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Infrastructure, Environmental Risk, and Youth Enterprise Livelihood Sustainability in a Rapidly Urbanizing African City: Evidence from Hawassa, Ethiopia

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Research Article

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Abstract

The rapid pace of urban growth in African secondary cities affects the context of young people's entrepreneurial activities, but enterprise and urban infrastructure policies remain largely disconnected. This study analyzes the relationship between infrastructure, environmental, and market factors and enterprise livelihood sustainability for youth-owned micro and small enterprises (MSEs) in Hawassa, Ethiopia. Using a concurrent mixed method approach, a survey of 252 MSE managers was supplemented by 12 key informant interviews, two municipal interviews, and observations from 12 MSE production sites. The binary logistic regression model was used to determine the relationship between livelihood sustainability, measured as an upward trend in enterprise net monthly income, and selected infrastructure, environmental, and market factors. Availability of medium water (OR = 3.293, p = .005) and retailer (OR = 6.151, p = .004) were positively related to livelihood sustainability, whereas high natural-disaster challenges (OR = 0.256, p = .004) and medium resource pressure (OR = 0.252, p = .014) were negatively associated with it. The negative relationship of sanitation is analyzed carefully since some enterprises might invest their own money in these facilities. The findings link enterprise performance with urban expansion, wetlands, stormwater, and urban ecology in Hawassa. The research presents a model that connects urban infrastructure with enterprises and suggests that utilities, drainage, climatic robustness, provision of serviced space, and market linkages should be regarded as productive elements of urban economic policy.

1 Introduction

Throughout sub-Saharan Africa, the process of urbanization is becoming concentrated in secondary cities, whereby demographic expansion, economic change, inadequate infrastructure, and youth unemployment interplay. As such, youth self-employment has become an important vehicle for job creation and livelihoods stability, but research conducted in Ethiopia demonstrates that enterprise survival and success require a combination of factors at individual, firm, industry, market, and institutional levels [2, 9, 11]. Furthermore, recent research indicates that youth entrepreneurship is driven by socio-ecological conditions and not just by personal attributes [12]. Enterprise policy interventions may be less effective when financing, registration, training, and enterprise start-up are pursued without taking into consideration the urban systems which facilitate production.

Water, sanitation, drainage, energy, transport access, physical space, environmental management, and market access can be considered productive factors due to the impact that they have on costs of operation, vulnerability to risks, transaction costs, and income generation capabilities. This paradigm is consistent with the sustainable livelihoods approach, which understands livelihood outcomes as emerging from interaction between assets, vulnerabilities, strategies, and institutions [15, 16]. In this context, urban infrastructure and institutional structure can be considered part of the productive environment rather than an independent area of municipal welfare.

The connection between this issue and Hawassa is especially relevant due to the findings made recently by the research community. Recent research on urban development and land use identifies significant urban growth and transformation of agricultural land in Hawassa, where the area of built up land has significantly increased between 1984 and 2021 [4]. There is research on the Hawassa wetlands that describes the relation between urban growth and transformation of the wetlands and livelihood systems [5] as well as the sensitivity of urban stormwater management performance to land use dynamics and urban growth [6]. Recent research also highlights the role of Hawassa's urban green spaces in climate mitigation and the low capacity for carbon storage in highly impervious urban areas [8].

The enterprise literature reiterates the significance of firm capabilities but also stresses market access, predictability of policies, networks, finance and business strategies as other correlates of youth enterprise success and survival in Ethiopia [9, 11]. Recent findings from Ethiopia also underscore socio-political conditions and the institutional context for youth self-employment [10]. The study of the Ethiopian entrepreneurship ecosystem has found the significance of enterprise linkages to government, financial institutions, universities and other support agencies, including market and raw material linkages [13]. However, fewer studies have focused on the translation of urban infrastructure and environmental hazards into enterprise livelihood effects.

