, and opportunities inherent to a particular urban context. In contrast to more generalized methods, the case study method excels in capturing the distinct realities of a given setting, acknowledging the interplay among actors, institutional frameworks, and socio-economic challenges that characterize each urban environment [122].

The selection of this method rests on its capacity to reveal underlying mechanisms within a localized context, providing rich, context-specific insights that are directly applicable to the studied environment. While the findings are not intended to be broadly generalizable, the case study approach offers valuable lessons that can guide the design and implementation of similar studies across diverse contexts. In particular, it is adept at addressing the multidimensional challenges involved in SDG integration, considering the interdependencies between the social, economic, and environmental aspects of urban sustainability. Through this approach, the study offers actionable insights with relevance to other cities, particularly in sub-Saharan Africa [123].

3.2. Justification for Selecting Moundou, Chad, as the Study Site

Moundou, the economic capital and second-largest urban center in Chad is located between latitudes 08°31′ and 08°40′ North and longitudes 16° and 16°10′ East, approximately 480 km southwest of N'Djamena, the political capital. The city is bordered by the sub-prefecture of Déli to the north, the Logone River to the south, Lake Taba to the east, and the sub-prefecture of Bah and Lake Wey to the west. Administratively, Moundou is divided into four districts comprising 32 neighborhoods, supporting its role as a dynamic center for economic and logistical activities in the region [124].

Strategically positioned along major transport routes connecting key cities in Chad's Sudano-Sahelian region—such as Doba, Koumra, and Sarh—Moundou also benefits from its proximity to significant cross-border cities, including Bangui, the capital of the Central African Republic (641 km away), and N'Gaoundéré in Cameroon (400 km distant). These attributes have solidified Moundou's role as a central hub for regional trade and a critical gateway to the oil-producing region in southern Chad [125].

The selection of Moundou as a case study is particularly relevant due to several critical factors: (i) its demographic trajectory exemplifies rapid urbanization driven by the city's socio-economic appeal. The population grew from 100,000 inhabitants in 1993

to 187,000 in 2010 and reached an estimated 240,000 by 2023 [126]; (ii) while this urban expansion reflects growing economic opportunities, it also intensifies concerns about the capacity of local authorities to ensure equitable access to fundamental public services for residents. Furthermore, this growth places significant strain on natural resources—including wetlands, the classified Koutou forest, the Logone River banks, and adjacent lakes—raising considerable challenges to environmental sustainability [127,128].

Figure 2 illustrates Moundou's geographical position using a map generated through ArcGIS software (version 10.4). The map was constructed utilizing shapefile datasets provided by the National Research Centre for Development, based in N'Djamena, Chad.

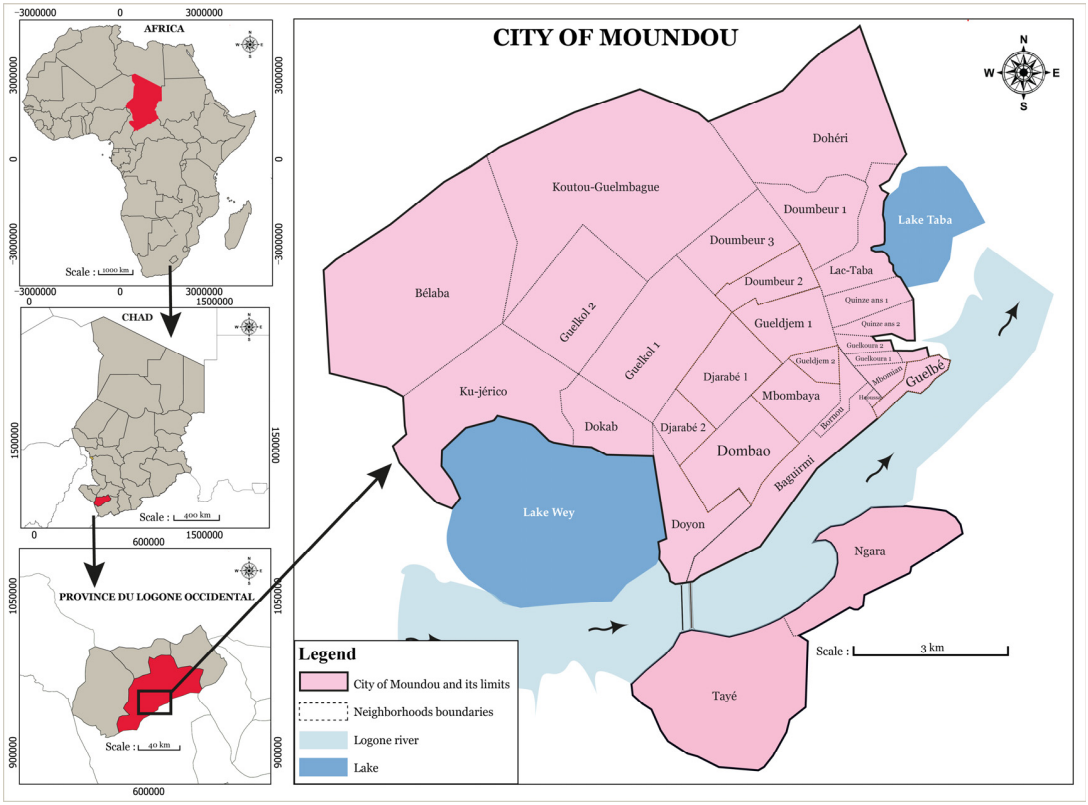

Figure 2. Geographical location of the city of Moundou.

3.3. Research Methods

3.3.1. Strategic Selection of the SDGs: A Response to Urban Challenges for Contextually Relevant Integration

In this study, defining the boundaries of our investigation with precision is crucial for ensuring contextual relevance and methodological rigor. This step is particularly important given the substantial variability in the applicability of SDGs across diverse urban environments shaped by socio-economic disparities and environmental challenges specific to the regions studied [41,74]. In light of this variability, certain SDGs align seamlessly with the focal points of our analysis, whereas others demonstrate minimal or negligible relevance to the pressing challenges confronting Moundou. To guide the selection of SDGs, we established a robust framework based on four interrelated criteria: (1) *Contextual relevance*: selected SDGs must directly address Moundou's urban priorities and challenges; (2) *Alignment with SDG 11*: the chosen SDGs should not merely complement, but actively contribute to the realization of the explicit targets outlined in SDG 11; (3) *Potential impact on urban sustainability*: the selected SDGs must demonstrate the capacity to transform the social, economic, and environmental dimensions of the urban context; and (4) *Measurability and data availability*: the SDGs should be assessable through concrete, quantifiable indicators,

supported by data that is readily accessible or locally collectible. Applying these criteria and building on the foundational work of Haou et al. (2024) [9], we identified 10 SDGs as particularly relevant to Moundou's context: SDG 3, SDG 4, SDG 6, SDG 7, SDG 8, SDG 9, SDG 11, SDG 12, SDG 13, and SDG 15. This selection reflects their alignment with the study's core objectives and their transformative potential within this specific urban setting. Consequently, our investigation is purposefully confined to these 10 SDGs, ensuring a focused and contextually grounded analysis. The detailed interlinkages between SDG 11 and the other nine SDGs, as depicted in Table 1, underscore their alignment with Moundou's specific challenges and opportunities, further reinforcing the relevance and coherence of this study's framework.

Table 1. Overview of the selected SDGs relevant to urban development in Moundou.

