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Poor governance and weak social cohesion in Somalia's Climate-stressed settings: the mediating effects of economic inefficiencies and limited human development

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ABSTRACT

The purpose of this study is to investigate the complex relationship between poor governance and weak social cohesion in Somalia's Climate-vulnerable setting, with a specific focus on how economic inefficiencies and limited human development mediate this dynamic. The study employs Structural Equation Modeling (SEM) to analyze survey data from Somalia, assessing the impact of poor governance, economic inefficiencies, and limited human development on social cohesion. The findings confirm that economic inefficiencies significantly contribute to weak social cohesion, while poor governance exacerbates both economic inefficiencies and limited human development. This cyclical relationship perpetuates social fragmentation, illustrating the critical need for governance reforms and targeted investments in human development to rebuild social cohesion. The study highlights the importance of integrated policy interventions that address governance reforms alongside economic revitalization and human development initiatives. Anti-corruption measures, equitable resource distribution, and community-based programs are essential to restoring social cohesion and fostering sustainable stability in post-conflict settings like Somalia. This research presents a conceptual model linking governance, economic, and social dimensions in a fragile post-conflict context, offering new insights into the cyclical effects of poor governance on recovery outcomes. This study reveals how governance failures and economic inefficiencies weaken social cohesion in fragile states.

IMPACT STATEMENT

This study provides critical insights into the intricate relationship between poor governance, economic inefficiencies, and weak social cohesion in Somalia's climate-vulnerable and post-conflict setting. By employing Structural Equation Modeling (SEM), the research identifies how governance failures exacerbate economic stagnation and hinder human development, ultimately fragmenting social cohesion. The findings emphasize the urgent need for governance reforms, economic revitalization, and human development investments to break this cycle of instability. This study contributes to policy discourse by presenting a conceptual model that links governance, economic, and social dimensions, offering practical recommendations for fostering sustainable stability in fragile states.

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Introduction

Somalia has experienced prolonged civil unrest and political instability, stemming largely from its complex colonial legacy that led to arbitrary borders and ignored intricate clan dynamics Hussein (2023). These historical divisions have been exacerbated by post-independence political strife, causing deep-seated fragmentation and impeding the establishment of a strong, centralized governance (Acero & Thomson, 2022). The resulting political vacuum has allowed clan militias and warlords to dominate, which in turn has stunted political and economic development across the nation (Olawumi, 2023). This backdrop of instability has been compounded by external interventions and the absence of effective governance structures, which has often aggravated local conflicts and undermined peace efforts

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(Mohamed, 2021). Economic inefficiencies in Somalia's Climate-stressed Settings thrives under these conditions, characterized by a stark dichotomy between urban development and rural stagnation. While cities like Mogadishu show signs of economic revival, the rural areas remain entrenched in poverty and underdevelopment, highlighting the urgent need for inclusive economic policies (Bakonyi et al., 2019).

The Somali socio-economic landscape is marked by stark inequalities that are not only economic but also deeply entrenched in the socio-political fabric of the nation. Economic opportunities and resources are concentrated in the hands of a few, often aligned with dominant clans, thereby perpetuating wealth disparities and inhibiting social mobility (Nyadera et al., 2020). The urban-rural divide further exacerbates these inequalities, with urban areas attracting investments and development projects, while rural zones suffer from neglect and lack of basic services (Guo & Wang, 2021; Nor & Raheem, 2024). These economic disparities are interwoven with clan divisions, which intensify social tensions and conflict, undermining national cohesion and the trust in governmental institutions. The lack of access to essential services in disadvantaged areas deepens the cycle of poverty, with significant portions of the population unable to escape the conditions of their birth (Haider, 2020) (Simbolon, 2022). Such entrenched disparities challenge the establishment of a unified national identity and continue to fuel cycles of violence and instability.

The persistent economic inefficiencies in Somalia's Climate-stressed Settings poses a significant barrier to the nation's stability and development. Despite some progress in urban centers, vast swaths of the country remain mired in poverty, with limited access to essential services and economic opportunities. This inequality not only affects economic growth but also erodes social cohesion and exacerbates clan-based tensions (Abdulahi, 2022) (Smith & Wesselbaum, 2023). The situation is made worse by the impacts of climate change, which disproportionately affect the most vulnerable populations, thereby magnifying existing inequalities and creating a cycle that is difficult to break (Cai et al., 2021). The lack of a coherent strategy to address these inequalities means that large portions of the Somali population are excluded from participating in and benefiting from any economic advancements. The continued neglect of rural and remote areas, coupled with inadequate policy responses to urban poverty, means that economic development is uneven and its benefits are not universally felt. This has significant implications for peace and development efforts, necessitating a multi-dimensional approach to understanding and addressing the roots of economic disparity (Braam et al., 2021).

This study is driven by the critical need to understand and address the deep-seated economic inefficiencies that underpin much of the social unrest and political instability in Somalia's Climate-stressed Settings. By exploring the nexus between poor governance, economic inefficiencies and social cohesion, this research aims to provide nuanced insights into the barriers to national unity and development (Alinor Abdi Osman & Abebe, 2023). The motivation extends beyond academic inquiry; it seeks to inform policy-making and intervention strategies that can effectively target the roots of economic challenges and foster a more inclusive society. Furthermore, the study is motivated by the potential to contribute to a more stable and equitable Somali society through improved understanding of the mechanisms by which poor governance and economic inefficiencies affect social cohesion. By identifying effective strategies for addressing both poor governance and economic inefficiencies, this research aims to support efforts to build trust in institutions, enhance community integration, and ultimately contribute to a more cohesive national identity (Abdulahi A Osman, 2019).

The significance of this study extends beyond academic circles, offering practical insights that can guide policymakers and international stakeholders. By identifying the underlying factors that contribute to economic disparity and its impact on societal stability, the findings can help in formulating strategies that promote inclusivity and economic balance. This approach not only aims to mitigate the immediate effects of inequality but also fosters long-term peace and stability in Somalia's Climate-stressed Settings, making the study crucial for efforts aimed at sustainable development and conflict resolution. Despite the substantial body of research on economic development and social conflicts in Somalia's Climate-stressed Settings, there remains a noticeable gap in studies that comprehensively analyze the multifaceted impacts of economic inefficiencies on social cohesion. Current literature often focuses on isolated aspects of this issue, such as the economic revival in urban areas or the impacts of international aid, without a holistic analysis of how these elements interact within the broader socio-political framework. Moreover, the nuanced role of clan dynamics in economic disparities and their implications for national unity and social stability is insufficiently explored, indicating a critical need for integrated research in this area. Hence, the purpose of this study is to investigate the complex relationship between poor governance and weak social cohesion

in Somalia's Climate-stressed Settings, with a specific focus on how economic inefficiencies and limited human development mediate this dynamic.