The present paper fills this gap by using evidence collected among 252 youth-led MSEs in three Hawassa sub-cities. This research raises the following questions: (1) In what ways is water, sanitation, environmental hazard, resource use pressure and market access linked to livelihood sustainability of youth enterprises? and (2) What kind of urban planning and municipality coordination might alleviate infrastructure-based livelihood vulnerability? The core argument made in this paper is that enterprise sustainability arises as a product of both firm capabilities and the urban infrastructure environment. The deficiency in infrastructure may end up shifting the cost and risks of collective systems to resource-scarce enterprises, while market connectivity may partially define the capabilities of enterprises to turn productive assets into improved income trajectories.

The paper makes contributions towards interdisciplinary literature on urbanization, youth livelihoods, infrastructure, environmental changes, governance, and sustainable development within African secondary cities. Empirically, there are significant associations found between certain environmental/infrastructure factors and income trajectory at the enterprise level. In terms of conceptual contribution, there is an urban infrastructure-enterprise relationship developed by linking livelihood assets, municipal infrastructure, environmental risks, and market access.

2 Conceptual framework and recent literature

2.1 Urban livelihoods and productive infrastructure

According to the Sustainable Livelihoods Framework, the focus is on the relationships between livelihood assets, vulnerability context, transformation processes, livelihood strategy, and outcomes [15,

16]. Though this model was initially formulated primarily in the context of rural livelihoods, its resource-based perspective applies to urban business contexts as well as long as the productive environment is seen as one of the resources used by livelihood actors. Physical capital in such environment should not be limited to privately-owned equipment and premises. Collective infrastructure can become part of the productive environment since firms rely on infrastructure that they cannot efficiently reproduce on their own.

In other words, a firm may have sufficient finance, equipment, and entrepreneurial skills, but still remain vulnerable because of unstable water networks, costly sanitation, poor drainage, and environmental risks which interrupt production. The key point here is not the existence of such infrastructure as such but its reliability, affordability, accessibility, and institutional support. This framework also highlights the importance of cost distribution since poor collective infrastructure forces businesses to use expensive private solutions.

This is supported by recent findings from Hawassa, which show that urbanization has affected the wetlands and their surrounding livelihood systems [5] and that stormwater management is responsive to land cover dynamics [6]. Research on urban ecology shows that green spaces can help mitigate climate change and that impervious surfaces correlate with reduced carbon sequestration capability [8]. Such findings show that urban ecological and infrastructural systems can influence economic resilience despite infrastructure being rarely considered as part of the enterprise dimension.

2.2 Youth enterprise sustainability as an urban-system product

The survival and success of youth-led MSEs in Ethiopia has been linked to entrepreneur factors, firm factors, industry environment, market access, savings, networking, predictable policies, and business strategies [9, 11]. Recent research on entrepreneurship by youths in sub-Saharan Africa reveals that socio-ecological barriers interact as opposed to only one entrepreneurial barrier [12]. For example, in the context of Ethiopia, there are now new findings that reveal the importance of socio-political context in youth self-employment [10], while entrepreneurial ecosystem literature focuses on the linkages between enterprises and institutions. Furthermore, findings from current research on enterprise support in Ethiopia indicate that business development services and entrepreneurship training can help to enhance enterprise growth and performance [14].

This research proves the significance of the entrepreneurial ecosystem, but there is one more critical issue to be solved, namely the question about what will happen when the city in which the enterprises function cannot guarantee collective infrastructure. Institutional theory allows us to explain this issue, as it highlights the fact that any organization exists in certain institutional environments, formal and informal, influencing organizational structures and practices as well as resources. In the context of urban enterprises, the institutional environment involves regulations and coordination mechanisms relating to land, infrastructure, water, sanitation, environmental issues, and enterprise development.

2.3 The urban infrastructure–enterprise nexus

Four pathways are proposed within this study's conceptual framework for how urban infrastructure and the environment may be related to sustainable youth enterprise livelihoods. Firstly, infrastructure can serve as a production input: water, power, sanitation, transport, and serviced workspace could minimize interruptions and transaction costs. Secondly, infrastructure shortcomings may lead to private substitution costs when enterprises develop, buy, transport, or service services that would be collectively organized under better circumstances. Thirdly, environmental exposure including flood risks, drainage problems, heat and unstable land use may result in physical damage to productive assets or interruption of business operations. Fourthly, retailer proximity and input market access may determine the costs of procurement, market connections, and working capital needs.