SDGs	Concerned Targets	Connection with the Targets of SDG 11
SDG 3 (Good Health and Well-being)	3.6. Reduce deaths from road accidents; 3.9. Reduce illnesses from pollution.	Directly enhance 11.2. Enhance access to safe and efficient transportation systems while significantly improving road safety; 11.6. Substantially mitigate the environmental impact of urban areas
SDG 4 (Quality Education)	4.4. Increase the number of youth and adults equipped with the necessary skills; 4.5. Ensure equitable access to education; 4.7. Promote education for sustainable Development.	Drive progress in 11.3. Strengthen sustainable urbanization and enhance participatory planning and management capacities; 11.b. Engage stakeholders in the rational use of resources, adaptation to the impacts of climate change, and the development of disaster resilience
SDG 6 (Clean Water and Sanitation)	6.1. Access to safe drinking water; 6.2. Ensure access to adequate sanitation and hygiene services.	Closely aligns with 11.1. Ensure access to adequate and safe basic services while improving and rehabilitating informal settlements and slums; 11.6. Reduce the negative environmental impact of urban areas.
SDG 7 (Affordable and Clean Energy)	7.1. Ensure access to reliable, modern, and affordable energy services.	Reinforces: 11.1. Ensure universal access to adequate, safe, and affordable housing and basic services.
SDG 8 (Decent Work and Economic Growth)	8.3. Promote entrepreneurship and support small and medium-sized enterprises; 8.9. Foster sustainable tourism practices.	Bolster: 11.7. Ensure access to safe public spaces for all, particularly for women, children, and persons with disabilities; 11.4. Safeguard and promote cultural heritage.
SDG 9 (Industry, Innovation, and Infrastructure)	9.1. Build quality, reliable, sustainable, and resilient infrastructure; 9.c. Increase access to technologies.	Strengthen: 11.2. Improve access to safe and efficient transportation systems; 11.7. Ensure access to safe public spaces for all; 11.c. Construct sustainable buildings using local materials.
SDG 12 (Responsible Consumption and Production)	12.4. Responsible waste management; 12.5. Promote recycling and the reuse of waste; 12.8. Encourage the promotion of sustainability and lifestyles in harmony with nature.	Advance: 11.3. Implement sustainable practices; 11.6. Urban waste management, enhancing environmental quality.
SDG 13 (Climate action)	13.1. Strengthen adaptive capacities and resilience to the impacts of climate change; 13.3. Increase education and awareness regarding climate change adaptation.	Support: 11.4. Strengthen efforts to protect natural heritage; 11.b. Enhance the adaptive capacities of cities in the face of climate change.
SDG 15 (Life on Land)	15.1. Preserve wetlands; 15.2. Protect forests.	Contribute to: 11.4. Protect natural spaces within urban areas.

(Source, authors, 2024).

3.3.2. Data Collection and Study Sample

To achieve the research objectives, a hybrid methodological framework combining qualitative and quantitative techniques was adopted, ensuring a comprehensive analysis. The qualitative approach encompassed two complementary phases: (i) an extensive documentary review of key urban development plans for Moundou, including: *Plan Urbain de Référence (PUR)* [129], *the Plan de Développement Communal (PDC)* [124], *Plans de développement des Arrondissement* [130], and the *Schémas Directeurs d'Assainissement des eaux pluviales et des eaux usées de la Ville de Moundou (SDA-Moundou)* [131]. This analysis provided critical insights into Moundou's strategic orientations for sustainable urban development, revealing converging strategies despite fragmented implementation. (ii) Semi-structured interviews were conducted with 22 key stakeholders, identified through purposive sampling [132]. This sample included policymakers, urban planners, and NGO representatives involved in Moundou's development. These interviews yielded valuable qualitative data on stakeholder perceptions of the SDGs, barriers to their implementation, and potential strategies to enhance their integration into urban plans. Collectively, these phases offered a nuanced understanding of the interplay between public policy, urban governance, and sustainability, thus underscoring the complexities of integrating the SDGs into Moundou's urban development framework.

The quantitative component of our methodology involved the administration of rigorously designed semi-structured survey instruments to gather nuanced insights from primary stakeholders actively shaping Moundou's urban development. To ensure methodological precision and validity, institutions and organizations were selected based on their proven track record of sustained involvement in Moundou's urban development for at least five years. These entities were chosen for their direct participation in initiatives aligned with the 2030 Agenda and their recognized expertise in advancing the SDGs. These surveys aimed to investigate four key themes: stakeholders' perceptions of SDG integration into urban planning, synergies among the SDGs, primary obstacles to their implementation, and satisfaction with current initiatives. The surveys included a five-point Likert scale [133], a methodological choice known for its reliability, effectively capturing perceived barriers and satisfaction levels in participatory processes. This scale enabled respondents to indicate their level of agreement with carefully formulated statements across the following categories: (1) strongly disagree (SD), (2) disagree (D), (3) undecided (U), (4) agree (A), and (5) strongly agree (SA).

To determine the sample size, we employed Slovin's formula [134], a widely recognized and validated method for calculating optimal sample sizes based on specific population characteristics. Using the estimated population of Moundou, which stood at approximately 240,000 in 2023 [126], this formula allowed for a statistically reliable calculation tailored to the study's objectives and context.

$$\text{Sloven's Formula} : n = \frac{N}{1 + N \times \mathrm{e}^2}$$

n: the sample size;
N: the population size;
e: the desired level of significance;
1: is the constant.

To ensure precision and reliability, we adopted a 5% (0.05) significance level, a standard in statistical research, minimizing Type I errors and safeguarding the validity of our results.

$$n = \frac{240,000}{1 + 240,000 \times (0.05)^2} \leftrightarrow n = 399.33 \approx 400$$

Considering the technical complexities of integrating SDGs into urban planning and the logistical constraints of conducting online surveys in Chad, administering the survey in person was deemed more effective. This approach ensured participants' full understanding of the survey content, thereby improving response rates and the reliability of the data. Table 2 presents a detailed distribution of the sample across sectors and their respective categories.

Table 2. Detailed profiles of the socio-professional categories participating in the study.

Sectors	Socio-Professional Categories	Number of Data Collection Forms	Percentages (%)
Public	Local Administrative Services	100	25
	Municipal Technical Services	80	20
	District Development Committees	70	17.5
Private	Development NGOs	80	20
	Civil Society Associations and Organizations	70	17.5
Total		400	100

(Sources: authors, 2024).

3.3.3. Data Analysis

At this juncture, the qualitative data—elicited through 22 in-depth interviews with key stakeholders—were subjected to an exhaustive thematic analysis. The transcripts were rigorously coded utilizing NVivo software (version 14), enabling an inductive approach that distilled emergent categories and themes, thereby elucidating stakeholder perceptions regarding the integration of the SDGs into urban planning. These data were meticulously curated into verbatim excerpts, a selection of which are presented in the Discussion Section to substantiate the study's findings. The qualitative insights derived from this process are indispensable, providing a nuanced complement to the quantitative analyses by uncovering the social, political, and economic dynamics underpinning the integration of the SDGs into Moundou's urban strategies.

Simultaneously, the quantitative data underwent meticulous organization and formatting using Microsoft Excel (version 2304) before being analyzed in depth with IBM SPSS Statistics (version 28). Descriptive statistical methods were employed to examine stakeholder response distributions, focusing on frequencies, means, and standard deviations. The mean offered a robust measure of central tendency, encapsulating the average values within the dataset, while the standard deviation provided critical insights into variability, delineating the dispersion of observations around the mean. These metrics were derived through the rigorous application of standardized computational formulas:

$$\text{Mean}(\mu) = \frac{1}{n} \cdot \sum_{i=1}^{n} x_i$$

x_i: the individual value of each data point;
$\sum x_i$: the sum of all data values;
n: the total number of data.

$$\text{Standard deviation } (\sigma) = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - \mu)^2}$$

Wx_i: each individual data value;
μ: sample mean;

n: total number of data points in the sample.

Spearman's rank correlation analysis was conducted to identify significant relationships between the independent variables and stakeholders' perceptions of the SDGs, shedding light on the strength and direction of these associations. The Mann–Whitney and Kruskal–Wallis tests were then applied to examine variations in perceptions across socio-professional groups. This was followed by an exploratory factor analysis (EFA), which analyzed key synergies among the SDGs while accounting for diverse influencing factors. Finally, an analysis of variance (ANOVA) assessed disparities in perceptions of barriers to SDG integration among the groups.

3.3.4. Ethical Considerations

In compliance with ethical standards, all participants provided informed consent after being thoroughly briefed on the study's objectives, the voluntary nature of their participation, and their right to withdraw at any time without repercussions. To ensure anonymity, pseudonyms (e.g., X, Y) were used, and their perspectives will be published under strict confidentiality. All data were handled with the utmost care, adhering to rigorous protocols to uphold confidentiality and maintain the highest ethical integrity.