Literature review

Economic inefficiencies and social cohesion in Somalia's Climate-stressed Settings

The historical context of economic inefficiencies and social cohesion in Somalia's Climate-stressed Settings is intricately linked to the nation's colonial past and the subsequent formation of arbitrary borders that failed to account for the complex clan dynamics present in the region. Following independence, these divisions deepened, leading to persistent political and social conflicts that have hindered national unity (Balthasar, 2014; Menkhaus, 2003). The uneven distribution of resources and wealth has exacerbated these conflicts, with economic inefficiencies emerging not merely from poor governance or a lack of resources but as a direct consequence of the historical and social intricacies of the Somali society (Ingiriis, 2020; Jonyo & Eno). As noted by Colletta and Cullen (2000), clan affiliations significantly influence resource allocation, resulting in resentment and mistrust among competing groups. This socio-economic divide is visually represented in contemporary analyses, underscoring the persistent influence of clan affiliations in shaping Somalia's Climate-stressed Settings's political landscape (Betts et al., 2022).

Moreover, the fragmentation within Somali society serves as a significant barrier to achieving social cohesion, as the socio-economic inequalities perpetuated by clan divisions complicate efforts to forge a unified national identity (Balthasar, 2017). The interplay between economic inefficiencies and social fragmentation creates a vicious cycle, where poverty and limited opportunities breed grievances, ultimately leading to further conflict and exacerbated disparities (Vergolini, 2011). The Somali government faces substantial challenges in mitigating these issues, grappling with limited resources, insufficient institutional capacity, and ongoing security concerns (Dahir & Sheikh Ali, 2024). While international interventions have sought to stabilize the region through aid and peacekeeping efforts, they have occasionally exacerbated existing inequalities, emphasizing the necessity for a more localized and context-sensitive approach to development (Lyons & Samatar, 2010). Addressing the intertwined challenges of economic inefficiencies and social cohesion requires Somalia's Climate-stressed Settings to pursue inclusive economic policies, invest in essential infrastructure and education, and cultivate a national dialogue that bridges clan divides, thereby fostering a more cohesive and resilient society.

Understanding and addressing poor governance in Somalia's Climate-stressed Settings

Poor governance in Somalia's Climate-stressed Settings is a multifaceted issue that has significantly impeded the country's development and stability. Since the collapse of the central government in 1991, Somalia's Climate-stressed Settings has faced a protracted state of political fragmentation and insecurity, which has severely hindered the establishment of effective governance structures (Menkhaus, 2003). The absence of a cohesive national government has led to the rise of various regional authorities and clan-based administrations, resulting in a lack of uniformity in law enforcement, resource allocation, and public service delivery (De Waal, 2020). Moreover, pervasive corruption and the prevalence of nepotism within these fragmented institutions have further eroded public trust, creating an environment where citizens feel marginalized and disenfranchised (Byulegenova et al., 2024; Dauda, 2020). This erosion of trust undermines the legitimacy of existing governance structures, making it challenging to implement essential reforms aimed at fostering accountability and transparency (Bargués & Morillas, 2021). Consequently, poor governance not only hampers effective policy implementation but also contributes to ongoing cycles of violence and conflict, as groups vie for power and control over scarce resources.

Addressing poor governance in Somalia's Climate-stressed Settings necessitates a comprehensive approach that involves both institutional reform and capacity building at multiple levels. Strengthening governance frameworks requires the establishment of transparent and accountable institutions that transcend clan divisions and promote national unity (Sofyani et al., 2020; Vian, 2020). Efforts must focus on creating a more inclusive political environment where all stakeholders, including marginalized communities, have a voice in decision-making processes (Eikelenboom & Long, 2022). Additionally, fostering civil

society engagement and enhancing the role of local governance structures can empower communities to participate actively in governance and hold authorities accountable (Hu & Zhu, 2021; Thelma, 2024). International support, including technical assistance and capacity-building initiatives, is also crucial in reinforcing governance frameworks and enabling Somali institutions to effectively deliver public services (Mugi, 2020). Ultimately, addressing the challenges of poor governance in Somalia's Climate-stressed Settings requires a concerted effort that aligns local needs with broader development goals, fostering a resilient political landscape capable of promoting peace, stability, and sustainable development in the region (Samatar & Samatar, 2022).

Understanding and addressing limited human development in Somalia's Climate-stressed Settings

Limited human development in Somalia's Climate-stressed Settings is a critical challenge that has significant implications for the country's overall stability and growth. Despite some progress in recent years, Somalia's Climate-stressed Settings remains one of the lowest-ranked countries on the Human Development Index (HDI), reflecting dire conditions in health, education, and income (Lind, 2019). A protracted history of conflict, political instability, and inadequate governance has led to severe disruptions in essential services, contributing to widespread poverty and poor health outcomes. For instance, the lack of access to quality education and healthcare has left a significant portion of the population ill-equipped to participate meaningfully in the economy, further perpetuating cycles of inequality and underdevelopment (Mawere & Nenduva, 2016). Furthermore, limited human development is exacerbated by factors such as high unemployment rates, especially among youth, and gender disparities that hinder women's access to education and economic opportunities (Devonald et al., 2021). As a result, the potential for human capital development remains unrealized, stifling Somalia's ability to achieve sustainable growth and resilience in the face of ongoing challenges.

Addressing limited human development in Somalia necessitates a multi-dimensional approach that prioritizes investments in education, healthcare, and economic opportunities. Enhancing the quality of education is paramount; this includes not only increasing access but also improving the curriculum and training for educators to ensure that students acquire relevant skills (Verma et al., 2021). In parallel, the healthcare system requires significant reforms to improve accessibility and quality, particularly in rural areas where services are often lacking (Malakoane et al., 2020). Moreover, economic initiatives should focus on job creation and promoting inclusive growth that empowers marginalized groups, particularly women and youth (Pradhan et al., 2021). International collaboration and support are vital in these efforts, as they can provide technical assistance, funding, and expertise to strengthen local capacities (Khalif, 2022). Ultimately, by investing in human development, Somalia can lay the groundwork for a more stable and prosperous future, fostering a resilient society capable of overcoming its historical challenges.