The financial and organizational capacities of youth enterprises condition each pathway presented above. The framework does not postulate the linear and/or positive relationship between each infrastructure variable and the outcome being tested. Namely, while a relatively high degree of access to sanitation may be accompanied with relatively high private installation or maintenance costs, a relatively high category of access to water may not affect the outcome positively if there were issues with its reliability.The framework expands on the ecosystem framework by linking the enterprise to the urban spatial system. In that, where most studies on entrepreneurship ecosystems tend to focus on actors and networks [13], the present framework incorporates the physical infrastructure that underpins those relationships and markets.

3 Materials and methods

3.1 Study design and setting

This study applied a mixed-method design in the city of Hawassa, Ethiopia. Data gathering and analysis for both quantitative and qualitative evidence were conducted at the same phase of the research process. The use of mixed-method design was motivated by the need to provide context to the statistical relationships by explaining how enterprises interacted and managed infrastructure conditions [18]. Hawassa offers an analytically interesting site for this study because of its rapid urbanization and youth enterprise activity coupled with changes in land use, wetlands, storm water, and ecology [4–8].

3.2 Population, sampling, and data collection

The quantitative sampling frame consisted of 638 youth enterprises currently in operation in Hayk Dar, Menakerya, and Misrak sub-cities. The sample size of about 246 was calculated initially through Yamane's formula for precision [19]. In total, the survey sampled 252 managers of enterprises. Stratified random sampling with proportional allocation was done to represent manufacturing, construction, urban farming, services, and small trade.

The sampling-allocation table provided along with this research work consists of 633 enterprises in the shown strata although the manuscript indicates 638 enterprises in the total sampling frame. This inconsistency needs to be addressed against the actual municipal sampling frame and sampling sheet. No additional stratum and number of enterprises are inferred in this context.

Table 1
Total population of sub sector and strata population of Hawasa city

Sub-city	Sector	Total number of MSEs	Sample MSEs	Percent
Hak dar	Manufacturing	30	12	22.9
	Construction	20	8	
	Urban agriculture	5	5	
	Service	58	23	
	Small scale trading	28	11	
Menakerya	Manufacturing	67	26	39.8
	Construction	84	33	
	Urban agriculture	0	0	
	Service	70	27	
	Small scale trading	33	13	
Misrak	Manufacturing	41	16	37.3
	Construction	39	16	
	Urban agriculture	2	2	
	Service	143	55	
	Small scale trading	13	5	
Total		**638**	**252**	**100%**

Source

Derived from regional municipal administrative food-security registries.

The qualitative data collection involved 12 key-informant interviews with enterprise financial and sales managers, 2 interviews with municipal officials overseeing food security and entrepreneurship and non-participant observation in 12 manufacturing facilities. Interviews and observations were conducted to provide contextual information for the survey results as well as the study of mechanisms through which infrastructure conditions have influenced enterprise operations.

3.3 Measures

Enterprise livelihood sustainability was conceptualized as an upward tendency in enterprise net monthly income and coded as 1, while no change or downward tendency was coded as 0. This measure is understood as an indicator of livelihood improvement on the enterprise level rather than the measure of livelihood sustainability. It is vital to highlight that the livelihood sustainability is multi-dimensional construct involving resilience to shocks, maintenance of assets and livelihood security [15, 16].

Explanatory variables included: water supply adequacy, access to sanitation, exposure to natural disaster challenges, availability of retailers and resource utilization tendency. All explanatory variables were measured on categorical scale with low categories being treated as reference categories.

3.4 Analytical strategy

Binary logistic regression was performed to determine the relationship between infrastructure and environmental factors and the probability of enterprise livelihoods sustainability. The model formulation is as follows:

$$\log[P_i/(1 - P_i)] = \beta_0 + \beta_1 \text{Water}_i + \beta_2 \text{Sanitation}_i + \beta_3 \text{Disaster}_i + \beta_4 \text{Retailers}_i + \beta_5 \text{Resource Use}_i + \varepsilon_i$$

where P_i is the probability of the increasing net monthly income trajectory of enterprise i. The coefficients of categorical variables compare each category with the low-level category. The results are reported in terms of regression coefficients, standard errors, Wald statistic, test of significance, and odds ratio. Diagnostics of multicollinearity showed the values of VIF from 1.0 to 5.0. Since the data is cross-sectional, and the dependent variable is reported income trajectory, the estimates show statistical association, not causation.