4. Empirical Results

4.1. Demographic Characteristics of Key Informants

The survey data presented in Table 3 reveals a significant gender disparity, with male respondents representing 59.25% of the sample, compared to 40.75% for female participants. Regarding age distribution, the largest cohort comprises individuals aged 31–40 years (32%), followed closely by the 41–50 age group (29%), underscoring a strong representation of mid-career professionals whose perspectives are informed by substantial experience and a nuanced understanding of urban dynamics. The 20–30 age group, accounting for 22.25% of respondents, highlights the growing involvement of younger generations in urban sustainability discourses, signaling a shift toward more innovative and forward-looking approaches to urban challenges.

Table 3. Demographic characteristics of key informants.

Variables	Characteristics	Number	Percentages (%)
Gender	Male	237	59.25
	Female	163	40.75
Age groups	20–30 years	89	22.25
	31–40 years	128	32
	41–50 years	116	29
	50 years and above	67	16.75
Education level	Lower Secondary Education	55	13.75
	Upper Secondary Education	129	32.25
	Tertiary Education	216	54
Length of Professional Experience	Below 1 year	24	6
	1–5 years	83	20.75
	6–10 years	139	34.75
	10 years and above	154	38.5
Total		400	100

(Source: authors, 2024).

From an educational standpoint, the sample is predominantly well-educated, with 54% holding tertiary qualifications, reflecting high analytical capacities. This is complemented by 32.25% with upper secondary education and 13.75% with lower secondary education, illustrating a noteworthy diversity in academic backgrounds. Professionally, 38.5% of

respondents have over a decade of experience, offering deep, practice-based insights, while 34.75% have 6–10 years of experience, providing a blend of seasoned expertise and fresh perspectives.

This diverse demographic profile establishes a solid foundation for interpreting the study's findings, ensuring both depth and breadth of perspectives on urban sustainability.

4.2. Perceptions of Key Informants on the Integration of SDGs into Urban Plans and Their Impact on Urban Sustainability Practices

4.2.1. General Perceptions of Key Informants Regarding the Integration of the SDGs into Urban Plans

Table 4 provides a detailed analysis of stakeholders' perceptions regarding the integration of the SDGs into urban planning in Moundou, highlighting both widespread support and critical challenges. A majority of respondents (49.2% agreeing and 23.8% strongly agreeing) recognize the SDGs as pivotal for steering urban planning towards enhanced sustainability, reflecting broad theoretical approval. However, practical challenges temper this positive outlook.

Table 4. Key informants' general perceptions of the integration of the SDGs into urban plans.

Items	SD (%)	D (%)	U (%)	A (%)	SA (%)	Total (%)
The SDGs play a pivotal role in guiding urban plans toward achieving greater sustainability.	3.8	8.5	14.7	49.2	23.8	100
The integration of the SDGs into urban plans is currently a priority for your city.	5.4	10	22.3	45.4	16.9	
The SDGs are well-suited to the local realities and specific challenges faced by your city.	8	22	30	24.6	15.4	
The integration of the SDGs into urban plans is facilitated by the availability of adequate resources and the provision of appropriate tools.	33.1	28.4	23.1	12.3	3.1	

Likert scale (1 to 5): SD = strongly disagree, D = disagree, U = Undecided, A = Agree, and SA = strongly agree (source: authors, 2024).

Although 45.4% of respondents identify SDG integration as a priority for the city, 15.4% disagree, and 22.3% remain indifferent. More critically, only 24.6% and 15.38% (agreeing and strongly agreeing, respectively) believe that the SDGs effectively address Moundou's specific challenges. Notably, 30% of respondents remain neutral, while an additional 30% express disagreement, underscoring a significant misalignment between the SDGs' objectives and the city's actual needs.

The issue of resource availability emerges as a critical barrier. A substantial 61.6% of respondents (33.1% strongly disagreeing and 28.4% disagreeing) report insufficient support for SDG implementation. By contrast, only 15.4% express agreement, emphasizing an urgent need to address these resource gaps to enable effective integration of the SDGs into urban planning frameworks.

4.2.2. Key Informants' Perceptions of the Processes for Integrating the SDGs into Urban Planning

Table 5 presents empirical data on key informants' perceptions of the processes of SDG integration in urban planning, revealing mixed opinions. A significant portion of respondents (36.1%, including 12.3% strongly disagreeing) assert that current urban planning lacks clear SDG integration, reflecting concerns about the visibility and adequacy of SDG incorporation. Conversely, 41.9% of respondents affirm that the SDGs are visibly

integrated, while 22% remain undecided, illustrating a division in perceptions regarding the extent of integration.

Table 5. Key informants' perceptions of the processes of integrating the SDGs into urban plans.

Items	SD (%)	D (%)	U (%)	A (%)	SA (%)	Total (%)
The current urban plans demonstrate a clear integration of the SDGs.	12.3	23.8	22	26.9	15	100
The integration of the SDGs into urban plans has been carried out in an inclusive and participatory manner.	10	25.4	30	22.3	12.3	
The tools and methodologies employed to integrate the SDGs in urban plans are both appropriate and effective.	20	24.6	32.3	17.7	5.4	
An effective mechanism has been established to monitor And assess the integration of the SDGs into urban plans.	34.6	27.7	20.7	13.1	3.9	

Likert scale (1 to 5): SD = strongly disagree, D = disagree, U = undecided, A = agree, and SA = strongly agree (source: authors, 2024).

Opinions are similarly divided on the inclusivity and participatory nature of the integration process. Only 34.6% of respondents (22.3% agreeing and 12.3% strongly agreeing) perceive the processes as inclusive, while 35.4% express reservations, with 10% strongly disagreeing. These findings suggest that key stakeholders, particularly local communities and organizations, may feel marginalized, potentially hindering the collaborative dynamics essential for effective SDG implementation.

Regarding the tools and methodologies for SDG integration, 44.6% of participants (including 20% strongly disagreeing) find them inadequate, with 32.3% adopting a neutral stance. This points to a lack of tailored, context-specific approaches and technical capacity to operationalize the SDGs effectively within the urban planning framework.

The most concerning finding pertains to the perception of monitoring mechanisms. A substantial 62.3% of respondents (including 34.6% strongly disagreeing) report the absence of effective systems to assess SDG integration. This underscores a critical disconnect between the SDGs' intended outcomes and their practical monitoring and evaluation, highlighting an urgent need for robust, context-sensitive assessment frameworks.

4.2.3. Perceptions of the Impacts of Urban Plans' SDG Integration on Urban Practices

Table 6 offers a detailed overview of stakeholders' perceptions concerning the impacts of SDG integration into urban planning in Moundou. A significant 44.6% of respondents assert that the integration of the SDGs has significantly influenced urban sustainability practices, with 14.6% strongly agreeing. This reflects a positive transformation in urban sustainability, although a small minority (4.6%) strongly disagrees, indicating that the impact is not universally perceived.

Concerning coordination and collaboration, 36.8% acknowledge improvements, yet 27.7% express disagreement, pointing to persistent challenges in fostering effective stakeholder cooperation. These mixed perceptions highlight the need for stronger mechanisms to enhance collaboration among key actors.

Regarding shifting urban development priorities, a considerable 62.4% agree that these priorities have evolved in response to SDG integration, with only 10.4% expressing skepticism. This underscores a general alignment with the SDG framework as a guide for local development priorities, reflecting a positive trend in strategic urban planning.

Table 6. Perceptions of the impacts of SDG integration in urban plans on urban practices.

Items	SD (%)	D (%)	U (%)	A (%)	SA (%)	Total (%)
The integration of the SDGs into urban plans has significantly transformed urban sustainability practices within your city.	4.6	14.6	21.5	44.6	14.7	100
The integration of the SDGs into urban plans has fostered improved coordination and collaboration among the various stakeholders involved in urban development in Moundou.	5.4	27.7	24	36.8	6.1	
The integration of the SDGs into urban plans has led to a shift in urban development priorities in Moundou.	8.5	13.8	18.5	47.6	11.6	
The integration of the SDGs into urban plans has improved the effectiveness of urban projects in terms of tangible outcomes.	5.4	9.2	13.1	57.7	14.6	

Likert scale (1 to 5): SD = strongly disagree, D = disagree, U = undecided, A = agree, and SA = strongly agree (source: authors, 2024).

Finally, the perception of increased effectiveness in urban sustainability projects is strong, with 57.7% of respondents affirming improvements in tangible outcomes, including 14.6% who strongly agree. However, 5.4% of respondents remain unconvinced, indicating that the promising benefits of SDG integration remain unevenly realized across projects.