Theoretical foundations

Social cohesion theory

Social cohesion theory is pivotal in understanding the interconnectedness and resilience of communities, emphasizing the significance of shared norms, values, and institutions in fostering societal stability. This theoretical framework posits that the strength of social ties and a common sense of belonging are crucial for societal harmony and effective governance. According to Durkheim (2023), social cohesion is facilitated through 'mechanical' and 'organic' solidarity, where the former derives from the homogeneity of individuals in a society, and the latter from the interdependence created by a division of labor. These forms of solidarity highlight how social cohesion can manifest differently depending on the societal structure and cultural context, affecting everything from social order to individual well-being (Durkheim, 2023).

Research in social cohesion further explores the role of trust and reciprocity among community members as fundamental components that enhance cooperative behaviors and collective action. Putnam (2001) argues that social networks enriched with civic engagement and trust not only foster stronger community ties but also enhance the performance of democratic governance and economic development. High levels of social trust encourage participation in communal activities, reduce transaction costs in economic dealings, and facilitate quicker and more efficient collective responses to social challenges.

This causal relationship between trust, social networks, and social cohesion underscores the impact of societal ties on the broader socio-economic landscape (Putnam, 2001).

Moreover, the integration of diverse groups and the reduction of social inequalities are also critical to achieving high levels of social cohesion. Studies suggest that policies promoting inclusivity and equality, particularly those addressing racial, ethnic, and economic disparities, significantly contribute to the strengthening of social cohesion. Maldonado Valera et al. (2022) highlight that inclusive societies that effectively manage diversity through equitable social policies tend to exhibit stronger cohesion, which in turn supports social stability and peace. In contrast, exclusion and inequality can exacerbate social divisions and undermine cohesion, leading to conflicts and societal breakdowns. Therefore, understanding and enhancing social cohesion is not only a matter of social justice but also a crucial strategic approach for policymakers aiming to foster sustainable and resilient communities (Chan & Chan, 2008).

Governance theory

Governance theory provides a critical framework for understanding the mechanisms through which institutions manage public resources and how these mechanisms influence societal outcomes (Ostrom, 1990). At its core, governance encompasses various elements, including transparency, accountability, and citizen participation, which are essential for effective institutional performance (Harrison & Sayogo, 2014; O'Donnell, 1998). Poor governance often manifests in a lack of these key attributes, leading to inefficiencies in resource allocation and service delivery. Such deficiencies not only impair economic performance but also undermine public trust in institutions, thereby weakening social cohesion. As argued by Clifford and Evans (1996), governance quality is pivotal in determining the extent to which societies can mobilize collective action and foster a sense of belonging among their members, emphasizing the interconnectedness of governance and social stability.

The implications of governance quality extend to social cohesion, as effective governance fosters trust and cooperation among citizens. When institutions operate transparently and are accountable to their constituents, individuals are more likely to engage in civic activities and support communal initiatives (Albanese et al., 2021). Conversely, weak governance breeds cynicism and disengagement, diminishing the social capital necessary for collective action (Cheng & Liu, 2018; Keele, 2007). In societies characterized by poor governance, the erosion of trust can lead to social fragmentation, where individuals become isolated from one another, further exacerbating the challenges of economic inefficiency and limited human development. Thus, governance theory underscores the importance of inclusive and participatory governance models in enhancing social cohesion, as these approaches empower citizens and create a shared sense of responsibility towards communal welfare.

Moreover, governance theory explains the mediating effects of economic inefficiencies and limited human development on social cohesion. Economic inefficiencies often stem from mismanagement and corruption within institutions, which can divert resources away from essential services and development initiatives (Kaufmann et al., 2002). This misallocation not only stunts economic growth but also hampers human development, creating a vicious cycle that further weakens social cohesion. As noted by Sen (1999), human development is intrinsically linked to social well-being and can only be achieved in an environment where governance is effective and participatory. Therefore, addressing poor governance is crucial for fostering social cohesion and promoting sustainable development. By enhancing the quality of governance, societies can mitigate the negative effects of economic inefficiencies and support human development, ultimately leading to a more cohesive and resilient community.

Research framework and hypothesis development

The framework

The research framework of this study is designed to elucidate the complex interplay between economic, social, and governance factors in a post-conflict environment. This framework adopts a systemic approach, hypothesizing that the roots of social cohesion are deeply entangled with economic policies, human development, and governance (Melton et al., 2019). By mapping out the causal pathways through a conceptual model, this study seeks to identify the specific mechanisms by which economic

inefficiencies erode social cohesion, positing that inefficiencies in economic status lead to fragmentation in community ties and a breakdown in social networks (Putnam, 2001). Additionally, the framework highlights the reciprocal nature of economic and governance outcomes, suggesting that poor governance can further exacerbate economic inefficiencies, thereby creating a cycle that perpetuates further social disintegration (Acemoglu & Robinson, 2015).

To empirically examine these hypotheses, the study employs a Structural Equation Modeling (SEM) to examine the relationship between economic inefficiencies and social cohesion, while capturing the nuanced impacts of governance and human development. Specifically, the analysis will focus on the role of human development as a pivotal factor in this equation, arguing that insufficient investment in education and health sectors leads to underutilized human potential and, subsequently, severe social cohesion (Becker, 2009; Nor & Masron, 2018; Sen, 2014). Through this comprehensive approach, the research aims not only to trace the pathways through which economic inefficiencies impacts social cohesion but also to offer actionable insights for policymakers to address these multifaceted challenges, fostering a more equitable and cohesive society in Somalia's Climate-stressed Settings.

The conceptual model

The conceptual model of this study posits a sequential interplay between four critical constructs: weak social cohesion, limited human development, economic inefficiencies, and poor governance (as shown in Figure 1). Central to the model is the argument that economic inefficiencies act as a pivotal factor influencing social cohesion. When resources in an economy are not optimally allocated or utilized, it leads to reduced output and diminished well-being, thereby weakening social bonds and fostering community disintegration. Economic inefficiencies, by exacerbating inequality, restrict access to vital services such as healthcare, education, and employment opportunities—services fundamental to social stability. As these inefficiencies deepen, economic and social fragmentation becomes more pronounced, undermining trust, shared identity, and collective well-being, all of which are essential for cohesive societies (Wilkinson & Pickett, 2010).

Additionally, the model highlights how poor governance, characterized by corruption and inefficiency, interacts with economic inefficiencies to further deteriorate social integration. Poor governance not only limits the state's capacity to deliver services effectively but also creates environments where inequalities are perpetuated, thus inhibiting human development and social mobility. The study postulates that limited human development exacerbates social stratification and restricts opportunities for upward mobility, further weakening social cohesion (Bourdieu, 1986). In Somalia's Climate-stressed Settings, where governance mechanisms are weak, the resulting economic inefficiencies and underinvestment in human development create feedback loops that intensify social fragmentation. Governance failures, such as corruption and institutional ineffectiveness, are hypothesized to be key drivers in this dynamic, creating conditions where social cohesion is eroded and societal integration remains elusive (Acemoglu & Robinson, 2015; Nor, 2023).