Thematic analysis was performed to analyze the qualitative data as well as for triangulation. The interview and observational data were coded in terms of infrastructure reliability, coping costs, environmental exposure, market accessibility, and institutional coordination in a flexible thematic analysis approach [20].

4 Results

4.1 Enterprise and infrastructure context

The number of cooperatives among the surveyed firms was 88.10%. Services made up 54.37% of firms, while small-scale trade and manufacturing represented 26.59% and 16.67%, respectively. These proportions show that there may be concentration in certain types of activities that have relatively low barriers to entry and limited access to serviced sites. This finding is corroborated by other research showing that youth MSEs in Ethiopia are diverse and depend on sectoral composition, firm characteristics, market access, and policy environment for growth [9, 11].

Dependence on communal or external water and sanitation facilities was revealed through interviews and observations. Interviewees said that infrastructure disruptions had a direct effect on their

businesses since time and money were spent on solving the problem rather than on production and sales. This is in line with literature about the rapid urban growth of Hawassa being associated with pressure on land, wetlands, storm water, and other urban ecological infrastructure [4–8].

Table-2

Result of Binary Logistic Regression Model

Variables in Equation	B	S.E.	Wald	Df	P-value	Odds ratio
Availability of adequate water supply to the enterprise (low ref.)*			8.522	2	.014	
Medium	1.192	.427	7.802	1	.005	3.293
High	.112	.447	.063	1	.802	1.119
Accessibility of selling place (low ref.)*			1.989	2	.370	
Medium	.768	1.228	.391	1	.532	2.155
High	− .741	.826	.804	1	.370	.477
Accessibility of sanitation (low ref.)*			9.704	2	.008	
Medium	− .788	.424	3.451	1	.063	.455
High	-1.156	.382	9.147	1	.002	.315
Availability of money from saving of the enterprise's income (low ref.)*			1.517	2	.468	
Medium	1.028	.949	1.172	1	.279	2.794
High	.905	.835	1.174	1	.279	2.472
Competitiveness of enterprise's products (low ref.)*			4.563	2	.102	
Medium	.201	.603	.112	1	.738	1.223
High	− .645	.349	3.410	1	.065	.525
Availability of retailers to enterprise's products (low ref.)*			11.039	2	.004	
Medium	1.817	.639	8.071	1	.004	6.151
High	− .035	.414	.007	1	.932	.965
Trends of resource usage (low ref.)*			6.277	2	.043	
Medium	-1.379	.563	6.003	1	.014	.252
High	− .461	.422	1.192	1	.275	.631
Challenges from natural disaster (low ref.)*			8.448	2	.015	
Medium	− .556	.461	1.451	1	.228	.574
High	-1.364	.472	8.334	1	.004	.256
Constant	.841	.635	1.755	1	.185	2.319

Note

B=regression coefficient (Estimates), SE=Standard error, df= Degree of freedom, * = Significant at 5% level, low ref. = low level is reference point, * = Significant at the 5% level; low level is the reference category.

4.2 Water and sanitation

Higher water availability was positively linked with sustainable livelihoods. In comparison to the low-water availability, businesses having medium water availability were 3.293 times more likely to experience increasing incomes (B = 1.192, p = .005). The high-water availability category did not have any statistical significance (OR = 1.119, p = .802). This non-linear relationship implies that higher availability of water does not necessarily mean proportionately better results and that the reliability, sufficiency, and service quality of water supply may play an important role next to its availability.