Collectively, these findings reflect a favorable view of SDG integration, tempered by the recognition of critical gaps in stakeholder coordination and the comprehensive reorientation of urban priorities.

4.3. Level of Knowledge Among Key Informants Regarding the Synergies Between SDG 11 and the Other SDGs

Table 7 delineates stakeholders' knowledge levels regarding synergies between SDG 11 and other SDGs, classified into five degrees of perceived synergy: very low (VLS), low (LS), moderate (MS), strong (SS), and very strong (VSS). The results highlight notable disparities in the understanding of these interconnections. SDG 13 (climate action) emerges as the most recognized, with 48.5% of respondents identifying strong synergies (SS) and 17.7% reporting very strong synergies (VSS). This underscores a high level of awareness regarding its pivotal role in urban sustainability. Similarly, SDGs 6 (water and sanitation) and 7 (clean energy) display significant strong synergies (SS) at 43.8% and 44.6%, respectively, though fewer respondents acknowledge very strong synergies (VSS). In contrast, SDGs 3 (health), 9 (infrastructure), and 12 (sustainable consumption) predominantly reflect moderate synergies (MS), with strong synergies (SS) ranging between 34.6% and 38.5%. This suggests a partial but meaningful recognition of their relevance to SDG 11.

SDGs 4 (education) and 15 (biodiversity) show the weakest perceptions, with fewer than 13.1% of respondents identifying very strong synergies (VSS). This indicates critical gaps in understanding their connections to urban sustainability.

Finally, SDG 8 (decent work and economic growth) is perceived as having predominantly moderate synergies (MS) (36.9%) and a notably low recognition of very strong synergies (VSS) (10.8%). This highlights fragmented perceptions regarding its role in sustainable urban development.

Overall, these findings reveal an uneven understanding of the complex interdependencies among the SDGs, emphasizing the challenges inherent in achieving a coherent and integrated approach to sustainable urban development.

Table 7. Level of knowledge among key stakeholders regarding the synergies between SDG 11 and the other SDGs.

ODD	VLS (%)	LS (%)	MS (%)	SS (%)	VSS (%)	Total (%)
SDG 3–SDG 11	6.9	14.6	22.3	38.5	17.7	100
SDG 4–SDG 11	11.5	20	32.3	23.1	13.1	
SDG 6–SDG 11	6.2	16.2	21.5	43.8	12.3	
SDG 7–SDG 11	5.4	13.9	21.5	44.6	14.6	
SDG 8–SDG 11	9.2	18.5	36.9	24.6	10.8	
SDG 9–SDG 11	8.5	17.7	21.5	35.4	16.9	
SDG 12–SDG 11	10.8	14.6	25.4	34.6	14.6	
SDG 13–SDG 11	5.4	8.5	20	48.5	17.6	
SDG 15–SDG 11	10	26.9	27.7	23.1	12.3	

Linkert scale (1 to 5): VLS = very low synergy, LS = low synergy, MS = moderate synergy, SS = strong synergy, and VSS = very strong synergy (source: authors, 2024).

4.4. Principal Barriers Hindering the Integration of SDGs into Urban Development Plans

Figure 3 highlights the key dimensions of barriers identified by stakeholders: institutional, economic, socio-cultural, and data access. The institutional dimension, representing 37.46% and spanning all socio-professional categories, underscores significant challenges. These include weak intersectoral coordination and the absence of robust mechanisms for stakeholder engagement, which hinder the effective integration of SDGs into urban planning. The economic dimension, along with the data access dimension, each accounting for 23.08% across three categories, reveals persistent fiscal constraints. These are compounded by inefficiencies in the collection, management, and dissemination of data, which limit evidence-based decision-making processes. Finally, the socio-cultural dimension, representing 15.38% across two categories, highlights two critical issues: cultural resistance to change and a widespread lack of public awareness regarding the SDGs.

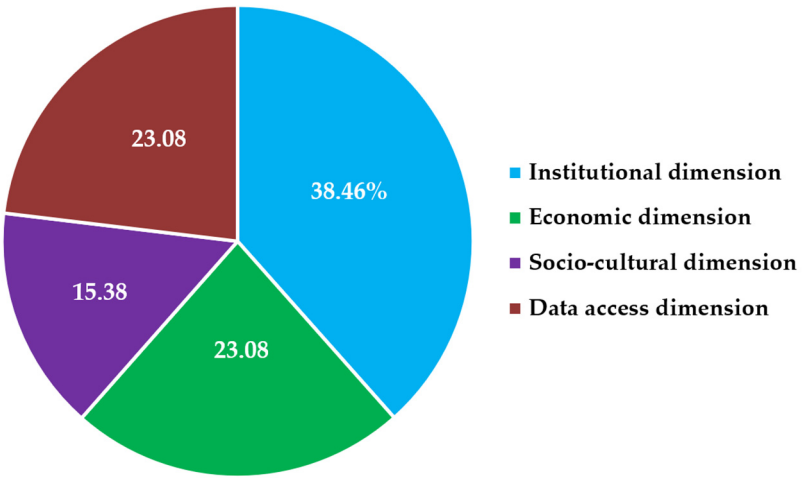

Figure 3. Dimensions of barriers by socio-professional categories (source: authors, 2024).

Table 8 outlines the key barriers identified by informants, grouped into four primary dimensions: institutional, economic, socio-cultural, and data accessibility. These categories are further analyzed by socio-professional groups to underscore the specific challenges perceived by each category of stakeholders. The findings are quantified using two critical metrics. First, the **mean** measures the perceived severity of each barrier on a 1-to-5 Likert scale, providing a clear indication of their relative importance. Second, the **standard**

deviation captures response variability, offering a nuanced perspective on the degree of consensus or divergence among respondents.

Table 8. Principal barriers hindering the integration of SDGs into urban development plans.

Dimensions	Socio-Professional Categories	Main Identified Barriers	Mean (μ)	Standard Deviation (σ)
Institutional	Local Administrative Services	Lack of multisectoral coordination	4.1	0.9
		Absence of a regulatory framework for SDG integration	4.3	0.8
	Municipal Technical Services	Centralized decision-making	4.0	1.0
		Lack of expertise	3.8	0.9
	Civil Society Associations and Organizations	Lack of community consultation	4.1	0.8
		Low representation in decision-making processes	4.0	0.9
	Development NGOs	Weak synergies between urban development programs and SDGs	4.2	0.9
		Limited long-term planning capacity	4.4	0.8
	District Development Committees	Lack of qualified human resources	4.2	0.9
Economic	Local Administrative Services	Insufficient municipal budgets	3.9	1.0
		Dependence on external funding	4.1	0.9
	Municipal Technical Services	High cost of green technologies	4.0	0.9
		Difficulty mobilizing funds for sustainable projects	4.0	0.8
	Development NGOs	Absence of fiscal incentives to support sustainable initiatives	4.3	0.8
Socio-cultural	Civil Society Associations and Organizations	Low awareness among populations	4.4	0.7
		Resistance to change within communities	3.9	1.0
	District Development Committees	Conflicts between local traditions and SDGs	3.8	0.9
Data Access	Municipal Technical Services	Lack of centralized databases	4.1	0.9
		Insufficient training to analyze available data	4.3	0.8
		Lack of a legal framework for urban data management	4.2	0.9
	Development NGOs	Outdated or unreliable data	4.4	0.7
	Local Administrative Services	Low transparency in data sharing	4.0	1.0

(Source: authors, 2024).

The table reveals significant institutional barriers to SDG integration, highlighting structural challenges across key socio-professional categories. Among these, the limited capacity for long-term planning, as reported by Development NGOs, stands out with an elevated mean score (μ = 4.4; σ = 0.8), emphasizing critical gaps in strategic foresight and sustainable planning. This issue is further compounded by the absence of a regulatory framework for SDG integration, noted by Local Administrative Services (μ = 4.3; σ = 0.8), which underscores systemic weaknesses within local governance structures. Additionally, weak synergies between urban development programs and the SDGs, highlighted by Development NGOs (μ = 4.2; σ = 0.9), along with insufficient multisectoral coordination reported

by Local Administrative Services (μ = 4.1; σ = 0.9), point to a concerning fragmentation in institutional frameworks.