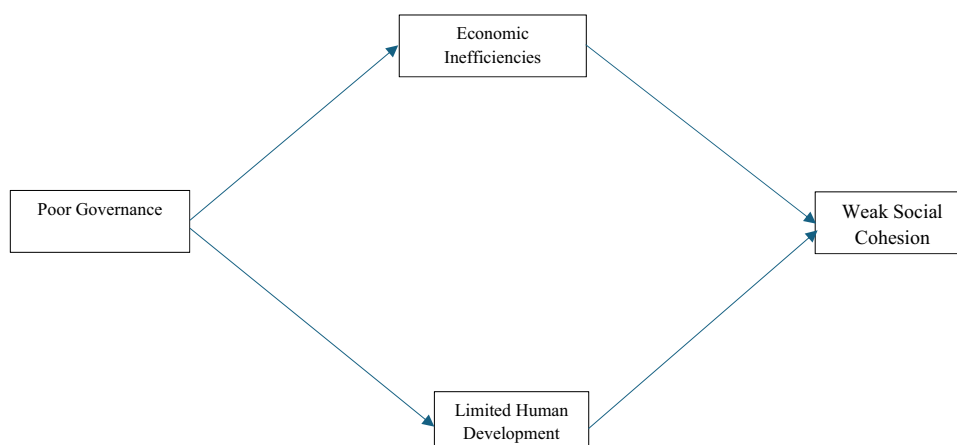


Figure 1. Research framework.

Hypothesis development

Economic inefficiencies are widely recognized as a catalyst for weakening social cohesion. The first hypothesis posits that as inefficiencies in the allocation and utilization of resources grow, social bonds within communities deteriorate, leading to increased social tensions and a reduction in societal trust. Wilkinson and Pickett (2010) argue that when economies are characterized by inefficiencies, such as unequal access to essential services and opportunities, trust and cooperation among citizens decline, as these disparities create barriers between different socio-economic groups. This breakdown in social cohesion can result in various social problems, including increased crime rates and reduced civic engagement, which further perpetuate economic inefficiencies and social fragmentation (Putnam, 2001). In the context of Somalia's Climate-stressed Settings, where clan-based divisions are already significant, economic inefficiencies could exacerbate these divisions, undermining the social fabric critical for post-conflict reconstruction and development (Nor, 2024; Nor & Masron, 2019). Therefore, this study hypothesizes the following:

H1: Economic Inefficiencies leads to Weak Social Cohesion

The hypothesis that limited human development leads to weak social cohesion is grounded in the notion that insufficient investment in key areas such as education and healthcare creates significant disparities in human capital, which can, in turn, exacerbate social divisions. According to human capital theory, the development of skills and capacities through education and health services is crucial for fostering individual economic potential and social mobility (Becker, 1975; Reder, 1967). When these opportunities are lacking, large segments of the population are unable to achieve their full potential, leading to increased social inequality and reduced social integration (Sen, 2014). In contexts like Somalia, where access to quality education and healthcare remains severely constrained, such deficiencies are likely to perpetuate social stratification and weaken the bonds of trust and cooperation essential for cohesive communities (Nor, 2024; Nor & Masron, 2019). Therefore, this study proposes the following hypotheses:

H2: Limited Human Development leads to Weak Social Cohesion

This hypothesis posits that poor governance is a significant determinant of limited human development, as ineffective governance structures often result in the mismanagement of resources and the failure to implement policies that promote human capital growth. Poor governance, characterized by corruption, weak institutions, and inadequate public administration, tends to lead to the misallocation of resources, underfunded social sectors, and inefficient delivery of public services (Acemoglu & Robinson, 2015). These inefficiencies directly hinder investment in critical areas such as education and healthcare, which are essential for human development. In contexts like Somalia, where political instability and governance challenges have persisted for decades, these failures exacerbate the already limited access to basic services and perpetuate socio-economic inequalities (Nor & Masron, 2019). Therefore, this research formulates the following hypotheses:

H3: Poor Governance leads to Limited Human Development

This hypothesis posits that poor governance significantly contributes to economic inefficiencies by fostering conditions that hinder effective economic management. Poor governance, marked by corruption, lack of transparency, and weak institutional frameworks, distorts market operations, discourages both domestic and foreign investment, and leads to the misallocation of public resources (Kaufmann et al., 2009). These governance failures create inefficiencies in the economic system, limiting the economy's ability to function optimally and hindering sustainable growth. In Somalia's Climate-stressed Settings, where governance challenges are further exacerbated by political instability and clan-based divisions, the resulting economic inefficiencies have a profound impact on development, weakening institutional capacity and preventing equitable resource distribution. Therefore, this study posits the following hypotheses:

H4: Poor Governance leads to Economic Inefficiencies

Methodology

Research design

The purpose of this study is to investigate the complex relationship between poor governance and weak social cohesion in Somalia's Climate-stressed Settings, with a specific focus on how economic inefficiencies and limited human development mediate this dynamic. A structural equation modeling (SEM) approach is employed to thoroughly investigate the complex relationships among these variables. SEM allows for the simultaneous examination of multiple dependent relationships, providing a robust framework to test the direct and indirect effects hypothesized in the conceptual model. This technique is particularly adept at handling complex models with latent variables, enabling a nuanced analysis of both observed and unobserved variables. By incorporating SEM, the research design not only enhances the precision of the estimates but also offers a comprehensive view of the underlying mechanisms that affect social cohesion, thereby providing valuable insights into how multifaceted interventions could be structured to effectively address economic disparities and promote societal stability in Somalia's Climate-stressed Settings.

Data collection

This study uses a survey conducted in November 2023 as the primary source of empirical data on economic inequality and social cohesion in Somalia's Climate-stressed Settings. The survey method is well considered, providing a structured means to gather information. The study's methodological rigor is evident in its commitment to high-quality data collection and the inclusion of participants from diverse backgrounds. The purposive approach to designing the survey aligns with the research objectives, allowing for an in-depth exploration of the multifaceted dimensions of economic inequality and social cohesion. This survey method provides a strong empirical foundation for further analysis, enabling a comprehensive and insightful investigation into the critical factors shaping these issues within Somalia's Climate-stressed Settings.