The coefficient of the variable measuring sanitation accessibility was negatively related to the low-access category. For example, for the medium category, the odds ratio is equal to 0.455 (p = .063), whereas for the high category, it is 0.315 (p = .002). However, it would be a wrong interpretation to claim that the existence of sanitation facilities hinders business sustainability. According to the information from the interviews, some enterprises paid for the installation of sanitation facilities themselves. Thus, this variable captures not only the lack of infrastructure but also institutional costs incurred by the enterprises.

4.3 Environmental hazards, resources, and market access

High natural disaster challenges were inversely related to livelihood sustainability (OR = 0.256, B = -1.364, p = .004). The odds ratio represents much lower odds for enterprises from the high-challenge category in comparison to the reference low category for reporting an increase in income. This relationship fits well with recently accumulated evidence about urban growth and land cover change and their implications for storm water flow dynamics in Hawassa [6], as well as changes in wetlands and livelihoods in response to urban growth [5].

Medium resource-use pressure was also inversely related to sustainability (OR = 0.252, B = -1.379, p = .014), suggesting that resource pressures can decrease the margin of enterprises without financial reserves. Medium retailer availability was positively related to sustainability (OR = 6.151, B = 1.817, p = .004), which implies that market spatial access may supplement basic infrastructure and create conditions to facilitate sustainable incomes. This result is consistent with evidence about the importance of market access and links with retailers for enterprise performance in Ethiopia [11, 13].

5 Discussion

The results challenge an instrumental conception of youth entrepreneurship as fundamentally a finance-and-skill problem. Water availability, exposure, resource constraints, and proximity to retail stores are

linked to the livelihoods of enterprises that operate in a specific urban context. The youth enterprise might have received credit and training but still be susceptible to the lack of collective systems in the city which enable productive activity. This interpretation fits with recent research which analyzes youth entrepreneurship from the point of view of interactive socio-ecological conditions [12] and literature from Ethiopia that stresses institutional, market, and supportive linkages [9–14].

The water finding demonstrates the productive aspect of urban infrastructure. The provision of water can decrease disruptions in operations and the costs of substitutions, thus securing working capital. This finding is consistent with the interpretation of infrastructure as productive livelihood capital rather than simply welfare service for households. It is also supported by literature indicating that changes in the land-use system of Hawassa put increasing strain on the urban ecosystems and stormwater management systems [4–8].

There is need for further interpretation of the sanitation effect. The negative relationship does not prove that sanitation quality leads to decreased sustainability. Rather, the result indicates that when sanitation services are lacking or unreliable, then individuals might pay for infrastructure needs out of their own pockets. Thus, the policy issue here is more of an issue of the distribution of infrastructure costs rather than just access alone. This supports the institutional approach of organizational results through organizational structures and resource dependence [17].

The disaster result links youth employment policy to urban planning and adaptation to climate change. Urban growth in Hawassa has transformed the wetlands and altered land cover dynamics, while disaster response depends on land cover dynamics [5, 6]. Other recent works have shown that urban green spaces can help mitigate climate change [8]. All of these findings point to the fact that resilience of enterprises is related to the infrastructure of the city.

The findings also contribute to a growing literature on differentiated urban resilience. Studies conducted in Kumasi have shown that resilience is socio-technical and differentiated between residential and industrial informal areas [21]. Studies from Hawassa provide evidence for the enterprise-livelihood perspective by demonstrating the relationship between infrastructure quality and income trends in youth-led enterprises. Recent studies of youth entrepreneurship in Hosanna also stress the role of socio-political factors in addition to personal characteristics of entrepreneurs [10].

This means that the general governance lesson is that infrastructure and enterprise-related policy should not be separated. Recent literature from Ethiopia shows some governance challenges facing urban development [7], while spatial planning literature emphasizes the need to better integrate industrial development into urban development [22]. In the current study, such governance challenges are seen through the experience of the costs of infrastructure and environmental risks faced by small firms.

The positive relationship with medium retailer presence is also significant because it provides evidence of the connection between infrastructure and the business ecosystem. The Ethiopian evidence indicates that enterprise performance depends on their ability to access markets, materials, financing, training,

and institutions [11, 13, 14]. This study implies that enterprise support should not only focus on establishing firms but also consider the geographic arrangement of buyers, retailers, suppliers, and serviced areas, which could determine whether investments in enterprise pay off through improved income pathways.