These shortcomings are exacerbated by centralized decision-making processes (μ = 4.0; σ = 1.0) and a persistent lack of technical expertise (μ = 3.8; σ = 0.9) within Municipal Technical Services, both of which limit the capacity for innovative practices and adaptive responses in urban sustainability efforts. Furthermore, the lack of community consultation (μ = 4.1; σ = 0.8) and low representation in decision-making processes (μ = 4.0; σ = 0.9), as reported by Civil Society Associations, reflect governance frameworks that do not sufficiently prioritize inclusivity. Such gaps in stakeholder engagement may ultimately hinder the effectiveness of sustainable development strategies.

Economic barriers to the integration of SDGs are primarily characterized by resource constraints and dependence on external financial resources. Most notably, the reliance on external funding by Local Administrative Services, with a mean score of 4.1 (σ = 0.9), underscores a vulnerable dependence that compromises the financial autonomy of local governments and threatens the stability of local governance. Moreover, insufficient municipal budgets (μ = 3.9; σ = 1.0) further exacerbate the challenges local governments face in effectively implementing sustainability initiatives. Additionally, Municipal Technical Services encounter significant obstacles, including the prohibitive cost of green technologies and difficulties in mobilizing funds for sustainable projects, both of which register mean scores of 4.0 (σ = 0.9 and σ = 0.8, respectively). Collectively, these findings highlight systemic financial limitations that hinder innovation and impede the successful integration of SDGs.

The socio-cultural barriers identified in the data reveal significant challenges to the integration of SDGs, particularly in terms of community engagement and cultural alignment. Notably, limited public awareness, as reported by Civil Society Associations and Organizations (μ = 4.4; σ = 0.7), emerges as a critical obstacle. This score reflects a significant gap in public knowledge, which in turn hinders widespread support for sustainable development initiatives. Additionally, resistance to adopting sustainable practices within communities (μ = 3.9; σ = 1.0) exacerbates this challenge, highlighting the difficulty in overcoming entrenched attitudes and behaviors that impede the adoption of sustainable practices. Furthermore, conflicts between local traditions and SDGs, as noted by District Development Committees (μ = 3.8; σ = 0.9), underscore the tension between local cultural values and the global sustainability agenda. This finding underscores the challenge of reconciling traditional practices with the goals of sustainable development, which may be perceived as foreign or incompatible by some local communities.

The data access barriers identified in the table highlight significant challenges in managing and utilizing urban data effectively for sustainable development. A key issue is the insufficient training in data analysis, as reported by the Municipal Technical Services (μ = 4.3; σ = 0.8), reflecting a critical gap in the technical capacities required for data-driven decision-making. This challenge is exacerbated by the lack of centralized databases (μ = 4.1; σ = 0.9) and the absence of a legal framework for urban data management (μ = 4.2; σ = 0.9), both of which hinder the efficient collection, organization, and use of data for planning and policy development. Moreover, Development NGOs report that outdated or unreliable data is prevalent (μ = 4.4; σ = 0.7), undermining the accuracy and reliability of assessments necessary for effective program implementation. Furthermore, Local Administrative Services report limited transparency in data sharing (μ = 4.0; σ = 1.0), signaling a lack of open access to critical data, which limits inter-institutional coordination and hinders collaborative efforts aimed at advancing sustainable urban development.

4.5. Correlation and Statistical Tests Analysis

4.5.1. Spearman Correlation Analysis

The results of the correlation analysis presented in Table 9 reveal significant relationships between the independent variables and perceptions of the SDGs. Education level shows a moderate positive correlation with viewing the SDGs as a city priority (r = 0.42, $p < 0.001$), their alignment with local contexts (r = 0.35, $p = 0.002$), and the effectiveness of integration tools (r = 0.38, $p = 0.001$). These findings suggest that individuals with higher levels of education are more likely to recognize and comprehend SDG-related challenges. Similarly, age exhibits a moderate positive correlation with perceptions of improvements in urban sustainability practices driven by SDG integration (r = 0.40, $p = 0.002$). A weaker but still significant correlation is also observed concerning the adequacy of resources for integration (r = 0.22, $p = 0.045$). These results highlight the critical influence of education and age in shaping perceptions of the SDGs, with older or more educated individuals expressing more favorable views of integration efforts. Consequently, these findings underscore the importance of developing targeted strategies to effectively engage and inform diverse socio-demographic groups.

Table 9. Spearman correlation analysis.

Independent Variable	Dependent Variable	Spearman Corr. Coe. (r)	*p*-Value	Conclusion
Education level	The integration of the SDGs into urban plans is currently priority for your city.	0.42	<0.001	Mod. Corr.
	The SDGs are well-suited to the local realities and specific challenges faced by your city.	0.35	0.002	Mod. Corr.
	The tools and methodologies employed to integrate the SDGs in urban plans are both appropriate and effective.	0.38	0.001	Mod. Corr.
Age	The integration of the SDGs into urban plans has improved the effectiveness of urban projects in terms of tangible outcomes.	0.40	0.002	Mod. Corr.
	The integration of the SDGs into urban plans is facilitated by the availability of adequate resources and the provision of appropriate tools.	0.22	0.045	Weak but Pos. Corr.

Corr. Coe.: correlation coefficient; Mod. Corr.: moderate correlation; Week but Pos. Corr.: week but positive correlation (source: authors, 2024).

4.5.2. Kruskal–Wallis Test Analysis

Table 10 presents the results of the Kruskal–Wallis test, revealing significant differences in socio-professional groups' perceptions of SDG integration into urban planning. NGOs, with the highest mean ranks, exhibit a markedly positive view of the SDGs' strategic orientation toward sustainability (H = 15.8; $p < 0.001$), their alignment with local needs (H = 10.5; $p = 0.015$), and their transformative potential for urban development practices (H = 16.3; $p < 0.001$), reflecting their key involvement in implementation efforts. Local administrative services and municipal technical departments recognize these aspects but hold more tempered perspectives, likely influenced by their formal institutional responsibilities. On the other hand, civil society organizations and development committees tend to express more cautious views, particularly on the prioritization of SDG integration (H = 8.4; $p = 0.038$), which may reflect limited involvement in decision-making processes or ongoing resource constraints. These results underscore the diverse roles and perspectives of stakeholders, emphasizing the need to address perceptual and operational gaps to foster cohesive and effective urban sustainability frameworks.

Table 10. Kruskal–Wallis test analysis.

Items	Socio-Professional Groups	Mean Rank	H (Statistic)	*p*-Value
The SDGs play a pivotal role in guiding urban plans toward achieving greater sustainability.	Local Administrative Services	145.2	15.8	<0.001
	Municipal Technical Services	132.4		
	Development NGOs	165.7		
	Civil Society Associations and Organizations	121.6		
	Comités de développement	135.3		
The integration of the SDGs into urban plans is currently a priority for your city.	Local Administrative Services	120.3	8.4	0.038
	Municipal Technical Services	140.5		
	Development NGOs	145.8		
	Civil Society Associations and Organizations	118.1		
	Comités de développement	130.4		
The SDGs are well-suited to the local realities and specific challenges faced by your city.	Local Administrative Services	140.6	10.5	0.015
	Municipal Technical Services	125.3		
	Development NGOs	150.8		
	Civil Society Associations and Organizations	130.2		
	District Development Committees	135.1		
The integration of the SDGs into urban plans has improved the effectiveness of urban projects in terms of tangible outcomes.	Local Administrative Services	146.1	16.3	<0.001
	Municipal Technical Services	134.3		
	Development NGOs	160.2		
	Civil Society Associations and Organizations	122.4		
	District Development Committees	140.5		

(Source: authors, 2024).

4.5.3. Mann–Whitney Test Analysis

The Mann–Whitney test, presented in Table 11, reveals significant divergences in perceptions between local administrative services and development NGOs regarding SDG integration. NGOs show a significantly stronger belief in the alignment of SDGs with local realities (mean rank = 150.8 for NGOs vs. 140.6 for local administrative services, U = 4212.0, $p = 0.022$) and their transformative impact on urban sustainability practices (mean rank = 160.2 for NGOs vs. 146.1 for local administrative services, U = 4521.5, $p = 0.044$), highlighting their proactive role in adapting global frameworks to local contexts and driving sustainability initiatives. Despite this, NGOs exhibit a marginally higher mean rank compared to local administrative services (160.2 vs. 135.0), though the difference is not statistically significant ($p = 0.067$). This suggests that the perceptions of both groups regarding resource adequacy are largely consistent, with only a marginal divergence that may warrant further exploration.