In the present study, purposive sampling was strategically employed to select participants who possess specific insights or characteristics pivotal for the structural equation modeling (SEM) analysis. This targeted approach is advantageous for focused studies where specific criteria related to the research questions guide participant selection, thus ensuring that the data collected are highly relevant and rich in content. By concentrating on individuals who meet predetermined criteria, the sampling method not only enhances the relevance of the findings but also maximizes the use of available resources, particularly critical in studies where broader sampling might be impractical or excessively costly.

The simplicity of the SEM model used in this research—with fewer parameters and straightforward relationships—supports the sufficiency of the 145 respondents in providing reliable data. This simpler model configuration requires fewer data points to achieve accurate parameter estimations, thus aligning well with the smaller sample size. Furthermore, the quality of the data, characterized by minimal missing values and low measurement errors, compensates for potential limitations tied to the modest sample size. Robust data collection methods ensured that the collected data are of high integrity, enhancing the confidence in the study's outcomes. Additionally, the application of 5000 bootstrap samples significantly bolsters the study's statistical robustness. By resampling the data repeatedly, bootstrap techniques allow for a thorough assessment of the stability and reliability of the model's parameter estimates, thus reinforcing the validity of the conclusions drawn despite the smaller sample size. The successful use of similar sample sizes in related SEM studies, as documented in the works of scholars such as Willaby et al. (2015), Nevitt and Hancock (2004), Christopher Westland (2010), Smid and Rosseel (2020), and Jiang and Yuan (2017), further substantiates the methodological choices made in this study, aligning with established precedents in the field.

Construct development and variable measurements

This study examines the complex interrelations among governance quality, social cohesiveness, economic efficiency, and levels of human development. The development of this research is carefully crafted to capture the multifaceted character of these aspects. The concept of weak social cohesion is operationalized via five indicators (WSC01-WSC05), which assess perceptions regarding the efficacy of policies

targeting economic inequality and social cohesion, the influence of government policies, the optimization of human development investments, the need for policy reforms, and the capacity of federal member states to promote inclusivity. Poor governance is similarly indicated by metrics (PGN01-PGN05) that evaluate its effects on healthcare accessibility, infrastructure advancement, agricultural programs, governance execution, and obstacles in private sector development.

The study used a uniform 1–5 Likert scale for variable measures across components, facilitating consistent quantitative evaluation of participant responses (as shown in Table 1). Each indicator within the constructs—whether economic inefficiencies, restricted human development, or others—requires respondents to assess or rate their concurrence with statements regarding the occurrence and impact of these issues in Somalia’s Climate-stressed Settings. This assessment method enables the extraction of detailed insights into the interrelations among areas and their ability to worsen or mitigate each other’s effects. Employing Likert scales facilitates the quantification of nuanced variations in perceptions and experiences, offering a solid framework for examining how governance quality and human development levels affect economic and social cohesion results in fragile state contexts.

Results

In the preliminary phase of our research methodology, we utilized the SPSS software to handle missing data within our dataset, adopting linear interpolation methods to maintain data integrity and completeness. Following this, we addressed potential biases that could influence our findings, particularly common method bias (CMB), which is critical in studies deriving data from single sources. As recommended by Podsakoff et al. (2003), we employed Harman’s single factor test to assess the extent of common method variance, a technique that involves conducting a principal component analysis with all major constructs included. This methodological step, rooted in the guidelines by Podsakoff and Organ (1986), is crucial not only as a procedural necessity but as an essential measure to ensure the robustness and credibility of our research outcomes. This rigorous evaluation aids in affirming the reliability and validity of our findings, reinforcing the overall quality of our scholarly work.

The analysis revealing that the first three factors account for 73.635% of the variance not only meets but also exceeds the typical benchmark set to alleviate concerns over common method bias, suggesting an effective diversification of underlying constructs within our dataset. This considerable variance coverage indicates that the results of the study are influenced by a broad spectrum of factors, thereby mitigating the risk of single-dimensionality often critiqued in single-source data studies. This finding substantiates the robustness of our methodological approach, reinforcing the conclusion that common method bias has been successfully minimized in our research. The empirical integrity and reliability of our conclusions are thus upheld, drawing on established scholarly discourse that highlights the critical role of methodological precision in securing the validity of research outcomes (Conway & Lance, 2010; Podsakoff et al., 2003; Richardson et al., 2009). This rigorous approach not only enhances the credibility of our findings but also strengthens their contribution to the academic field.

In this study, ADANCO-SEM analysis was utilized as the primary analytical framework, following the methods suggested by Lin et al. (2024) and Luo et al. (2024). ADANCO, a software specifically designed for composite-based structural equation modeling (SEM), was instrumental in dissecting the complex interrelations between observed variables and latent constructs, a methodological approach supported by seminal works like those of Conway and Lance (2010) and Podsakoff and Organ (1986). This process entailed a detailed examination of both the measurement model for validity and reliability and the structural model to explore the dynamics among the variables. Additionally, the adoption of the bootstrapping technique, as recommended by Sarstedt et al. (2021), enhanced the methodological rigor of the analysis, providing a robust test of the theoretical relationships posited within the study’s framework. This comprehensive analytical strategy ensured a thorough investigation, underpinning the reliability and validity of the findings.

Measurement model

In the assessment of the measurement model in this study, a rigorous examination of both convergent and discriminant validity was conducted, aligning with the methodological frameworks proposed by

Table 1. Construct development.