6 Policy implications

First, municipalities need to create enterprise zones secure with infrastructure. Potential youth enterprise sites need to be evaluated for water supply, sanitation, drainage, energy, waste disposal, accessibility, and environmental hazards prior to sending enterprises to the site. Serviced infrastructure needs to be considered part of the enterprise support package rather than municipality amenities.

Secondly, youth enterprise policy needs to be linked to spatial planning. It would be unrealistic for credit, registration, and enterprise development targets to be pursued in isolation from the readiness of work spaces, land suitability, infrastructure capacity, and market access. Such integration could be possible via an integrated platform between enterprise development, planning, land management, water and sanitation, environmental protection, and disaster risk management. This is in line with research on Ethiopia's urbanization challenges showing that urban governance and spatial coordination matter [7, 22].

Third, adaptation measures need to be incorporated into enterprise development. Measures such as drainage improvements, flood risk screening, resilient building standards, green infrastructure, and preparedness measures can decrease the vulnerability of productive assets. The wetlands changes, stormwater vulnerability, and urban expansion experienced by Hawassa together with the ecological context render this suggestion important [4–8].

Fourth, monitoring needs to differentiate between access to infrastructure and costs incurred due to lack of infrastructure. A business that accesses a particular infrastructure by spending much in installation and maintenance costs is in a different livelihood situation from one that is supported by proper common infrastructure.

Ultimately, policy assessment needs to focus more on the livelihood quality rather than on the creation of enterprises and credits provided. It is important to note that the number of the enterprises created or the provision of certain amounts of credit does not provide a complete picture in case these enterprises continue to operate in insecure locations and face consistent income loss.

7 Limitations and conclusion

The current research paper has several limitations. Firstly, a cross-sectional approach implies no temporal ordering and causality between variables. Secondly, livelihood sustainability is captured by the reported income trajectory. Thirdly, the environmental and infrastructure variables are categorical, and hence, it is impossible to capture the reliability, duration, intensity, and cost of the infrastructure. Fourthly,

the study focuses on three sub-cities of Hawassa only, and therefore, the findings cannot be extrapolated to other Ethiopian cities or African secondary cities.

Notwithstanding these deficiencies, the study reveals that the sustainability of youth enterprise livelihood in Hawassa depends on the physical infrastructure and environmental conditions of the urban spaces where businesses are located. Medium availability of water is positively linked to positive changes in income trend, whereas high challenges from natural disasters and medium pressure for natural resources use have negative effects on the sustainability of the business. Also, retailer availability is positively related to the dependent variable. The results related to sanitation highlight the need to interpret the infrastructure indicators in terms of service providers' identity.

The key contribution of the article is the reinterpretation of municipal infrastructure as productive livelihood capital. For youth-managed MSEs, electricity, proper drainage systems, climate-resilient conditions, safe workspace, and markets connectivity cannot be treated as additional amenities but are essential factors that influence the economic viability of their business. This implies that in rapidly urbanizing African secondary cities, youth employment policies and urban planning policies should be seen as mutually reinforcing policy fields.

Declarations

Competing interests

The author declares that he does not have any competing financial interest or personal relationship that may have influenced or impacted the empirical results and policy recommendations in this paper.

Ethics approval and consent to participate

According to the manuscript, the study was conducted according to the principles of the Declaration of Helsinki and approved by the Institutional Review Board of the hosting public academic institution according to the protocol number DBU/IRB/2026-098. Moreover, informed written consent was obtained from the participants prior to the data collection process.

Consent for publication

No information or images of individuals that would need publication consents to publish are included in the manuscript. In case the manuscript includes identifiable material at a later time, the statement needs to be changed.

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Author Contribution

The author, T.A.W. contributed alone on the conceptualization, design of the study, sampling, data analysis, interpretation, writing and revising the manuscript.

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Data Availability

The datasets from the survey and qualitative analysis include sensitive organizational data from youth micro-enterprises. Consequently, the manuscript does not include the raw data in the public domain. Anonymized data can be shared from the corresponding author upon request.

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