Table 11. Mann–Whitney test analysis.

Items	Compared Groups	Mean Rank (Loc. Ad. Serv.)	Mean Rank (NGOs)	U (Statistic)	*p*-Value	Conclu.
The SDGs are well-suited to the local realities and specific challenges faced by your city.	Local Ad. Serv. **vs.** Dev. NGOs	140.6	150.8	4212.0	0.022	Sig. Diff.
The integration of the SDGs into urban plans is facilitated by the availability of adequate resources and the provision of appropriate tools.	Local Ad. Serv. **vs.** Dev. NGOs	135.0	160.2	4589.5	0.067	Not Sig. Diff.
The integration of the SDGs into urban plans has improved the effectiveness of urban projects in terms of tangible outcomes.	Local Ad. Serv. **vs.** Dev. NGOs	146.1	160.2	4521.5	0.044	Sig. Diff.

Loc. Ad. Serv.: local administrative services, Dev.: development, Conclu.: conclusion; Sig. Diff.: significance difference (source: authors, 2024).

4.5.4. Exploratory Factor Analysis (EFA): Synergies Among SDGs

The exploratory factor analysis presented in Table 12 identifies three key factors explaining the interactions among the SDGs. First, Factor 1 (Environment), which includes SDGs 6, 7, and 13, accounts for 38.5% of the total variance, emphasizing synergies in resource access and climate change mitigation. Second, Factor 2 (Social), which includes SDGs 3, 4, and 11, explains 25.7% of the variance, highlighting the interdependence between health, education, and sustainable urban communities. Third, Factor 3 (Economy), which includes SDGs 8, 9, and 12, explains 18.3% of the variance, underscoring the importance of inclusive economic growth, innovation, and responsible consumption. These results, which highlight the interlinkages among environmental, social, and economic dimensions, further emphasize the need for integrated approaches to maximize the SDGs' impact in urban contexts.

Table 12. Exploratory Factor Analysis (EFA): Synergies among SDGs.

Main Factors	Strongly Correlated SDGs	Explained Variance (%)
Factor 1: Environment	SDG 6, SDG 7, SDG 13	38.5
Factor 2: Social	SDG 3, SDG 4, SDG 11	25.7
Factor 3: Economy	SDG 8, SDG 9, SDG12	18.3

(Source: authors, 2024).

4.5.5. ANOVA Analysis: Comparison of Barrier Means Across Socio-Professional Groups

The ANOVA analysis presented in Table 13 reveals statistically significant differences in the perception of barriers to SDG integration among the studied socio-professional groups. For instance, the lack of effective multisectoral coordination, with mean scores of 4.1 for Local Administrative Services and 4.2 for NGOs, is identified as a critical barrier. The *p*-value of 0.003 confirms the statistical significance of the difference, reflecting greater frustration among NGOs, whose initiatives often rely on intersectoral synergies that are frequently lacking. Similarly, insufficient municipal budgets, though exhibiting less variance (mean scores ranging from 3.9 to 4.1), show a significant difference ($p = 0.015$). This indicates a shared recognition of the barrier, though with subtle differences in perception across groups. Local Administrative Services, which are responsible for budget allocation and management, view this financial shortfall as an immediate operational constraint, while NGOs perceive it as a barrier to forging partnerships and securing external funding. Lastly, low public awareness presents a marked disparity (mean score of 4.4 for Civil Society Organizations versus 3.8 for Development Committees), with a *p*-value of 0.002. This difference underscores divergent perspectives on the importance of community engagement.

Civil Society Organizations, often in direct contact with the public, report limited support for SDG initiatives, whereas Development Committees with more institutional roles may underappreciate this challenge.

Table 13. ANOVA analysis: comparison of barrier means across socio-professional groups.

Barriers	Socio-Professional Group	Mean (μ)	F-Statistic	p-Value
Absence of multisectoral coordination	Local Administrative Services	4.1	5.6	0.003
	Municipal Technical Services	4.0		
	NGOs	4.2		
Insufficient municipal budgets	Local Administrative Services	3.9	4.2	0.015
	Municipal Technical Services	4.0		
	NGOs	4.1		
Low public awareness	Civil Society Organizations	4.4	7.1	0.002
	Development Committees	3.8		
Lack of a centralized database	Municipal Technical Services	4.1	6.3	0.005
	Local Administrative Services	4.0		

(Source: authors, 2024).

5. Proposed Solutions and Concrete Means and Tools for SDGs Integration into Urban Plans

This section outlines the solutions proposed by key informants to address the barriers hindering the integration of the SDGs into urban planning. These solutions, based on a rigorous and multifaceted methodology that includes both interviews and surveys, tackle several key dimensions, including institutional, economic, and social factors, as well as the critical issue of data accessibility. Table 14 below distills these solutions, systematically organized into relevant categories, to offer a comprehensive overview and highlight the integrated, holistic approach crucial for the effective mainstreaming of SDGs into urban planning.

First and foremost, one of the primary challenges identified by key stakeholders concerns the critical need to enhance both awareness and capacity-building within local communities regarding the SDGs. One proposed solution is the organization of participatory awareness workshops for stakeholders, accompanied by the development of a detailed operational manual for SDG integration, carefully tailored to the specificities of local contexts and challenges. Additionally, stakeholders emphasized the importance of adapting tools to local realities to ensure the relevance and effectiveness of SDG implementation, which includes designing bespoke training programs. The mean score of 4.25, with a standard deviation of 0.85, indicates a strong consensus on the pressing need to strengthen training and awareness initiatives.

Regarding the coordination of actions supporting the integration of the SDGs into urban plans, stakeholders have emphasized the imperative of implementing a multi-sectoral approach supported by participatory mechanisms. These measures aim to foster robust intersectoral collaboration and ensure that SDG implementation is both comprehensive and inclusive. Central to this strategy is the establishment of a permanent multisectoral committee tasked with overseeing coordination efforts, along with the development of a digital platform to streamline information exchange across sectors. An average score of 4.30, with a standard deviation of 0.75, indicates a compelling consensus in favor of this cohesive and inclusive framework.

Table 14. Proposed solutions and concrete means and tools for SDGs integration into urban plans.

Domains	Proposed Solutions	Mean	Stand. Dev.	Concrete Means and Tools
Stakeholder Perception	Strengthen awareness and training on SDGs.	4.25	0.85	- Organize participatory awareness workshops for all stakeholders; - Develop an operational manual on SDG integration for Moundou.
	Develop tools adapted to local realities.	4.10	0.78	
Coordination of actions related to the SDGs	Promote a multisectoral approach.	4.30	0.75	- Set up a permanent multisectoral committee to coordinate stakeholder actions; - Develop a digital platform for information sharing between sectors.
	Implement participatory mechanisms.	4.20	0.80	
Resources and Tools	Create dedicated funding.	3.95	0.88	- Establish a local sustainability fund supported by green taxes; - Organize certified training programs for municipal officers on SDG management; - Acquire specialized software for indicator tracking.
	Train specialized teams.	4.00	0.90	
Institutional Barriers	Decentralize decision-making processes.	4.40	0.70	- Develop and adopt a municipal charter on SDG integration; - Create an urban observatory to assess the impact of decisions on SDGs; - Establish a single window for local stakeholders.
	Develop a robust legislative framework.	4.35	0.72	
Economic Barriers	Diversify funding sources.	4.15	0.85	- Develop a public-private partnership program to finance sustainable projects; - Create a crowdfunding mechanism for local initiatives; - Develop a fiscal framework to encourage sustainable investments.
	Introduce fiscal incentives.	4.00	0.90	
Community Participation	Set up regular consultation processes.	4.10	0.82	- Use digital tools to collect citizens' opinions (online surveys, mobile apps); - Organize quarterly community forums; - Develop local clubs to promote citizen engagement in SDG initiatives.
	Organize awareness campaigns.	4.05	0.85	
Socio-Cultural Barriers	Raise awareness within communities about the benefits of SDGs.	4.25	0.78	- Train traditional leaders on SDGs and their role in urban sustainability; - Create a series of audiovisual content in local languages to simplify SDG concepts; - Organize intercultural dialogues to promote acceptance of necessary changes.
	Work with community leaders.	4.15	0.80	
Data Access Barriers	Create centralized databases.	4.20	0.83	- Develop a centralized urban portal for SDG-related data; - Use GIS (Geographic Information Systems) technology for monitoring and analyzing indicators; - Collaborate with research institutes for the collection and processing of local data.
	Set up open digital platforms.	4.10	0.85	

Stand. Dev.: standard deviation (source: authors, 2024).