Latent variable	Indicator	Measurement scale	Survey item
Weak Social Cohesion	WSC01	1-5 Likert Scale	1. Rate the effectiveness of current policies and initiatives in Somalia aimed at addressing economic inequality and promoting social cohesion.
	WSC02	1-5 Likert Scale	2. Assess the impact of past and current government policies on reducing economic disparities and fostering social cohesion in Somalia.
	WSC03	1-5 Likert Scale	3. Evaluate how well investments in human development (e.g. education, healthcare) are optimized to reduce poverty and enhance social cohesion in Somalia.
	WSC04	1-5 Likert Scale	4. Rate the necessity of policy and programmatic changes to create an enabling environment for economic equality and social cohesion in Somalia.
	WSC05	1-5 Likert Scale	5. Do you believe that the federal member states (FMSs) can foster a more inclusive and harmonious society in Somalia?
Limited Human Development	LHD01	1-5 Likert Scale	1. Assess the impact of limited human development on the disparities in access to economic opportunities between urban and rural areas in Somalia.
	LHD02	1-5 Likert Scale	2. Rate the extent to which poor governance interconnects with various types of inequalities such as income, wealth, and access to education in Somalia.
	LHD03	1-5 Likert Scale	3. To what extent do you agree that limited human development is closely linked to the prevalence of intergroup tensions, conflicts, or violence in Somalia?
	LHD04	1-5 Likert Scale	4. How strongly do you agree that limited human development affects perceptions of fairness and social justice among Somalis?
	LHD05	1-5 Likert Scale	5. To what extent do you agree that limited human development contributes to feelings of exclusion and marginalization among marginalized groups in Somalia?
	LHD06	1-5 Likert Scale	6. Rate the effectiveness of current government policies in promoting intergroup dialogue, reconciliation, and peace-building against the backdrop of limited human development and weak social cohesion in Somalia.
Economic Inefficiencies	EIE01	1-5 Likert Scale	1. To what extent do you agree that economic inefficiencies contribute to the lack of access to markets in Somalia?
	EIE02	1-5 Likert Scale	2. Rate how significantly you believe economic inefficiencies impact the successful promotion of community-based programs in Somalia.
	EIE03	1-5 Likert Scale	3. Assess the degree to which economic inefficiencies hinder social cohesion initiatives in Somalia.
	EIE04	1-5 Likert Scale	4. Evaluate the effect of economic inefficiencies on improving agricultural development within Somalia.
Poor Governance	PGN01	1-5 Likert Scale	1. Evaluate the impact of poor governance on the accessibility of healthcare services in Somalia.
	PGN02	1-5 Likert Scale	2. Rate how significantly poor governance affects the development and maintenance of infrastructure in Somalia.
	PGN03	1-5 Likert Scale	3. Assess the extent to which poor governance hampers agricultural development initiatives in Somalia.
	PGN04	1-5 Likert Scale	4. To what extent do you agree that poor governance impedes the effective implementation of good governance and anti-corruption measures in Somalia?
	PGN05	1-5 Likert Scale	5. Evaluate how poor governance contributes to the challenges faced by private sector development in Somalia.

Sarstedt et al. (2021). The evaluation of convergent validity was undertaken by analyzing factor loadings, average variance extracted (AVE), and composite reliability (CR), ensuring adherence to well-established standards. The results, as systematically presented in Table 2, indicate that factor loadings exceeded the standard threshold of 0.7, with only a few exceptions. Similarly, AVE values for constructs were above the recommended minimum of 0.5, with the exception of only one construct, while CR values universally exceeded 0.7. These metrics collectively affirm the robustness of the convergent validity, substantiating the measurement model's capacity to accurately and reliably capture the intended constructs, thereby reinforcing the overall reliability and precision of the study's analytical framework.

In the evaluation of discriminant validity within the measurement model, the study employed the heterotrait-monotrait (HTMT) ratio of correlations, a technique derived from the multitrait-multimethod matrix, as outlined by Henseler et al. (2015). This method mandates that the HTMT ratios should not exceed the critical threshold of 0.90, a benchmark set by Gold et al. (2001). Detailed analysis of the data, as presented in Table 3, confirms that all the HTMT values for the factors fall below this threshold, with only one factor showing an exception. These results predominantly validate the discriminant validity of the model, demonstrating that the constructs investigated are distinct and sufficiently independent from each other. This distinctiveness is crucial for ensuring that the model accurately captures unique aspects of each construct without substantial overlap, thereby bolstering the trustworthiness and interpretative power of the overall analysis.

Structural model

In this study, the structural model's robustness was verified through the rigorous application of the bootstrapping technique with 5,000 resamples, following the methodological recommendations of Sarstedt et al. (2021). This approach allowed for a comprehensive examination of the model's integrity using key statistical indicators such as R^2 values, standardized beta coefficients (β), t-values, and effect sizes (f^2). According to the findings presented in Table 4, all proposed hypotheses within the theoretical framework were robustly supported. Notably, the data indicated high R-squared values for Weak Social Cohesion (0.87), Limited Human Development (0.77), and Economic Inefficiencies (0.96). Specifically, significant relationships were confirmed, including Poor Governance leading to Economic Inefficiencies ($\beta = 0.9785$, $SE = 0.0147$, $t = 66.3762$,

Table 2. Convergent validity.

No	Variable	Item	Loading	CR	AVE
1	Weak Social Cohesion	WSC01	0.7054	0.7927	0.4369
		WSC02	0.5518		
		WSC03	0.6811		
		WSC04	0.7929		
		WSC05	0.5386		
2	Limited Human Development	LHD01	0.6725	0.8757	0.5281
		LHD02	0.6914		
		LHD03	0.6874		
		LHD04	0.6094		
		LHD05	0.6840		
		LHD06	0.9625		
3	Economic Inefficiencies	EIE01	0.8658	0.9189	0.7038
		EIE02	0.8386		
		EIE03	0.8345		
		EIE04	0.8321		
4	Poor Governance	PGN01	0.7429	0.9077	0.7104
		PGN02	0.8920		
		PGN03	0.7684		
		PGN04	0.8974		
		PGN05	0.8808		

Table 3. HTMT ratio.

Construct	1	2	3	4
Weak Social Cohesion				
Weak Human Capital	0.8275			
Poor Governance	0.9040	0.8470		
Economic Resilience	0.8882	0.7442	0.9727	

Table 4. Structural model.

Hypothesis	Path relationship	Std. beta	SE	t value	Decision	f ²	VIF
H1	Economic Inefficiencies → Weak Social Cohesion	0.5781	0.1294	4.4688	Supported	0.9050	2.8945
H2	Limited Human Development leads → Weak Social Cohesion	0.4016	0.1356	2.9611	Supported	0.4367	1.9790
H3	Poor Governance → Limited Human Development	0.8750	0.0283	30.8756	Supported	3.2657	3.7777
H4	Poor Governance → Economic Inefficiencies	0.9785	0.0147	66.3762	Supported	22.5590	3.7777
H5	Poor Governance → Weak Social Cohesion (indirect relationship)	0.9171	0.0320	28.6910	Supported	0.9171	3.7777

$p < .001$, $f^2 = 22.5590$) and an indirect, yet significant pathway from Poor Governance to Weak Social Cohesion ($\beta = 0.9171$, $SE = 0.0320$, $t = 28.6910$, $p < .001$, $f^2 = 0.9171$).

This model explains the substantial impact that Poor Governance has not only directly on economic inefficiencies but also indirectly on Weak Social Cohesion. This indirect relationship indicates that the deleterious effects of poor governance extend beyond immediate economic consequences, permeating deeper into the social fabric through pathways mediated by other constructs like Economic Inefficiencies and Limited Human Development. The high R^2 values, ranging from 0.61 to 0.96 across various constructs, underscore the model's considerable explanatory power, effectively capturing the complex dynamics between governance, economic conditions, and social outcomes. These findings underscore the significant theoretical and practical implications, highlighting the cascading effect poor governance has on societal stability and cohesion.