Access to appropriate resources and tools for SDG integration constitutes a critical strategic dimension. The moderate endorsement of the proposed solutions, as demonstrated by an average score of 3.95 and a standard deviation of 0.88, underscores the need for targeted resource allocation. One of the primary recommendations from stakeholders is the establishment of dedicated financing mechanisms, such as a locally managed sustainability fund supported by green taxes. Additionally, the creation of certified training programs for municipal officials to enhance their expertise in SDG management was emphasized. Similarly, the procurement of specialized software for precise monitoring and tracking of SDG indicators was suggested as an essential step.

One of the most critical challenges consistently highlighted by stakeholders is the imperative to overcome institutional barriers. To address this, several pivotal solutions have been proposed, foremost among them the effective decentralization of decision-making processes, with the goal of devolving greater authority to local governments. Alongside

this, stakeholders emphasize the strengthening of a robust and coherent local legislative framework to facilitate the integration of the SDGs. Specific recommendations include the formulation and adoption of a municipal charter formalizing the commitment to SDG integration, the establishment of an urban observatory to rigorously evaluate the consequences of decisions on SDG outcomes, and the creation of a comprehensive one-stop-shop designed to streamline coordination and amplify stakeholder engagement. These proposals have garnered substantial support, with average scores of 4.40 and 4.35 and standard deviations of 0.70 and 0.72, respectively, underscoring a broad consensus on the critical role of institutional reform as an indispensable lever for ensuring the sustainable and effective mainstreaming of the SDGs.

The average scores of 4.15 and 4.00, accompanied by standard deviations of 0.85 and 0.90, reflect moderate but significant support for these economic strategies while simultaneously underscoring the challenges inherent in securing sustainable financing. Stakeholders have meticulously highlighted the economic barriers to SDG integration, advocating for a multifaceted approach, including the diversification of funding sources and the implementation of strategic tax incentives. Paramount among the proposed solutions is the development of robust public–private partnerships aimed at financing long-term sustainable projects, alongside the establishment of innovative crowdfunding mechanisms to strengthen local initiatives. Furthermore, the proposal to introduce a comprehensive fiscal framework designed to stimulate sustainable investments was identified as a pivotal lever for advancing long-term SDG integration.

Regarding the integration of the SDGs into urban planning, stakeholders emphasized the pivotal role of community participation and the necessity of overcoming socio-cultural barriers to ensure successful implementation. Proposed solutions to foster community inclusion included the establishment of structured consultation mechanisms, the deployment of digital tools to capture citizen feedback, and the organization of quarterly community forums, all aimed at enhancing dialogue and collective decision-making. Furthermore, the creation of local clubs was proposed as a strategy to strengthen citizen engagement in SDG-oriented initiatives. These proposals garnered a notably high average score of 4.10, with a standard deviation of 0.82, signifying broad consensus on the critical importance of community-based approaches for the effective realization of the SDGs. In parallel, to address the socio-cultural barriers that may impede SDG adoption, stakeholders advocated for initiatives such as raising awareness of the SDGs' benefits, training traditional leaders, and producing audiovisual content in local languages to make SDG concepts more accessible. Additionally, intercultural dialogues were recommended as a strategy to cultivate acceptance of the necessary transformative changes. These solutions received robust support, with average scores of 4.25 and 4.15 and standard deviations of 0.78 and 0.80, respectively, emphasizing the widespread recognition of the need to dismantle socio-cultural barriers for SDG integration.

Finally, stakeholders emphasized the critical importance of enhancing access to data to facilitate the monitoring and evaluation of SDGs. Proposed solutions include the establishment of centralized databases, the development of a digital platform dedicated to SDG-related data, and the incorporation of Geographic Information Systems (GIS) into the monitoring and analysis of SDG indicators. Additionally, fostering collaboration with research institutions for data collection and processing was suggested. The average score of 4.20, with a standard deviation of 0.83, highlights the paramount significance of data management infrastructure in facilitating the effective integration of SDGs, highlighting the consensus on its critical role in advancing sustainable development.

6. Discussion, Limitations, and Research Perspective

In 2015, the United Nations introduced an ambitious framework of 17 SDGs designed to address multifaceted and interrelated global challenges. However, significant socio-economic disparities and distinct local priorities highlight the need for a rigorous contextualization of the SDGs [33]. While extensive literature examines the interconnections between these goals at the national level [32–37], studies focusing on their integration into urban strategies remain limited [83,84]. Furthermore, comprehensive and systematic research into the specific barriers to urban-scale integration, particularly in resource-constrained regions such as sub-Saharan Africa, is notably lacking [97,99]. To address this significant gap, the present study adopts a mixed-methods approach, combining qualitative and quantitative analyses to systematically identify and analyze the structural and contextual obstacles to SDG integration in urban planning. Taking the city of Moundou, Chad, as a case study, the study offers a nuanced perspective on the complex dynamics and unique challenges faced by urban contexts in this region.

6.1. Key Informants' Perceptions of the Integration of the SDGs into Urban Plans

This research primarily focuses on analyzing key informants' perceptions of the integration of the SDGs into urban plans. The findings consistently underscore the SDGs' strategic importance as tools for advancing sustainability. However, they also reveal a significant gap between the conceptual alignment of these goals and the tangible priorities guiding urban development. This misalignment highlights a lack of comprehensive planning for integration mechanisms, exacerbated by limited resources and the absence of effective methodological tools—a challenge widely documented in studies on SDG operationalization in African contexts [54,58]. Previous research demonstrates that while local actors often recognize the relevance of the SDGs, this recognition often fails to result in substantive action, primarily due to the lack of sufficient frameworks and resources [39,54,55,58]. These findings necessitate a critical reassessment of SDG implementation strategies, emphasizing the need for strategic resource mobilization and the development of context-specific mechanisms to align local priorities with the overarching objectives of the SDGs.

The findings also reveal that integrating the SDGs into urban plans is hindered by a fragmented approach to stakeholder engagement and inadequate methodologies, leading to limited participation and feelings of exclusion. This reflects the prevalence of non-inclusive frameworks, in which the involvement of local communities and civil society organizations is minimal. As one key informant (X) observed: "*Public consultations remain selective, do not involve a sufficient number of people, and fail to adequately address the real concerns of local communities*". Scholars attribute this lack of participation to the technical and financial constraints faced by local authorities, which often struggle to raise awareness and mobilize a broad range of stakeholders [54,58,99]. In many sub-Saharan African cities, these challenges are exacerbated by the absence of comprehensive SDG monitoring and evaluation mechanisms and poor coordination among relevant actors. These findings corroborate the observations made by Parnell (2022) and Croese (2022), who emphasized that fragmented efforts among stakeholders undermine the effectiveness of SDG integration at the urban level [98,99]. Addressing these barriers necessitates the development of robust, context-specific mechanisms for raising awareness and fostering dialogue, in line with the recommendations outlined in the UN-Habitat report (2023) [49].

6.2. Recognizing SDG Synergies: Diverging Knowledge Gaps Among Key Informants

The synergies most frequently identified by stakeholders are those connecting SDG 11 to SDGs 6, 7, and 13, while the links to SDGs 3, 9, and 12 are perceived as less significant. This emphasis underscores the critical importance of urgent issues, such as access to clean

water and sanitation (SDG 6), electricity (SDG 7), and climate change adaptation (SDG 13). These findings align with studies by Nagati et al. (2023) and Haou et al. (2024), which identify SDGs 6, 7, and 11 as strategic priorities for sub-Saharan African governments seeking to improve living conditions [9,58]. The research further reveals that municipal administrators and NGO representatives tend to possess a deeper understanding of SDG synergies, likely due to their consistent engagement in initiatives addressing these goals. Conversely, other stakeholders often exhibit limited awareness, a gap attributed to inadequate training and the absence of inclusive mechanisms [98]. This underscores the necessity of a systemic understanding of SDG interlinkages, echoing the arguments of Anderson et al. (2021), who argue that fragmented knowledge of SDG synergies undermines the coherence and impact of sustainable urban development policies [35]. Moreover, complementary studies underscore the importance of integrating the SDGs into urban planning while simultaneously addressing environmental and socio-economic interdependencies [39,41,42]. Tailored training and awareness campaigns are thus essential for empowering stakeholders. As one civil society representative (Y) stated: "*As a member of civil society, I have participated in a few workshops, but my knowledge remains limited. Comprehensive training is crucial for us to make a meaningful contribution to the development of our city*".

6.3. Multidimensional Barriers to SDG Integration in Urban Plans

Several structural barriers hindering the effective integration of the SDGs into urban plans were identified by key informants, which can be classified into four interrelated dimensions. Among these, the institutional dimension was unanimously recognized as crucial by all surveyed socio-professional categories. Key challenges include ineffective governance, characterized by excessive centralization of decision-making and inadequate coordination among stakeholders. These institutional deficiencies highlight the systemic incapacity of Moundou's administrative framework to design and implement strategies in line with the SDGs. Strengthening local institutional capacities emerges as an urgent priority [51,54]. This requires the establishment of a decentralized, participatory governance model that fosters coherent stakeholder engagement and strategic planning suited to local contexts [135]. At the same time, the economic dimension presents itself as a significant barrier. Stakeholders highlighted the persistent inadequacy of municipal budgets, the excessive dependence on external funding, and the prohibitive costs of green technologies, which are critical for achieving SDG targets 6, 9, 11, and 15. These constraints expose a structural financial fragility that undermines both the ambition and the effectiveness of local initiatives. The literature supports these findings: studies by Jiya and Falinya (2022) and Jaiyesimi (2016) underscore that the absence of robust financing mechanisms, combined with inefficient tax systems, represents a major obstacle to SDG implementation at the local level [136,137].

Key informants also highlighted several significant barriers related to socio-cultural aspects, including insufficient public awareness and widespread resistance to change, which reflects the deep influence of local social dynamics on the integration of the SDGs into urban planning. These findings align with those of Jaiyesimi (2016) and Klopp and Petretta (2017), who demonstrated that cultural resistance, social inequalities, and lack of awareness are significant barriers hindering SDG integration at the local level [137,138]. Moreover, tensions between traditional cultural practices and global objectives, as noted by the Development Committees, underscore the importance of adopting a culturally sensitive approach to overcoming resistance. This need is further emphasized by Ngubane and Pillay (2023), who advocate for a contextual understanding of SDG integration within African municipalities [139]. Furthermore, challenges in data collection and harmonization, exacerbated by the absence of centralized databases and gaps in analytical capacities, reveal systemic

deficiencies in information governance. These issues, highlighted by Klopp and Petretta (2017), emphasize the fundamental role of reliable, accessible data in tracking progress and guiding decision-making for the effective integration of SDGs [138]. Ultimately, the lack of a robust legal framework for urban data management exacerbates concerns regarding transparency and data protection among stakeholders. This issue, identified by Che (2020) [140], underscores the urgent need for specific legislation and an authoritative body to oversee urban data management, ensuring both security and transparency.

6.4. Research Strengths and Limitations

One of the main strengths of this research is its innovative methodological approach, which integrates both qualitative and quantitative techniques to elucidate the complexities of SDG integration into urban planning. This hybrid approach, as advocated by Nagati et al. (2023) [58], enables a nuanced analysis of stakeholder perceptions and captures the multidimensional challenges inherent in sustainable urban governance. Furthermore, the study addresses a critical gap in the literature by focusing on sub-Saharan Africa, a region that is often overlooked in discussions on SDG implementation. By systematically examining barriers specific to urban planning, this research goes beyond previous studies, such as those by Mutambissi and Chavunduka (2023) [54], which primarily emphasize institutional reforms.

Another key strength of this study lies in its focus on practical, context-specific outcomes. Drawing on insights from Mtapuri and Myeni (2020) [55], the study proposes actionable strategies to address institutional and economic challenges, including weak coordination and excessive reliance on external funding. By recommending targeted interventions—such as capacity-building initiatives and enhanced data management systems—the study offers evidence-based solutions for policymakers. These recommendations align with Anderson et al.'s (2021) [35] call to identify synergies and manage trade-offs in SDG implementation, thus providing a roadmap for advancing urban sustainability.

Notwithstanding these contributions, several limitations must be acknowledged. Being a single-case analysis, the findings are inherently context-specific and may lack full generalizability, a common limitation in case study research [9]. Although Moundou provides a valuable lens through which to explore urban challenges in sub-Saharan Africa, further studies in diverse urban contexts are needed to substantiate these findings. Furthermore, by focusing exclusively on formal urban plans, the study overlooks informal practices, which play a significant role in cities like Moundou and fails to adequately represent marginalized groups, such as informal settlers or squatters [108]. The temporal scope, limited to current barriers, reflects limitations identified by Ngubane et al. (2023) in African urban studies [139]. Finally, challenges in accessing reliable data expose broader systemic issues in developing countries, as highlighted by Wu et al. (2023) [32]. Future research should, therefore, refine this framework by integrating inclusive governance mechanisms, addressing stakeholder interdependencies, and accounting for informal dynamics in order to optimize SDG integration across diverse urban contexts in sub-Saharan Africa.

7. Conclusions

This study employed a mixed-methods approach to provide a rigorous and multidimensional analysis of the barriers to integrating the SDGs into urban planning, with a focus on the city of Moundou, Chad, as a case study. It provides actionable insights pertinent to the studied urban context and offers valuable lessons for other cities across Sub-Saharan Africa. By addressing three well-defined research questions, the study identified the following key findings:

1. Key informants' perceptions

Key stakeholders, including local administrative services, municipal technical services, development NGOs, and civil society organizations, consider the integration of SDGs essential for advancing urban sustainability. However, their perspectives highlight a misalignment between SDG priorities and local realities. Stakeholders expressed concerns about inadequate participatory processes, limited public awareness, and weak institutional frameworks, which collectively hinder effective integration.

2. Primary identified Barriers

Four key dimensions of barriers were identified:

- Institutional barriers, accounting for 38.46% of the total, encompass weak multisectoral coordination, limited capacity for long-term planning, and inadequate regulatory frameworks, among other factors;
- Economic barriers, accounting for 23.08% of the total, include excessive reliance on external funding, the prohibitive costs of green technologies, and the lack of fiscal incentives to promote sustainable initiatives, among others;
- Socio-cultural barriers, accounting for 23.08%, are primarily characterized by low public awareness and resistance to change within communities, which further exacerbate the challenges of sustainable development;
- Data access barriers, representing 15.38% of the total, arise from the absence of centralized databases, insufficient training, and reliance on outdated data, all of which impede evidence-based decision-making.

3. Strategic and practical solutions

In order to effectively address these barriers, the study proposes the following strategic and practical solutions:

- Enhancing institutional capacities through targeted training programs and strengthened multisectoral coordination, ensuring that key stakeholders are equipped to drive SDG initiatives;
- Establishing robust financial mechanisms, such as environmental levies and dedicated sustainability funds, to provide resilient funding sources for SDG-related initiatives;
- Promoting public awareness campaigns and fostering community engagement, thereby cultivating a culture of sustainability that involves all societal stakeholders;
- Improving data accessibility and availability by developing centralized databases and promoting transparent data-sharing practices, which are essential for evidence-based decision-making and policy formulation.

These findings underscore the intrinsic complexity of integrating SDGs into urban plans, particularly in resource-constrained environments, and emphasize the need for context-specific strategies. While the insights derived from Moundou may not be universally applicable to all sub-Saharan African cities, they offer a valuable, adaptable methodological framework and practical lessons that can inform similar studies in comparable settings. Future research should focus on tailoring these approaches to diverse urban contexts, considering their distinct socio-economic, cultural, and environmental challenges.

By addressing fundamental knowledge gaps, this study contributes significantly to the advancement of urban sustainability. It provides actionable recommendations for policymakers, urban planners, practitioners, and scholars seeking to enhance the integration of SDGs into urban planning frameworks, thereby promoting more sustainable, inclusive, and resilient urban development in the region.

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