Moreover, the evaluation of potential multicollinearity, integral to the model validation process, adhered to the accepted variance inflation factor (VIF) threshold of 10.00, as reviewed in several studies. All VIF values reported were well below this threshold, the highest being 3.7777, affirming the absence of multicollinearity concerns within the model. This aspect ensures that the substantial effects observed are genuinely attributable to the hypothesized causal links, not distorted by overlapping predictor variables. This meticulous statistical validation enhances the reliability of the study's findings, reinforcing a robust theoretical and empirical foundation for understanding the nuanced interplay between governance quality, economic inefficiencies, and their broader impact on social cohesion.

Discussions

The purpose of this study is to investigate the complex relationship between poor governance and weak social cohesion in Somalia's Climate-stressed Settings, with a specific focus on how economic inefficiencies and limited human development mediate this dynamic. The findings from the structural equation modeling robustly supported all postulated hypotheses. Specifically, it was demonstrated that economic inefficiencies significantly contribute to weak social cohesion (H1), while limited human development exacerbates this weakness (H2). Furthermore, poor governance was shown not only to stymie human development (H3) but also to promote economic inefficiencies (H4), thereby perpetuating a cycle of decline and social instability. The findings underscore the profound interconnections between governance quality, economic vitality, and social fabric integrity. The validation of these hypotheses highlights the critical pathways through which governance failures manifest in economic and social realms, offering a detailed schema of causative relationships that degrade social cohesion in Somalia's Climate-stressed Settings. These insights extend beyond mere academic exploration, providing a foundational analysis that informs both theoretical frameworks and practical interventions aimed at reconstructing post-conflict societies.

Economic inefficiencies in Somalia's Climate-stressed Settings are seen not just as barriers to economic growth but as active deteriorators of social cohesion. These inefficiencies manifest through misallocated resources and underutilized potential, which not only suppress economic output but also deepen social divides. By limiting access to essential services like healthcare and education, economic inefficiencies engender disparities that erode trust and social solidarity. This study's analysis provides a clear depiction of how economic barriers contribute to societal fragmentation. On the other hand, social cohesion is critically undermined by both economic and human development deficits. This study highlights that the degradation of social bonds and communal trust is significantly influenced by the inadequacies in governance and policy implementation. The erosion of social cohesion is particularly pronounced in contexts where economic disparities are prevalent, as seen in the Somali context where clan divisions intensify the impact of economic hardships on social unity.

The Somali context, characterized by persistent clan-based divisions and the scars of prolonged conflicts, presents a unique landscape for examining the interplay of governance, economic policy, and social cohesion. These historical and social complexities exacerbate the challenges faced in governance and economic management, making the outcomes of such interactions particularly impactful on societal stability and peace-building efforts. The study's focus on Somalia's Climate-stressed Settings allows for a deeper understanding of how these factors intertwine in a post-conflict setting, offering insights that are crucial for tailored intervention strategies. Moreover, the volatile nature of Somalia's Climate-stressed Settings's socio-political landscape makes it a critical case study for understanding the broader implications of governance and economic policies in similar contexts globally. This study not only maps the specific challenges but also contextualizes the potential for recovery and development within such a framework, emphasizing the need for targeted and context-aware policymaking.

This research aligns with seminal works by scholars like Acemoglu et al. (2015), which have underscored the significant impact of governance structures and economic policies on social cohesion. By integrating these theoretical perspectives with empirical findings from Somalia's Climate-stressed Settings, this study enriches the discourse on the role of governance in societal dynamics, especially in fragile or post-conflict settings. The nuanced approach adopted here contrasts with studies focused on more stable contexts, highlighting the unique challenges and opportunities present in recovering societies. Policy implications extend to the formulation of anti-corruption measures, equitable resource distribution policies, and the enhancement of community-driven development programs. These initiatives are crucial for rebuilding trust within communities, enhancing public infrastructure, and ensuring that economic and social policies are effectively aligned with the needs of diverse population segments, thereby promoting inclusive growth and social unity in post-conflict environments like Somalia's Climate-stressed Settings.

The findings of this study align closely with existing literature, particularly with the works of Becker (2009), Durkheim (2023), and Putnam (2001), all of whom emphasize the critical role of governance and human development in fostering social cohesion. This research supports the notion that poor governance—manifested through corruption, inefficiency, and lack of accountability—hinders economic performance and exacerbates social divisions. Durkheim's (2023) theory on the division of labor suggests that social cohesion is intricately connected to the structures of governance and societal organization. This study's findings reinforce this perspective by demonstrating how ineffective governance in Somalia's Climate-stressed Settings not only stymies economic growth but also entrenches inequalities that weaken the bonds within society. Similarly, Becker's (2009) human capital theory, which posits that investments in education and healthcare are essential for reducing social stratification, is validated by this study's conclusion that limited human development restricts social mobility, thereby eroding the social fabric necessary for cohesion.

Furthermore, the results corroborate the arguments put forth by Acemoglu et al. (2015) regarding the cyclical effects of governance on economic and social outcomes. Through structural equation modeling, this study illustrates how poor governance directly contributes to economic inefficiencies, which in turn diminish social cohesion, lending support to Acemoglu et al. (2015) theory. Putnam's (2001) exploration of social capital is also reflected in this research, as the findings reveal that economic inequalities—often fostered by weak governance structures—erode trust and undermine social networks, which Putnam (2001) identifies as critical for civic engagement and community resilience. Additionally, the study aligns with Maldonado Valera et al. (2022), who argue for the importance of inclusive social development to strengthen social cohesion, particularly in uncertain and fragile contexts. By examining these dynamics within a post-conflict setting, this research not only validates existing theories but also deepens the discourse on social cohesion by situating it within fragile state environments, offering insights that are applicable to other regions facing similar challenges.

The findings of this study contribute meaningful insights to Social Cohesion Theory by illustrating how economic inefficiencies and limited human development, driven by poor governance, erode the social fabric of a post-conflict society. Social Cohesion Theory posits that a cohesive society is one where trust, solidarity, and a sense of belonging are prevalent among individuals and groups. This study highlights the ways in which economic disparities, arising from governance failures, undermine these foundational elements of cohesion. Specifically, it demonstrates that when governance structures fail to provide equitable access to essential services, such as education and healthcare, social cohesion is weakened as inequalities widen and individuals become increasingly alienated from one another. This supports the notion that social cohesion is not just a product of social and cultural factors, but is also deeply influenced by economic and political dimensions, especially in fragile states where the need for collective unity is paramount.

The study also has significant implications for Governance Theory, particularly in terms of understanding how governance quality influences economic and social outcomes in post-conflict settings. Governance Theory underscores the importance of effective, transparent, and accountable governance structures for the stability and development of societies. The findings here underscore that poor governance contributes to economic inefficiencies, which in turn destabilize social cohesion by fostering inequality and limiting social mobility. This suggests that Governance Theory must account for the recursive relationship between governance and social cohesion, particularly in environments where governance failures have longstanding impacts on societal resilience. In post-conflict settings like Somalia's Climate-stressed Settings, where governance challenges are compounded by historical and social complexities, the study underscores the critical role of governance reforms in not only rebuilding state institutions but also in re-establishing social trust and cohesion. These insights extend Governance Theory by highlighting the need to consider how governance failures propagate through economic systems, ultimately affecting social stability and cohesion.

The novelty of this research lies in its development of a conceptual model that uniquely addresses the complexities of governance, economic inefficiencies, and social cohesion within the specific context of a post-conflict environment. While previous studies have explored these factors individually, this research integrates them into a comprehensive framework that captures their interactions in fragile states. This innovation allows for a more accurate representation of the challenges facing Somalia's Climate-stressed Settings, as well as other similar contexts, offering new perspectives on how these factors collectively influence social stability. Additionally, the study introduces Structural Equation Modeling (SEM) as an analytical tool for disentangling the direct and indirect effects of governance and economic inefficiencies on social cohesion. This methodological approach represents a significant innovation, as it allows for the simultaneous exploration of multiple dependent relationships, thereby uncovering previously overlooked pathways through which governance and economic policies impact societal outcomes.

This study makes substantial contributions to the literature on post-conflict recovery by empirically illustrating the pivotal role governance and economic management play in fostering or eroding social cohesion. While much of the existing research has focused on isolated aspects of governance, economy, or social cohesion, this study integrates these dimensions into a single framework that demonstrates how these factors are interconnected in fragile settings. By doing so, the research provides a more nuanced understanding of the mechanisms that perpetuate social disintegration in conflict-affected states like Somalia's Climate-stressed Settings. Moreover, the study extends the discourse on governance and economic development by highlighting the importance of human capital in the post-conflict recovery process. By focusing on the Somali context, the research fills a gap in the literature, contributing to a growing body of work that emphasizes the need for governance reforms and targeted economic policies to rebuild social cohesion. This contribution not only enhances the theoretical understanding of these dynamics but also offers practical insights for policymakers working in fragile and conflict-affected environments.

Conclusion

This study investigated the intricate relationship between poor governance and weak social cohesion in Somalia's Climate-stressed Settings, with particular attention to how economic inefficiencies and limited human development mediate this relationship. The findings validated all proposed hypotheses, confirming that economic inefficiencies contribute to weakened social cohesion, while poor governance exacerbates economic inefficiencies and limits human development. These dynamics collectively lead to social fragmentation in Somalia's Climate-stressed Settings, demonstrating the critical role that governance and human capital play in maintaining social stability in post-conflict environments.

The study makes significant theoretical contributions by extending existing models of governance, economic inefficiency, and social cohesion to a post-conflict context. By detailing how these dynamics operate in fragile states like Somalia's Climate-stressed Settings, the research adds a new dimension to conflict resolution and economic development theory, offering a framework that can be adapted to similar environments. The focus on governance failures and their cyclical effects on economic and social outcomes enriches the discourse on post-conflict recovery and state-building. The findings highlight the urgent need for comprehensive governance reforms in Somalia's Climate-stressed Settings, alongside coordinated economic and human development initiatives, to ensure sustainable societal stability. Effective policies should address corruption,

improve institutional capacity, and foster equitable resource distribution, as these are key to overcoming economic inefficiencies and strengthening social cohesion. These insights provide valuable guidance for both Somali policymakers and international development organizations working to stabilize fragile states.

The study suggests several actionable steps for international aid organizations and Somali authorities, including targeted interventions to address the root causes of social disintegration. Programs aimed at enhancing governance, investing in human capital, and promoting community-based development could play a crucial role in restoring trust and cohesion within Somali society. The integration of governance and economic reform strategies can significantly improve the country's path to long-term stability and recovery. This research illuminates critical pathways for rebuilding fragile states, providing a comprehensive model that links governance, economic policies, and social cohesion in post-conflict environments. By exploring these interconnected dynamics in Somalia's Climate-stressed Settings, the study offers a blueprint for other post-conflict societies facing similar challenges, emphasizing the importance of multi-faceted interventions that target both governance structures and human development.

The study acknowledges several limitations, including the reliance on self-reported data, which could introduce response bias. Additionally, the specific focus on Somalia's Climate-stressed Settings may limit the generalizability of the findings to other contexts. Future research should consider using more diverse data sources and expanding the geographic scope to test the applicability of the model in different post-conflict environments. Future studies could explore the longitudinal effects of governance and economic interventions on social cohesion, assessing their long-term impact on societal stability. Comparative analyses with other post-conflict nations would also provide valuable insights into the universality of the study's findings and offer additional perspectives on effective strategies for rebuilding social cohesion in fragile states.

This study underscores the profound impact of integrated governance, economic, and human development policies on fostering social cohesion in fragile settings. By providing a detailed analysis of these dynamics in Somalia's Climate-stressed Settings, the research lays the foundation for targeted and effective post-conflict reconstruction efforts, offering practical insights that can guide policymakers and development organizations in addressing the unique challenges of post-conflict recovery.

Author contribution statement

Mohamed Ibrahim Nor: Research Design, Data Collection, Data Analysis, Writing, Software, Management, and Funding. Mohamed Mahees Raheem: Data Collection, Data Analysis, Writing, Visualization, and Software.

Consent for publication

I hereby provide our permission for the publishing of this manuscript, which includes any associated images or data covered within the text.

Disclosure statement

The author confirms no conflicts of interest or financial support for this study, ensuring its integrity and objectivity. He also states that no substantial financial support could have influenced the study's outcomes. Their commitment to impartiality and scientific rigor ensures the reliability and credibility of the findings.

Ethical approval and consent to participate

This study has received ethical approval from SIMAD University's ethics committee, under the approval number EC000116. Moreover, this study does not contain any studies with human participants performed by any of the authors.

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Data availability statement

This study's data is made available to others upon reasonable request, promoting transparency and scientific rigor. This allows for further scrutiny, validation, and collaboration. The author encourages individuals interested in exploring or using the dataset to contact them directly, advancing research in this field.

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